Acta Medica Okayama

Volume 8, *Issue* 1 1952 *Article* 1

JANUARY 1952

Studies on the Helminth Fauna of Japan. Part 49. Cestodes of Fishes, II.

Satyu Yamaguti*

*Okayama University,

Studies on the Helminth Fauna of Japan. Part 49. Cestodes of Fishes, II.*

Satyu Yamaguti

Abstract

Caryophyllaeidae Claus, 1879 1. Glaridacris limnodrili Yamaguti, 1934 Bothriocephalidae Blanchard, 1849 2. Bothriocephalus fluviatilis n. sp. 3. B. lateolabracis n. sp. 4. B. branchiostegi n. sp. 5. B. acheilognathi Yamaguti, 1934 6. B. brotulae n. sp. 7. B. apogonis n. sp. 8. Oncodiscus sauridae Yamaguti, 1934 9. Glossobothrium nipponicum n. g., n. sp. Amphicotylidae Ariola, 1899 10. Amphicotyle quinquarii n. sp. 11. Eubothrioides lamellatus n. g., n. sp. Phyllobothriidae Braun, 1900 12. Phyllobothrium triacis n. sp. 13. P. filiforme n. sp. 14. P. serratum n. sp. 15. P. laciniatum (Linton, 1889) 16. P. loculatum n. sp. 17. P. squali n. sp. 18. P. lactuca van Beneden, 1850 19. Anthobothrium rajae n. sp. 20. A. pteroplateae n. sp. 21. A. bifidum n. sp. 22. A. parvum Stossich, 1895 23. Orygmatobothrium musteli (van Beneden, 1850) 24. O. versatile Die3ing, 1854 25. Monorygma megacotyla n. sp. 26. Pithophorus vulpeculae n. sp. 27. Echeneibothrium bifidum n. sp. 28. E. tobijei Yamaguti, 1934 29. Marsupiobothrium alopias n. g ., n. sp. 30. Dinobothrium spinulosum n. sp. 31. Gastrolecithus planus (Linton, 1922) n. g. Onchobothriidae Braun, 1900 32. Acanthobothrium triads n. sp. 33. A. micracantha n. sp. 34. A. latum n. sp. 35. A. gracile n. sp. 36. A. dasybati Yamaguti, 1934 37. A. ijimai Yoshida, 1917 38. A. grandiceps n. sp. 39. Calliobothrium verticillatum (Rud., 1819) van Bened., 1850 40. Platybothrium auriculatum n. sp. 41. P. musteli n. sp. Aberrant Tetraphyllidea 42. Pelichnibothrium speciosum Montic., 1889 43. Discobothrium japonicum Yamaguti, 1934 Tentaculariidae Poche, 1926 44. Nyelinia manazo n. sp. 45. N. sphyrnae n. sp. Floricipitidae Dollfus, 1929 46. Floriceps uncinatus (Linton, 1924) Tetrarhynchidean larvae 47. Pintneriella musculicola Yamaguti. 1934 48. Microbothriorhynchus coelorhynchi n. g., n. sp. 49. Oncomegas wageneri (Linton, 1890) 50. Pterobothrium chaeturichthydis n. sp. 51. P. hira n. sp. 52. Callotetrarhynchus speciosus (Linton, 1897) 53. Symbothriorhynchus uranoscopi n. g., n. sp. 54. Nybelinia anguillae n. sp. 55. N. nipponica n. sp. 56. Otobothrium dipsacum Linton, 1897

Studies on the Helminth Fauna of Japan. Part 49. Cestodes of Fishes, II.

With 22 Plates.

By

Prof. **Satyu Yamaguti**

(Department of Parasitology, Okayama University Medical School)

Received for publication on 16 April 1926.

Contents.

CARYOPHYLLAEIDAE Claus, 1879.

1. *Glaridacris limnodrili* Yamaguti, 1934.

Two immature and four mature specimens from *Pseudogobio*

esocinus from Lake Suwa measured in alcohol 1.25 – 2.6 mm long by 0.3 – 1.0 mm broad. In my previous description the uterus is stated that it does not extend farther forward than the cirrus pouch, but in one of the present gravid specimens it is strongly distended with eggs and pressed not only against the vitellaria but also against the posterior testes.

BOTHRIOCEPHALIDAE Blanchard, 1849.

2. *Bothriocephalus fluviatilis* n. sp.
(Pl. I, Fig. 1)

Habitat and locality. Small intestine of *Hymenophysa curta* (Temm. et Schleg.); River Yodo, Kyoto Prefecture.

Small tapeworm 22.5 mm in length, with maximum breadth of 0.65 mm at end proglottides, comprising about 100 genital sets. Scolex subcylindrical, sharply set off from first segment, 0.8 mm in length, 0.43 mm in maximum breadth. Terminal disc not distinctly marked out, 0.3 mm in diameter. Sucking grooves about 0.6 mm long, shallow, indistinctly delimited. No neck portion. Strobila gradually increasing in breadth posteriorly. First few proglottides measuring 0.18 – 0.21 mm in length and 0.35 – 0.36 mm in breadth; a series of 11 posterior mature segments, separated at the time of mounting, measures 2.86 mm in length, and 0.47 – 0.65 mm in breadth, each segment being 0.26 mm long by 0.56 mm broad on the average. First genital anlage appearing 3.0 mm behind scolex. Excretory stem narrow (only 3 μ wide), running through medial portion of testicular field. No transverse anastomosis. Testes oval, about 40 in each proglottis, divided into two two-layered submedian groups extending throughout proglottis length and continuously from proglottis to proglottis. Vas deferens convoluted near base of cirrus pouch, may be up to 30 μ wide when distended with spermatozoa. Cirrus pouch pyriform, 50 – 70 μ in diameter, situated obliquely on right or left of median line; its base on a level with uterine pore in contracted proglottides, usually posterolateral to it, occupied completely by vesicula seminalis, surrounded by prostatic cells; pars prostatica not differentiated; cirrus narrow, winding in distal portion of cirrus pouch. Genital pore dorsal, postequatorial, just out of median line. Ovary bilobed, 144 – 240 μ in transverse diameter in posterior proglottides. Uterine sac globular, up to 66 μ in diameter, opening ventrally near anterior end of proglottis

almost in median line or a little to one side of it opposite base of cirrus pouch. Vitelline follicles small, distributed diffusely in one layer in cortical parenchyma but rather sparsely in dorsal and ventral median fields. Vagina narrow, winding, opening sideways into base of genital cloaca.

This species resembles *Bothriocephalus formosus* Müller et van Cleave, 1932, more closely than any of the other known members of the genus, but differs chiefly in maximum breadth of strobila, in size of scolex. and in position of uterine pore relative to that of cirrus pouch. In the American species the cirrus pouch lies exactly posterior to the uterine pore, whereas in our species the former lies posterolateral or even lateral to the latter and never in the median field.

3. *Bothriocephalus lateolabracis* n. sp.
(Pl. I, Figs. 2 and 3; Pl. XIX, Figs. 1 and 2)

Habitat and locality. Small intestine of *Lateolabrax japonicus* (Cuv. et Valenc.); Mie Prefecture.

Strobila about 13 cm long by 3.5 mm broad. Scolex 1.9 × 1.3 mm, somewhat rectangular in end-on view, with inconspicuous terminal disc notched in median line, constricted posteriorly. Anterior segments distinctly campanulate in groups of two; middle ones densely crowded, without indication of grouping, posterior ones 4–15 times as broad as long. with transverse wrinkles and one or two submedian furrows on dorsal and ventral surface. Inner longitudinal muscle bundles columnar, pressed one against the other, each consisting of innumerable fine fibers becoming smaller toward lateral edges. A thin transverse muscle layer just inside inner longitudinal muscle sheath. Outermost medullary excretory stems running along outskirt of testes, innermost stem prominent, passing beside ovary. Nerve cord a little nearer to ovary than to outer end of testes. Testes single-layered, occupying whole of medulla outside of ovary and uterus; their total number is unable to determine. Cirrus pouch elliptical to pyriform, up to 0.22×0.09 mm, with thick muscular wall, situated oblique-sagittally with proximal end intruding into medulla opposite uterine sac, containing winding ductus ejaculatorius 15 μ wide and straight cirrus 20 μ wide. Cirrus opening into funnel-shaped genital atrium at its bottom. Genital pores nearly middorsal, near anterior end of each segment, irregularly alternate. Ovary unbranched, trans-

versely elongated along posterior margin of segment. Vitelline follicles very closely arranged in one layer just outside of inner longitudinal muscle sheath, interrupted in dorsal and ventral median fields. Uterine sac occupying entire thickness of medullary parenchyma, may extend as far outward as nerve cord of its own side, not encroaching much on neighboring proglottides. There being no preformed uterine pore, eggs are discharged by the rupture of the body wall, which occurs on the dorsal or ventral surface as the case may be. Eggs light brown, elliptical. thick-shelled, 70 – 79 × 42 – 47 μ in life; contained ovum not segmented. Vagina opening into genital atrium immediately behind cirrus or a little to side of uterine sac, without sphincter. No receptaculum seminis vaginae.

Since the detailed structure of *Bothriocephalus labracis* Duj., 1845, from the related host, *Labrax lupus*, is not known to me owing to Ariola's paper being inaccessible, I would regard the present species as provisional.

4. *Bothriocephalus branchiostegi* n. sp.
(Pl. I, Figs. 4 and 5)

Habitat and locality. Small intestine of *Branchiostegus japonicus* (Houttuyn); Tosa.

Length up to 45 mm or more, breadth 1.5 – 2.0 mm under cover glass pressure. Scolex semi-elliptical in lateral view, 0.45 – 0.46 mm in length, with maximum dorsoventral diameter of 0.2 – 0.3 mm near its posterior end. Sucking groove running on dorsal and ventral side throughout length of scolex, with prominent relatively thin edges. No neck. Strobila gradually increasing in length as far back as some distance behind its middle, whence it gradually narrows again toward posterior extremity; consisting of 90 – 150, distinctly campanulate proglottides, whose salient posterior border is deeply incised both dorsally and ventrally. Secondary segmentation present in anterior part of strobila. Terminal proglottis sterile, reduced to a conical or nodular lobe; penultimate one sterile or gravid, 0.27 – 0.75 × 0.28 – 0.65 mm, with sides nearly parallel and somewhat constricted at segmentation line, and posterior border less markedly incised. Testes arranged in one layer in submedian medulla, about 10 on each side. Vas deferens convoluted near proximal end of cirrus pouch opposite uterine sac. Cirrus pouch oval, up to 90 μ in diameter, with thick wall consisting

of inner circular and outer longitudinal muscle fibers, surrounded by accompanying cells except at its proximal end penetrated by ducts of prostatic cells. Pars prostatica well differentiated at base of cirrus pouch. Cirrus plump, smooth, opening dorsally in median line a little in front of middle of proglottis at about level of postero-lateral corners of preceding segment. Ovary transversely elongated, coarsely lobed, somewhat attenuated at middle, about 0.1× 0.19 mm in the segment shown in Pl. I, Fig. 5, situated in ventral median field of medulla at posterior end of proglottis, with testes on each side or with testes on one side and uterus of the succeeding segment on the other side in contracted fully gravid proglottides. Uterine sac fairly large, alternating irregularly from right to left of median line, opening ventrally usually a little out of median line in front of genital pore at anterior end of proglottis. Eggs elliptical, operculate, thin-shelled, 54 – 60×30 – 33 μ in life ; contained ovum not segmented ; first eggs appearing in the 55th to 65th segment. Vagina narrow throughout, provided with very powerful sphincter 20 – 40 μ in diameter at its opening which lies immediately postero-lateral to the male aperture. Vitelline follicles relatively large, closely arranged in one layer in cortical parenchyma, interrupted in dorsal and ventral median field.

This species differs from the closely allied *B. manubriformis* (Linton, 1899) in shape and size of scolex and strobila, number of testes, etc.

5. *Bothriocephalus acheilognathi* Yamaguti, 1934.

Three immature specimens of this worm were found in the small intestine of *Gnathopogon elongatus suwae* (Jord. et Hubbs) from Lake Suwa. They are 10 – 28 mm long and consist of 84 – 113 segments.

6. *Bothriocephalus brotulae* n. sp.
(Pl. II, Figs. 6 and 7)

Habitat and locality. Small intestine of *Brotula multibarbata* Temm. et Schleg. ; Onahama, Hukusima Prefecture.

Length 205 mm, maximum breadth 2.8 mm. Scolex 0.475 mm long, with a wide longitudinal groove on each surface ; lateral edge 234 μ in diameter ; no distinct apical disc. In lateral view it is nearly parallel-sided and assumes a cylindrical appearance. Stro-

bila covered all over with exceedingly small spines, increasing in breadth toward fully gravid portion, whence it tapers again toward the end proglottides. Anterior segments campanulate or trapezoidal, with secondary segmentations which are no more distinguishable from the primary segmentations in gravid proglottides. Mature and gravid proglottides much broader than long, with senile proglottides narrower, may be longer than broad (1.2 – 1.6× 0.75 mm) when extended. Testes in small number, arranged in each lateral medulla in one layer. Vas deferens 6 – 20 μ wide, winding between base of cirrus pouch and uterus. Cirrus pouch fusiform, elliptical or pyriform, 0.1 – 0.13 mm long by 54 – 60 μ broad, with thin wall of fine longitudinal fibers. Ductus ejaculatorius winding, 6 – 8 μ wide, may form an inconspicuous dilatation at its proximal end. Common genital pore at center of dorsal surface of proglottis, but pre-equatorial in senile proglottides. Ovary transversely elongated with the two ends directed dorsally, 0.15× 0.55 mm in the gravid proglottis figured. Uterine sac opening midventrally at anterior end of proglottis, rounded or oval, 0.2–0.55 mm in diameter, provided with a lamellar connective tissue capsule which is extensible with the increase of its contents and may encroach upon the preceding segment. Vitelline follicles rounded, extending in one layer just outside inner longitudinal muscle sheath continuously from proglottis to proglottis. Eggs elliptical or elongate oval, 75 – 84×45 – 52 μ; ovum not segmented.

This species differs from the closely related *Bothriocephalus sciaenae* Yamaguti, 1934, in shape and size of scolex, in size of eggs, etc.

7. *Bothriocephalus apogonis* n. sp.
(Pl. II, Figs. 8 and 9; Pl. XIX, Figs. 3 – 6)

Habitat and locality. Small intestine of *Apogon lineatus* Temm. et Schleg.; Tokoname Aiti Prefecture.

Length 26 – 58 mm, breadth increasing toward middle of strobila to a maximum of 2 – 3 mm, decreasing again further posteriorly. Maximum thickness 0.75 mm in contracted state. Scolex 0.3 – 0.35 mm long, with greater diameter dorsoventrally than transversely; terminal disc 0.2 – 0.25 mm in transverse diameter, excavated on apical surface; surficial bothria with a shallow, transverse slit in median line at base of terminal disc, and two fleshy lateral lobes which rest on the first segment posteriorly and show two or three

rib-like transverse folds between. Neck absent. Strobila serrate, consisting of 450 – 530 segments in fully gravid individuals, with a distinct median furrow on each surface in immature portion, and less conspicuous longitudinal ones outside of uterine field. Secondary external segmentations are seen here and there throughout the strobila. Posterior borders of proglottides salient, incised by above mentioned longitudinal furrows. Gravid proglottides with almost parallel sides, 0.15 – 0.25 × 0.9 – 1.0 mm. Transverse musculature divided into two layers by strong inner longitudinal muscle bundles. One of the main excretory vessels passing between lateral testicular field and median genital complex, another at lateral edge of medulla, with intermediate one in testicular field and indefinite longitudinal vessels in innermost layer of cortical parenchyma. Testes divided into two lateral groups, 12 – 18 on the right, 12 – 19 on the left, totalling 24 – 36 for each proglottis, a few of them lying medial to nerve trunk. Vas deferens narrow, strongly convoluted, occupying entire thickness of medulla immediately lateral to cirrus pouch. Cirrus pouch oval to pyriform, 50 – 65 μ in diameter, with thick wall of lamellar muscle fibers, situated in median field in front of ovary. Cirrus wider (15 μ in outside diameter) than ductus ejaculatorius, lined with thick cuticle, opening into genital atrium immediately in front of vagina. Genital pore equatorial, in middorsal line or only slightly out of it. Ovary coarsely lobed or indented, situated in median field at posterior end of proglottis with its central portion in contact with ventral boundary of medulla and its lateral portions directed dorsally. Uterine sac oval, occupying entire length of proglottis opposite convoluted vas deferens, opening ventrally a little to right or left of median line at anterior end of proglottis. Before opening to the outside the uterine sac leads into a rounded sucker-like vestibule which is lined with cylindrical epithelia and provided densely with radial muscle fibers and surrounded by a thick coat of accompanying cells. Eggs elongate oval or elliptical, 66 – 78 × 34 – 48 μ in life, hatching in 9 days in watch glass culture at room temperature of 16° – 20°. Vagina narrow, but somewhat enlarged at its opening immediately behind cirrus. Vitelline follicles single-layered, extending in dorsal and ventral cortical parenchyma between outer layer of transverse muscle and subcuticular cell layer.

This species is characterized by the bothria possessing rib-like transverse folds.

8. *Oncodiscus sauridae* Yamaguti, 1934.

This worm was found in the small intestine of *Saurida argyrophanes* from East China Sea and Tosa Bay.

9. *Glossobothrium nipponicum* n. g., n. sp.
(Pl. II, Fig. 10; Pl. III, Fig. 11; Pl. XIX, Figs. 7 - 10)

Habitat and locality. Intestine of an unknown fish related to *Psenopsis anomala*; Taizi, Wakayama Prefecture.

Length 33 - 52 mm, breadth increasing posteriorly but decreasing toward gravid end proglottides. Largest strobila comprising 240 segments. Scolex consisting of three parts, i.e., an apical disc, surficial sucking grooves and their tongue-shaped basal appendages; apical disc cushion-like in shape, 0.13 - 0.14 mm dorsoventrally and 0.18 - 0.23 mm transversely; sucking groove with thin lateral margins about 0.6 mm long, deepest (0.11 mm) at middle; sucking appendage fluted externally, 0.35 - 0.5 mm long by 0.18 - 0.2 mm broad, arising from base of sucking groove, projecting horizontally in dorsoventral direction with its end usually turned backwards. No neck. Proglottides crowded throughout strobila with salient posterior borders; anterior ones distinctly imbricated, often with a secondary segmentation; gravid ones 0.6 - 1.0 mm long by 1.4 - 2.35 mm broad, more or less transversely corrugated. Testes 60 - 100 in number for each proglottis, extending in one layer in medulla, divided into two lateral groups, which may be united with each other behind the ovary by a single transverse row of testes, 9 - 28 in front of cirrus pouch, 9 - 17 behind vagina, 38 - 56 on the antiporal side. Cirrus pouch club-shaped, oblique, 0.5 - 0.75 × 0.21 - 0.25 mm, surrounded all round by a layer of deeply staining gland-like cells; its muscular wall up to 36 μ thick, consisting of a very thick inner layer of circular fibers and a thinner outer layer of longitudinal fibers. Ductus ejaculatorius 6 - 12 μ wide, convoluted, cirrus densely covered with exceedingly minute, medially directed spines. Genital pores distinctly notched, irregularly alternate, though tending to be unilateral, at junction of middle with posterior third of proglottis margin. Ovary 0.15 - 0.25 × 0.9 - 1.4 mm in gravid proglottides, with two morulate lobes extending transversely at posterior end of proglottis, with its central isthmus a little to pore side of median line. Uterus opening ventrally in median line a little behind anterior end of proglottis on a level with anteriormost

border of cirrus pouch or only slightly in front of it. It may extend further anteriorly to near anterior end of proglottis in front of base of cirrus pouch, and sometimes it may develop another tubular outgrowth toward antiporal side, thus forming a widely divergent Y- or V-shaped fork in front of uterine pore. Immediately before opening to the outside, it forms a well defined globular or oval uterine sac up to 0.25 mm in diameter when fully distended with eggs. Eggs oval, operculate, 57 – 75×39 – 49 μ in life, containing unsegmented ovum and a number of large yolk cells. Vagina forming fusiform muscular swelling up to 84 μ wide in front of ovarial isthmus.

This genus is characterized by peculiar tongue-shaped appendage of scolex, fusiform muscular swelling of vagina, marginal genital pore, median uterine pore, cortical vitellaria, etc. Except for the structure of the scolex and vagina and the marginal genital pore, it bears a close resemblance to *Parabothriocephaloides* Yamaguti, 1934. In order to include the present genus it seems necessary to emend the subfamily *Parabothriocephalinae* Yamaguti, 1934.

Glossobothrium n. g.

Generic Diagnosis. Bothriocephalidae Blanchard, 1849. Scolex with two longitudinal bothria on flat sides of strobila and a tongue-shaped fluted appendage projecting outwards at right angles from base of each bothrium. No neck. Proglottides crowded, imbricated. Testes numerous, in medulla. Cirrus pouch strongly muscular, large Cirrus armed with exceedingly minute spines, opening into genital atrium in front of vagina. Genital pores marginal, alternating irregularly. Ovary bilobed, displaced a little to atrial side at posterior end of proglottis. Uterus sigmoid, median, forming saccular dilatation just before opening midventrally near anterior end of proglottis. Vagina forming fusiform muscular swelling in front of ovarial isthmus. Vitellaria follicular, cortical, diffuse. Eggs operculate, containing unsegmented ova. Parasitic in marine fishes.

Genotype : *Glossobothrium nipponicum.*

AMPHICOTYLIDAE Ariola, 1899.

10. *Amphicotyle quinquarii* n. sp.

(Pl. III, Figs. 12 and 13 ; Pl. XIX, Figs. 11 and 12)

Habitat and locality. Small intestine of *Quinquarius japonicus* (Döderlein) ; Tosa Bay.

Length up to 50 cm, breadth up to 2.65 mm. Scolex flattened from side to side, with dorsoventral diameter of about 0.4 mm at its

button-shaped terminal disc, which is slightly constricted off from the remainder of the head and shows in the median plane two distinct (a dorsal and a ventral) sinuses representing the anterior ends of the sucking grooves of the bothridia. Bothridia[1] surficial, canoe-shaped, with fairly thick, inflected borders, 0.3 – 0.35 mm wide, 1.0 – 1.4 mm long from lateral edges of apical disc to their own posterior ends projecting prominently over the first proglottis, each divided by transverse septal grooves into several loculi, of which the two extremes form the deepest, most efficient suctorial pockets. Neck absent. Strobila gradually increasing in breadth toward the proglottis in which the first eggs appear in the uterus, and then almost uniformly broad for a considerable length, and finally narrowing gradually toward posterior extremity. Anterior proglottides distinctly imbricated, with or without secondary segmentation. As development proceeds the typical imbrication disappears, while on the dorsal and ventral surfaces irregular circular wrinkles make their appearance, so the original segmentation lines become less conspicuous, and finally disappear completely in the terminal segments. Of the longitudinal excretory stems there are in the median frontal plane four or five pairs in the medulla and one or two in the cortex; they communicate with one another by reticular anastomoses. The outermost stems send out side branches opening to the exterior by so-called foramina secundaria at the marginal notches. Testes oval, 70 – 100 in number for each proglottis, distributed in medulla in one layer from side to side and continuously from proglottis to proglottis. Vas deferens up to 20 – 40 μ wide, tightly convoluted anteromedial to base of cirrus pouch, tapering toward its distal end, which is only 7 or 8 μ in diameter at the point of penetrating the cirrus pouch. Cirrus pouch club-shaped, 0.4 – 0.5 × 0.12 – 0.17 mm, composed of thick inner circular and thin outer longitudinal muscles, containing ductus ejaculatorius and cirrus embedded in cellular parenchyma, situated transversely or somewhat obliquely with proximal end reaching to preovarian uterine duct in fully mature or gravid segments. Cirrus up to 0.45 mm long by 39 μ broad, armed throughout its length with stout, rose-thorn-shaped spines 15 μ long, opening outside immediately in front of vaginal aperture on right or left margin at

1) In the present species the sucking apparatus is so prominent that this term seems more appropriate than bothria.

level of anterior end of ovary or slightly in front of it. Ovary 0.15–0.28×0.32–0.5 mm, consisting of two, compact, almost symmetrical lobes with indented surface and a moderately broad isthmus, situated usually not exactly in median field but slightly toward pore side nearer to ventral cortex than to the dorsal; pore side lobe usually a little larger than the other. Uterine sac globular to oval, up to 0.38 mm in diameter when fully distended with eggs, with distinct muscular wall, densely covered by cilia, situated in median line some distance in front of ovary, penetrating ventral inner longitudinal muscle sheath, and opening ventrally by way of a funnel-shaped passage lined with smooth cuticle. Eggs elliptical or elongate oval, non-operculate, thin-shelled, 57–69 μ long by 36–40 μ broad in sectioned and total preparations. Vagina opening immediately behind cirrus, divided into a narrow proximal portion and a muscular distal portion lined with cuticle and surrounded by accompanying cells. Vitelline follicles distributed all round the proglottis just outside of inner longitudinal muscle sheath, occasionally intruding into latter or medullary parenchyma, continuously from proglottis to proglottis.

This species differs from *Amphicotyle heteropleura* (Dies., 1850) of Schumacher in shape and size of body, size of cirrus pouch and eggs, etc. It is worth while noting that the ovary lies in the dorsal medulla in Schumacher's material, whereas in the present species it lies in the ventral medulla.

11. *Eubothrioides lamellatus* n. g., n. sp.
(Pl. III, Figs. 14 and 15; Pl. XIX, Fig. 13)

Habitat and locality. Small intestine of *Zenopsis nebulosa* (Temm. et Schleg.); Suruga Bay.

Length 90–210 mm, breadth 1.8–3.0 mm. Scolex sagittate, 1.2–1.5 mm anteroposteriorly, 2.0–2.5 mm dorsoventrally at its base, 0.7–0.85 mm transversely, without distinct apical plate or disc. On the dorsal and ventral side of the scolex there is a prominent longitudinally elongated simple bothridium with somewhat crenulated, fleshy edges. No neck. Strobila fleshy, gradually increasing in breadth and thickness toward the point some distance short of posterior extremity, whence it tapers posteriorly, with an inconspicuous groove throughout on middorsal and midventral surface. Proglottides strongly crowded, rather laminate for greater

part, but elongated posteriorly and distinctly campanulate, elliptical or oval in cross section; first proglottides broader than head, terminal one markedly atrophied. Nerve cord immediately dorsal to vas deferens and vagina on one side but ventral on the other side. In addition to the dorsal and ventral excretory stems there is an accessory stem with the same caliber as the dorsal stem inside the two regular stems opposite the nerve cord. It communicates with the ventral stem at varying levels and may often be obsolete on one side or both. Between the dorsal stems of the two sides is a transverse anastomosis, but none between the ventral stems, though the latter directly communicate with the plexus in the surrounding parenchyma and also with the accessory stem as described above. Testes oval, about 30 in number for each proglottis, a little fewer on the pore side, massed together in two lateral fields between uterus and nerve cord; a few of them may intrude into the space among the innermost bundles of the inner longitudinal muscle sheath. Vas deferens, 12 – 20 μ wide, strongly twisted anterodorsal to ovary between uterus and nerve cord, but narrower (about 12 μ wide) and more loosely twisted further distally, usually passing between two excretory stems along with vagina, but dorsal to them in some proglottides. Cirrus pouch elliptical, 0.1 – 0.135 mm long by 50 – 75 μ broad, situated transversely in cortex behind equator, reaching not quite to outer layer of inner longitudinal muscle sheath, containing a spirally twisted ductus ejaculatorius and a short, narrower, unarmed cirrus opening into genital atrium alongside vagina. Genital atrium funnel-shaped, indifferently on right or left margin of proglottis near its posterior corner or on the same side in several successive proglottides. Ovary coarsely indented or lobed, 0.2 – 0.45 mm transversely, situated in ventral medulla just medial to ventral excretory stem of pore side. Uterus wide, tubular, convoluted, occupying considerable median space between testicular fields. Uterine sac relatively small, penetrating ventral muscle sheath and cortical parenchyma sagittally and opening on midventral surface near anterior end of proglottis, often covered up by posterior margin of preceding proglottis. It is elliptical, fusiform or pyriform in horizonal section, with the attenuated end directed dorsally, 70 – 140 μ in diameter, and lined, like the uterus proper, with a layer of strongly flattened epithelia and surrounded by subcuticular muscle and cell layers continuous with those of body wall. No cilia have been observed on the epithelia.

Uterine pore lined with cuticle. Eggs elongate pyriform, with attenuated end gently bowed to one side, operculate at broader end, thin-shelled, 80 – 102×32 – 45 μ; contained ovum segmented. Vitelline follicles distributed all round in cortical parenchyma except for anterior part of proglottis; some of them may intrude into the outer layer of the inner longitudinal muscle sheath. Vagina narrow throughout, opening into genital atrium immediately dorsal or ventral to cirrus, running transversely along with vas deferens dorsal to nerve cord on one side and ventral to it on the other side, and then between two excretory stems, occasionally dorsal to them.

The present genus, apparently belonging to Amphicotylidae Ariola, 1899, differs from the most closely related members of the family, *Eubothrium* Nybelin and *Amphicotyle* Diesing as follows :

	Eubothrioides n. g.	*Eubothrium* Nybelin	*Amphicotyle* Diesing
Surficial grooves of strobila	present	present	absent
Position of nerve cord relative to cirrus or vas deferens and vagina	dorsal on one side, ventral on other side	dorsal on both sides	dorsal on both sides
Cirrus pouch	confined to cortex	extending into medulla	extending well into medulla
Ovary	submedian	median	submedian[1]
Vitellaria	continuous in median field	interrupted in median field	continuous in median field
Eggs	operculate, thin-shelled	operculum ? thick-shelled	without operculum, thin-shelled

As is evident from the comparative table given above, *Eubothrioides* bears a certain resemblance to *Eubothrium* Nybelin on the one hand and to *Amphicotyle* Diesing on the other. It may be defined as follows :

1) Schumacher states that the ovary lies in the median field opposite the uterine pore in *A. heteropleura*, but in *A. quinquarii* it lies ventrally a little to the pore side of the median line.

Eubothrioides n. g.

Generic Diagnosis. Amphicotylidae Ariola, 1899. Scolex sagittate, without distinct apical disc; bothridia simple. No neck. Strobila fleshy, with a dorsal and a ventral longitudinal groove; external segmentation distinct. Two pairs (a dorsal and a ventral) of excretory stems. Nerve cord dorsal to vas deferens and vagina on one side and ventral on the other side. Testes in two lateral fields inside of nerve cord. Cirrus pouch muscular, small, confined to cortical parenchyma. Genital pore marginal, irregularly alternate. Ovary transversely elongated, ventral, just medial to ventral excretory stem of pore side. Shell gland complex dorsal. Uterus tubular, convoluted in median field. Uterine sac comparatively small, opening on midventral surface near anterior end of proglottis. Eggs elongate pyriform, with attenuated end gently bowed to one side, operculate, thin-shelled. Vitellaria follicular, distributed all round in cortex, not interrupted in median field. Vagina narrow throughout, not forming receptaculum seminis. Vas deferens and vagina passing usually between dorsal and ventral excretory stem, occasionally dorsal to these. Parasitic in marine fishes.

Genotype: *Eubothrioides lamellatus.*

PHYLLOBOTHRIIDAE Braun, 1900.

12. *Phyllobothrium triacis* n. sp.
(Pl. IV, Fig. 16; Pl. XX, Fig. 14)

Habitat and locality. Spiral intestine of *Triacis scyllium* Müller et Henle; Pacific.

Length 35 – 46 mm, breadth 0.8 – 0.9 mm; strobila consisting of 40 – 50 segments. Scolex about 0.68 mm in diameter. Bothridia thin, 0.4 – 0.5 mm in diameter, with entire margin; accessory suckers on anterior margin. 60×65 – 75 μ. Neck slender, about 10 mm by 0.1 mm broad, with marginal serration due to transverse wrinkles. Proglottides finely serrate, a little broader than long, parallel-sided anteriorly, but about twice as long as broad and somewhat constricted at intersegments posteriorly, 1.45 – 2.0×0.8 – 1.05 mm, with distinct notch at genital pore; posterior margin overlapping anterior end of succeeding segment. Testes 180 – 230 in number, extending in one layer with their outskirts enclosed between dorsal and ventral layer of vitellaria and leaving a free space in front. Cirrus pouch pear-shaped, slightly curved forwards, 0.27 – 0.35×0.11 – 0.175 mm, thin-walled. reaching to near median line. Cirrus muscular, convoluted, lined throughout with minute spines, opening immediately behind vagina into genital atrium, which in turn opens to the exterior on the same side (left in the

type and right in the two paratypes) throughout the strobila twice or a little more as far from the posterior end of the proglottis as from the anterior. Ovary 4-winged, 0.22 – 0.3×0.5 – 0.6 mm, each wing composed of numerous, slender, tubular acini extending to outer boundary of medulla. Uterus terminating at level of proximal end of cirrus pouch. Vagina forming a conspicuous fusiform swelling in front of cirrus pouch. Receptaculum seminis vaginae oval to elliptical, 50 – 90 μ in diameter. Vitellaria V-shaped in cross section, extending between nerve cord and excretory stems from anterior end of proglottis to ovary but not further backwards.

This species resembles *Phyllobothrium dasybati* Yamaguti, 1934, very closely, but differs from it distinctly in the cirrus being conspicuously spinose. In *P. dasybati* the cirrus is entirely devoid of spines. In this species the serration of the cuticle is also present throughout the strobila though not mentioned in my previous description.

13. *Phyllobothrium filiforme* n. sp.
(Pl. IV, Figs. 17 and 18)

Habitat and locality. Spiral intestine of *Alopias vulpinus* (Bonnaterre); Pacific,

Length 13 – 24 mm, breadth 0.3 – 0.45 mm. Scolex 0.45 – 0.47 mm in diameter. Bothridia thin, round, 0.25 – 0.3 mm in diameter, sessile, with entire margin; accessory suckers submarginal, directed toward axis of scolex, 55 – 75 μ in diameter. Neck about 5 – 6 mm long by 65 – 75 μ broad, wrinkled transversely. Proglottides also with serrate margins, 25 – 40 in number for each strobila, gradually increasing in length toward posterior extremity of strobila, with lateral margins nearly parallel and posterior margin slightly covering somewhat contracted anterior end of succeeding segment; last proglottis 1.0 – 2.0 × 0.3 – 0.45 mm. No gravid segments observed. Testes 100 – 120 in number, continuous in front but arranged in one row at level of cirrus pouch and in four somewhat zigzag rows behind it, two on each side. Cirrus pouch pyriform, thin-walled, 0.16 – 0.19×0.08 – 0.12 mm, extending only slightly beyond median line, cirrus covered inside with minute spines and outside with accompanying cells, opening into small genital atrium immediately behind vagina. Genital pores usually irregularly alternate, occasionally unilateral, slightly in front of junction of anterior with middle third of proglottis margin. Ovary 4-winged,

0.15 – 0.4 × 0.15 – 0.33 mm, occupying entire breadth of medulla at posterior end of proglottis. Median uterus reaching to proximal end of cirrus pouch. Vagina running obliquely in front of cirrus pouch, curving round vas deferens coils and base of cirrus pouch to descend dorsal to uterus. Receptaculum seminis vaginae inconspicuous. Vitellarian acini transversely elongated and arranged in two (a dorsal and a ventral) longitudinal rows along outskirts of testes.

This species differs from the most closely related *Phyllobothrium rotundum* (Klaptocz, 1906) in size of accessory suckers, distinct segmentation of strobila, anterior position of genital pore, etc.

14. *Phyllobothrium serratum* n. sp.
(Pl. IV, Figs. 19 – 21)

Habitat and locality. Spiral valve of *Triacis scyllium* Müller et Henle; Hamazima.

Length up to 22 cm, breadth up to 3.0 mm, thickness up to 1.0 mm. Scolex rounded, 2 – 3 mm in diameter; bothridia sessile, each divided to near base into symmetrical lobes, whose margin is strongly curled and folded as in *Phyllobothrium lactuca*; accessory suckers close to apical center, 0.125 – 0.175 mm in diameter. No unsegmented neck region. Strobila very finely serrate throughout, almost uniformly wide (0.7 – 1.0 mm) anteriorly but widening gradually with appearance of genital primordia, attaining maximum breadth at mature segments, narrowing again towards fully gravid segments. The two gravid segments shown in Pl. IV, Figs. 20 & 21 measure 1.0 × 3.0 mm and 4.15 × 2.0 mm respectively. Inner longitudinal muscle bundles not forming a definite sheath separating cortex from medulla. No transverse musculature. Nerve cord between outskirts of dorsal and ventral layers of vitellaria. Dorsal excretory stem at inner end of dorsal vitellaria, ventral stem at inner end of ventral vitellaria, both running along outskirts of testes and of ovarian wings, with vagina and cirrus pouch between. Testes closely massed together in intervascular field, confluent in median line at anterior end of proglottis but interrupted by uterus and not extending over it in contrast with *Phyllobothrium lactuca*. Cirrus pouch thin-walled, elliptical or retort-shaped, up to 0.9 × 0.5 mm, containing narrow, twisted ductus ejaculatorius and a long, muscular cirrus. Cirrus lined throughout with minute, hair-like spines, marked-

ly widened at distal end, frequently with annular folds, forming a bulbous swelling up to 0.13mm in diameter just before leading into this terminal enlargement, opening into funnel-shaped genital atrium. Genital pores at about middle of lateral margin of proglottis, alternating irregularly from right to left. Ovary with four finely lobulated wings. Uterus with a number of lateral outgrowths, reaching to near anterior end of proglottis when fully gravid. Eggs discharged through midventral slit formed by rupture of body wall. Outer egg shell 21 – 24 × 19 – 22 μ, embryo 17 – 21 × 15 – 18 μ as fixed in alcohol and measured in water. Vitellarian acini extending at each outer end of medullary parenchyma throughout proglottis, separated by intervening parenchyma into two (dorsal and ventral) layers, each of which lies between nerve cord and excretory stem of its own side. Vagina covered inside with hairs throughout its length, opening into genital atrium immediately in front of cirrus, swollen distally in form of a spindle and surrounded by strong circular muscle fibers between this dilatation and its aperture, narrowed as it curves round vas deferens coils but widened again dorsal to uterus proper to form a cylindrical, club-shaped or bulbous receptaculum seminis.

This species resembles *Phyllobothrium lactuca* van Beneden so closely that a very careful comparison is necessary not only on total mounts but also on sectioned preparations. In the present species the strobila is much longer and thinner than in *P. lactuca*, and the eggs are smaller.

The specific name refers to the fine transverse serration of the cuticle.

15. *Phyllobothrium laciniatum* (Linton, 1889)

Syn. *Crossobothrium laciniatum* Linton, 1889

(Pl. V, Fig. 22; Pl. XX, Figs. 15 – 17)

Habitat and locality. Spiral intestine of *Squalus sucklii* Girard; East China Sea.

Length 35 – 60 mm or more, breadth 1.5 – 3.2 mm, consisting of 38 – 125 or more segments. Bothridia sessile, discoid, 1.0 – 1.25 mm in diameter with thickened, frequently folded borders; suckers 0.12 – 0.13 mm in diameter. Neck lacking. Immature proglottides broader than long, bulging out dorsally and ventrally between paired conical lappets, which are attenuated distally, flaring or covering

the next segment and may well reach to the base of their fellows of the succeeding segment. Mature proglottides, increasing in length posteriorly with the sides more and more convex, elliptical in cross section; free gravid proglottis 4.5 mm long by 3 mm broad, nearly oval though somewhat constricted through bases of posterior lappets. Inner longitudinal muscle bundles strongly flattened from side to side, 80 – 90 in number, each consisting of numerous, very fine fibers. Nerve cord just inside of outer edge of vitellaria, dorsal to vagina and cirrus pouch. Dorsal and ventral excretory stems in same sagittal plane at inner ends of vitellaria, with cirrus pouch and vagina between; ventral stem very wide, may occupy more than half breadth of medulla, without transverse anastomosis. Testes very numerous, packed in one to four layers in intervascular field between ovary and anterior end of proglottis. Vas deferens convoluted in dorsal central field. Cirrus pouch ovoid, thin-walled, 0.45 – 1.1×0.18 – 0.35 mm in mature proglottides, tapering abruptly toward its somewhat pointed inner end intruding into testicular field. Cirrus opening into genital atrium, immediately antero- or posterodorsal, or exactly dorsal, to vagina, occupying greater length of cirrus pouch, provided throughout its length with cuticular hairs and a very compact layer of accompanying cells. Genital pore irregularly alternate, a little behind middle of lateral margin of proglottis. Ovary composed of numerous tubular acini, of which the posteromedial ones curve inwards to encircle the shell gland complex, distinctly bilobate in dorsoventral view, but four-winged in cross sections, extending as far outwards as excretory stems. When fully developed the ovarial acini may extend into the space among the inner longitudinal muscle bundles or encroach upon the cortical parenchyma. Uterus with saccular outpocketings on each side, extending on ventral side between ovary and convoluted vas deferens. Eggs rounded, 24 – 33 μ in diameter in mounted condition. Vagina opening into genital atrium immediately antero- or posteroventral, or ventral, to cirrus. Vitellaria extending in two layers (a dorsal and a ventral) along entire length of proglottis just inside inner longitudinal muscle sheath, joining each other between nerve cord and outer edge of muscle sheath; interrupted by cirrus pouch and vagina on pore side. In transverse sections they assume a typical V-shape, with divergent inner ends overreaching excretory stems, though in posterior proglottides some acini may intrude into cortical parenchyma through muscle sheath, thus making their outline irregular.

16. *Phyllobothrium loculatum* n. sp.
(Pl. V, Figs. 23 and 24; Pl. XX, Figs. 18-21)

Habitat and locality. Spiral intestine of *Heterodontus zebra* (Gray); East China Sea

Length 20-40 mm, breadth 1.0-2.4 mm. Scolex flattened dorsoventrally, 1.0-1.5 mm broad; its apex projecting forwards more or less prominently between dorsal and ventral pair of bothridia. Bothridia sessile, foliate, with folded edges, pressed one against the other; each with a typical accessory sucker 0.16-0.2 mm in diameter at anterior end. When fully straightened out under a cover glass they are oval, saucer-shaped and 1.2 mm long by 1.0 mm broad, with the flat face divided into numerous, small, rounded or polygonal, muscular loculi and the thin, incurved, free border also divided into a row of over 50 muscular loculi 0.1-0.12 mm long by 20-25 μ thick. Neck 4-18 mm long, attenuated toward middle to minimum of about 0.8 mm, with very fine transverse striations. Proglottides crowded, with nearly parallel, somewhat ruffled sides, becoming gradually broader posteriorly but narrower and longer as they mature, though still much broader than long in terminal proglottides which have not yet attained egg-producing maturity. Nerve cord at lateral edge of medulla outside of excretory stems. Dorsal and ventral excretory stems in same sagittal plane, with cirrus pouch and vagina between. Inner longitudinal muscles coarse, forming very thick sheath, especially in the neck, where they are massed into broad bundles compressed from side to side and occupying entire cortical parenchyma. Testes very numerous, closely packed in medulla between excretory stems of the two sides. Cirrus pouch subcylindrical, equatorial or just postequatorial, 0.73 mm long by 0.08 mm broad in the proglottis shown in Fig. 24, extending inwards transversely well beyond middle of lateral half of proglottis. Cirrus long, muscular, winding. Genital pore just postequatorial, alternating irregularly from side to side. Ovary X-shaped in transverse section, each wing narrow, cylindrical, extending transversely to excretory stems at posterior end of proglottis. Uterus irregular in outline, in front of ovarial isthmus. No eggs were observed. Vagina postero-dorsal to cirrus pouch, opening into genital atrium immediately dorsal to cirrus. Vitellaria V-shaped in cross section, extending entire length of proglottis outside of excretory stems.

This species resembles *Phyllobothrium foliatum* Linton, 1890,

in loculated bothridia, but differs from it in complete absence of pedicels supporting them. The vagina opens in front of the cirrus in Linton's species, whereas it lies dorsal to the cirrus in the present species.

17. *Phyllobothrium squali* n. sp.
(Pl. V, Fig. 25; Pl. XX, Fig. 22 and 23)

Habitat and locality. Spiral valve of *Squalus sucklii* (Girard); Onahama, Hukusima Prefecture.

Length 14 cm, breadth 2.15 mm (up to 2.6 mm in flattened proglottides). Scolex fairly large, 2.85 mm in diameter; bothridia foliate, with folded margin; anterior marginal sucker 0.3 – 0.35 mm in diameter. Neck about 45 mm long, 0.6 mm in diameter at narrowest part, increasing in breadth posteriorly up to 1.8 mm. Strobila comprising more than 300 segments, broadened posteriorly but narrowed again at gravid end proglottides, not very prominent at posterior margin of each segment. Proglottides crowded anteriorly, increasing in length and breadth posteriorly but broader than long except the 4 terminal fully gravid ones which are a little longer than broad, measuring respectively 2.5×2.45 mm, 2.85×2.45 mm, 2.9×2.4 mm and 3×2.3 mm. The subcuticular longitudinal muscle fibers are scattered in the greater peripheral portion of the subcuticular cell layer though the inner fibers tend to form bundles flattened from side to side. There is neither inner longitudinal muscle sheath nor transverse muscle. Dorsal and ventral excretory stems between vitellarian and ovariotesticular field with cirrus and vagina between. Nerve trunk at outer end of medulla between two layers of vitellaria immediately dorsal to terminal genitalia on pore side. Testes confined to preovarian medulla between vitellaria of two sides, continuous across median line anteriorly, 80 – 100 in number for each proglottis, arranged in several confused layers. Vas deferens coiled medial to cirrus pouch between uterus and testes of pore side. Cirrus pouch elliptical, thin-walled, about 0.5 mm long by 0.15 – 0.2 mm broad in posterior gravid proglottides. Cirrus covered inside with fine cuticular hairs; genital atrium with thick coat of accompanying cells, narrowed toward its external aperture which lies in front of middle of lateral margin, alternating irregularly from side to side. Ovary 4-lobed as usual, situated at posterior end of proglottis between two vitellarian fields; each wing divided peripherally into

numerous follicular lobules. Uterus approximately oval, occupying central area between ovary and testes, with a few lateral constrictions, from which strong septal ingrowths of fibrous connective tissue arise. Uterine eggs subglobular, about 40 μ by 30 μ, embryonic shell 24 μ by 21 μ, and embryo 18 μ in diameter, in mounted condition. Vitelline follicles extending along whole length of lateral margin of proglottis, V-shaped in cross section. Vagina surrounded by glandular cells, opening into genital atrium immediately anterior or ventral to cirrus, running inwards along cirrus pouch, forming a distinct fusiform receptaculum seminis in median field just behind uterus.

This species resembles *Phyllobothrium thridax* van Beneden, 1850, but the latter being inadequately described, a satisfactory comparison is not possible.

18. *Phyllobothrium lactuca* van Beneden, 1850
(Pl. X, Fig. 56; Pl. XX, Figs. 24 and 25)

Habitat and locality. Spiral intestine of *Mustelus manazo* Bleeker; Sea of Japan.

Alcoholic specimens up to 65 mm in length, 4 mm in breadth and 2 mm in thickness. Scolex with cauliflower-like bothridia, 2–4 mm in diameter. Accessory suckers 0.13 mm in diameter. Proglottides crowded, gradually elongated posteriorly; gravid ones still broader than long; end proglottis produced backward into a pointed process, definitely longer than broad; posterior border slightly salient except in fully gravid proglottides in which the lateral margins are convex and rather constricted at the intersegments. Inner longitudinal muscle bundles consisting of relatively coarse fibers, running throuth entire thickness of subcuticular cell layer. Nerve cord at junction of dorsal and ventral layers of vitellaria, dorsal to cirrus pouch and vagina. Dorsal and ventral excretory stems along outskirts of testes, just inside medial ends of vitellaria, with cirrus pouch and vagina between. Testes filling up all available space between excretoy stems of two sides. Cirrus pouch thin-walled, saccular, about 1.0×0.08 mm in a gravid proglottis 3.33 mm broad. Cirrus lined throughout with minute spines, markedly widened distally, often with annular folds. Genital atrium widened and covered with minute spines at base but smooth elsewhere, opening indifferently on right or left margin of proglottis at about its middle except for posteriormost proglottides, in which it lies distinctly more

anteriorly as shown by van Beneden (Pl. XVI. Fig. 3). In this connection it must be pointed out that in Southwell's material the genital pore is nearer the posterior extremity than the anterior. Ovary X-shaped in transverse sections, each wing divided distally into numerous follicles extending along inner boundary of cortex to near vitellaria. Uterus extending between ovarial isthmus and anterior end of proglottis, developing saccular lateral outgrowths, which are pressed against the marginal testes, cirrus pouch, vas deferens and vagina. Posteriorly it intrudes into the space between the dorsal and the ventral wings of the ovary as well as between the two ventral wings. Outer egg shell subglobular, 33 – 48×33 – 45 μ; inner shell globular, 24 – 27 μ in diameter; embryo 15 – 18 μ in diameter, as fixed in acetic sublimate and measured in water. Vagina opening into genital atrium immediately in front of cirrus, covered throughout with cuticular hairs, very wide at its transverse portion. Vitellaria V-shaped in transverse section, extending entire length of proglottis outside of testes, not interrupted, though reduced, at cirrus pouch and vagina.

19. *Anthobothrium rajae* n. sp.
(Pl. V, Figs. 26 – 27; Pl. XX, Fig. 26)

Habitat and locality. Spiral intestine of *Raja kenojei* Müller et Henle; Suruga Bay.

Length 9 – 16 mm, breadth 0.36 – 0.75 mm. Type about 10 mm long by 0.558 mm broad, composed of about 140 segments. Scolex rounded, 0.7 – 1.0 mm in diameter. Myzorhynchus subcylindrical, 0.24 ×0.135 mm, with muscular ring about 90 μ in diameter at its base, containing at bottom of its wide apical sinus an oval disc, which is 45 μ thick by 60 μ broad, and to which are attached numerous muscle fibers through the basal ring into the bothridia. Bothridia pedicelled, auriculate, with thick, crenulated, muscular borders; their shape and appearance vary considerably; stalk short, 0.2 mm in diameter. No accessory suckers. Neck very short, 0.12 – 0.21 mm in diameter. Stroblia may often be attenuated some distance behind neck, where it is 135 μ broad in the type. Proglottides crowded anteriorly, increasing in length and breadth posteriorly, (0.38 – 0.88×0.36 – 0.65 mm), though the last segment of the type is a little narrower than the preceding, 0.88 mm long by 0.475 mm broad; lateral margins nearly parallel to each other or slightly convex,

especially in mature proglottides, with more or less distinct notch at genital pore; posterior margins slightly imbricated. No gravid proglottides available. Testes 25–30 in number, closely arranged in one continuous layer in preovarian medulla, not intruding into space between cirrus pouch and poral wings of ovary. Vas deferens strongly convoluted in dorsal median field in front of ovary, intruding a little into space between two dorsal wings of ovary. Cirrus pouch thin-walled, ovoid, situated a little obliquely immediately in front of dorsal ovarial lobe of pore side, with broader proximal end near median line 0.17×0.11 mm in last proglottis of type. Cirrus covered insides with minute spines. Genital pore depressed in form of a shallow funnel, irregularly alternate, a little behind middle of lateral margin. Ovary U-shaped in dorsoventral view with its central isthmus at middle of posterior end of proglottis; each limb bifid, rather coarsely lobed. Uterus ventromedian, with zigzag outline, reaching to anterior end of proglottis. Vagina running inwards along anterior border of cirrus pouch. Vitellaria consisting of dense mass of transversely elongated acini, extending between excretory stems and outer edges of medullary parenchyma from anterior end of proglottis to posterior, not interrupted by cirrus pouch and vagina on their dorsal and ventral sides.

This species resemhles *Anthobothrium variabile* (Linton, 1889) closely in characters of bothridia and proglottides, but differs from it distinctly in possession of a very conspicuous myzorhynchus and body size.

20. *Anthobothrium pteroplateae* n. sp.
(Pl. VI, Figs. 28 and 29; Pl. XX, Fig. 27; Pl. XXI, Fig. 29)

Habitat and locality. Spiral intestine of *Pteroplatea japonica* Temm. et Schleg.; Hamazima.

Length 25 mm, breadth increasing posteriorly to maximum of about 1.0 mm. Scolex 0.5×0.96 mm; bothridia rather flat, with a very short stalk. The border of the bothridium is crenulated and thickened with fine parallel muscle fibers which are directed at right angles to the surface and give a sucker-like appearance in optical section. Neck cylindrical, 0.55 mm long by 0.28 mm broad, wrinkled transversely, narrowed abruptly behind to be continued into the segmented portion which is 0.21 mm broad and shows the first sign

of internal segmentation 0.45 mm further posteriorly. Immature and mature proglottides broader than long with intersegmental constriction which is especially conspicuous in posterior mature proglottides measuring 0.6 – 0.65 mm long by 0.8 – 1.0 mm broad. Dorsal excretory stem sinuous, in same sagittal plane as ventral stem in lateral part of medulla, dorsal to cirrus pouch and vagina; ventral stem ventral to cirrus pouch and vagina, with transverse anastomosis at posterior end of each proglottis. Testes 40 – 70 in number for each proglottis, extending in one layer or two between excretory stems and median uterus from anterior end of proglottis to ovary (vagina on pore side) with nearly equal number for each group. Vas deferens convoluted in dorsal medulla immediately in front of proximal end of vagina. Cirrus pouch ovoid, thin-walled, 0.14×0.09 mm in the proglottis shown in Pl. VI, Fig. 29, situated immediately in front of pore side lobes of ovary. Cirrus twisted, expanded at its distal end in form of a funnel densely covered inside with minute, cuticular spines about 3 μ long, opening immediately behind vagina into genital atrium, which in turn opens on lateral margin at about middle of its posterior two thirds, alternating irregularly from side to side. Ovary four-lobed, extending transversely at posterior end of proglottis, each lobe consisting of numerous transversely elongated acini, reaching almost to lateral edge of medulla leaving a very narrow space for vitellaria. Uterus extending in midventral medulla between ovarial isthmus and anterior end of proglottis, with its wall strongly folded until egg producing maturity is reached. No eggs observed. Vitellarian acini just inside of longitudinal muscle sheath, encircling greater lateral portion of testes but not extending over ovary, though some of them intrude into the extraovarian marginal medullary fields. Vagina strongly dilated, covered inside with cuticular spines, running transversely in front of cirrus pouch, opening very widely immediately anterior to cirrus, occupying greater part of genital atrium.

This species is characterized by the extensive development of the vitellaria and by the posterior position of the genital pore.

21. *Anthobothrium bifidum* n. sp,
(Pl. VI, Fig. 30; Pl. XXI, Fig. 30)

Habitat and locality. Spiral intestine of *Dasybatus akajei* Müll. et Henle (type host); *D. zugei* Müll. et Henle;

Pteroplatea micrura Bloch et Schneider ; East China Sea.

Length 57 – 125 mm ; breadth 0.7 – 1.2 mm. Largest specimen consisting of more than 200 segments. Scolex rounded in front, without myzorhynchus, 1.4 – 1.8 mm in diameter. Bothridia sessile, in dorsal and ventral pair ; each divided for a little more than half its length into two lobes. whose margin is strongly crenulated. In end-on view the scolex assumes a cauliflower-like appearance when fully developed. Neck slender when extended, but practically absent when contracted. External segmentation is faintly indicated a short distance behind scolex but genital anlagen appear more posteriorly, Mature proglottides imbricated but more and more distinctly constricted off posteriorly, 0.7 – 1.45×0.5 – 1.2 mm, with nearly parallel sides, conspicuously notched at genital pore. No gravid proglottides observed. Dorsal and ventral excretory stems passing sinuously just outside ovarial wings, with cirrus pouch and vagina between. Testes 100 – 130 in number for each proglottis, confined to intervascular field anterior to vagina and antiporal wing of ovary, covered up laterally by vitellaria. In immature proglottides they are in one layer and separated into two submedian groups, but in mature proglottides they are mostly in two layers except in the median line, where they are continuous across the uterus dorsally. Cirrus pouch club-shaped or oval, thin-walled, 0.15 – 0.4×0.075 – 0.13 mm, extending transversely or obliquely between vagina and poral wings of ovary in anterior half of posterior third of proglottis. Cirrus funnel-shaped, covered inside with minute spines, opening into genital atrium immediately behind vagina. Genital atrium opening on right or left at junction of middle with posterior third of proglottis margin or a little more posteriorly. Ovary X-shaped, situated at posterior end of proglottis between posterior vitellaria just inside of inner longitudinal muscle bundles ; each wing made up of numerous, closely massed tubular acini, whose attenuated ends are converged toward the center of the organ ; antiporal wing extending usually a little more anteriorly than poral wing. Vitellaria follicular, extending throughout proglottis length outside of excretory stems, over which they may reach a little medially. Vagina lying transversely along anterior margin of cirrus pouch, but distinctly funnel-shaped in fully mature proglottides, with its wide opening at base of genital atrium. Vaginal duct markedly twisted in front of ovarial isthmus, ventral to which it forms an oval receptaculum seminis up

to 60 μ long by 50 μ wide.

This species is characterized by the bothridia being bifurcated as in *Phyllobothrium dagnalli* Southwell, 1927, from which it differs, however, in strongly crenulated bothridia, absence of accessory suckers, position of genital pore, etc. It is distinguished from *Anthobothrium panjadi* Shipley et Hornell, 1909 (= *A. crispum* S. et H., 1906), by the characters of the proglottides.

22. *Anthobothrium parvum* Stossich, 1909[1] nec *A. parvum* Yamaguti, 1934 (renamed *A. exiguum* Yamaguti 1935) (Pl. VI. Figs. 31 and 32; Pl. XXI, Fig. 31)

Habitat and locality. Spiral intestine of *Mustelus manazo* Bleeker; Obama. Hukui Prefecture.

Length about 11 mm, breadth up to 0.33 mm. Number of segments 70 – 90. Bothridia shaped like a lady's straw hat, about 0.4 mm in diameter, with a short, fan-shaped stalk containing coarse muscle fibers. Neither accessory suckers nor myzorhynchus. Neck 1.1 – 2.3 mm long, 60 μ wide at its anterior end, gradually broadened posteriorly, densely covered all over with minute acicular spines up to 8 μ long. Proglottides crowded anteriorly, with prominent posterior border projecting backward both dorsally and ventrally in form of a short apron widely emerginate at middle, gradually increasing in length posteriorly and measuring 0.3 – 0.34 mm long by 0.32 – 0.34 mm broad at mature posterior proglottides, in which the lateral margins are slightly convex or nearly parallel and somewhat constricted at the intersegments. Inner longitudinal muscle bundles moderately developed in neck region but lacking in posterior proglottides. Ventral excretory stem relatively wide, running along outskirts of testes and ovary, curving inwards as it crosses the cirrus pouch ventrally. No dorsal stem could be detected. Testes extending in intervascular medulla from ovary to near anterior end of proglottis; their number was unable to make out. Cirrus pouch transversely elongated oval, thin-walled, up to 90×80 μ. Cirrus cylindrical, surrounded by compact layer of accompanying cells. Genital pore irregularly alternate, pre-equatorial. Ovary X-shaped, about 0.2 mm broad, between ventral excretory stems of two sides at posterior end of proglottis. Vitellaria poorly developed, extending entire

1) Compared with Stossich's description cited in Southwell's.

length of proglottis outside of excretory stems.

This species has been regarded by Southwell as a synonym of *Anthobothrium cornucopia* van Beneden, 1850, but until further convincing evidences are submitted I would rather consider it distinct.

23. *Orygmatobothrium musteli* (van Beneden. 1850)
Syn. *Orygmatobothrium velamentum* Yoshida, 1917
(Pl. VII, Figs. 33 and 34; Pl. XXI, Fig. 32)

Habitat and locality. Spiral valve of *Mustelus manazo* (Bleeker); Hamazima.

Examination of the present material has convinced me of the synonymy of *Orygmatobothrium velamentum* with *O. mustli* as suggested by Woodland. The following note is to supplement Yoshida's description, in which the free gravid segments have not been referred to.

Length 22 – 36 mm, maximum breadth 0.8 – 1.0 mm in quadrate proglottides. Scolex 1.2 – 1.5 mm in diameter; brothridia circular, short-stalked. 0.65 mm in diameter including velum; anterior sucker muscular, 60 – 70 μ in diameter, central sucker somewhat elongated transversely, weakly muscular, 84 – 100×100 – 135 μ. Neck 5.7 – 8.6 mm long, 0.18 – 0.25 mm broad at its anterior end, increasing gradually in breadth posteriorly. Proglottides slightly imbricated, much broader than long anteriorly, increasing in length posteriorly and definitely longer than broad at posterior end, where they measure 1.35 – 2.1 mm in length and 0.7 – 0.8 mm in breadth. Free gravid proglottides lanceolate, rounded in front but notched behind, up to 6 mm long, 0.75 – 0.95 mm broad, with wide ventral slit due to rupture. Testes about 200 in number in posterior mature proglottides, 300 in free gravid proglottides, extending in medulla from anterior end of proglottis to ovary, divided into two lateral groups by median genital complex, interrupted on pore side by distal portion of cirrus pouch and vagina, but confluent in median line between anterior end of proglottis and turning point of vagina. Cirrus pouch club-shaped or elliptical, 0.5 – 0.8×0.23 – 0.28 mm in free proglottides, with very thin membranous wall, situated obliquely with its base in median line at about junction of anterior two thirds of proglottis. Cirrus covered inside, like ductus ejaculatorius, with minute cuticular spines, attaining a length ot 1.5 mm or more when fully protruded; basal swelling of protruded cirrus covered with broad-based

spines up to 6 μ long. Genital atrium covered with sharp or blunt, dentiform spines 5 – 8 μ long, opening indifferently on right or left margin of proglottis a little in front of its middle. Ovary 4 – lobed, extending transversely at posterior end of proglottis in immature proglottides but longitudinally elongated in end proglottides as well as in free gravid ones, attaining a maximum length of 1.5 mm, each lobe subdivided peripherally into tubular lobules and reaching as far outward as vitellaria. Uterus extending in ventral median field between ovarial isthmus and anterior median testes. Eggs subglobular, 27 – 30×24 – 27 μ in mounted condition. Vitellarian acini forming a dorsal and a ventral strand along each lateral edge of medulla throughout its length, overlapping outskirts of testes. Vagina opening into genital atrium immediately in front of cirrus, running obliquely forwards as far as middle of anterior third of proglottis, where it turns backwards abruptly to descend in middorsal field. Proximally it is covered inside with cuticular bristles and forms a subcylindrical dilatation 30 – 90 μ in diameter before crossing the ovarial isthmus dorsally.

24. *Orygmatobothrium versatile* Dies., 1854
Syn. *O. musteli* (van Beneden, 1850) of Woodland, 1927
(Pl. VII, Figs. 35 and 36)

Habitat and localities. Spiral intestine of *Mustelus manazo* Bleeker; Pacific and Sea of Japan.

Length 25 – 35 mm, breadth 1.7 – 1.9 mm. Largest mature specimen consisting of about 60 segments. Bothridia in a dorsal and a ventral pair, sessile, saucer-shaped, without velum, 0.6 – 1.0 mm in diameter, with two accessory suckers, of which the anterior marginal notch, and the posterior, 0.1 – 0.175 mm in transverse diameter, lies at the center of the bothridium. Neck constricted, broadened posteriorly. Proglottides are narrower again. Detached mature proglottides longer than broad, with convex sides, 2.5 – 3.1×1.45 – 1.7 mm. Dorsal and ventral excretory stems running along outskirts of testes, with cirrus pouch and vagina between. Testes numerous, in two or more layers, occupying all available space in preovarian intervascular field. Cirrus pouch elongate saccular, 0.5 – 0.75×0.16 – 0.25mm, curved anteriad with broader inner end at or very near median line at level of posterior part of anterior third of proglottis. Ductus ejaculatorius and cirrus covered inside with hairs, though the

hairs at the opening of the cirrus are rather spiniform. Genital atrium opening at about middle of lateral margin in immature proglottides, but a little more anteriorly in mature proglottides, alternating irregularly from right to left. Ovary 4-lobed, each lobe consisting of compact mass of tubular acini. Uterus extending forwards in ventral median field as far as inner end of cirrus pouch. No eggs observed. Vitellaria follicular, occupying lateral fields between cortical and medullary parenchyma throughout length of proglottis, slightly overreaching outskirts of testes across excretory stems but not extending so far inwards as in *Orygmatobothrium plicatum* Yamaguti, 1934. Vagina widened at its opening into genital atrium immediately anterior to cirrus, running inwards along anterior border of cirrus pouch, turning abruptly backwards dorsal to coiled vas deferens and forming retort-shaped seminal receptacle up to 66 μ in diameter dorsal to ovarial isthmus.

25. *Monorygma megacotyla* n. sp.
(Pl. VII, Figs. 37 and 38; Pl. XXI, Fig. 33)

Habitat and locality. Spiral intestine of *Cephaloscyllium umbratile* Jordan et Fowler; Nagasaki.

Length 80 mm or more; breadth up to 2.0 mm. Number of segments over 600 in a specimen 72 mm long. Scolex pyramidal, 0.5 – 1.1 mm broad at base between dorsal and ventral pair of bothridia, with disc-shaped myzorhynchus 0.1 – 0.105 mm in diameter at its apex. Bothridia pyriform 0.35 – 0.6 mm broad, pressed one against the other in median line, hollowed out near posteromedial corner, each pair 0.7 – 1.4 mm in combined breadth; accessory sucker muscular, well marked out, 0.25 – 0.26 × 0.2 – 0.21 mm. Neck 1.5 – 2.0 mm long by 0.4 – 0.95 mm broad. Proglottides crowded, with posterior border slightly salient and dorsal as well as ventral surface rather flat, increasing slowly in length, breadth and thickness posteriorly, but as they mature they become a little narrower again; proglottis shown in Pl. VII, Fig. 38 measuring 0.65 × 1.45 mm. Inner longitudinal muscle bundles not forming a definite layer. Nerve cord at outer end of medulla. Dorsal and ventral excretory stems winding considerably in same sagittal plane just inside vitellarian field, with cirrus pouch and vagina between. Testes small, numerous, two- or three-layered in dorsal medulla between ovary and anterior end of proglottis, interrupted by uterus and ascending vagina.

Cirrus pouch elongate, thin-walled, 0.255×0.35 mm in proglottis figured, extending transversely to outer end of testes, containing a twisted ductus ejaculatorius and a straight wider cirrus covered with hair-like spines. Genital atrium tubular, opening indifferently on right or left margin of proglottis a little in front of its middle. Ovary X-shaped, extending transversely at posterior end of proglottis as far as outskirts of testes, with dorsoventrally flattened, very finely lobed wings against dorsal and ventral cortex. Uterus extending in ventral median field from ovary to the point, where the vagina turns backwards at nearly right angles. No eggs observed. Vagina narrow, opening into genital atrium directly ventral to cirrus. Vitellaria divided by nerve cord into a dorsal and a ventral group, each lying between nerve cord and excretory stem along inside boundary of cortical parenchyma, occasionally overreaching excretory stem medially.

This species, whose specific name refers to the powerful accessory sucker, differs from the most closely related *Monorygma perfectum* (van Beneden, 1853) in breadth of strobila as well as in character of accessory sucker, and from *M. longicolle* (Molin, 1858) in shorter neck, pre-equatorial genital pore, etc. According to Linton the testes extend laterally nearly to the nerve and the vitellaria are continuous at the lateral margins in *M. perfectum*. If this be true in van Beneden's original the differences between *M. perfectum* and the present species should be much more distinct.

26, *Pithophorus vulpeculae* n. sp.
(Pl. VIII, Figs. 43 and 44)

Habitat and locality. Spiral intestine of *Vulpecula marina* Valmont; Taizi, Wakayama Prefecture.

Strobila slender, up to 20 mm in length, with maximum breadth of about 1.0 mm or more at scolex, comprising 20 – 30 segments or more. Scolex with four cylindrical short-stalked bothridia, each of which contains a muscular tube parallel to the long axis of the body. This suctorial organ is 0.55 – 1.2 mm in length, 0.32 – 0.55 mm in outside diameter and consists of circular muscle fibers which form a very dense layer near the inner surface of the tube. The anterior opening of this organ is oval to elliptical, up to 0.45 mm in greater diameter when extended, but very small when contracted, and has a circular or elliptical accessory sucker 90 – 130 μ long by 40 – 60 μ

broad on the inner face of its medial corner ; the posterior opening is much smaller, elliptical or fusiform and up to 60 μ by 18 μ when extended. Neck unarmed, 0.5 – 1.0 mm in length with minimum breadth of 0.3 – 0.4 mm at base of scolex. Anterior proglottides much broader than long, parallel-sided, gradually increasing in length toward posterior extremity of strobila, mature proglottides definitely longer than broad, 0.6 – 1.4 × 0.45 – 0.52 mm, more or less constricted at intersegment, with straight or somewhat convex sides. No inner longitudinal muscle sheath. Intersegmental transverse muscles forming a distinct layer. Ventral excretory stems running along outskirts of testes across dorsal side of cirrus pouch and vagina, with very fine transverse anastomosis at posterior end of each proglottis. No dorsal excretory stems. Testes arranged in one layer in intervascular field between ovary and anterior end of proglottis, 70 – 80 in number for each proglottis. Cirrus pouch claviform in immature segments but in mature segments it bulges out inwards and forwards at the base to take a rather round shape, and may extend slightly beyond the median line, measuring 0.2 – 0.34 mm by 0.1 – 0.28 mm. Vesicula seminalis interna 0.07 – 0.16 mm wide, curved at base of cirrus pouch, cirrus covered with spines all over, opening laterally immediately behind vagina. Genital pore depressed, irregularly alternating, dividing lateral margin of proglottis in ratio of 1 : 3 – 4. Ovary X-shaped, situated at posterior end of proglottis with its laterally enlarged wings extending to vitellarian field, each wing consisting of a number of transverse tubular acini. Even in the mature end proglottis the uterus extending in ventral median field from ovarial isthmus to base of cirrus pouch contains no eggs. Vitellaria extending along each lateral margin of proglottis throughout its length, covering outskirts of testes. Vagina opening immediately in front of cirrus, running transversely along anteroventral margin of cirrus pouch.

This species differs from *Pithophorus tetraglobus* (Southwell, 1911), the only known member of the genus, in body size, number of testes, extent of ovary and uterus, anterior position of genital pore, etc. The accessory sucker of the bothridium has been undoubtedly overlooked by Southwell.

27. *Echeneibothrium bifidum* n. sp.
(Pl. XXI, Fig. 34)

A single worm was found encysted in the body cavity of *Tra-*

churus trachurus Linné at Maisaka, Sizuoka Prefecture.

Head with a feebly muscular apical sucker about 75 μ in diameter and four crosswise disposed pedicels, each of which is 0.2 – 0.26 mm long by 0.08 – 0.12 mm broad and bears two scoop-shaped symmetrical bothridia, which are 0.22 – 0.28 mm long by 0.12 – 0.2 mm broad and connected with each other at their approximated ends by a short band of compact cellular tissue enclosed in the limiting membrane continuous with that of the bothridia. Each bothridium is provided on the sucking face with 12 – 13 transverse and two longitudinal septa; the median areolae are rather flat, while the lateral, deeper toward the longitudinal septa, may serve as a more efficient suctorial apparatus. Neck about 0.15 mm in diameter.

Although the adult is unknown, this characteristic bipartite bothridium divided each into three longitudinal rows of loculi is sufficient to justify the creation of a new species, for which the name *Echeneibothrium bifidum* is proposed with reference to the condition of the bothridia. In *E. cancellatum* (Linton, 1890) each bothridium has three longitudinal rows of loculi, but it is not divided into symmetrical halves.

28. *Echeneibothrium tobijei* Yamaguti, 1934
(Pl. IX, Fig. 45; Pl. XXI, Figs. 35 and 36)

Habitat and locality. Spiral intestine of *Myliobatis tobijei* (Bleeker); Hamazima.

When distended with eggs the uterus reaches to the anterior end of the proglottis, developing 14 – 18 digitiform or saccular outgrowths on each side as shown in Pl. XXI, Fig. 36, and the eggs may possess a much longer filament than 0.1 mm, and the atrophied ovary is pressed against the posterior end of the proglottis. The vas deferens extends further outward than described in my previous paper.

29. *Marsupiobothrium alopias* n. g., n. sp.
(Pl. VIII, Figs. 39 – 42; Pl. XXI, Fig. 37)

Habitat and locality. Spiral valve of *Alopias vulpinus* (Bonnaterre); Pacific.

Length about 25 mm, breadth 0.38 – 0.75 mm. Number of segments 70 – 95. Scolex squarish in front view, 0.45 – 0.58 mm broad, with flat conical apex projecting more or less prominently. Bothridia sessile, in form of a pear-shaped sac in profile, as well as in

front-view, in a dorsal and a ventral pair, covered all over with minute spines. The obliquely truncated opening of this pouch is directed anteriad and toward the axis of the scolex, and provided with sphincter-like circular muscles, which form on the posterior margin an arcuate cylindrical pad 0.13 – 0.175 mm long by 35 – 45 μ broad and separated from the lateral margin by a distinct notch. The pouch, 0.16 – 0.21 mm in inside diameter, is covered with smaller spines than those on the outer surface, and its wall, mainly composed of very fine radial muscle fibers, is 24 – 33 μ thick at the base. At the anterior end of the pouch there is a small accessory sucker about 45 μ in diameter and 30 μ thick and surrounded in front by the circular muscles bordering the pouch but not delimited behind. To this sucker are attached on the side facing to the axis of the scolex the strong inner longitudinal muscle bundles running up from the neck. Neck narrow, 6 – 8.5 mm long by 0.1 – 0.2 mm broad, finely wrinkled transversely on the lateral margins like the rest of the strobila. The genital anlage appears earlier than the external segmentation. The inner longitudinal muscle fibers are coarse in the anterior part of the neck but become finer and sparser as they approach the posterior end of the strobila and finally disappear in the free proglottides. Posterior proglottides oblong, 0.62 – 1.25×0.38 – 0.75 mm. Free proglottis very much elongated, 4.4×0.7 mm, with button-shaped anterior and blunt-pointed posterior extremity. The dorsal and ventral excretory stems lie just inside the muscle sheath, a little nearer to the median line than to the lateral margins, the former being dorsal to the testes and ovary and the latter ventral to these, both crossing the cirrus pouch and vagina on the pore side. It is very remarkable that the testes appear on each side as if they were divided into two fields by the excretory stems. There are no transverse anastomoses.

Testes 150 – 180 in number, close together in one layer, continuous in front but separated into two fields between cirrus pouch and ovary. Vas deferens up to 27 μ in diameter, compactly coiled between proximal end of cirrus pouch and vagina. Cirrus pouch approximately pyriform, thin-walled, 0.18 – 0.36×0.07 – 0.15 mm, transverse, with its enlarged proximal end reaching to median field. Ductus ejaculatorius twisted at proximal end of cirrus pouch. Cirrus opening into genital atrium immediately behind vagina, covered with minute spines, swollen at base when everted. Genital pore at posterior end of anterior third of proglottis margin, unilateral

except in the last segment of one paratype, in which it lies on the opposite side. Ovary 4-winged, 0.3×0.52 mm in the last proglottis of the type, 1.0×0.4 mm in the free proglottis, in which each wing is very much elongated anteroposteriorly and consists of distally enlarged acini extending along the lateral margin and a long, backwardly directed, tubular acinus. The sinuous uterine duct passes forwards immediately dorsal to the vagina and opens into the ventral uterus a little in front of the ovary. Uterus median, reaching to proximal end of cirrus pouch, containing no mature eggs even in the free proglottis. Vitellaria V-shaped in cross section, extending just inside lateral edges of muscle sheath throughout length of proglottis; in the free proglottis they form a separate group between the ovary and the posterior extremity. The vagina may form in front of the cirrus pouch a fusiform swellng up to 35 μ wide and lined with thick cuticle. In the compressed free proglottis it is dilated posteriorly to a maximum width of 75 μ and connected by a short narrow duct with the receptaculum seminis which is approximately elliptical and 0.225 mm long by 0.1 mm wide, and lies dorsal to the ovarial isthmus with its posterior end reaching to the shell gland. The seminal duct originating from the posterior end of the receptaculum seminis is about 60 μ long and very narrow (only 5 μ in diameter) at the beginning but enlarged posteriorly into a bulb, which is about 25 μ in diameter and surrounded by small gland-like cells, and joins the germiduct at its posterior end.

This genus is characterized by the bothridium being modified into a pouch, whose opening is provided with strong sphincter-like muscle, especially on the posterior margin. The present species differs from *Orygmatobothrium forte* Linton, 1942, which should be transferred to this new genus, in the genital pore opening unilaterally at the posterior end of the anterior third of the proglottis. In Linton's species the genital pores are irregularly alternate and a little in front of the middle of the proglottis.

Marsupiobothrium n. g.

Generic diagnosis. Phyllobothriidae Braun, 1900. Scolex squarish in front view. Bothridia sessile, in form of pear-shaped sac, whose opening is provided all round with sphincter-like muscles, especially on the posterior margin; a submarginal accessory sucker is present at the anterior end of each bothridium. Neck present. Proglottides distinct, with nearly parallel sides, broader than long anteriorly but longer than broad posteriorly. Free proglottis very much elongated.

Inner longitudinal muscle sheath strongly developed except in terminal and free proglottides. Dorsal and ventral excretory stems running just inside muscle sheath nearer to median line than to lateral margins. Genitalia of *Phyllobothrium* type. Parasites of sharks.

Genotype. *Marsupiobothrium alopias* n. sp.
Other species. *M. forte* (Linton, 1942).

30. *Dinobothrium spinulosum* n. sp.
(Pl. IX, Fig. 46; Pl. XXI, Fig. 38; Pl. XXII, Fig. 39)

Habitat and locality. Spiral intestine of *Cetorhinus maximus* (Gunner); Pacific.

Length 9 – 23 mm, maximum breadth 0.4 – 1.0 mm. Largest strobila consisting of 43 segments, of which the last ten are gravid. Scolex 0.6 – 1.3 mm broad, with a dorsal and a ventral pair of large bothridia. No myzorhynchus. Each bothridium sessile, scoop-shaped or leaf-like, concave on external face, 0.9 – 1.3 mm long by 0.4 – 0.55 mm broad, covered with minute backwardly directed spines up to 9 μ long along medial and lateral edges of greater foliate portion which tapers posteriorly to a blunt point, with a fleshy lobe turning back on itself and terminating in a small, pointed non-chitinous, backwardly directed claw-like horn at each end of its concave, reflexed, anterior margin. The outer lobe is continued dorsally (ventrally in dorsal one) into an auricular appendage hanging down between the dorsal and the ventral bothridium of its own side and divided at its posterior end into two pointed lobes, of which the inner is a little longer than the outer and reaches to the level of the beginning of the neck. The globular accessory sucker resting on each bothridium with its aperture directed anteroventrally (anterodorsally in the dorsal pair) is 0.09 – 0.16 mm in diameter and bears along its anterodorsal (anteroventral in the dorsal pair) border semicircular rows of over 20 minute, partly rudimentary, blunt spines. It is a typical sucker mainly composed of radial muscle fibers and provided with a distinct outer limiting membrane. The two suckers of each pair are about 0.25 mm apart from each other in the specimen shown in Pl. XXII, Fig. 39 and may or may not project beyond the inner claw-like lobe, which lies usually a little higher than the outer. Neck slender, 2 – 6.5 mm in length, with minimum breadth of 0.12 – 0.36 mm, covered all over with sharp, backwardly directed spines which are rather scale-like anteriorly but become longer and slender (15 – 27 μ) toward the level

just behind the bothridia, whence they diminish in length posteriorly to a minimum of 5 μ and disappear at the commencement of the segmentation. Proglottides much broader than long in immature ones, 0.5 – 0.7×0.4 – 0.65 mm in mature ones and longer than broad (0.6 – 1.1×0.44 – 0.8 mm) in gravid ones, with nearly parallel sides except in fully gravid ones, which have more or less convex sides. Terminal proglottides tapering posteriorly, 1.7 – 2.2×0.42 – 0.58 mm. No imbrication of proglottides throughout strobila. Segmentation line distinct and straight. Inner longitudinal muscle bundles well developed but comparatively fine in posterior proglottides except in the dorsal and ventral median fields, where they may form a fairly conspicuous longitudinal band. Dorsal and ventral excretory stems in same sagittal plane, shifted more and more laterally as they proceed backwards, with cirrus pouch and vagina between. Ventral transverse anastomoses present. Nerve trunk just outside of vitellaria, dorsal to cirrus pouch and vagina. Testes rounded, 28 – 45 in number, situated in one layer or two in preovarian medulla between excretory stems of two sides dorsal and lateral to uterus in gravid proglottides. Cirrus pouch elongate, curved, comparatively thin-walled proximally, 0.3 – 0.43×0.07 – 0.11 mm in mature and gravid proglottides, extending obliquely a little beyond median line, with its proximal end directed forwards. Cirrus covered throughout except at its opening with hair-like spines about 12 μ long, occupying nearly entire length of cirrus pouch when introverted, tapering gradually toward its junction with ductus ejaculatorius, somewhat constricted at its opening which lies immediately anterior or posterior to the vaginal aperture. Genital pore more or less prominent, irregularly alternate, at about middle of lateral margin. Ovary consisting of a dorsal and a ventral pair of grape-like bunches of rounded follicles, H-shaped in mature proglottides but V-shaped in fully gravid proglottides, in dorsoventral view. Uterus surrounded by testes dorsally and laterally, extending in ventral medulla from ovary to anterior end of proglottis, developing saccular outgrowths on each side; when fully distended with eggs it occupies entire medullary parenchyma, leaving but little space for cirrus pouch and vagina. Even though this state of development has not been reached, it may well encroach upon the preceding segment, and as the ovary disappears it comes into contact with its fellow. In the posterior proglottides the ventral wall splits spontaneously in the median line, and the

eggs escape from the eventually ruptured uterus. Eggs rounded, 39 – 42 μ by 37 – 45 μ, oncospheres 21 – 24 μ by 22 – 27 μ and embryonic hooks 9 μ long, in fresh state. Vitelline follicles extending entire length of proglottis between nerve trunk and outskirts of ovary and testes just internal to dorsal and ventral excretory stems. Vagina opening directly anterior or posterior to cirrus, its transverse distal portion beset with cuticular hairs.

This species differs from the related *Dinobothrium septaria* van Beneden of Woodland in some important points as shown in the following table.

	D. septaria	*D. spinulosum*
Length	110 mm	9 – 23 mm
Breadth	2.5 mm	0.4 – 0.8 mm
Bothridia	5×3.3 mm without spines (?) no definite accessory sucker	0.9 – 1.3×0.4 – 0.55 mm spined typical accessory sucker present
Neck	absent	long, covered with spines
Gravid Proglottides	3 – 3.5×1.5–2.0mm	0.6 – 1.1×0.44 – 0.8 mm
Cirrus pouch	0.99 – 1.32×0.38 – 0.44 mm	0.3 – 0.43×0.07 – 0.11 mm
Vagina	convoluted, reaching to anterior end of proglottis	not convoluted, not reaching so far as anterior end of proglottis

D. planum Linton, 1922, is so much different from *D. septaria* and the present species, that no comment is needed.

31. *Gastrolecithus planus* (Linton, 1922) n. g.
Syn. *Dinobothrium planum* Linton, 1922.
(Pl. IX, Figs. 47 and 48; Pl. X, Figs. 49 – 55; Pl. XXII, Fig. 40)

Habitat and locality. Upper portion of spiral intestine of *Cetorhinus maximus* Gunner; Pacific

Length up to 40 cm in life, maximum breadth 7 mm, thickness up to 2.5 mm in alcohol. Scolex 6 – 7.5 mm transversely, 2 – 4 mm dorsoventrally, at apex. Bothridia flat or calyciform, with inconspicuous groove at posterior margin, 5 – 9 mm long by 3 – 5 mm broad; inner end of anterior margin projecting forwards in form of

minute dentiform or nodular protuberance; outer end continued into a fleshy lobe, which turns backwards and extending over back of bothridium for about 2 mm terminates in two pointed tips of unequal length. Accessory sucker 0.4 – 0.8 mm in diameter, with its thickened semicircular border forming a shelf-like projection. Neck 22 – 35 mm long, 3.0 – 3.5 mm broad, 1.5 – 2.0 mm thick, transversely corrugated, with a median furrow on each surface, abruptly narrowed at its junction with segmented portion. It is to be noted that besides the dorsal and ventral median furrows continuous with those of neck there is on each side a distinct submarginal longitudinal furrow slightly dorsal to lateral genital pore. Proglottides crowded throughout strobila, with nearly parallel or slightly convex sides and more or less imbricated posterior borders; posterior gravid proglottides 0.5 – 1.0×3.9 – 6.0 mm. Inner longitudinal muscle bundles well developed, forming complete sheath for medulla, decreasing in strength toward cuticle. Intersegmental musculature very well developed. Dorsal excretory stem near lateral edge of medulla, dorsal to vagina and cirrus pouch; ventral stems distinctly medial to dorsal stems and ventral to vagina and cirrus pouch, just inside ventral transverse muscle layer, curving inwards at intersegments like dorsal stems, with very narrow transverse anastomoses. Nerve trunk just inside lateral edge of longitudinal muscle sheath. Testes 200 – 250 in number for each proglottis, (270 – 300 after Sproston) massed together in medullary parenchyma dorsal to vitellaria and uterus, anterior and lateral to ovary, extending a little more outward than vitellaria to sagittal plane through ventral excretory stem. Cirrus pouch subcylindrical, 0.5 – 0.7 mm long by 0.12 – 0.2 mm broad in gravid proglottides, with comparatively thin muscular wall, situated transversely, usually dorsal, sometimes antero- or postero-dorsal, to vagina. Cirrus stout, eversible, armed with acicular spines about 15 μ long, opening into genital atrium dorsal, anterior, or posterior to vaginal aperture. Genital pores alternating irregularly from side to side a little in front of middle of proglottis. Ovary bilobed, extending transversely at posterior end of proglottis, occupying almost entire thickness of medulla with its outer ends reaching to near middle of each lateral half of proglottis, each lobe consisting of closely massed tubular acini. Uterus forming ventral median tube when immature, but extending transversely in preovarian ventral medulla when gravid, and finally occupying entire medulla between ventral excretory stems of two

sides, leaving narrow space for remnants of genitalia. As measured on whole mounts the subglobular eggs are only 12 – 15 μ in diameter, but in the fresh state they measured 42 – 51 μ by 43 – 51 μ and the oncospheres 21 μ by 18 – 21 μ. Vitelline follicles extending in ventral medulla between ventral excretory stem and sagittal plane through middle of ovarial lobe, crowded and occupying almost entire length of proglottis laterally, but less extensive and forming a thinner layer medially. Vagina opening into genital atrium immediately ventral, anterior, or posterior to cirrus, very wide and covered inside with long cuticular bristles at its winding distal portion.

Though Linton states that there is no groove at the posterior edge of the bothridium and illustrates this as entire in his figure 2, it seems almost certain that he has overlooked the marginal groove. Further, his statement that no layer of circular muscles could be distinguished in any of the sections, is undoubtedly due to his error of observation. As compared with *Dinobothrium septaria* van Beneden, the present species shows a very important feature in the disposition of the vitellaria besides the six marked differences enumerated by Woodland. Woodland doubted the correctness of Linton's description that the vitellaria are distributed along the ventral side of the proglottis next within the longitudinal muscle layer, but this being the case, it is necessary to erect a new genus for Linton's species, *Dinobothrium planum*. As to the systematic position of the new genus there is some difficulty in assigning it to the Phyllobothriidae on account of the ventral position of the vitellaria, but in view of the fact that though the vitellaria are marginal in most of the known members of this family, they may be distributed more extensively toward the median field both dorsally and ventratly in *Orygmatobothrium plicatum* Yamaguti, 1934, we may safely regard the character in question as of mere generic significance.

Gastrolecithus n. g.

Generic diagnosis. Phyllobothriidae Braun, 1900. Strobila large, thick; Scolex large, with a dorsal and a ventral pair of sessile, flat or concave bothridia. each bothridium provided with an accessory sucker in front and a terminally bifid, crest-like appendage at its anterolateral corner as in *Dinobothrium* and *Pseudodinobothrium*. Neck long and thick, well marked off from narrower ensuing segmented portion. Proglottides crowded, with salient posterior borders and nearly parallel or slightly convex sides; even fully gravid ones much broader than long.

Inner longitudinal muscle sheath well developed. Nerve trunk just inside lateral edge of this sheath. Dorsal excretory stems dorsolateral to ventral stems, dorsal to cirrus pouch and vagina. Ventral excretory stems close to ventral inner longitudinal muscle, ventral to cirrus pouch and vagina. Testes numerous, dorsal to vitellaria and uterus, anterior and lateral to ovary, occupying entire length of proglottis. Vas deferens convoluted. Cirrus pouch extending medially beyond ventral excretory stem, containing winding ductus ejaculatorius and armed cirrus. Genital pores marginal, alternating irregularly. Ovary two-lobed, extending transversely in ventral medulla at posterior end of proglottis, but never reaching to vascular fields. Uterus extending transversely in front of ovary as far as ventral excretory stems when fully gravid. Eggs subglobular, thin-shelled, containing oncospheres. Vitellaria follicular, distributed in ventral medulla from ventral excretory stem to submedian field. Vagina ventral to cirrus pouch and vas deferens, dorsal to vitellaria and uterus, covered inside with cuticular bristles at its wide distal portion. Parasitic in selachians.

Genotype. *Gastrolecithus planus* (Linton, 1922).

ONCHOBOTHRIIDAE Braun, 1900

32. *Acanthobothrium triacis* n. sp.
(Pl. XI, Figs. 57 – 60)

Habitat and locality. Spiral intestine of *Triacis scyllium* Müller et Henle; Hamazima.

Length over 10 cm, breadth up to 1.4 mm. Scolex 0.8 – 1.0 mm long by 0.5 – 0.62 mm broad at level of bothridial hooks. Each bothridium canoe-shaped, surmounted by a single accessory sucker about 90 μ in diameter, 0.7 – 0.85 × 0.3 – 0.35 mm, split up into three loculi by two septa. Bothridial hooks bifid, in one pair for each bothridium, unequal in length, inner hook 200 – 216 μ long, outer 150 – 168 μ long; outer prong of each hook shorter than inner. Neck 3.0 – 5.0 mm long, markedly attenuated at level of posterior ends of bothridia and then swollen to maximum breadth of 0.55 – 0.75 mm, whence it narrows again and holds nearly uniform breadth for remaining portion. Strobila comprising more than 400 segments, gradually broadened toward mature segments, whence it narrows very little toward gravid posterior end. Proglottides crowded, with slightly prominent posterior border, broader than long throughout strobila, though increasing in length toward posterior end; mature proglottides 0.45 – 1.1 mm long by 0.95 – 1.4 mm broad, gravid ones 0.7 – 0.9 mm long by 1.0 – 1.1 mm broad, with somewhat convex sides. Of the inner longitudinal muscles the finer outer bundles occupy the subcuticular

cell layer, and the stronger inner bundles form a typical sheath for the medulla. The lateral portion of these inner bundles is directly continued into the scolex, while the medial bundles are massed together just in front of the broadest part of the neck into four bulbs, each of which tapers anteriorly to a uniformly thick column attached to the base of the bothridial hook. Dorsal and ventral excretory stems running near lateral margins of strobila in gravid proglottides, with cirrus pouch and vagina between. Ventral transverse anastomosis present. Testes 110 – 140 in number for each proglottis, occupying whole of dorsal intervascular medulla in front of ovary. Cirrus pouch pear-shaped, 0.16 – 0.22×0.08 – 0.14 mm in mature proglottides, 0.22 – 0.25 ×0.12 – 0.15 mm in gravid proglottides, reaching slightly beyond excretory stems. Ductus ejaculatorius twisted. Cirrus slender, spinose, up to 0.45 mm long when fully protruded, immediately posterior to vaginal aperture. Genital pore irregularly alternate, at about middle of proglottis margin. Ovary consisting of a dorsal and a ventral pair of wings extending transversely to excretory stems at posterior end of proglottis; each wing morulate at periphery. Uterus intervascular, ventral to testes, split up into a number of lobules radiating from midventral center ; eggs are discharged through ruptured ventral body wall. Eggs 38 – 45 μ long by 30 – 36 μ broad in whole mounts. Vitellaria finely follicular, extending on each side along excretory stems on their outer side and intruding into space between two stems.

This species is distinguished from the most closely related *Acanthobothrium herdmani* Southwell, 1912, by the two hooks of each bothridium being distinctly different in size. The neck swelling containing four conspicuous bulbs of inner longitudinal muscle bundles is also worth noting.

33. *Acanthobothrium micracantha* n. sp,
(Pl. XI. Figs. 61 and 62 : Pl. XXII, Figs. 42 – 45)

Habitat and localities. Spiral intestine of *Dasybatus akajei* (Müller et Henle) (type host) ; *Dasybatus zugei* Müller et Henle ; *Pteroplatea micrura* Bloch et Schneider ; Nagasaki (type locality) ; East China Sea.

Length 68 – 140 mm, breadth 0.9 – 1.8 mm. Largest specimen consisting of over 400 segment. Scolex almost square, 1.3 – 1.5 mm from side to side. Bothridia oval or circular, with prominent, strong-

ly muscular wall, 0.6–0.8×0.55–0.75 mm, each divided by two costae into three loculi, of which the anterior is the largest and the posterior the smallest. Hooks on anterior border of each bothridium bifid, of one pair, 75–90 μ long; outer prong well curved near its base, 20–25 μ long: inner prong 40–50 μ long, with an inconspicuous tubercle proximally. In front of each bothridium there is a fairly large, well-defined accessory sucker 0.125–0.2 mm in diameter and about 60 μ in thickness. Behind the bothridia just inside the longitudinal muscle sheath there are eight (four dorsal and four ventral), very strong columns of thick longitudinal and oblique muscle fibers attached anteriorly to bothridium of their own side, and continued posteriorly into inner longitudinal muscle sheath. Mature proglottides broader than long or longer than broad according to state of contraction, 0.35–1.5×0.82–1.8 mm, with slightly salient posterior border, oval to ellipsoidal in detached ones. Inner longitudinal musculature divided into two distinct layers; outer layer of very numerous fine bundles lying just inside subcuticular cell layer, inner layer of 11–16 moderately strong bundles, lying between cortical and medullary parenchyma.

Dorsal and ventral excretory stems winding, at about middle of each lateral third of proglottis in mature proglottides, with cirrus pouch and vagina between, without transverse anastomosis. Testes 110–150 in number for each proglottis, a little more on antiporal side than on poral. Cirrus pouch usually club-shaped, ovoid when contracted, 0.25–0.5×0.06–0.15 mm, situated for most part medial to excretory stems, separated from ovary by a number of testes, containing convoluted ductus ejaculatorius covered inside with minute spines throughout its length. Genital pore on right or left margin of proglottis a little behind its middle. Ovary extending transversely as far as excretory stems, strongly lobed dorsally as well as ventrally. Uterus ventromedian, reaching to near anterior end of proglottis. No eggs observed. Vagina running along anterior margin of cirrus pouch, then markedly twisted in median field dorsal to uterus. Receptaculum seminis vaginae oval, ventral to ovarial isthmus. Vitellaria extending along excretory stems on their outer side throughout length of proglottis, interrupted on pore side by vagina and cirrus pouch.

This species differs from the most closely related *Acanthobothrium uncinatum* (Rud., 1819) van Beneden, 1850, chiefly in relative length of prongs of bothridial hooks and number of testes.

34. *Acanthobothrium latum* n. sp.
(Pl, XI, Figs. 63 and 64)

Habitat and locality. Spiral intestine of *Dasybatus akajei* (Müll. et Henle); Sea of Ariake, Kyusyu.

Length 54 – 120 mm, breadth 1.4 – 3.6 mm. Gravid specimen consisting of about 400 segments. Scolex 0.66 – 0.75 mm broad. Bothridia elliptical, muscular, 0.48 – 0.6×0.24 – 33 mm, divided into three loculi, of which the posterior is the smallest. Bothridial hooks 150 – 180 μ from base to tip of outer prong, 135 – 165 μ from base to tip of inner prong, 69 – 87 μ from base to angle of bifurcation; outer prong 80 – 105 μ long; inner prong 75 – 90 μ long, with tubercle at base. Each bothridium is surmounted by a muscular conical pad about 0.18 mm broad at the base and bearing at the top an ill-defined sucker about 90 μ in diameter. Neck long, with minimum breadth of 0.32 – 0.36 mm. Proglottides crowded with nearly parallel sides, only slightly imbricated, 0.32 – 0.4×2.7 – 3.6 mm in mature ones, 0.5 ×3.0 – 3.1 mm in gravid ones. Inner longitudinal muscle bundles uniformly developed, consisting of very fine fibers. Dorsal and ventral excretory stems close to lateral margin of proglottis, with cirrus pouch and vagina between. Testes 120 – 150 in number for each proglottis, occupying all available space of medulla dorsal, anterior and lateral to ovary, in front of which they are arranged in two layers, extending outwards between dorsal and ventral excretory stems as far as vitellaria. Cirrus pouch pear-shaped, usually 0.25–0.3×0.15–0.2 mm, reaching a little further inwards than excretory stems in immature proglottides, but not quite so far in gravid proglottides. Ductus ejaculatorius convoluted in cirrus pouch, covered inside with minute hair-like spines throughout its length. Cirrus slender and attenuated distally when fully protruded, up to about 0.5 mm long and 60 μ wide at base. Genital atrium shallow, opening at about middle of proglottis margin, indifferently on right or left. Ovary two-winged, each wing consisting of numerous tubular acini, extending transversely in posterior ventral medulla as far as excretory stems, separated from vitellaria by small number of testes. Uterus occupying all available space of medulla when fully distended with eggs, may well intrude into vitellarian field. Eggs subglobular; outer shell 20 – 24 μ long, embryo 12 – 15 μ in diameter, as measured on whole mount. Vitellaria extending on each side along outer boundary of testes. Vagina opening into genital atrium immediately

in front of cirrus, densely covered with hair-like spines, running transversely in ventral medulla in front of ovary.

This species resembles *Acanthobothrium coronatum* (Rud., 1819) in characters of scolex, especially in bothridial hooks, but differs from it distinctly in relative breadth of proglottides, numuer of testes, extent of cirrus pouch, etc. The specific name refers to the most outstanding feature of the strobila.

35. *Acanthobothrium gracile* n. sp.
(Pl. XII, Figs. 65 and 66; Pl. XXII, Fig. 46)

Habitat and locality. Spiral intestine of *Narke japonica* (Temm. et Schleg.); Tokusima.

Strobila 35–62 mm long, up to 0.65 mm broad, comprising more than 150 segments. Scolex bulbous, 0.5–0.75 mm in diameter. Bothridia elliptical, pressed against scolex throughout their length, 0.35–0.45×0.2–0.28 mm, each divided into three loculi, slightly thickened at margin, surmounted by a fleshy pad 0.1–0.13 mm in diameter and a pair of bifurcate hooks. This hook is similar in shape to that of *Acanthobothrium dasybati* Yamaguti, 1934, 0.11–0.12 mm in entire length, 45–54 μ from tip of root to angle of bifurcation; inner prong gently curved or straight, with a small knob at base, 70–84 μ long; outer prong bent at right angles with its distal half nearly parallel to inner prong, to which it is almost equal in length when stretched. Neck very long and slender, 28–34 mm in length, 0.15–0.2 mm in maximum breadth when extended. Proglottides not imbricated, with nearly parallel sides throughout strobila, broader than long anteriorly, but longer than broad posteriorly, up to 1.3 mm long. No gravid proglottides observed. Testes 75–95 in number, divided into two submedian groups in immature proglottides though indistinctly in mature ones. Cirrus pouch ovoid, thin-walled, 0.17–0.18×0.09–0.11 mm in mature proglottides, lying transversely a little behind middle of proglottis. Cirrus apparently unarmed. Genital pores postequatorial, alternating irregularly from one side to the other. Ovary U-shaped, reaching to level of cirrus pouch in mature proglottides. Vitellaria extending along outskirts of testes and ovary throughout length of proglottis. Vagina opening immediately in front of cirrus.

This species differs from the most closely related *Acanthobothrium dasybati* Yamaguti, 1934, in slender strobila, number of testes and position of genital pore.

36. *Acanthobothrium dasybati* Yamaguti, 1934
(Pl. XII, Figs. 67 and 68 ; Pl. XXII, Figs. 47 and 48)

With addition of two mature specimens from *Raja kenojei* Müller et Henle from Maisaka, and of another from *Urolophus fuscus* Garman from Hamazima, the original specimens described in 1934 were re-examined for comparison, and it was found that the original description of the proglottides had been based on a specifically different specimen obtained from the same host species at a different date.

The original diagnosis is, therefore, emended as follows on the basis of the type specimen and the present material.

Specific diagnosis. Length over 20 mm, breadth 0.4 – 0.85 mm, consisting of more than 80 segments. Scolex 0.57 – 1.0 mm broad. Bothridia elliptical, divided into three loculi, of which the anterior is the largest and the posterior the smallest. 0.35 – 0.65×0.2 – 0.48 mm, surmounted by fleshy pad[1] 0.11 – 0.195 mm broad. No typical accessory sucker. Bothridial hooks 105 – 130 μ long, 45 – 75 μ from base to angle of bifurcation ; inner prong gently curved or nearly straight, with a small knob at base, 66 – 78 μ long ; outer prong bent at right angles, with its sharp-pointed distal half nearly parallel to inner prong, 54 – 75 μ long as measured along its inner margin. Neck variable in length and breadth, somewhat constricted off from segmented portion. Mature proglottides with nearly parallel sides and more or less conspicuous intersegmental constriction, 0.2 – 0.9×0.3 – 0.85 mm. No gravid proglottides observed. Testes oval, relatively large, 40 – 70 in number for each proglottis. Vas deferens strongly coiled in median field. Cirrus pouch pyriform, about one fourth the proglottis breadth or a little longer (up to 0.27 mm long by 0.12 mm broad). Genital pore irregularly alternate, equatorial. Ovary four-winged, V- or U-shaped in dorsoventral view, with its pore side wings reaching to posterior margin of cirrus pouch. Vagina opening immediately in front of cirrus. Vitellaria extending along outer boundary of testes and ovary throughout length of proglottis.

Habitat. Spiral intestine of *Dasybatus akajei* Müller et Henle (type host) ; *Raja kenojei* Müller et Henle, and *Urolophus fuscus* Garmen.

Localities. Inland Sea (type locality) ; Pacific coast.

37. *Acanthobothrium ijimai* Yoshida, 1917
(Pl. XIII, Fig. 71)

A single fully matured specimen from spiral intestine of *Dasy-*

1) Overlooked in my previous observation.

batus akajei from East China Sea, about 60 mm in length with maximum breadth of 1.9 mm. Scolex rounded quadrangular, 2.6 mm in diameter, with distinct incision between bothridia. Bothridia oval in outline, 1.4 – 1.5 mm in transverse diameter, with anterior septum gradually thickened toward middle to form a well-defined flat or prominent muscular knob. It is indicated in Yoshida's plate-figure 13, though not mentioned in the text. Bothridial hooks 120 – 150 μ in total length, 68 – 75 μ from base to bifurcation; outer prong 40 – 60 μ long; inner prong 75 – 90 μ long, with tubercle at base. Accessory suctorial pad 0.26 – 0.28 mm in diameter; central sucker 0,08 – 0.15 mm, lateral one 45 – 75 μ, in diameter. Neck present. Proglottides somewhat imbricated, with nearly parallel sides, crowded anteriorly, but gradually increasing in length and breadth posteriorly, last gravid one 2.0 mm long by 1.5 mm broad. Dorsal and ventral excretory stems passing between vitellarian field and testicular field, just outside of ovary. Testes globular to oval, about 100 for each proglottis and arranged in two layers in preovarian intervascular field. Cirrus pouch oval to ellipsoidal, 0.16 – 0.3×0.11 – 0.14 mm. Ductus ejaculatorius covoluted, covered inside with minute spines throughout its length. Genital atrium slit-like in contracted proglottides, but distinctly funnel-shaped in gravid proglottides, opening indifferently on right or left margin of proglottis in front of its middle in mature proglottides, but about middle of anterior half in fully gravid proglottides. Ovary strongly lobulated, reaching on each side to middle of proglottis. Vitellaria extending throughout length of proglottis just outside of excretory

	Authors		
	Yoshida	Yamaguti	Southwell
Breadth of scolex	?	2.6	0.9 – 1.15
Bothridia	spread out from scolex 1.6 – 1.7×1.2 – 1.4	spread out from scolex 1.3 – 1.5×1.4 – 1.5	pressed against scolex 0.7 – 0.76×0.45 – 0.53
Anterior septum of bothridium	thickened at middle	with distinct thickening at middle	without thickening at middle
Bothridial hook .	90 – 110 μ	120 – 150 μ	133 – 170 μ
Accessory suckers	central 0.1 lateral 0.05	central 0.08 – 0.15 lateral 0.045 – 0.075	central as large as lateral
Genital pore . . .	pre-equatorial	pre-equatorial	postequatorial

stems. Vagina thick-walled, running along anterior margin of cirrus pouch. Uterus occupying entire medullary parenchyma, divided on each side by parenchymatous septa into numerous compartments of irregular outline in fully gravid proglottides. Eggs could not be measured owing to shrinkage.

Acanthobothrium ijimai of Southwell from *Narcine timlei* and *Chiloscyllium* sp. differs markedly from Yoshida's original and the present material as shown in the above table. (Measurements in mm unless otherwise indicated)

As is evident from the above comparison Southwell's specimen should not be assigned to *Acanthobothrium ijimai* Yoshida.

38. *Acanthobothrium grandiceps* n. sp.
(Pl. XII, Figs. 69 and 70; Pl. XXII, Fig. 49)

Habitat and locality, Spiral intestine of *Dasybatus zugei* Müller et Henle (type host); *D. akajei* Müller et Henle; East China Sea.

Length 14–20 cm; breadth 1.3–2.0 mm. Largest type consisting of about 950 segments. Scolex rounded quadrangular in apical view, 4–5 mm in diameter, with distinct notch between bothridia. Each bothridium ovoid in outline with two inconspicuous septal notches on each side, 2.2–2.3 mm long by 2.1–2.4 mm broad, divided into three loculi, of which the anterior and posterior are biconvex, and the middle is biconcave, anterior septum with a conspicuous nodular swelling at middle. Bothridial hooks 165–180 μ long; 70–84 μ from base to bifurcation, with sharp-pointed prongs; outer prong 50–80 μ long, forming with inner prong an angle of 70°–80°; inner prong 96–114 μ long, with rudimentary basal knob. Accessory suctorial pad rounded triangular or three-lobed, 0.32–0.38 mm broad at base, with a large central sucker 0.2–0.21 mm in diameter and two smaller lateral ones 0.1–0.15 mm in diameter. Neck 4 to 15 mm long, 0.4–0.5 mm wide at narrowest part. Proglottides crowded anteriorly, imbricated throughout strobila, and nearly parallel-sided, gradually longer and broader toward fully matured ones, whence the breadth decreases posteriorly, though the length increases continuously, measuring 0.3–0.81 mm long by 1.3–2.05 mm broad in mature and gravid ones. Excretory stems at about middle of lateral third of proglottis in mature proglottides. Inner longitudinal muscle bundles thick, close to one

another, forming a definite sheath for the medulla. Testes 110 – 130 in number for each proglottis, arranged in one layer in immature proglottides but in two layers in mature proglottides, in preovarian intervascular field. Cirrus pouch oval, 0.2 – 0.3×0.12 – 0.13 mm in mature and gravid proglottides, may overreach excretory stems. Cirrus protrusible, armed with hair-like spines like ductus ejaculatorius. Genital pore irregularly alternate, at middle of proglottis margin or only slightly in front of it. Ovarial wing divided into numerous small, distally rounded acini, reaching as far forward as middle of proglottis. Vitellaria extending throughout length of proglottis just outside of excretory stems. Vagina running along anterior margin of cirrus pouch, opening into genital atrium immediately in front of cirrus, covered inside with hair-like spines. Uterus in ventral central area, giving off saccular lateral pouches of irregular outline. Eggs not yet fully developed.

This species is characterized by enormous size of scolex, hence the specific name.

39. *Calliobothrium verticillatum* (Rud., 1819) van Beneden. 1850
(Pl. XIII, Figs. 72 – 74)

Habitat and locality. Spiral intestine of *Mustelus manazo* Bleeker; Sea of Japan.

Length 57 – 120 mm, breadth 0.6 – 1.1 mm. Largest specimen consisting of about 560 segments, smallest of about 480 segments. Scolex fused with first segment, 0.32 – 0.35 mm in combined length. Bothridia elliptical in outline, 0.13 – 0.24×0.095 – 0.105 mm, divided into three loculi, of which the anterior is a little more than half as large as entire bothridium. Bothridial hooks of two pairs, slender with broad base; inner pair 63 – 78 μ long lineally from tip to anterior end of base, more strongly curved than outer, which is 72 – 84 μ long in the same way of measuring. Each bothridium is surmounted by a muscular pad which is 80 – 105 μ in diameter and indistinctly divided into three sucker-like structures, of which the middle is larger than the lateral. Proglottides very small, with four triangular flaps (two dorsally and two ventrally), longer than broad at beginning, increasing in breadth posteriorly but not in length until the testicular anlagen appear, or rather crowded at the point, where each of the two submedian flaps becomes fused with the

lateral of its own side. The posterior margin of the proglottis begins to be produced backwards both dorsally and ventrally between the two lateral flaps at the 80th to 90th segment, and the median flap thus formed is notched at the middle of its free margin at the 155th to 210th segment to be divided later into two flaps similar to the lateral ones. This 8-flapped condition continues for large numbers of segments (200 – 260) but finally each of the two submedian flaps becomes fused with the lateral of its own side at the 385th to 430th segment, thus forming on each side of the median line a broad flap corresponding to the original lateral flap. After that the proglottides become gradually longer posteriorly without appreciable increase in breadth, and the intersegments are more or less constricted; the mature posterior proglottides measure 1.5 – 2.4 mm in length inclusive of flaps and 0.58 – 0.95 mm in breadth, the terminal one without flaps is produced backward into a more or less sharp point and 1.75 – 2.8 mm long by 0.58 – 0.75 mm broad. Free gravid proglottides (with uterus emptied) subcylindrical, flattened dorsoventrally, blunt-pointed in front, with or without four flaps behind, 4.3 – 6.65×0.95 – 1.25 mm. Inner longitudinal muscle bundles 90 – 130 in number. Between this sheath and the regular subcuticular longitudinal musculature, especially close to the latter, there are numerous finer longitudinal bundles which are continued into the flaps, in which they are separated by transverse muscles from the strongly developed dorsoventral muscle fibers. In contrast with the description by Southwell or by Woodland there is only one pair of excretory stems, the ventral pair, running between the dorsal and the ventral vitellaria. Testes closely arranged in one layer or two between two vitellarian fields from anterior end of proglottis to anterior part of ovary. Cirrus pouch oval, thin-walled, 0.12 – 0.25×0.09 – 0.18 mm in mature and gravid proglottides, lying transversely, with its broader medial end extending a little more inwards than vitellaria. Cirrus strongly convoluted, covered inside with hair-like spines throughout its length contrary to Southwell's observation, very long and slender, up to 1.5 mm long when everted. Genital pore irregularly alternate, at posterior part of anterior third of proglottis margin, occasionally a little more posteriorly. Ovary two-winged, consisting of very closely massed relatively large tubular acini, occupying entire intervitellarian field at posterior end of proglottis. In transverse section it is not X-shaped contrary to Woodland's observation. Uterus with sinuous

wall, extending in ventral median medulla from ovarial isthmus to a level a little anterior to genital pore. Vagina opening into genital atrium directly in front of cirrus.

40. *Platybothrium auriculatum* n. sp.
(Pl XIV, Figs. 75-77)

Habitat and locality. Spiral intestine of *Prionace glauca* (Linné); Pacific coast of Mie Prefecture.

Described from a single, not fully mature specimen. Length 18 mm, breadth 0.4 mm near posterior extremity. Scolex cuboidal, 0.4 mm long, 0.3 mm broad in front and 0.35 mm broad behind. Bothridia in dorsal and ventral pair, elongate, covered with very fine spines, each with two arcuate costae near posterior end, 0.12 - 0.15 mm in maximum breadth at first costa, which projects fairly prominently. On each side of bothridium just in front of its middle is an auricular lobe 63 - 75 μ long. Inner bothridial hook inverted Y-shaped · two prongs may be parallel distally or more widely divergent than is shown in Pl. XIV, Fig.76, nearly equal in length (80 - 93 μ), root simple, rod-shaped, 48 - 54 μ long, flexed outwards abruptly near its junction with prongs. Outer hook with two hollow, claw-like prongs and a rod-shaped, root-like process 54 - 60 μ long; as measured along convex side outer prong is 60 - 75 μ long, and inner 80 - 87 μ long, with its stumpy root articulated with broader outer end of connecting bar. Latter simple, 72 - 75 μ long, blunt-pointed at inner end overlapping root of inner hook, broadened toward faceted outer end. Accessory sucker 40 - 50 μ in diameter, situated immediately in front of inner hook. Strobila slender, made up of about 90 segments. Unsegmented neck region about 4.5 mm long, 70 μ broad anteriorly but 0.3 mm broad at its posterior end, covered densely with deciduous spines up to 30 μ long. These spines are also present on the proglottides, though smaller (10 - 21 μ long) and much more sparse toward posterior end of strobila. Anterior proglottides much broader than long, with parallel sides; posterior ones longer than broad, bottle-shaped in dorsoventral view, 0.4 - 0.55×0.33 - 0.35 mm. Testes 50 - 60 in number, separated in two lateral fields between anterior end of proglottis and level of genital pore, but in the proglottis constricted near the anterior end the two fields become continuous anteriorly and divergent posteriorly. Occasionally a testicle may intrude into space bet-

ween cirrus pouch and ovarial lobe of pore side. Cirrus pouch elongate, thin-walled, oblique, 0.15 mm long by 40 μ broad in the proglottis figured. Cirrus opening indifferently on right or left margin of proglottis at anterior half of posterior third, immediately behind vagina. Ovary consisting of two compact, coarsely lobed wings. Median anlage of uterus apparently reaching level of proximal end of cirrus pouch. Vagina anterior to cirrus pouch, crossing it at its proximal end, opening immediately in front of cirrus. Vitellaria poorly developed, extending along outskirts of testes and ovary throughout proglottis length.

This species is unique in possessing a pair of auricular appendages on each bothridium, hence the specific name.

41. *Platybothrium musteli* n. sp.
(Pl. XIV, Figs. 78 and 79)

Habitat and locality. Spiral intestine of *Mustelus manazo* Bleeker; Sea of Japan.

Length 3.7 – 5.3 mm, breadth 0.2 – 0.25 mm. Strobila slender, composed of 11 or 12 segments. Scolex nearly squarish, 0.2 – 0.3 mm in diameter at its truncate apex, behind which it is somewhat constricted. Bothridia trough-shaped, 0.3 – 0.42×0.15 mm, covered all over with minute spines, consisting of coarse muscle fibers running at right angles to surface, each bearing at its posterior end a cup-like loculus about 135 μ in diameter. Bothridial hooks measure in μ as follows :

	Total length	Breadth at base	Inner prong	Middle prong	Outer prong
Three-pronged hook	90 – 114	75	75 – 93	70 – 75	50 – 55
Two-pronged hook	90 – 126	60	80 – 90	—	70 – 80

Each inner prong of the two hooks is provided with a short, blunt process on inner side of its base, with connecting bar 24 – 36 μ broad between. No suckers at apex of bothridia. Neck 0.6 – 1.0 mm long, narrowest (45 – 60 μ) immediately behind head, whence it gradually broadens posteriorly, covered very densely with minute simple spines which are up to 6 μ long and directed backwards. Proglottides also finely spined all over, though the posterior ones

are almost naked; anteriormost proglottides broader than long, increasing in length posteriorly, while the intersegmental constriction becomes more and more pronounced toward the loosely attached terminal segment, which is subcylindrical or elongated elliptical and 0.9 – 1.5 mm long by 0.2 – 0.25 mm broad. There are no inner longitudinal muscles, though the subcuticular longitudinal muscle fibers are fairly well developed. Testes numerous, closely massed in medulla between ovarial isthmus and anterior end of proglottis. Cirrus pouch oval, thin-walled, up to 0.15 mm long by 0.09 mm broad, situated transversely, with its proximal end extending beyond median line. Cirrus narrow, unarmed, convoluted in cirrus pouch, opening into small genital atrium immediately behind vagina. Genital pore irregularly alternate, slightly in front of middle of lateral margin of proglottis. Ovary two-winged, 0.4 – 0.45 mm long in terminal segment, extending longitudinally in posterior third of proglottis between vitellaria of two sides. Uterus not yet developed. Vagina opening immediately in front of cirrus, running inwards along anterior margin of cirrus pouch, forming elongate pyriform receptaculum seminis dorsal to ovarial isthmus. Vitellaria extending throughout length of proglottis just outside of testes and ovary.

This species is characterized by small size of strobila, cup-like loculus at posterior end of each bothridium and very long posterior segments.

ABERRANT TETRAPHYLLIDEA

42. *Pelichnibothrium speciosum* Monticelli, 1889

Numerous mature but not gravid specimens were found in the spiral valve of *Prionace glauca* (Linné) and immature ones up to 25 cm long in the small intestine of *Lampris regia* (Bonnaterre) and *Thynnus thynnus* (Linné) at Hamazima, Mie Prefecture.

43. *Discobothrium japonicum* Yamaguti, 1934
(Pl. XIV, Fig. 80)

Host and localities. *Narke japonica*; Maisaka and Koti.

Length up to about 16 mm, breadth 0.25 mm, consisting of 140 – 160 segments. Scolex 0.4 – 0.5 mm in diameter, marginal suckers up to 0.3 mm long; terminal sucker of myzorhynchus 0.14 – 0.175

mm in diameter, covered with minute spines on its free surface, which may be protruded outside in form of a dome. Neck short, 0.15 – 0.2 mm broad. End proglottides 0.5 – 0.85 × 0.2 – 0.28 mm, containing rudimentary genitalia. Free proglottides tapering posteriorly, 1.4 – 4.0 × 0.22 – 0.6 mm, with semi-elliptical vesicular terminal swelling at anterior end. Testes 6 in number, extending in a longitudinal series in median field dorsal to uterus from a little in front of ovary to base of anterior vesicular swelling. After receiving the vasa efferentia the vas deferens turns forwards slightly behind the shell gland complex to wind its way dorsal to the uterus toward the base of the cirrus pouch, in the vicinity of which it is thrown into convolutions ; in the ascending course it may be distended with spermatozoa to a maximum width of 60 μ, but it is usually narrow at the convoluted distal end. Cirrus pouch elongate, transverse or oblique, 0.18 – 0.28 × 0.038 – 0.054 mm, fixed at its base with dorsal wall of proglottis by means of a number of short muscle fibers. Genital pore on right or left margin of proglottis at a level between second and fourth testis. With the distention of the uterus the genital pore is shifted toward the dorsal surface of the proglottis. Ovary divided into symmetrical halves, each of which is distinctly three-lobed. The shell gland complex is illustrated in Pl. XIV, Fig. 80. Vagina opening into common genital pore immediately behind male aperture. Uterus extending in ventral field between ovary and anterior vesicular swelling ; when fully distended with eggs it occupies the greater part of the proglottis, giving the latter a fusiform appearance. Eggs rounded, 14 – 18 μ in diameter, with delicate spiniform filament of unequal length on each side ; longer filament may be as long as 0.1 mm ; shorter one 30 – 45 μ long. Of the excretory system in the free proglottides there are on each side two very narrow vessels corresponding to the dorsal and ventral stems ; both are united with each other at the extremities and open to the outside by a short vessel at each end of the proglottis.

TENTACULARIIDAE Poche, 1926

44. *Nybelinia manazo* n. sp.

(Pl. XV, Figs. 81 and 82 ; Pl. XXII, Fig. 50)

Habitat and locality. Stomach of *Mustelus manazo* Bleeker ; Hamazima.

Length unknown (probably more than 35 mm), maximum breadth 1.1 mm. Strobila rather slender, with parallel sides in immature specimen, distinctly constricted at intersegments in gravid specimen. Scolex[1] 0.95 – 1.05 mm long by 0.7 – 0.75 mm broad; pars bothridialis a little longer than pars bulbosa and postbulbar velum combined, pars vaginalis coinciding with pars bothridialis. Bothridia about 0.4 mm long, fringed with long hairs along puckered edges. Proboscis 0.25 – 0.34 mm in length, 35 μ in breadth excluding hooks, somewhat attenuated toward anterior end, with 18 – 19 spiral rows of about 10 hooks each; apical hooks 8 – 10 μ long with base 5 – 9 μ long; basal hooks only 4 – 6 μ long, rootless; intermediate hooks attaining maximum length of 15 – 18 μ with base 8 – 9 μ long. Proboscis sheath about 0.3 mm long. Proboscis retractor attached to base of muscle bulb, which is elliptical and measures 0.23 – 0.25 × 0.084 – 0.11 mm. Velum flared or contracted, about 0.25 mm long with somewhat crenulated border. Immature proglottides broader than long, mature and gravid ones with convex sides, squarish, longer than broad or broader than long, 0.65 – 1.0 × 0.66 – 1.1 mm. No inner longitudinal muscle sheath. The median muscle band as observed in *Nybelinia pintneri* has not been detected. Two pairs of excretory stems of same width in mature proglottides. In the gravid proglottides, however, the much narrower dorsal stem runs along the outskirts of the testes dorsal to the genital pore, without intersegmental anastomosis; the ventral stem lies a little medial to the dorsal stem and ventral to the cirrus pouch and vagina, with transverse anastomoses at the intersegments. Intersegmental median vesicle with dorsal opening present. Testes 36 – 64 in number for each proglottis, lying in one layer or two inside vitellaria between two dorsal excretory stems, occasionally overlapping latter. In the immature proglottides they are fewer (36 – 50) and divided into two distinct submedian groups, which are continuous in the median line at the posterior end of the segment. Cirrus pouch subcylindrical, somewhat enlarged at distal end, thin-walled, 0.24 – 0.3 × 0.065 – 0.075 mm, extending obliquely between convoluted vas deferens and genital pore, containing twisted ductus ejaculatorius and unarmed cirrus. Genital pores ventromarginal in same sagittal plane as dorsal excretory stem a little nearer to anterior end of proglottis than to its middle, alternating

1) The description relating to the scolex is based on the two immature specimens.

irregularly from one side to the other. Ovary X-shaped in cross section, situated in median field with its isthmus usually just behind equator ; each lobe divided into comparatively large follicular acini in end proglottis. Uterus occupying all available space inside vitellaria between two dorsal excretory stems, not encroaching upon ovary both dorsally and ventrally. Eggs subglobular, thin-shelled, 27 – 36×27 – 33 μ in mounted condition. Vitellaria follicular, forming a continuous layer immediately inside subcuticular cells. Vagina opening lateral to cirrus, running inwards anterodorsal to cirrus pouch, crossing latter dorsally to proceed toward the ovarial isthmus, on the anterodorsal side of which it forms an elongate twisted receptaculum seminis up to 54 μ wide.

This species differs from the related species of the genus with ventromarginal genital pores such as *N. lingualis* (Cuvier), *N. palliata* (Linton, 1924), *N. syngenes* Pintner, 1929, *N. perideraeus* (Shipley et Hornell) of Southwell, and *N. pintneri* Yamaguti, 1934, in length of strobila, number of spiral rows of proboscis hooks, number of testes, position of genital pores, etc.

45. *Nybelinia* (*Syngenes*) *sphyrnae* n. sp
(Pl. XV, Figs. 83 and 84)

Habitat and locality. Pars pylorica of *Sphyrna zygaena* (Linné) ; Nagasaki.

Length 100 mm or more, breadth 1.5 – 2.3 mm when flattened. Scolex bulbous, bluntly rounded in front, 0.8 – 1.0 mm in length, with maximum breadth of 0.6 – 0.65 mm at pars bothridialis, whence it gently tapers posteriorly ; velum 0.075 – 0.13×0.32 – 0.38 mm, with entire posterior margin. Bothridia elongate, curved, 0.45 – 0.6 mm long, fringed with long hairs along free borders, arranged in dorsal and ventral pair ; paired ones concave on medial margin, close to each other at posterior ends, in direct contact with the opposite pair at outer margin of anterior half. Proboscis cylindrical, 0.35 – 0.4× 0.034 mm ; proboscis hooks a little smaller posteriorly, 14 μ (at base of proboscis) to 21 μ (at tip of proboscis) from tip of strongly recurved blade to anterior end of root, which is 12 – 15 μ long by 4 μ broad, arranged in regular spiral rows (12 longitudinal rows of 16 each). Proboscis retractor attached to posterior end of muscle bulb. Latter cylindrical, 0.325×0.09 – 0.15 mm, slightly intruding into pars bothridialis anteriorly. Pars bothridialis coinciding with pars vaginalis but distinctly longer than pars bulbosa in contrast with that of *Nybe-*

linia syngenes Pintner, 1929. Neck 0.6 – 0.75 mm long, 0.24 mm wide at its narrowest anterior end. Proglottides slightly imbricated, gradually broader posteriorly, with nearly parallel or slightly convex sides, 0.625×2.25 mm in the flattened mature one (Pl. XV, Fig. 84), still broader than long even in fully gravid terminal ones. Inner longitudinal muscle bundles thick, forming complete sheath throughout strobila. Intersegmental band of transverse muscles very conspicuous, especially compact at its posterior layer lying immediately behind excretory vesicle. Excretory stems of two pairs, dorsal to cirrus pouch and vagina, communicated with each other as well as with median excretory vesicle by transverse anastomoses running at intersegments or anterior end of proglottis; outer stem very narrow, between two layers of testes at about middle of lateral third of proglottis, crossing cirrus pouch near its middle; inner stem 6 – 8 μ wide in mature and gravid proglottides, between testes and uterus, crossing cirrus pouch at about middle of its proximal half. Excretory vesicle tubular, lying dorsoventrally, opening dorsally at middle of each intersegment. Testes transversely elongated oval, up to 75 ×100 μ, 80 – 100 in number for each proglottis, arranged in two layers, filling up entire dorsal medullary parenchyma except median field, not continuous across median line in contrast with *Nybelinia pintneri* Yamaguti, 1934. Cirrus pouch cylindrical, thin-walled, 0.8 mm long by 0.1 mm broad in the proglottis figured, with its proximal end extending to anterior end of proglottis in line with poral outer end of ovary. No vesicula seminalis interna. Cirrus opening into basally enlarged, shallow genital atrium in front of vagina. Genital pore indifferently on right or left margin of proglottis, at about its middle and only slightly to ventral side. Ovary X-shaped, about one- third the breadth and one-half the length of proglottis when mature; each wing compact, with morulate surface. Uterus ventral, reaching as far as outer edges of medulla. Eggs subglobular, thin-shelled, not operculate, 33 –45×27 – 36 μ in mounted condition. Vagina provided with sphincter at its opening, whence it runs inwards along posterior margin of cirrus pouch. Vitelline follicles mainly outside of muscle sheath, partly interfascicular, continuous across median line in front of ovary both dorsally and ventrally, but interrupted in vicinity of shell gland complex.

This species agrees well with *Nybelinia* (*Syngenes*) *palliata* (Linton, 1924) in the characters of the proglottides and of the proboscis hooks, but differs distinctly in the scolex, especially in its velum.

In *N. palliata* the velum (collar) is 0.7 mm long, whereas in the present species it is only 0.075 – 0.13 mm long, although the strobila is more than three times as long. In *N. bisulcata* Linton, 1889, there are about eight proboscis hooks in each spiral, and the marginal genital pores lie always near the anterior edge of the proglottis. In *N. peraderaeus* Shipley et Hornell, 1906, of Southwell the testes are 60 – 70 in number and continuous across the median line behind the ovary.

FLORICIPITIDAE Dollfus, 1929

46. *Floriceps uncinatus* (Linton, 1924) n. comb.
(Pl. XVIII, Fig. 106)

Habitat and locality. Spiral valve of *Vulpecula marina*; Taizi.

Strobila slender, 73 mm or more in length, comprising more than 60 segments. Scolex 3.5 – 3.8 mm long, bothridia 0.7 – 1.23 mm long in flattened whole mounts. Proboscides 4 – 4.3 mm long and somewhat attenuated toward anterior end when fully protruded, 75 – 125 μ in diameter, armed with hooks as described and figured by Linton; basal spineless portion 0.6 – 0.65 mm long; large hooks grouped in a semicircle at base of hook-bearing portion, forming 6 longitudinal rows of 2 or 3 each, largest 0.15 mm long and 35 μ broad at base; hooks at each end of circle slender, 54 μ long. Next portion bearing oblique rows of minute hooks, of which the outer are rose-thorn-shaped and the inner bristle-like, the intermediate being of transitional form. The remaining portion reaching to the apex of the proboscis is covered with longitudinal rows of hooks of four different shapes; the number of the hook rows decreases from behind toward the apex and the dissimilarities in the shape of the hooks diminish accordingly. The hooks of the smallest type are directly continuous with the minute hooks mentioned above, and arranged on the inner side in several longitudinal rows posteriorly with the blade almost parallel to the surface of the proboscis, but in single row anteriorly and disappear at the apex. On the outer side there are two longitudinal rows of decumbent hooks 40 – 45 μ long. They are directed backwards with their tips converged toward each other; at the apex of the proboscis they are 30 – 33 μ long and arranged in a single row. Between the above mentioned two types of hooks there are on each side 8 longitudinal rows of long rather upright

hooks. At the apex of the proboscis the two groups join together owing to disappearance of the smallest hooks. The hooks nearest to the double row of decumbent hooks are the heaviest and strongly recurved at the tip but become gradually slender and less upright toward the inner side of the proboscis with gradual decrease of terminal curvature. Proboscis retractor attached to base of muscle bulb which is 0.55 – 1.0 mm long. Pars postbulbosa 1.0 – 2.0 mm long. Proglottides crowded anteriorly, gradually increasing in length toward posterior extremity of strobila, mature ones 2.1 – 4.6×0.6 – 0.9 mm with parallel sides, only slightly constricted at segmentation line; free gravid ones subcylindrical, 4.2 – 6.8×0.75 – 1.3 mm, with a distinct mammiform elevation anterior as well as posterior to genital pore. Testes innumerable, closely packed in medulla in 2 or 3 layers. Vesicula seminalis (Locomotionsblase of Zerny) up to 0.17 mm in inside diameter, with a very thick wall of lamellar fibers, pressed against anterior end of gravid uterus. Cirrus pouch oval or fusiform, up to 0.35 mm long by 0.2 mm broad, occupied proximally by voluminous receptaculum cirri containing spermatozoa and distally by cirrus, pushed obliquely forward by gravid uterus but transverse in segments which are not yet gravid. Genital pores irregularly alternating, dividing proglottis length in ratio of 1 : 3.0 – 3.8. Ovary consisting of symmetrical mulberry-like lobes, situated in median field at a short distance from posterior end of proglottis; its dorsal and ventral surfaces furrowed longitudinally by inner longitudinal muscle bundles. Uterus distended with eggs sausage-shaped, extending from ovary to vesicula seminalis. Vitellaria attaining full development in free gravid proglottides, closely set in one layer and occupying entire cortical parenchyma except in region of genital pore and ovary. Vagina opening into genital atrium immediately in front of male aperture, running inwards along anterior border of cirrus pouch and then crossing it on ventral side of its base.

In general anatomy this species agrees well with *Floriceps elongatus* Rud., 1918, only differing in the position of the vagina relative to the cirrus pouch and in the characters of the proboscis hooks. Therefore, it should be transferred to *Floriceps* from *Rhynchobothrium*, in which it was placed by the original author, and which is now regarded as a heterogenous group.

TETRARHYNCHIDEAN LARVAE

47. *Pintneriella musculicola* Yamaguti, 1934

(Pl. XV, Figs. 85 and 86)

Habitat and locality. Flesh of *Epinephelus akaara* ; Tarumi, Kobe.

Length 23 mm long by 2.5 mm broad. Cuticle beset with exceedingly minute spines all over except on caudal appendage. Bothridia elliptical in outline, surficial, 1.1 – 1.38×0.7 mm, each with an inconspicuous notch at posterior end. Proboscis long and slender, 45 – 75 μ in diameter (broadest at the point where the microhooks are massed together) ; proboscis hooks in 18 longitudinal rows except for basal ones. On one side there are two rows of relatively stout hooks 35 – 40 μ long, the others being slender and up to 45 μ long on the opposite side. At a short distance (about 0.25 mm) from the base the proboscis is only slightly enlarged and armed with several longitudinal rows of minute slender hooks and 18 oblique rows of distally recurved hooks, of which 11 rows are more oblique than the others and so closely arranged that they look like a fine file, while the other rows are a little more apart one from another, though the hooks in each row are very close to each other and longest (up to 18 μ) at the middle of the row, whence they become shorter anteriorly and falciform posteriorly with gradual decrease in length. The slender microhooks lying near the coarser file are falciform and only 4 – 5 μ long anteriorly but become longer posteriorly with gradual modification of form from an ear-pick to a simple claw, while the others arranged near the finer file are merely arcuate anteriorly but become longer and straight and then curve outwards and extend further back of their neighbors, attaining a maximum length of 21 μ. Behind this irregularly spined area the proboscis is armed on one side with rooted or rootless acicular spines up to 42 μ long and on the other side with apically curved spines continuous with those described above.

48. *Microbothriorhynchus coelorhynchi* n. g.; n. sp.
(Pl. XVI, Figs. 87 – 89)

Habitat and locality. Body cavity of *Coelorhynchus* sp. ; Maisaka, Sizuoka Prefecture.

Described from two whole mounts. Cyst long and cylindrical. Body nearly cylindrical, 19 – 22 mm in length, with maximum breadth of 0.9 mm at level of posterior ends of muscle bulbs. Cuticle beset all over with exceedingly minute spines. Proboscis 0.15 – 0.2

mm broad at posterior portion, but very narrow at its introverted anterior portion, armed with hooks of four different types except at its narrow introverted portion. On the side facing to the axis of the body are two longitudinal rows of stout hooks (I) and on the opposite side are numerous rows of slender, spiniform hooks (II), while on the two remaining sides are comb-like groups (III and IV) of five each at the same level. The first type measures up to 165 μ from the tip to the anterior end of the root, which is up to 120 μ long, the second up to 60 μ, the third and fourth are strongly curved near the tip, and increasing in length toward the first type, with maximum of 100 μ for the third and of 120 μ for the fourth, whose curving point lies nearer to the tip than that of the third. The total number of these hooks is unable to make out on account of introversion of the narrow anterior portion of the proboscis. The latter portion is armed with small number of minute basally bifid hooks of two types, one being thick and abruptly curved at the tip and the other simply spiniform. Bothridia represented by a folded, fleshy collar encircling base of proboscis, divided into two lobes (a dorsal and a ventral) touching each other at outer ends. Pars vaginalis 10–12 mm long by 1.0–1.4 mm broad, slightly tapering anteriorly. Proboscis sheath 60–70 μ in diameter. Proboscis retractor 12–24 μ in diameter, apparently attached to posterior end of muscle bulb. Pars bulbosa cylindrical, 8.5–10.0 mm long by 1.8 mm broad at slightly enlarged posterior end; muscle bulb slender and undulating, about 1.2 mm in diameter. Posterior appendage 1.4×1.4 mm, somewhat truncate at posterior end; terminal atrium, into which the excretory stems open, shallow, covered with hairs, with wide aperture.

This species is characterized by the collar-like bothridia, the very long pars vaginalis and pars bulbosa, and the armature of the proboscis. Similar worms, apparently belonging to the same genus, were found in the perirenal connective tissue of *Lophius litulon* (Jordan) from the Pacific and the body cavity of *Ariscopus iburius* Jordan et Snyder from Toyama Bay.

Microbothriorhynchus n. g.

Generic diagnosis. Cystidea. Family? Adult unknown. Scolex very long, slender. Bothridia consisting of two (a dorsal and a ventral) collar-like lobes encircling bases of proboscides. Proboscides stout, armed with hooks of different sizes and shapes on different sides. Pars vaginalis and pars bulbosa very long, nearly cylindrical, followed by stumpy appendage, muscle bulbs long, slender. Parasitic as larva in body cavity of marine teleosts.

Genotype. *Microbothriorhynchus coelorhynchi.*

49. *Oncomegas wageneri* (Linton, 1890) (Pl. XVI, Figs. 90 and 91)

Habitat and locality. Body cavity of *Conger myriaster* and *Cepola schlegeli* (Bleeker); Sea of Japan.

Body cylindrical, 4.2 – 11 mm long. Scolex proper 2.8 – 4.0×0.5 – 0.7 mm; caudal appendage 1.35 – 7.0 mm long. Bothridia 0.4 – 0.46 mm long by 0.4 mm broad, emarginate on posterior edge. Proboscis, inclusive of introverted portion, 1.9 – 2.48 mm long, 70 – 90 μ in diameter at broadened base. Basal marcohook 50 – 60 μ from tip to anterior end of base, which is 35 – 42 μ anteroposteriorly. Except for the minute basal hooks 6 – 24 μ long the proboscis hooks are arranged in spiral rows, each of which consists of 11 – 13 hooks, largest one on the side facing to the axis of the body, measuring 33 – 42 μ from the tip to the anterior end of the base which is 27 μ anteroposteriorly, and the opposite ones being the smallest. Proboscis sheath strongly coiled, especially in front of muscle bulb, 38 – 70 μ in diameter. Proboscis retractor 15 – 30 μ in diameter, attached to posterior extremity of bulb. Muscle bulbs 1.1 – 1.5×0.1 – 1.14 mm, with a band-like mass of nuclei at their posterior ends. Pars postbulbosa slightly tapering posteriorly, 0.5 – 0.7 mm long, distinctly constricted off from the caudal appendage. Latter 1.35 – 7.0 mm long, just as broad as scolex proper, containing well developed inner longitudinal muscle sheath besides excretory system.

50. *Pterobothrium chaeturichthydis* n. sp. (Pl. XVII, Fig. 95)

Habitat and locality. Body cavity of *Chaeturichthys hexanemus* Bleeker; Maisaka, Sizuoka Prefecture.

A single larva, liberated from blastocyst, about 10 mm long and 1.8 mm broad at level of bothridia. Pars vaginalis 3.5 mm long behind bothridia, somewhat attenuated at middle, its posterior portion and pars bulbosa cylindrical, 1.4 mm broad. Pars postbulbosa stumpy, 1.3×1.1 mm, with shallow sinus at its truncate posterior end. Bothridia terminal, disposed cruciformly with the convex sides directed outwards, about 1.0 mm long. Proboscis tubular, 0.15 – 0.16 mm in diameter, about 3 – 4 mm long in combined length. Apart from the introverted portion the proboscis hooks are arranged in two alternating groups of 10 each, attaining maximum length

near proboscis base. Six of them form a transverse semicircular row, measuring in length up to 195 μ, 195 μ, 195 μ, 170 μ, 105 μ, and 87 μ respectively, while the other four are much smaller, one (up to 60 μ long) lying in front of the smallest end hook of the semicircular row and each of the remaining three behind the third, fourth and fifth (as numbered from the stoutest one) of the same row respectively, measuring up to 69 μ, 60 μ and 54 μ in respective length. Anteriorly the blade of the stoutest end hook of the semicircular row becomes shorter and more strongly curved, and its base becomes more and more elongated to attain maximum length of 111 μ and then the entire hook decreases progressively in size like the others. Toward the end of the introverted portion of the proboscis the hooks are rudimentary, fewer and irregular in arrangement. No special group of hooks at base of proboscis. Proboscis retractor varying in diameter from 24 μ to 70 μ according to state of contraction, attached to muscle bulb near its middle. Muscle bulbs 3.5 mm long by 0.45 mm broad.

51. *Pterobothrium hira* n. sp.
(Pl. XVI, Fig. 92; Pl. XVII. Figs. 93 and 94)

Habitat and locality. Body cavity, especially on liver and pyloric ceca, of *Ilisha elongata* (Bennett); Sea of Ariake, Kyusyu.

Blastocyst 13.0 – 18.5 mm long, constricted into an anterior bulb containing scolex and a long, cylindrical, posterior portion, at the rounded posterior end of which opens the tubular excretory vecicle formed by union of two lateral descending stems. Scolex proper 5 – 6 mm long, about 0.8 mm broad at anterior ends of bothridia where the proboscides originate. Bothridia terminal, disposed crosswise with convex sides directed outwards, 0.4 – 0.5 mm long. Pars vaginalis 2.1 – 2.7 mm between bothridia and bulbs, with minimum breadth of 0.3 – 0.4 mm a little behind bothridia, whence it becomes slightly broader toward the bulbs. Pars bulbosa 0.5 – 0.65 mm broad. Pars postbulbosa 1.0 – 2.0 mm in length, with maximum breadth of 0.56 – 0.85 mm at about its middle, tapering abruptly toward its posterior end enclosed in sinus of anterior bulbous swelling of blastocyst. Proboscides slender, 2.5 mm long when fully everted, 54 μ broad at apex, 70 – 90 μ broad at base. Proboscis hooks grouped into three sets except for basal hooks: first set consisting of 35 obliquely transverse rows of 10 hooks each, of which the middle is the stoutest, with a falciform blade and measures up to 75 – 100 μ from

tip to anterior end of base, and terminal two at each end of the row are slender, rootless, and up to 90–120 μ long, while the intermediate are transitional in shape and size; second set consisting of 7–9 slender hooks arranged in two alternate rows, lying behind two ends of each row of first set, anterior hook measuring up to 52 μ long and posterior up to 25 μ long; third set forming a longitudinal band of minute acicular spines 10–30 μ long between two ends of transverse rows of first set. All hooks of three sets diminishing gradually toward apex and base of proboscis, especially those of second set, decreasing in number and disappearing at proboscis base. The basal hooks are divided into two groups, one of which is formed by continuation of the transverse rows of hooks mentioned above, while the other consists of about a dozen longitudinal rows of minute claw-like spines 10–15 μ long. Proboscis sheath 60–75 μ in diameter, proboscis retractor 20–33 μ in diameter, attached to muscle bulb in front of its middle. Muscle bulbs cigar-shaped, 0.85–1.15×0.15–0.2 mm.

Despite Southwell's opinion to the contrary I cannot look upon *Pterobothrium* Diesing as identical with *Gymnorhynchus* Rudolphi, so far as the latter genus is defined "capite bothriis duobus bipartitis . . . . . ".

The specific name is the Japanese name for the host.

52. *Callotetrarhynchus speciosus* (Linton, 1897)
(Pl. XVII, Figs. 96 and 97)

Syn. *Lintoniella speciosa* (Linton, 1897) Yamaguti, 1934

Hosts: *Scomber japonicus* Houttuyn, *Muraenesox cinereus* (Forskål), *Platycephalus indicus* (Linnè), *Trichiurus japonicus* (Temm. et Schleg.), *Seriola purpurascens* Temm. et Schleg., *Platycephalus punctatus* Cuv. et Valenc., *Scomberoides guttatum* Bloch et Schneider, *Sciaena albiflora* (Richardson), *Euthynnus pelamys* (Linné).

Localities; Inland Sea of Japan, Pacific coast of Japan and East China Sea.

As liberated from the connective tissue capsule of the host origin the blastocyst is elongated club-shaped, white opaque, and measures 5–57 mm in length and up to 4 mm in breadth at the enlarged end where the larva is contained.

Larva consisting of scolex proper and its appendage, 5.2–16.5

mm long by 0.4 – 2.0 mm broad at posterior end of pars bulbosa which projects more or less prominently over the anterior end of the appendage. Bothridia surficial, 0.55 – 2.0×0.4 – 1.5 mm, distinctly emarginate on posterior border with long stiff hairs in marginal groove gradually disappearing anteriorly. Proboscides cylindrical, gradually tapering anteriorly, 1.6 – 2.5 mm long, 45 – 70 μ broad at base but 15 – 20 μ broad at apex when fully everted. The proboscis hooks are arranged in every instance just as described and figured in my previous paper. The longitudinal chain-like row of the smallest hooks (12 – 18 μ long) reaches to the base of the proboscis but not to its anterior end. The transverse sets of the other hooks are about 100 in number, each consisting of 15 hooks, of which the largest is 30 – 39 μ long. As numbered after Pintner, the "Hakenkettlein" corresponds to the 16 th row in contrast with that of *Callotetrarhynchus gracillimus* Pintner, 1931. Though not explained in the text the peculiar arrangement of the hooks is indicated in Linton's Pl. LXV, Fig. 1. I believe that a re-examination of Linton's original type specimen, which is very desirable, will show the same arrangement of the proboscis hooks. The pars vaginalis between the bothridia and the muscle bulbs, subject to considerable variation by contraction and extension, is 1.8 – 6.1 mm long by 0.15 – 1.3 mm broad at its most attenuated anterior end. In *C. gracillimus* Pintner it is 5 – 13 times as long as the pars bulbosa, while in the present species it is 2 – 7 times as long. The frontal glands, well developed in the pars vaginalis, are oval, 9 – 18 μ in diameter and massed together around the four close-set bundles of ducts, toward which the narrow individual ducts are converged just as shown by Pintner for *C. gracillimus* in his Fig. 20. The collecting bundles, in a dorsal and a ventral pair, open to the outside at the apical end of the scolex. Proboscis sheath 27 – 70 μ, proboscis retractor 14 – 20 μ in diameter. Muscle bulbs 0.6 – 2.1×0.12 – 0.45 mm. Posterior appendage subcylindrical, 2.0 – 9.0 mm in length and 0.3 – 1.25 mm in maximum breadth at its anterior end. Occasionally it may be longer than the scolex proper, but usually a little shorter. At the somewhat attenuated posterior end is a button-like retractile process covered with hairs.

53 *Symbothriorhynchus uranoscopi* n. g., n. sp.
(Pl. XVII, Figs. 98 – 100)

Habitat and locality. Body cavity of *Uranoscopus oligolepis*

Bleeker ; Tosa Bay.

Described from two larvae liberated from the blastocysts. Body 2.25 – 2.35 mm long by 1.2 – 1.3 mm broad at level of muscular bulbs, where it is divided into two lateral lobes projecting outward very prominently. Cuticle very thick at pars vaginalis and anterior part of pars bulbosa, but thin elsewhere. Bothridia 2, surficial, foliate, with somewhat crispate margins, covered with very minute spines ; posterior margin without any distinct notch at middle, fringed with short stiff hairs. In the type the bothridia are forcibly stretched out and project slightly beyond the lateral margins of the pars vaginalis, while in the paratype they are approximated in front and widely divergent behind in profile and measure 0.35 mm anteroposteriorly. Pars vaginalis cylindrical and 0.42 – 0.5 mm across for most part, enlarged posteriorly. Pars bulbosa divided posteriorly into two rounded lateral lobes, each of which contains a dorsal and a ventral muscle bulb. Posterior appendage mammillary, enclosed in pars bulbosa, with its base just behind level of anterior ends of muscle bulbs, projecting very little beyond pars bulbosa, 0.45 – 0.53 mm long, 0.36 – 0.43 mm broad at its rounded posterior end, with terminal depression into which the paired excretory stems open. Proboscis cylindrical, somewhat attenuated toward apex, 1.25 – 1.3 mm in length when fully everted, 50 μ broad at base. Except for the basal hooks the proboscis hooks are arranged in 14 longitudinal rows, ten of which form a number (over 40) of oblique circular rows and the others form a longitudinal band between the two ends of the circular rows. The hooks of this band are uniform in size and shape, only 6–7 μ long and strongly curved backwards, while those of the circular row opposite the band are stout, up to 27 – 30 μ long from the tip to the anterior end of the root and become gradually slender toward the band. Behind each end of the circular row is another slender hook, so that there are 12 hooks for each transverse set besides the band of the microhooks. The basal hooks are divided into two groups ; anterior group consisting of over 70, slender, well recurved hooks, the largest of which is up to 27 μ from the height of the curve to the posterior end of the root ; posterior group consisting of a number of minute acicular hooks surrounding proboscis all round, and a circle of 9 hooks, of which the outer are comma-shaped, measuring up to 60 μ from the tip to the anterior end, and the inner are wedge-shaped and 18–24 μ long. Proboscis sheath spirally twisted, 27 – 40 μ in diameter. Proboscis retractor 5 – 10 μ in diameter, attached to inner wall of muscle

bulb.

This new genus is characterized in the larval stage by two surficial foliate bothridia, armature of proboscis, two-lobed pars bulbosa and a mammillary posterior appendage enclosed in pars bulbosa.

Symbothriorhynhus n. g.

Generic diagnosis. Cystidea. Family? Adult unknown. Scolex proper small, with mammillary appendage enclosed in two-lobed pars bulbosa. Bothridia 2, surficial, foliate, comparatively small. Proboscides long and slender, armed with a longitudinal band of very small hooks and a number of oblique circular rows of larger hooks. Proboscis retractor attached to inner wall of muscle bulb. Pars vaginalis short cylindrical, enlarged posteriorly. Pars bulbosa divided posteriorly into two lateral lobes, each containing a dorsal and a ventral muscle bulb. Parasitic as larva in body cavity of marine teleosts.

Genotype. *Symbothriorhynchus uranoscopi.*

54. *Nybelinia anguillicola* n. sp.
(Pl. XVIII, Figs. 101 and 102)

Habitat and locality. Encysted in submucosa of intestine of *Anguilla japonica*; Kuki, Mie Prefecture.

Length 2.8 – 2.85 mm long, breadth 1.0 mm at middle of pars bothridialis. Proboscis tubular, 1.0 – 1.2×0.075 – 0.08 mm. Proboscis hooks in numerous spirals of 13 each, curved near tip, with simple nodular base and 50 – 70 μ long for the greater anterior part of proboscis, markedly reduced in size (22 – 30 μ long) and provided with distinct root a little in front of base of proboscis on outer side; anterior hooks of basal group 30 – 46 μ long, somewhat swollen at middle, strongly curved at tip, posteriormost hook of same group comma-shaped, 15 – 18 μ long, intermediate hooks transitional in shape. Proboscis sheath 75 μ in diameter. Proboscis retractor about 24 μ in diameter, attached to posterior end of muscle bulb. Bothridia 1.1 – 1.25×0.4 mm, in a dorsal and a ventral pair; paired ones in direct contact with each other by their posterior inner margins. Pars vaginalis usually longer than pars bothridialis; muscle bulbs subcylindrical or banana-shaped, 1.1 – 1.25×0.25 – 0.27 mm, extending to anterior end of posterior appendage. Velum short, about 0.13 mm long, contracted posteriorly; its wall 70 – 80 μ thick. Posterior appendage 0.36 – 0.4 mm long, 0.5 mm broad and 0.28 mm thick at anterior end, nearly conical in ventral view but subcylindrical in lateral view, with wide, funnel-shaped atrium

opening at posterior extremity. The atrium, 0.25 mm wide in the type, is densely covered with bristles and contains a flat conical projection, which has a marked incision on each side near its tip, thus forming a double cone in dorsoventral view. There are two pairs of excretory stems, of which the narrower lateral pair opens into the atrium close to the lateral incision mentioned above and the wider medial pair opens about 15 μ further posteriorly at about the middle of the lateral margin of the distal cone.

This species is characterized by the armature of the proboscis and the muscle bulbs just as long as the bothridia. Since these two characters persist in the adult stage, no great difficulty will be encountered in identifying the adult. This is the reason why I venture to create a new species for the present larva.

55. *Nybelinia nipponica* n. sp.
(Pl. XVIII, Figs. 103 and 104)

Habitat. Gastro-intestinal wall or body cavity of *Neobythites macrops* Günther (type host), *Xystrias grigorjewi* (Herzenstein), *Pseudorhombus pentophthalmus* Günther and *Argentina kagoshimae* Jordan et Snyder.

Localities. Maisaka, Sizuoka Prefecture (type locality), Tosa Bay, and Obama, Hukui Prefecture.

Body broadly rounded in front, tapering posteriorly, with a stumpy posterior appendage. Length 1.35 – 2.9 mm, breadth 0.6 – 1.35 mm at pars bothridialis. Bothridia 0.6 – 1.2 × 0.25 – 0.3 mm ; paired ones curved inwards posteriorly. Proboscis tubular, 0.9 – 1.4 mm long by 30 – 60 μ broad. Proboscis hooks in numerous spiral rows, each of which consists of 9 – 10 hooks except at the posterior part of the proboscis, where the hooks are arranged in a manner characteristic of the species. On one side of the proboscis they are slightly curved, with a claw-like tip and a simple, swollen base for most of the proboscis length, but as they approach the basal hooks they are more strongly curved and lack the terminal claw, with the base elongated backwards, attaining a maximum length of 35 – 38 μ, though diminishing in length to 30 μ just in front of the basal hooks, while on the other side they are thorn-shaped with stout base and up to 30 μ long but become rather slender posteriorly as the base is elongated backwards, and finally assume an inverted U- or V-shape in front of the basal hooks, with minimum length of 15 – 18 μ. Basal

hooks about 30 in number (about 12 on inner side, about 28 on outer side), 6 – 27 μ long, those of the last spiral row being rudimentary, and the others subcylindrical for the most part but with a distinct claw-like tip, and decreasing in length posteriorly. Proboscis sheath 24 – 45 μ in diameter (60 μ when contracted), provided near its posterior end with a muscular fixer, whose fibers run backward divergently and disappear in the parenchyma. Proboscis retractor 5 – 8 μ in diameter (12 μ when contracted), attached to posterior end of muscle bulb. From this point of attachment fine muscle fibers arise divergently as if they were direct continuation of the retractor muscles and form a thick network immediately in front of the base of the posterior appendage. Muscle bulb 0.31 – 0.55 × 0.075 – 0.12 mm. Pars vaginalis 0.1 – 0.56 mm, longer than pars bothridialis. Velum 0.075 – 0.14 mm long, with inside diameter of 0.18 – 0.35 mm at its posterior end. Posterior appendage stumpy, 0.23 – 0.38 mm long by 0.2 – 0.35 mm broad at anterior end, with wide atrium covered with bristles ; terminal projection enclosed in atrium, with file-like surface and one or two lateral incisions, one of which is constant and more conspicuous than the other. Inner excretory stem opening into atrium at about middle of lateral margin of distal cone-shaped portion of this terminal projection, outer stem opening nearer to constant lateral incision than to opening of inner stem.

On the basis of the shape, size and arrangement of the proboscis hooks this larva may be safely identified with the adult in case the latter is found.

56. *Otobothrium dipsacum* Linton, 1897
(Pl. XVIII, Fig. 105)

Habitat and locality. Body cavity of *Chelidonichthys kumu* Lesson et Garnot. ; East China Sea.

Body 2.6 mm long by 0.6 mm broad at level of posterior ends of muscle bulbs. Bothridia about 0.9 mm long, fleshy, canoe-shaped, each bearing at its posterior end a semicircular ciliated pit up to 66 μ in diameter. They are divided into a dorsal and a ventral pair, the two of each pair being fused at the inner margin, with a distinct incision between them at each end. Proboscis thick, cylindrical, probably 2.0 mm long when fully everted, armed with innumerable hooks 15 – 50 μ long in a very characteristic manner as illustrated by Linton and Southwell. The hooks are all slender but

vary in shape according to the sides on which they are arranged; on one side (inner?) the hook is strongly curved near its tip and its root tends to be produced backwards toward the base of the proboscis, while on the other side it is more gently curved, and its forwardly directed, blunt-pointed root becomes gradually longer posteriorly and finally so long as or even longer than the blade. Proboscis retractor apparently attached to muscle bulb near its anterior end as shown by Southwell in his figure 60 A. Muscle bulbs subcylindrical, about 0.95×0.15 mm, extending, two on each side, to tips of symmetrical posterior lobes, which project backwards with a conspicuous triangular sinus between and enclose the anterior half of the mammillary appendage. Latter 0.35 mm long by 0.29 mm broad, covered all over with extremely fine downy bristles. It contains paired dorsal and ventral excretory stems, of which the latter form at the posterior end a small vesicle opening outside at the tip of the appendage.

Literature.

Cooper, A. R., North American Pseudophyllidean cestodes from fishes. Illin. Biol. Monogr. 4 (4), p. 133 – 145, 1918. — Dollfus, R. Ph., Sur les Tétrarhynques. Bull. Soc. Zool. France, 54 (4), p. 338, 1929. — Dollfus, R. Ph., Sur les Tétrarhynques. Mém. Soc. Zool. France, 29 (3), p. 139 – 216, 1930. — Klaptocz, B., Neue Phyllobothriden aus *Notidanus* (*Hexanchus*) *griseus*, n. g. Arb. zool. Inst., Wien, Vol 16, p. 325 – 360, 1906. — Linton, E., Notes on entozoa of marine fishes of New England, with descriptions of several new species. U. S. Fish & Fisheries Rep. for 1886, 479 – 486, 1889; 771 – 775, 1890: 843 – 845, 1891. — Linton, E. Notes on larval cestode parasites of fishes. Proc. U. S. Nat. Mus., 19, p. 801 – 807, 1897. — Linton, E., Parasites of fishes of Beaufort, North Carolina. Bull. Bur. Fish. f. 1904, Vol. 24, p. 385, 1905. — Linton, E., A contribution to the anatomy of *Dinobothrium*, a genus of selachian tapeworms; with description of two new species. Proc. U. S. Nat. Mus., Vol. 60, Art 6, p. 1 – 8, 1922. — Linton, E.. Notes on cestode parasites of sharks and skates. Proc. U. S. Nat. Mus., 64 (21), 16 – 19, 20 – 22, 81 – 82, 95 – 97, 1924. — Müller, J. F. and van Cleave, H. J. Parasites of Oneida Lake fishes, Part II. Description of new species and some general taxonomic considerations, especially concerning the trematode family Heterophyidae. Roosev. Wild Life Ann., 3 (2), 99 – 102, 1932. — Nybelin, O., Anatomisch systematische Studien über Pseudophyllideen. Göteb. Kungl. Vet., och Vitterh.-samh. Handl. Fjärde Följden, XXVI: I, p. 156 – 179, 1922. — Pintner, T., Tetrarhynchen von den Forschungsreisen des Dr. Sixten Bock. Göteb. kungl. vetensk.-och Vitterh.-samh. Handl. Ser. B, Bd. 1. No. 8, 3 – 28, 1929. — Pintner, T., Wenigbekanntes und Unbekanntes von Rüsselbandwürmern II. Sitz.-

ber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. I, Bd. 140, p. 787 – 791, 1931. — Pozo, D. G., Cestodes del genero *Dinobothrium*, parasitos de grandes Selacios, pescado sen las costas espanõlas. Rev. Iberica Parasit. Lopez Neyra Mem. Vol. 260 – 270. 1945 — Schumacher, G., Cestoden aus *Centrolophus pompilus* (L.) Inaug. Diss., p. 1 – 19, 1913. — Shipley, A. E. and Hornell, J., Report on the cestode and nematode parasites from the marine fishes of Ceylon. Rep. Ceylon Pearl Oyster Fisher. Part 5, 51 – 58, 1906. — Southwell, T., Notes on some tetrarhynchid parasites from Ceylon marine fishes. Ann. Trop. Med. Par. 18, 471 – 473, 1924. — Southwell, T., A monograph on the Tetraphyllidea with notes on related cestodes. Liverp. Sch. Trop. Med. Mem. (N. S.) No. 2, 1925. — Southwell, T., The fauna of British India, including Ceylon and Burma. Cestoda Vol. 1, 1930. — Sproston, N. G., On the genus *Dinobothrium* van Beneden (Cestoda). with a description of two new species from sharks, and a note on *Monorygma* sp. from the electric ray. Parasit., 39 (1 & 2), 73 – 90, 1948. — Woodland, W. N. F., On *Dinobothrium septaria* van Beneden, 1889, and *Parabothrium bulbiferum* Nybelin, 1922. Jour. Parasit., 13 (4), 231 – 241, 1927. — Woodland, W. N. F., A revised classification of the Tetraphyllidean cestoda, with descriptions of some Phyllobothriidae from Plymouth. Proc. Zool. Soc. London, 529 – 530, 1927. — Yamaguti, S., Studies on the helminth fauna of Japan. Part 4. Cestodes of fishes, Jap. Jour. Zool., 6 (1), 112 pp. and postscript to Part 6, cestodes of birds, I. Jap. Jour. Zool., 6 (2), p. 232, 1935. — Yoshida, S., Some cestodes from Japanese selachians including five new species. Parasit., Vol. 9, p. 560 – 592, 1917. — van Beneden, P. J., Mémoire sur les vers intestinaux. Suppl. Compt. Rend. d. Séanc. d. l'acad. d. Sci. II, 376 pp. 1861.

Explanation of plates

Pl. I.

Fig. 1. Mature proglottis of *Bothriocephalus fluviatilis*, ventral view.
Fig. 2. Scolex of *Bothriocephalus lateolabracis*, ventral view.
Fig. 3. Mature proglottis of *Bothriocephalus lateolabracis*, ventral view.
Fig. 4. Scolex of *Bothriocephalus branchiostegi*, lateral view.
Fig. 5. Gravid proglottis of *Bothriocephalus branchiostegi*, dorsal view.

Pl. II.

Fig. 6. Scolex of *Bothriocephalus brotulae*, ventrolateral view,
Fig. 7. Gravid proglottis of *Bothriocephalus brotulae*, dorsal view.
Fig. 8. Scolex of *Bothriocephalus apogonis*, lateral view.
Fig. 9. Gravid proglottis of *Bothriocephalus apogonis*, ventral view.
Fig. 10. Scolex of *Glossobothrium nipponicum*, ventrolateral view.

Pl. III.

Fig. 11. Gravid proglottis of *Glossobothrium nipponicum*, ventral view.

Fig. 12. Scolex of *Amphicotyle quinquarii*, ventrolateral view.
Fig. 13. Gravid proglottis of *Amphicotyle quinquarii*, ventral view.
Fig. 14. Scolex of *Eubothrioides lamellatus*, ventrolateral view.
Fig. 15. Mature proglottis of *Eubothrioides lamellatus*, dorsal view.

Pl. IV.

Fig. 16. Mature proglottis of *Phyllobothrium triacis*, dorsal view.
Fig. 17. Scolex of *Phyllobothrium filiforme*, apical view.
Fig. 18. Mature proglottis of *Phyllobothrium filiforme*, dorsal view.
Fig. 19. Scolex of *Phyllobothrium serratum*, ventral view.
Fig. 20. Mature proglottis of *Phyllobothrium serratum*, ventral view.
Fig. 21. Gravid proglottis of *Phyllobothrium serratum*, dorsal view.

Pl. V.

Fig. 22. Mature proglottis of *Phyllobothrium laciniatum*, ventral view.
Fig. 23. Scolex of *Phyllobothrium loculatum*, lateral view.
Fig. 24. Mature proglottis of *Phyllobothrium loculatum*, ventral view.
Fig. 25. Gravid proglottis of *Phyllobothrium squali*, dorsal view.
Fig. 26. Myzorhynchus of scolex of *Anthobothrium rajae*, ventral view.
Fig. 27. Mature proglottis of *Anthobothrium rajae*, ventral view.

Pl. VI.

Fig. 28. Scolex of *Anthobothrium pteroplateae*, ventral view.
Fig. 29. Mature proglottis of *Anthobothrium pteroplateae*, dorsal view.
Fig. 30. Mature proglottis of *Anthobothrium bifidum*, dorsal view.
Fig. 31. Scolex of *Anthobothrium parvum*, ventral view.
Fig. 32. Mature proglottis of *Anthobothrium parvum*, dorsal view.

Pl. VII.

Fig. 33. Scolex of *Orygmatobothrium musteli*, apical view.
Fig. 34. Gravid proglottis of *Orygmatobothrium musteli*, dorsal view.
Fig. 35. Scolex of *Orygmatobothrium versatile*, ventral view.
Fig. 36. Endproglottides of *Orygmatobothrium versatile*, ventral view.
Fig. 37. Scolex of *Monorygma megacotyla*, ventral view.
Fig. 38. Mature proglottis of *Monorygma megacotyla*, dorsal view.

Pl. VIII.

Fig. 39. Scolex of *Marsupiobothrium alopias*, ventral view.
Fig. 40. Bothridium of scolex of *Marsupiobothrium alopias*, lateral view.
Fig. 41. Free proglottis of *Marsupiobothrium alopias*, dorsal view.
Fig. 42. Complex of genital ducts of *Marsupiobothrium alopias*, dorsal view.
Fig. 43. Scolex of *Pithophorus vulpeculae*, ventro-apical view.

Fig. 44. Mature proglottis of *Pithophorus vulpeculae*, dorsal view

Pl. IX.

Fig. 45. Gravid proglottis of *Echeneibothrium tobijei*, ventral view.
Fig. 46. Mature proglottis of *Dinobothrium spinulosum*, ventral view.
Fig. 47. Scolex of *Gastrolecithus planus*, ventrolateral view.
Fig. 48. Gravid proglottis of *Gastrolecithus planus*, ventral view.

Pl. X.

Fig. 49. Transverse section of gravid proglottis of *Gastrolecithus planus* through cirrus pouch and vagina.
Fig. 50. Transverse section of same through vitellaria, testes and uterus.
Fig. 51. Sagittal section of mature proglottis of *Gastrolecithus planus* through cirrus pouch and vagina.
Fig. 52. Same through vitellaria, cirrus pouch, testes and vagina.
Fig. 53. Same through vas deferens coils.
Fig. 54. Same through ovary, testes and vagina.
Fig. 55. Same through ovary and anlage of uterus.
Fig. 56. Transverse section of *Phyllobothrium lactuca* through ovary and cirrus pouch.

Pl. XI.

Fig. 57. Scolex of *Acanthobothrium triacis*, ventral view.
Fig. 58. Bothridial hooks of *Acanthobothrium triacis*.
Fig. 59. Mature proglottis of *Acanthobothrium triacis*, dorsal view.
Fig. 60. Gravid proglottis of *Acanthobothrium triacis*, dorsal view.
Fig. 61. Bothridial hooks of *Acanthobothrium micracantha*.
Fig. 62. Mature proglottis of *Acanthobothrium micracantha*, dorsal view.
Fig. 63. Bothridial hooks of *Acanthobothrium latum*.
Fig. 64. Mature proglottis of *Acanthobothrium latum*, ventral view.
Fig. 65. Scolex of *Acanthobothrium gracile*, ventrolateral view.
Fig. 66. Mature proglottis of *Acanthobothrium gracile*, dorsal view.
Fig. 67. Scolex of *Acanthobothrium dasybati*, apical view.
Fig. 68. Mature proglottis of *Acanthobothrium dasybati*, ventral view.
Fig. 69. Scolex of *Acanthobothrium grandiceps*, apical view.
Fig. 70. Mature proglottis of *Acanthobothrium grandiceps*, ventral view.

Pl. XIII.

Fig. 71. Scolex of *Acanthobothrium iijimai*, apical view.
Fig. 72. Scolex of *Calliobothrium verticillatum*, ventral view.
Fig. 73. Mature proglottis of *Calliobothrium verticillatum*, dorsal view.
Fig. 74. Complex of genital ducts of *Calliobothrium verticillatum*, dorsal view.

Pl. XIV.

Fig. 75. Scolex of *Platybothrium auriculatum*, ventral view.
Fig. 76. Bothridial hooks of *Platybothrium auriculatum*.
Fig. 77. Mature proglottis of *Platybothrium auriculatum*, ventral view.
Fig. 78. Scolex of *Platybothrium musteli*, ventral view.
Fig. 79. Endproglottis of *Platybothrium musteli*, ventral view.
Fig. 80. Complex of genital ducts of *Discobothrium japonicum*, dorsal view.

Pl. XV.

Fig. 81. Scolex of *Nybelinia manazo*, ventral view.
Fig. 82. Gravid proglottis of *Nybelinia manazo*, dorsal view.
Fig. 83. Scolex of *Nybelinia* (*Syngenes*) *sphyrnae*, lateral view.
Fig. 84. Mature proglottis of *Nybelinia* (*Syngenes*) *sphyrnae*, dorsal view.
Fig. 85. Anterior part of proboscis of *Pintneriella musculicola*.
Fig. 86. Posterior part of proboscis of *Pintneriella musculicola*.

Pl. XVI.

Fig. 87. *Microbothriorhynchus coelorhynchi*, ventral view.
Fig. 88. Anterior proboscis hooks of *Microbothriorhynchus coelorhynchi*.
Fig. 89. Posterior proboscis hooks of *Microbothriorhynchus coelorhynchi*.
Fig. 90. Anterior part of proboscis of *Oncomegas wageneri*.
Fig. 91. Posterior part of proboscis of *Oncomegas wageneri*.
Fig. 92. *Pterobothrium hira*, ventral view.

Pl. XVII.

Fig. 93. Proboscis hooks of *Pterobothrium hira*.
Fig. 94. Posterior proboscis hooks of *Pterobothrium hira* on inner side.
Fig. 95. Proboscis hooks of *Pterobothrium chaeturichthydis*.
Fig. 96. *Callotetrarhynchus speciosus*.
Fig. 97. Proboscis hooks of *Callotetrarhynchus speciosus*.
Fig. 98. *Symbothriorhynchus uranoscopi*.
Fig. 99. Proboscis hooks of *Symbothriorhynchus uranoscopi*.
Fig. 100. Basal proboscis hooks of *Symbothriorhynchus uranoscopi*.

Pl. XVIII.

Fig. 101. *Nybelinia anguillicola*, ventral view.
Fig. 102. Proboscis hooks of *Nybelinia anguillicola*.
Fig. 103. *Nybelinia nipponica*, ventrolateral view.
Fig. 104. Proboscis hooks of *Nybelinia nipponica*.
Fig. 105. *Otobothrium dipsacum*.
Fig. 106. Proboscis hooks of *Floriceps uncinatus*.

Pl. XIX.

Fig. 1. *Bothriocephalus lateolabracis*, 1×.

Fig. 2. Eggs of *Bothriocephalus lateolabracis*, 200×.

Fig. 3. *Bothriocephalus apogonis*, 1×.

Fig. 4. Scolex of immature specimen of *Bothriocephalus apogonis*, 75×.

Fig. 5. Scolex of mature specimen of *Bothriocephalus apogonis*, 35×.

Fig. 6. Gravid proglottides of *Bothriocephalus apogonis*, 35×.

Fig. 7. One mature and one immature specimen of *Glossobothrium nipponicum*, 1×.

Fig. 8. Scolex of *Glossobothrium nipponicum*, 50×, ventro'ateral view.

Fig. 9 Same, 35×, lateral view.

Fig. 10. Gravid proglottis of *Glossobothrium nipponicum*, 25×.

Fig. 11. Scolex of *Amphicotyle quinquarii*, 25×.

Fig. 12. Gravid proglottis of *Amphicotyle quinquarii*, 25×.

Fig. 13. *Eubothrioides lamellatus*, 1×.

Pl. XX.

Fig. 14. Mature proglottis of *Phyllobothrium triacis*, 25×.

Fig. 15. *Phyllobothrium laciniatum*, 1×.

Fig. 16. Transverse section of immature proglottis of *Phyllobothrium laciniatum* through opening of uterine duct into uterus, 35×.

Fig. 17. Transverse section of immature proglottis of *Phyllobothrium laciniatum* through oocapt, 35×.

Fig. 18. *Phyllobothrium loculatum*, 1×.

Fig. 19. Scolex of *Phyllobothrium loculatum*, 20×.

Fig. 20. Transverse section of scolex of *Phyllobothrium loculatum* through suckers, 75×.

Fig. 21. Transverse section of neck of *Phyllobothrium loculatum*, 50×.

Fig. 22. Transverse section of not yet fully mature proglottis of *Phyllobothrium squali* through cirrus pouch and vagina, 25×.

Fig. 23. Same through ovary, 25×.

Fig. 24. *Phyllobothrium lactuca*, 1×.

Fig. 25. Transverse section of scolex of *Phyllobothrium lactuca* through suckers, 20×.

Fig. 26. Scolex of *Anthobothrium rajae*, 50×.

Fig. 27. Scolex of *Anthobothrium pteroplateae*, 35×.

Fig. 28. *Anthobothrium bifidum*, 1×.

Pl. XXI.

Fig. 29. Mature proglottis of *Anthobothrium pteroplateae*, 35×.

Fig. 30. Transverse section of scolex of *Anthobothrium bifidum*, 35×.

Fig. 31. Scolex of *Anthobothrium parvum* Stossich. 50×.

Fig. 32. Scolex of *Orygmatobothrium musteli*, 35×.

Fig. 33. Transverse section of immature proglottis of *Monorygma megacotyla* through cirrus pouch, vas deferens and testes, 35 ×.

Fig. 34. Scolex of *Echeneibothrium bifidum*, 50 ×.

Fig. 35. Scolex of *Echeneibothrium tobijei*, 20 ×.

Fig. 36. Gravid proglottis of *Echeneibothrium tobijei*, 25 ×.

Fig. 37. Scolex of *Marsupiobothrium alopias*, 75 ×.

Fig. 38. *Dinobothrium spinulosum*, 35 ×.

Pl. XXII.

Fig. 39. Scolex of *Dinobothrium spinulosum*, 35 ×.

Fig. 40. *Gastrolecithus planus*, 1 ×.

Fig. 41. *Anthobothrium micracantha*, 1 ×.

Fig. 42. Scolex of *Anthobothrium micracantha*, 25 ×.

Fig. 43. Transverse section of Scolex of *Acanthobothrium micracantha* through suckers, 25 ×.

Fig. 44. Transverse section of immature proglottis of *Acanthobothrium micracantha* through cirrus pouch and vagina, 50 ×.

Fig. 45. Transverse section of *Acanthobothrium micracantha*, 50 ×.

Fig. 46. Scolex of *Acanthobothrium gracile*, 35 ×.

Fig. 47. Scolex of *Acanthobothrium dasybati*, 25 ×.

Fig 48. Mature proglottides of *Acanthobothrium dasybati*, 50 ×.

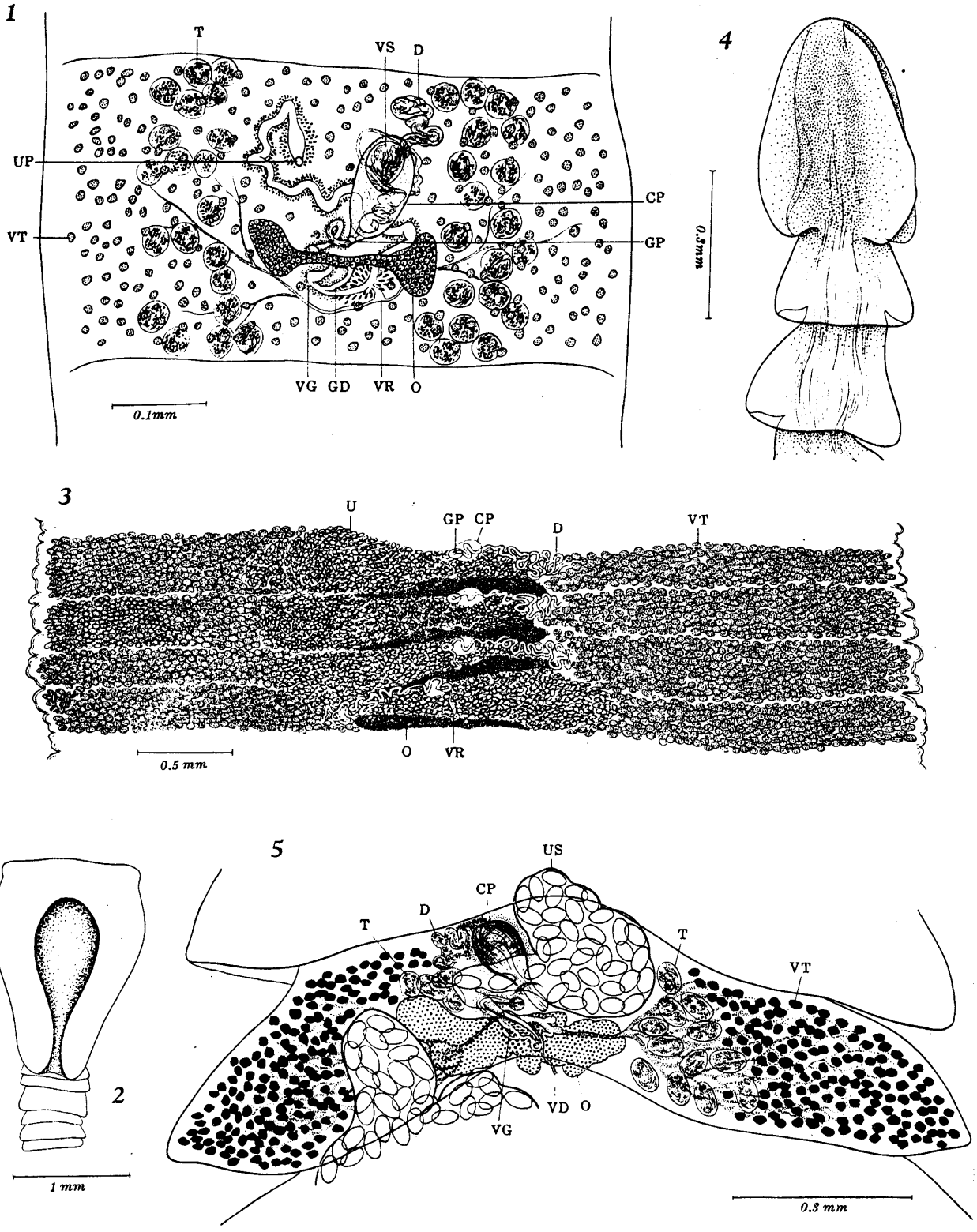
Fig. 49. *Acanthobothrium grandiceps*, 1 ×.

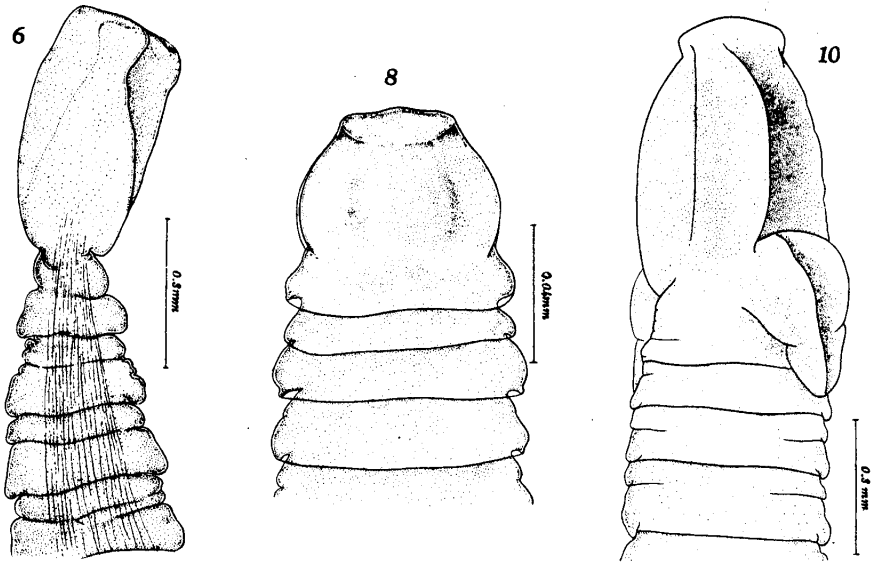
Fig. 50. Scolex of *Nybelinia manazo*, 35 ×.

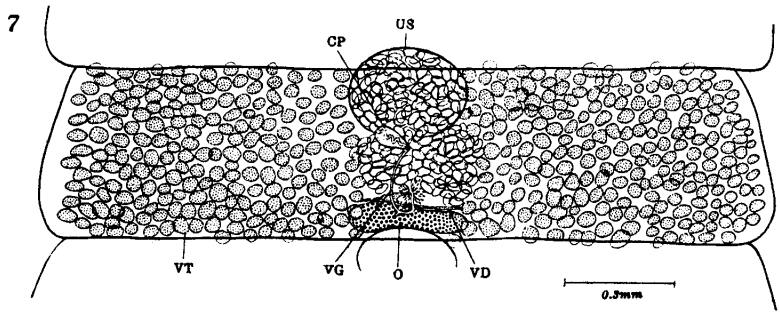
Abbreviations used in figures.

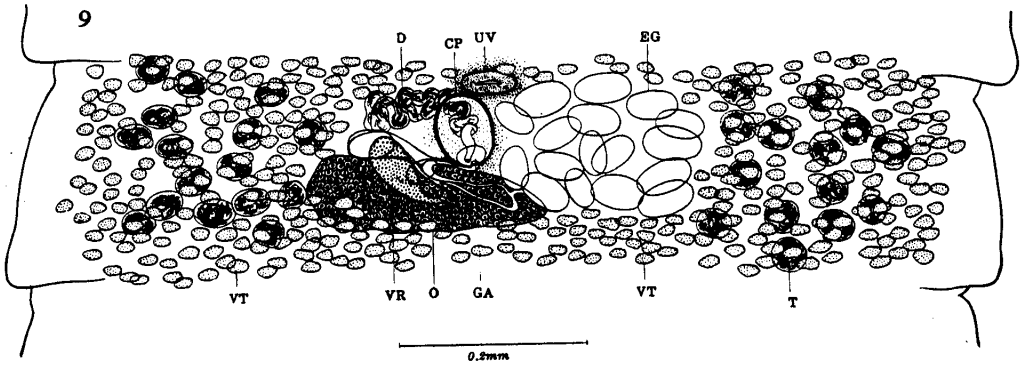
C = cirrus, CP = cirrus pouch, D = vas deferens, DS = ductus seminalis, DV = dorsal vessel, EG = egg, EP = excretory pore, FS = foramina secundaria, GA = genital atrium, GD = germiduct, GP = genital pore, IL = inner longitudinal muscle, MG = marginal groove, N = nerve trunk, O = ovary, OC = oocapt, RS = receptaculum seminis, SG = shell gland, T = testis, TA = transverse anastomosis, U = uterus, UD = uterine duct, UP = uterine pore, US = uterine sac, UV = uterine vestibule, VD = vitelline duct, VG = vagina, VR = vitelline reservoir, VS = vesicula seminalis, VT = vitellaria, VV = ventral vessel.

YAMAGUTI : STUDIES ON HELMINTH FAUNA OF JAPAN XLIL Pl. I

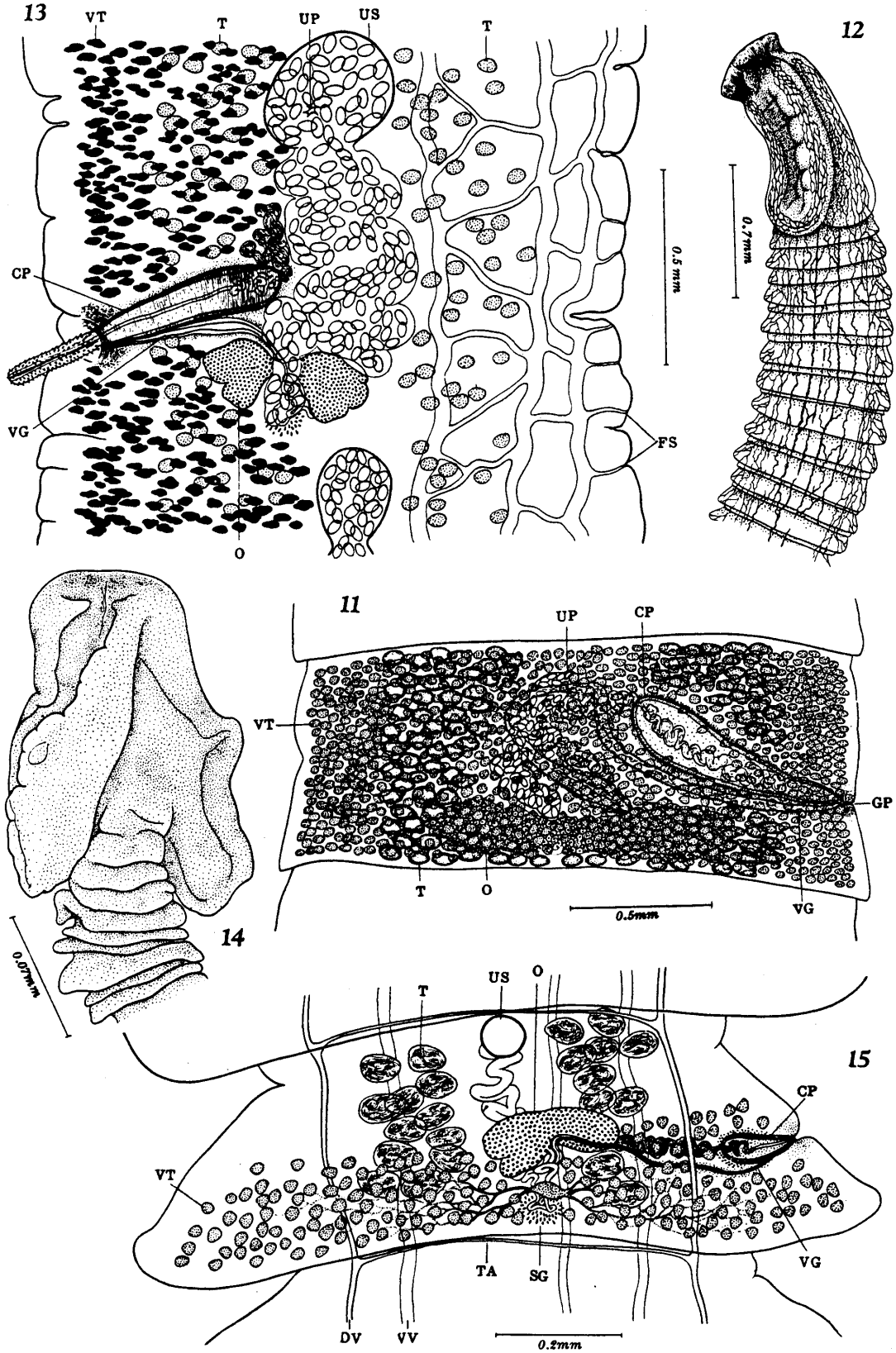



6
0.5mm
8
0.04mm
10
0.5 mm

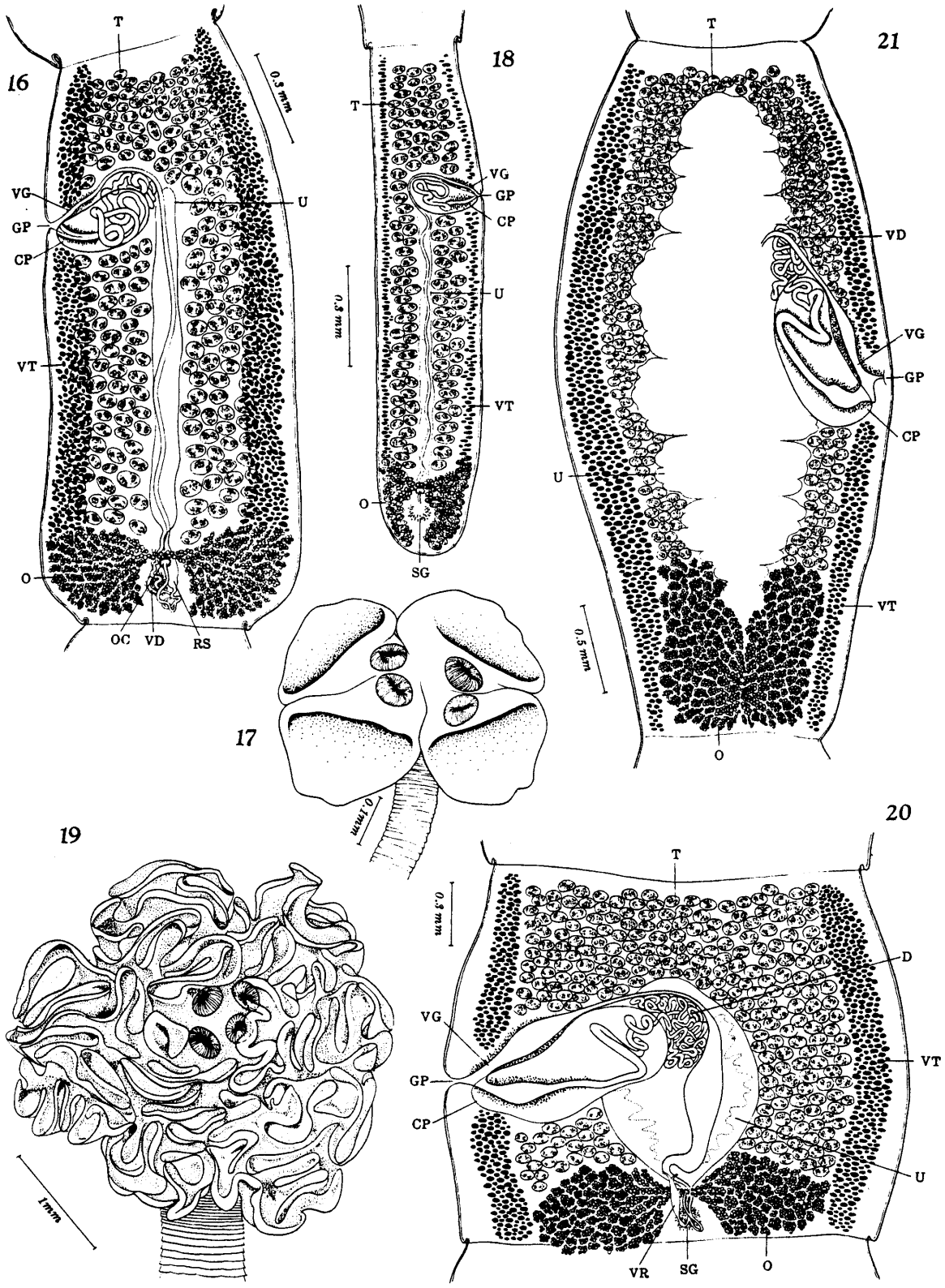

7
US
CP
VT
VG
O
VD
0.5mm


9
D
CP
UV
EG
VT
VR
O
GA
VT
T
0.2mm

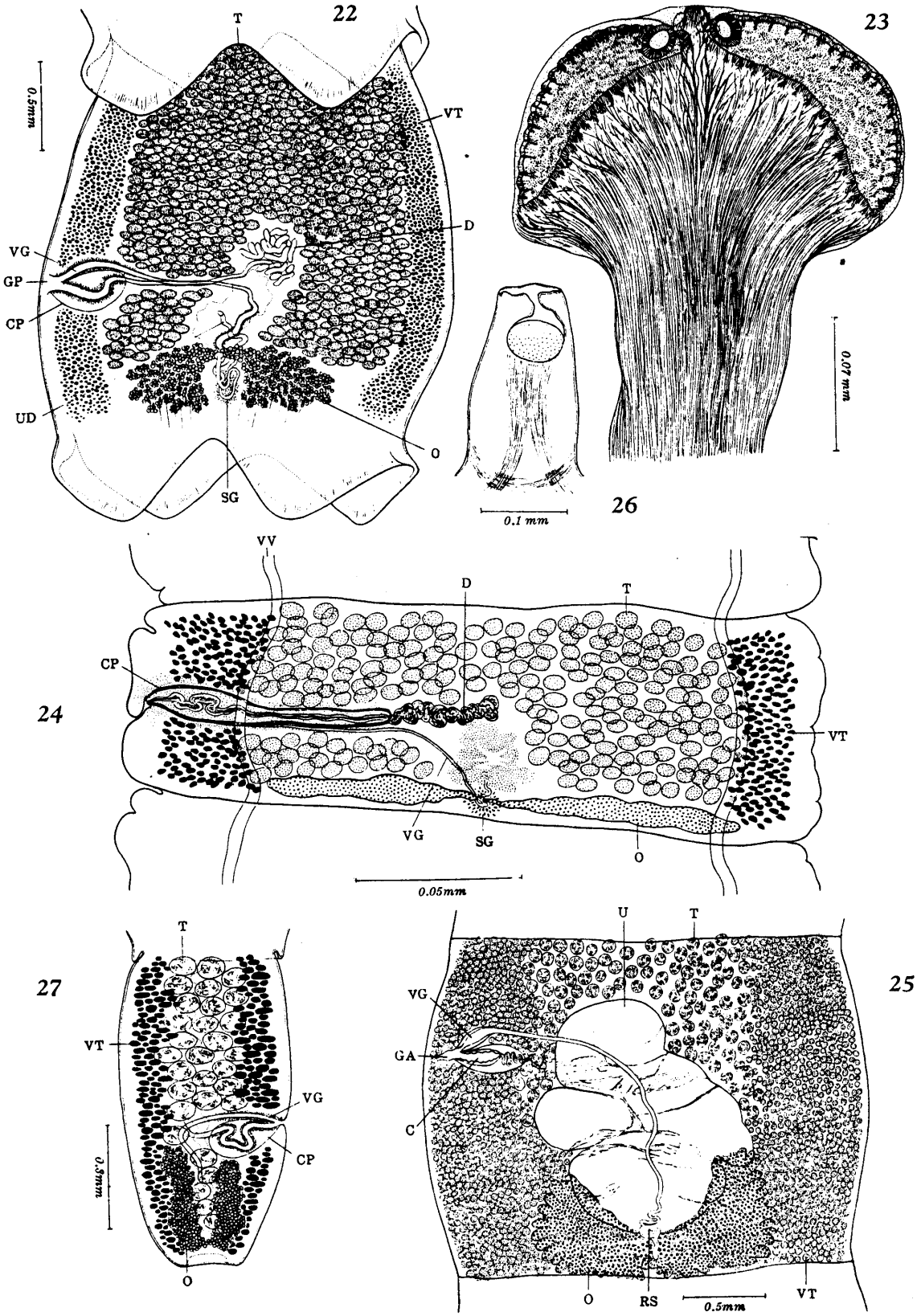
YAMAGUTI : STUDIES ON HELMINTH FAUNA OF JAPAN XLII. Pl. III

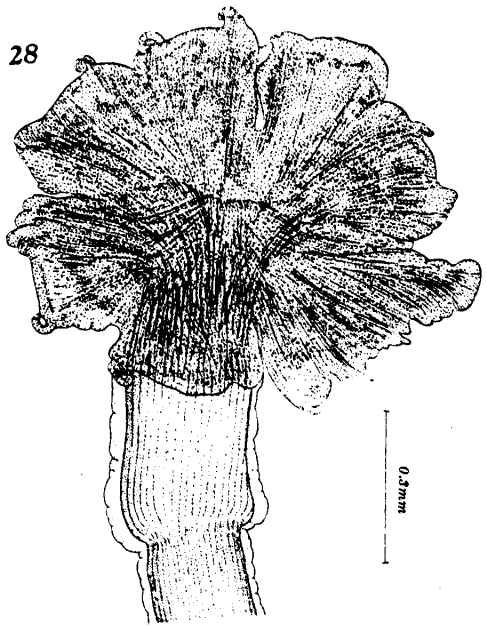


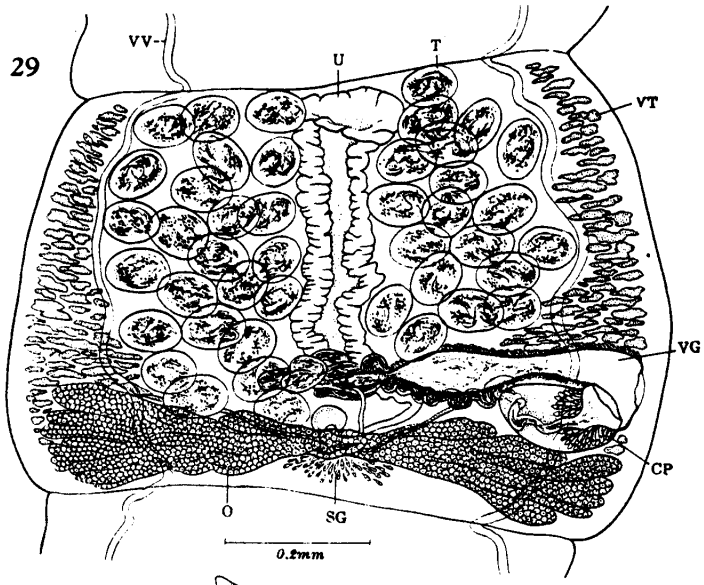
YAMAGUTI : STUDIES ON HELMINTH FAUNA OF JAPAN XLIX Pl. IV

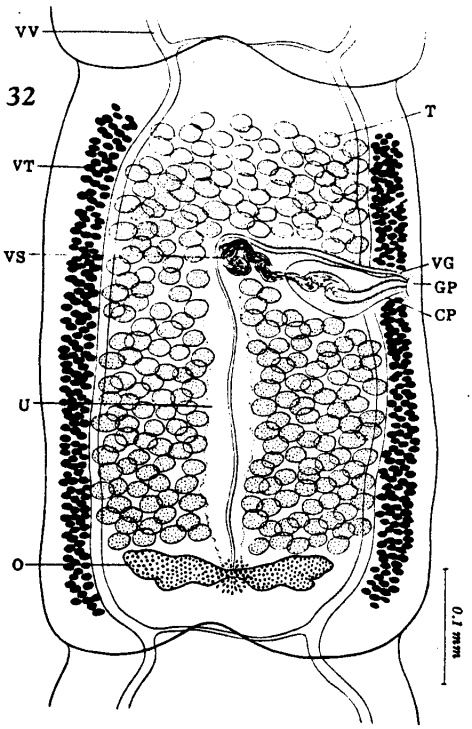


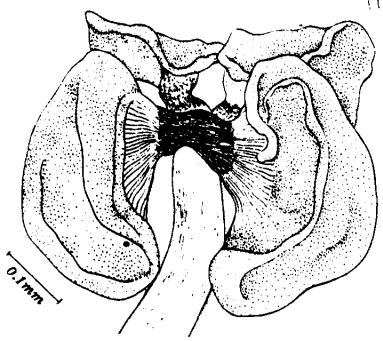
YAMAGUTI : STUDIES ON HELMINTH FAUNA OF JAPAN XLIX Pl. V

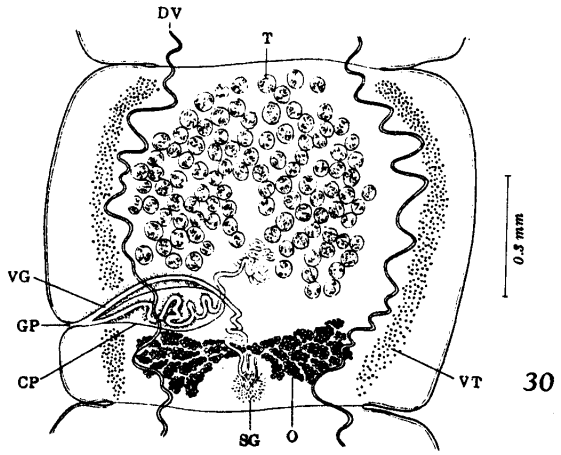



28
0.3mm

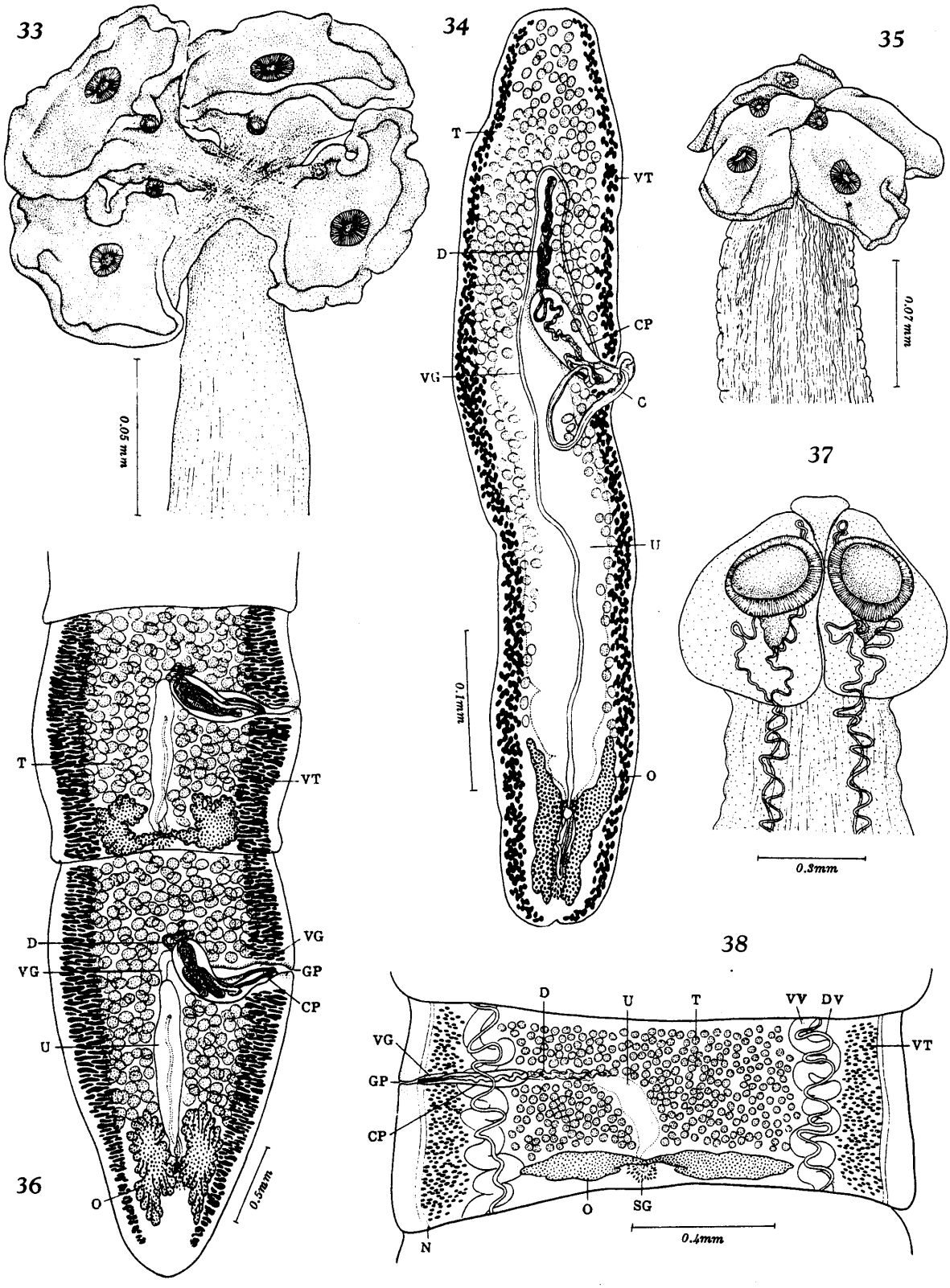

29
VV
U
T
VT
VG
CP
O
SG
0.1mm


32
VV
T
VT
VS
VG
GP
CP
U
O
0.1mm

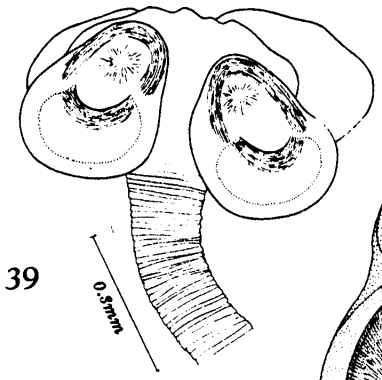

31
0.1mm

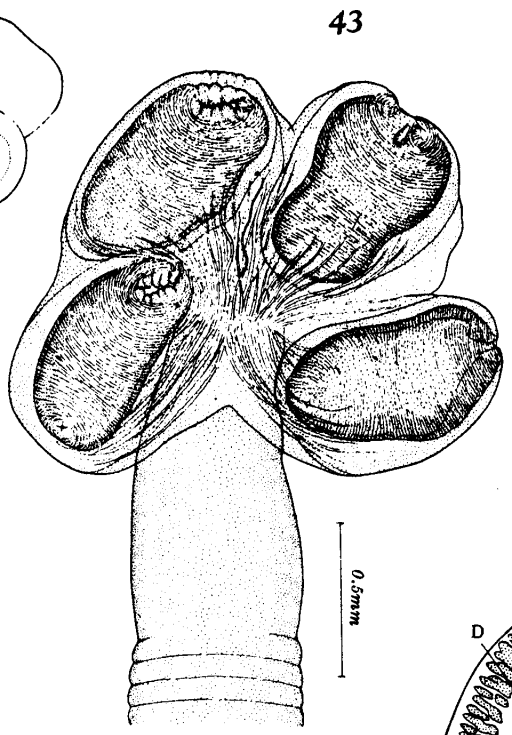

DV
T
VG
GP
CP
VT
SG
O
0.3 mm
30

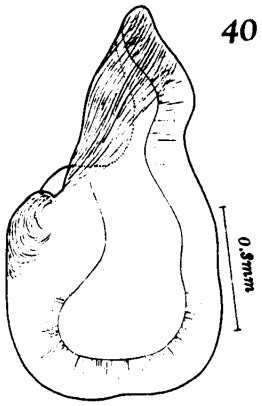
YAMAGUTI : STUDIES ON HELMINTH FAUNA OF JAPAN XLIX Pl. VII

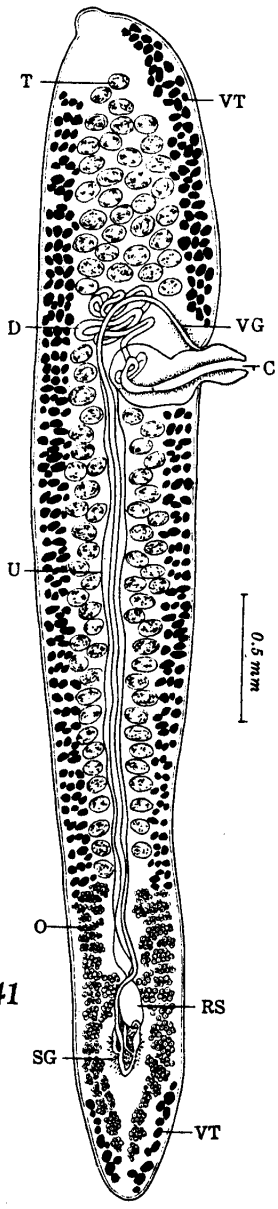


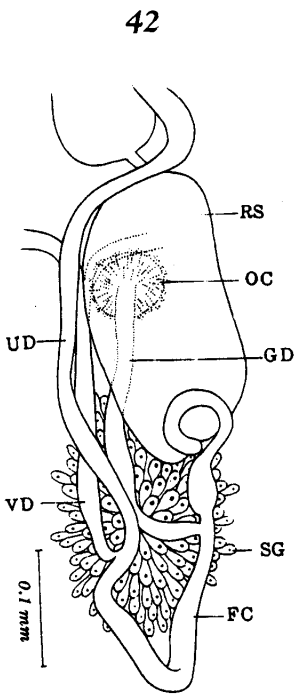
YAMAGUTI : STUDIES ON HELMINTH FAUNA OF JAPAN XLIX Pl. VIII

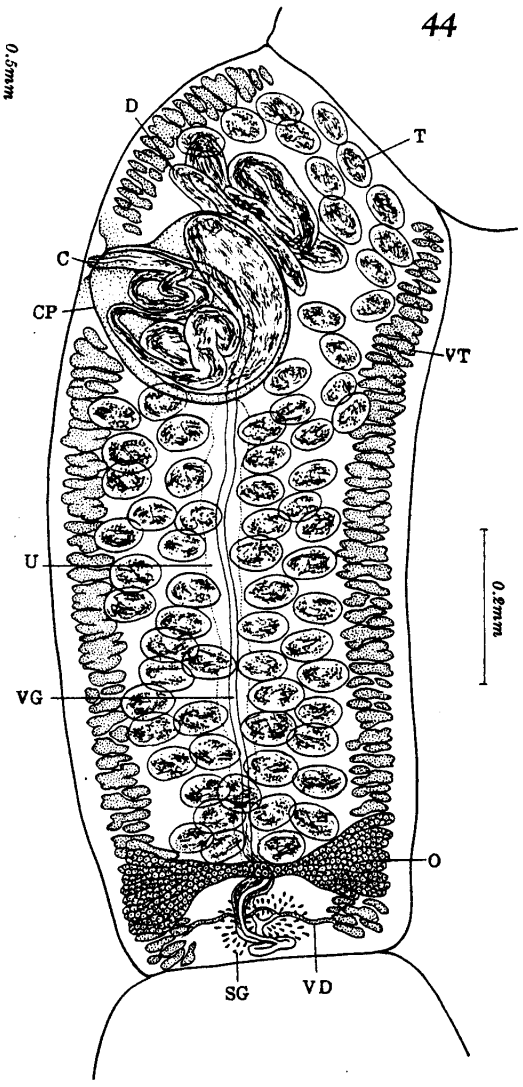


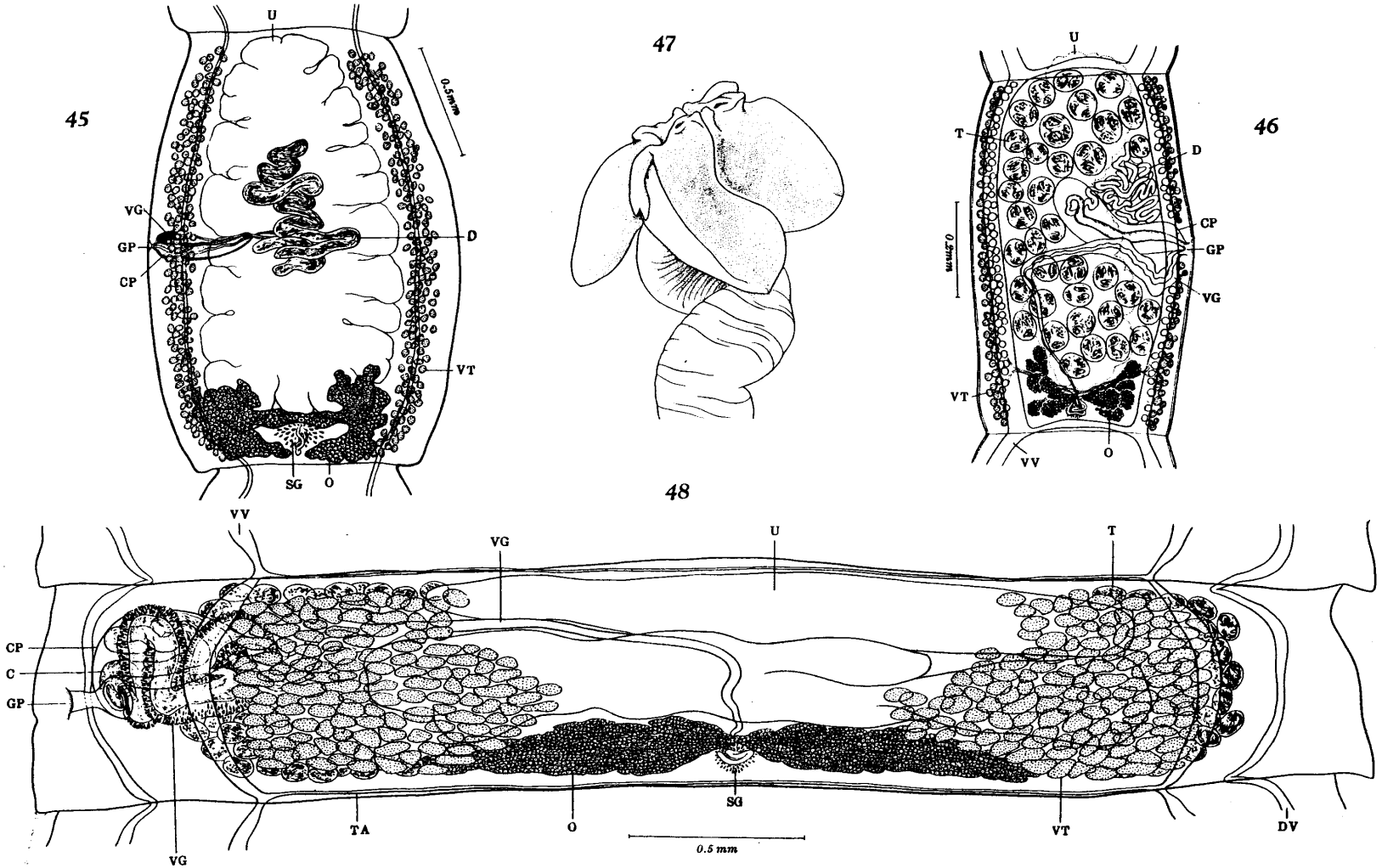




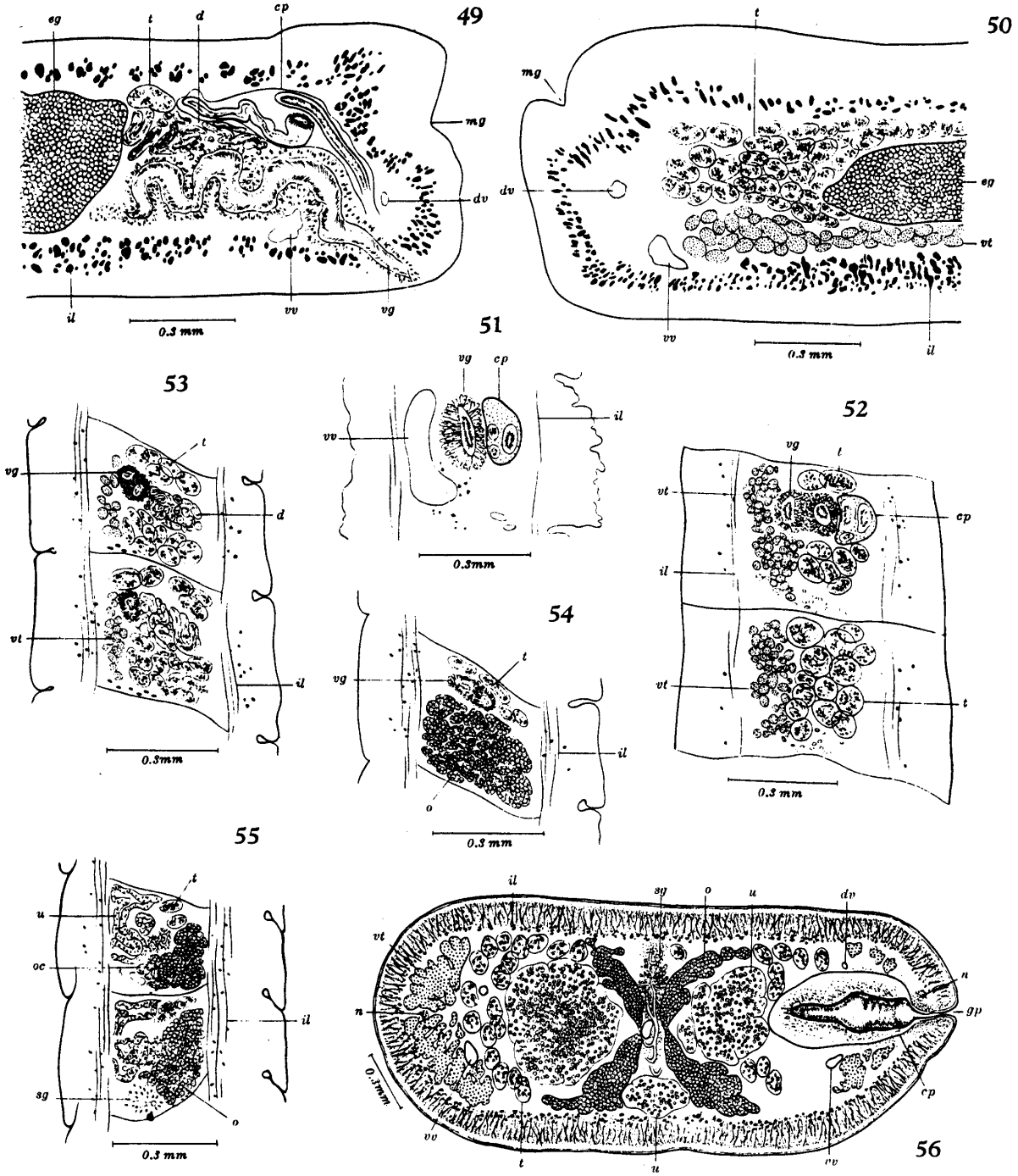


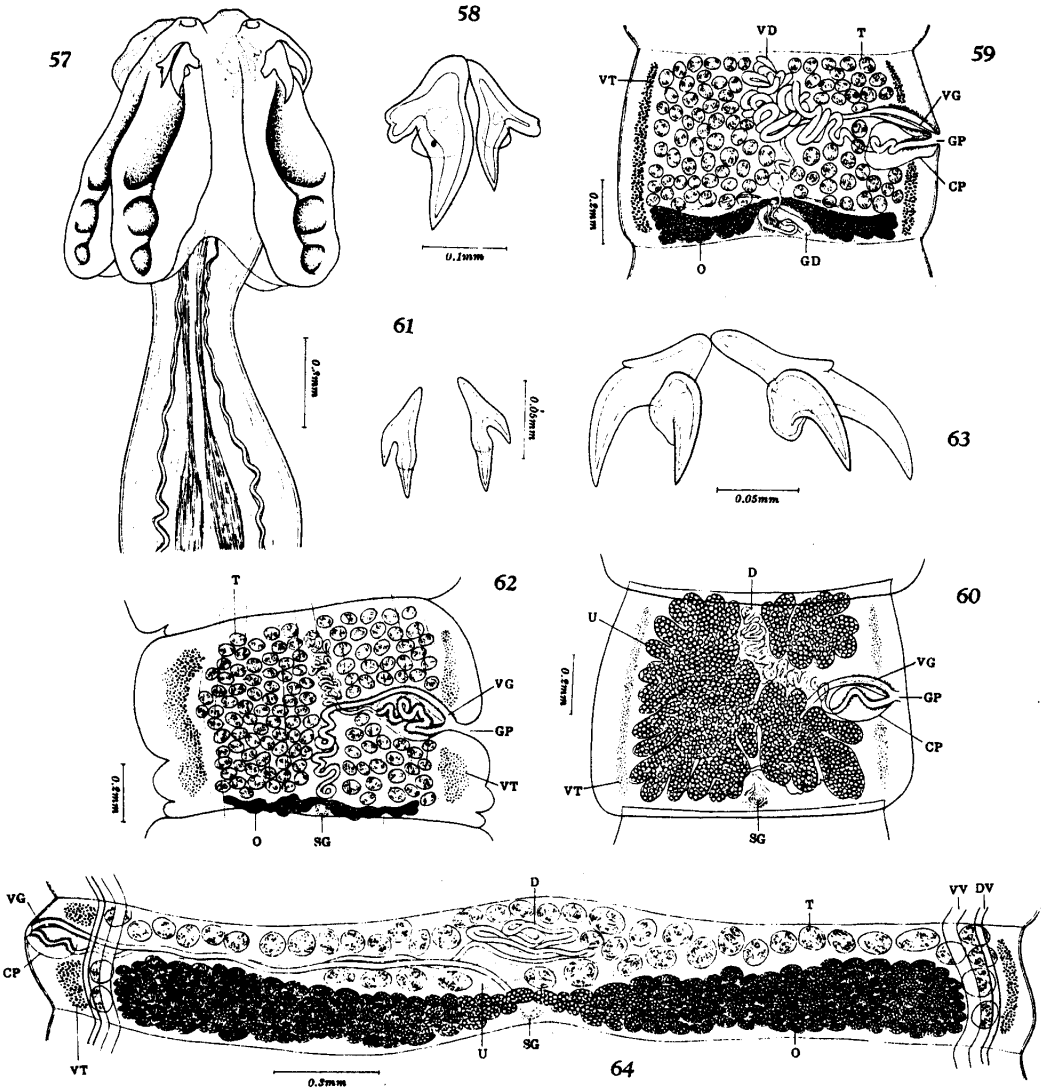


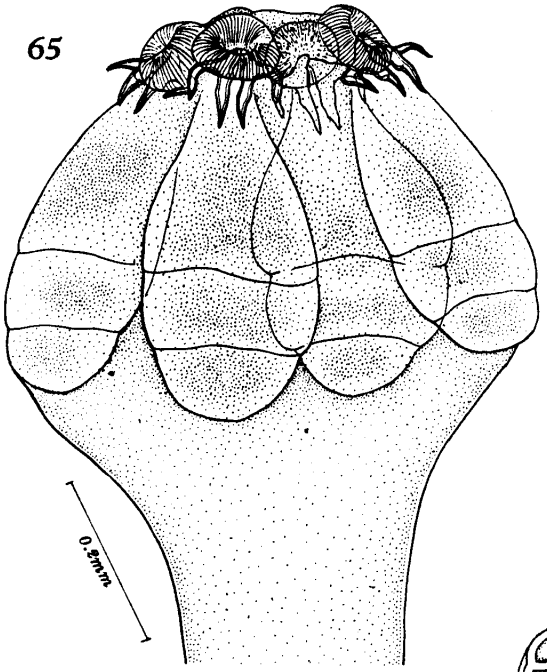


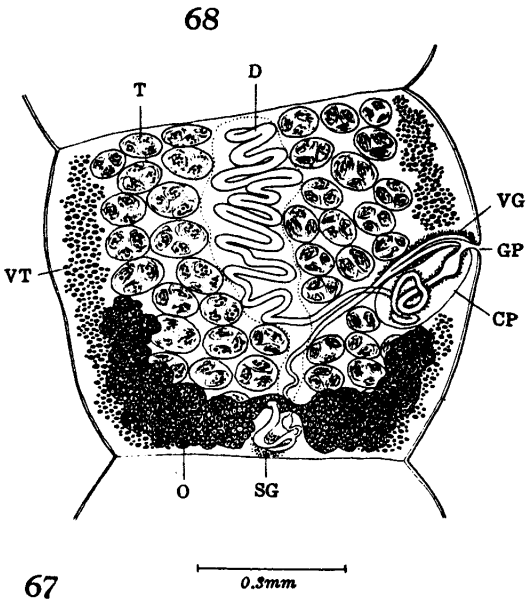

45
U
0.5mm
VG
GP
CP
D
VT
SG
O
47
46
U
T
D
CP
GP
VG
0.5mm
VT
VV
O
48
VV
VG
U
T
CP
C
GP
SG
TA
O
VT
DV
VG
0.5 mm

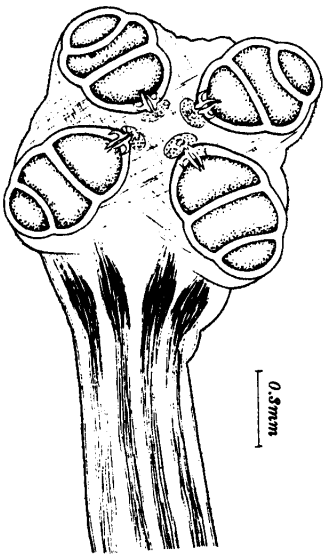
YAMAGUTI : STUDIES ON HELMINTH FAUNA OF JAPAN XLIX Pl. X

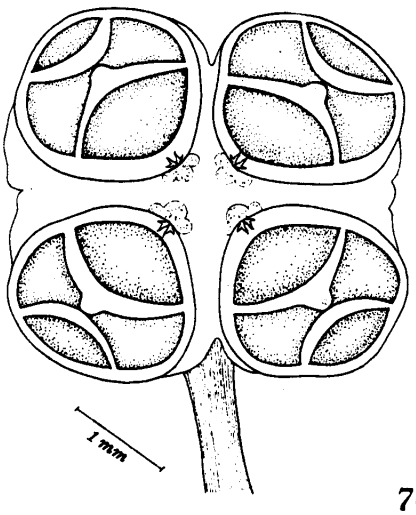


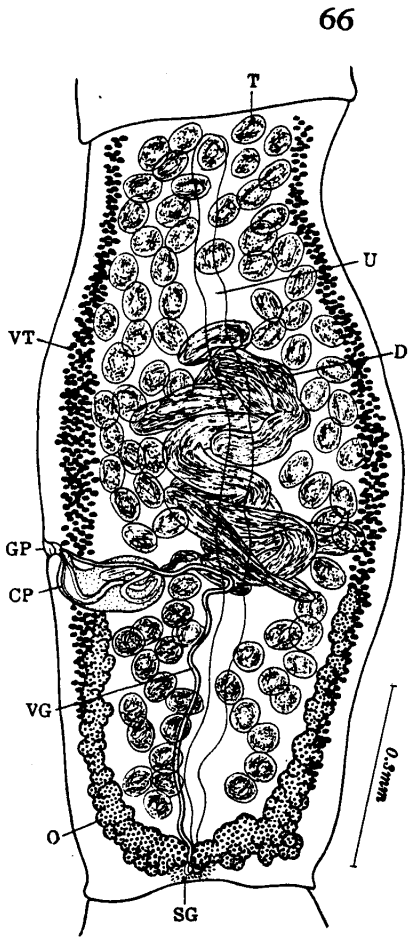

57
0.5mm
58
0.1mm
59
VD
T
VT
VG
GP
CP
0.5mm
O
GD
61
0.05mm
63
0.05mm
62
T
VG
GP
VT
0.5mm
O
SG
60
D
U
VG
GP
CP
0.5mm
VT
SG
64
VG
CP
VT
D
T
VV DV
U
SG
O
0.5mm

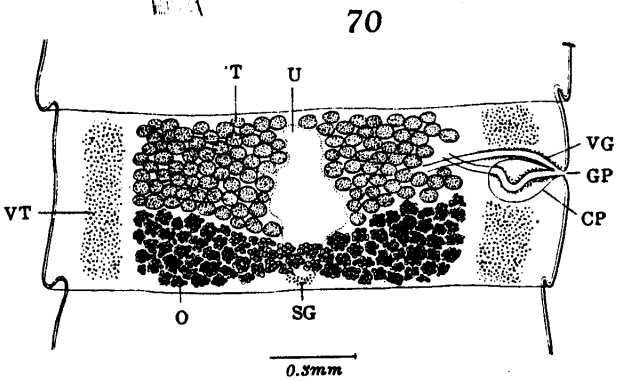

65
0.2mm

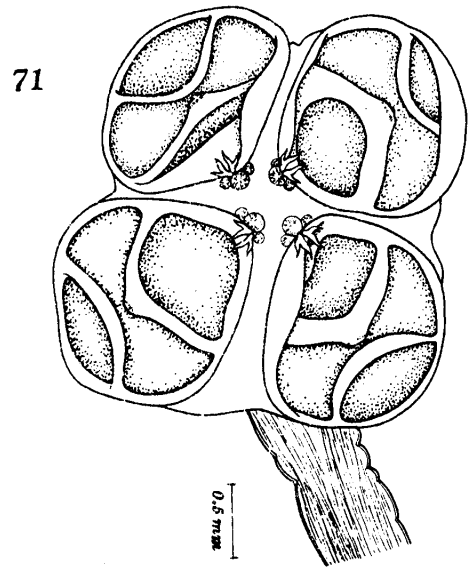

68
T
D
VG
GP
VT
CP
O
SG
0.3mm

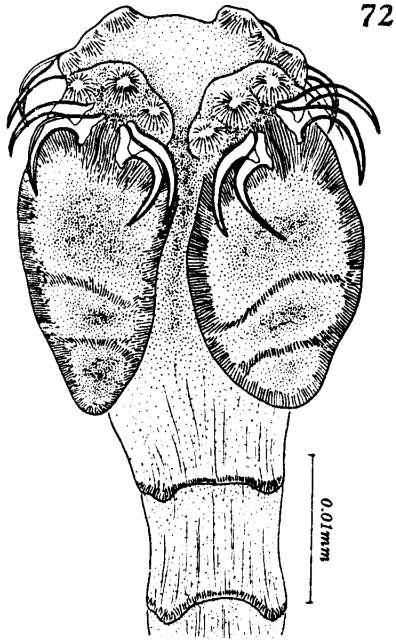

67
0.3mm

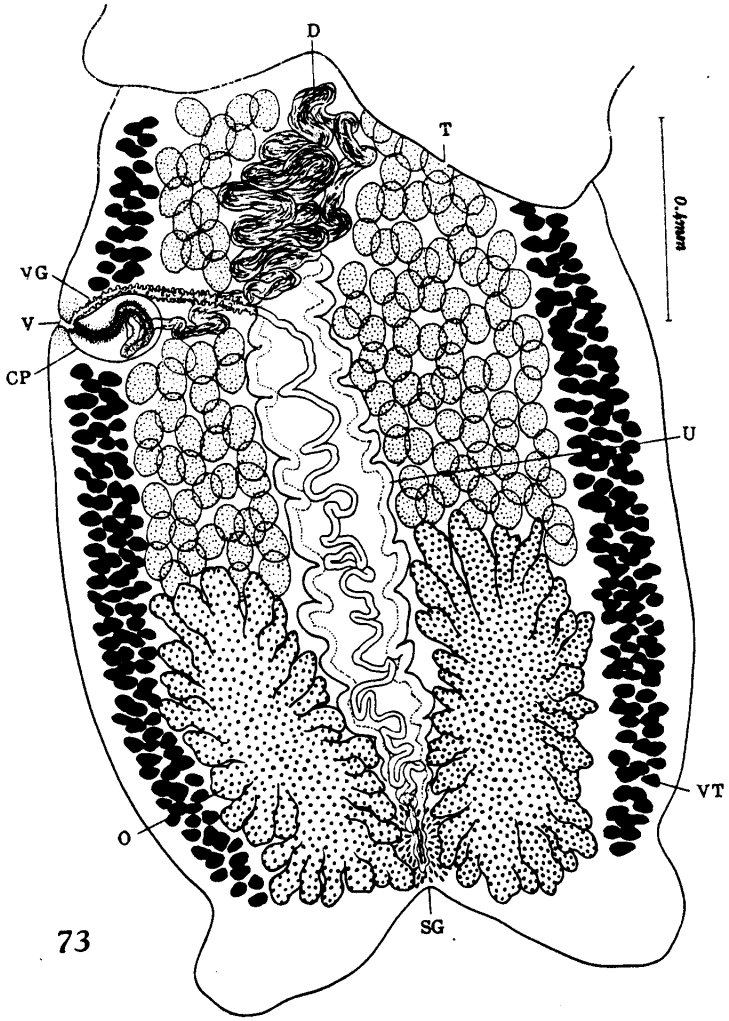

69
1mm

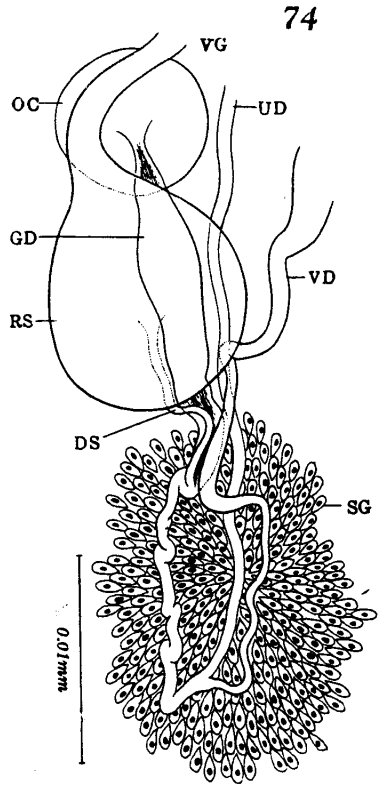

66
T
U
VT
D
GP
CP
VG
O
SG
0.3mm

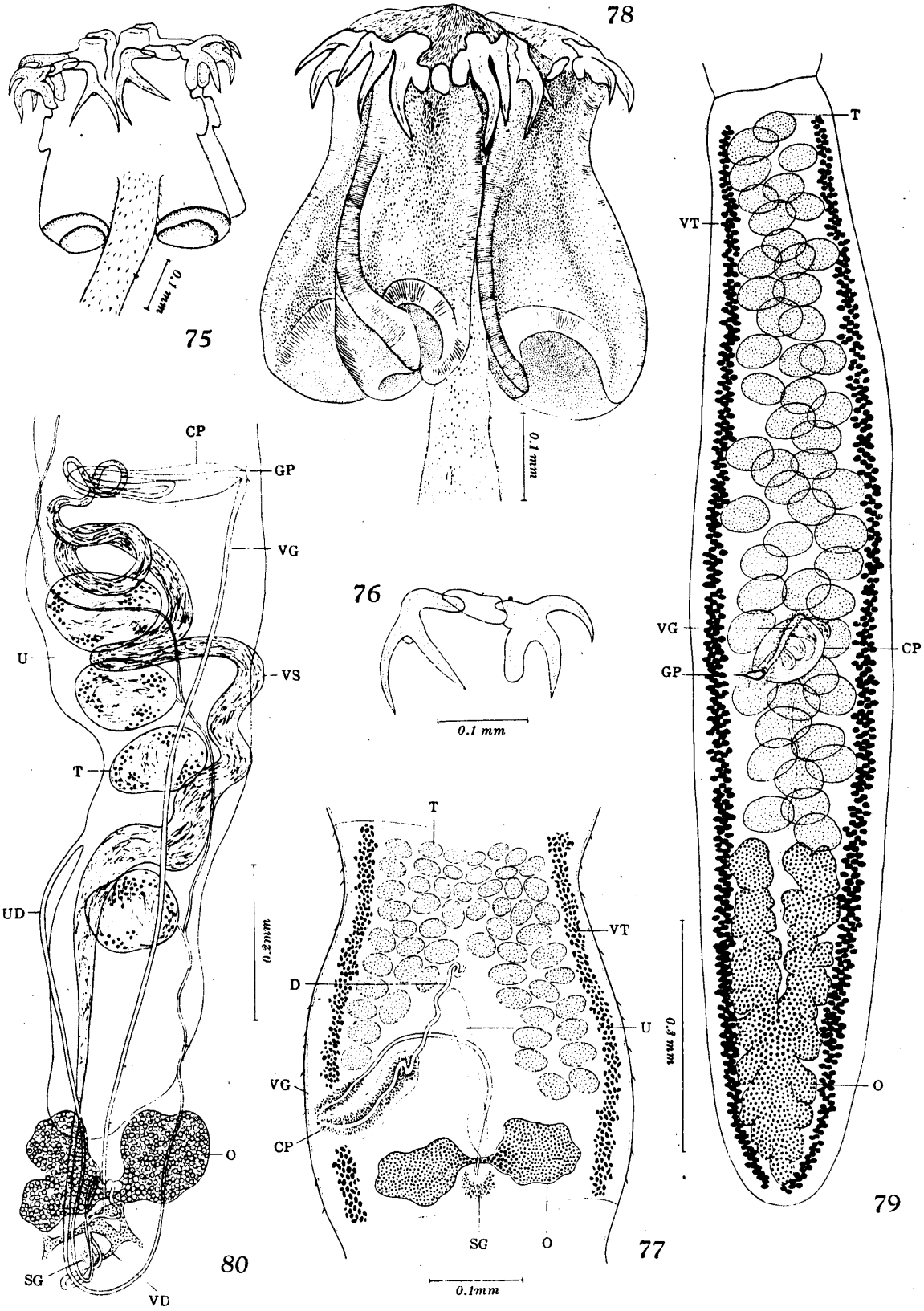

70
T
U
VG
GP
VT
CP
O
SG
0.3mm

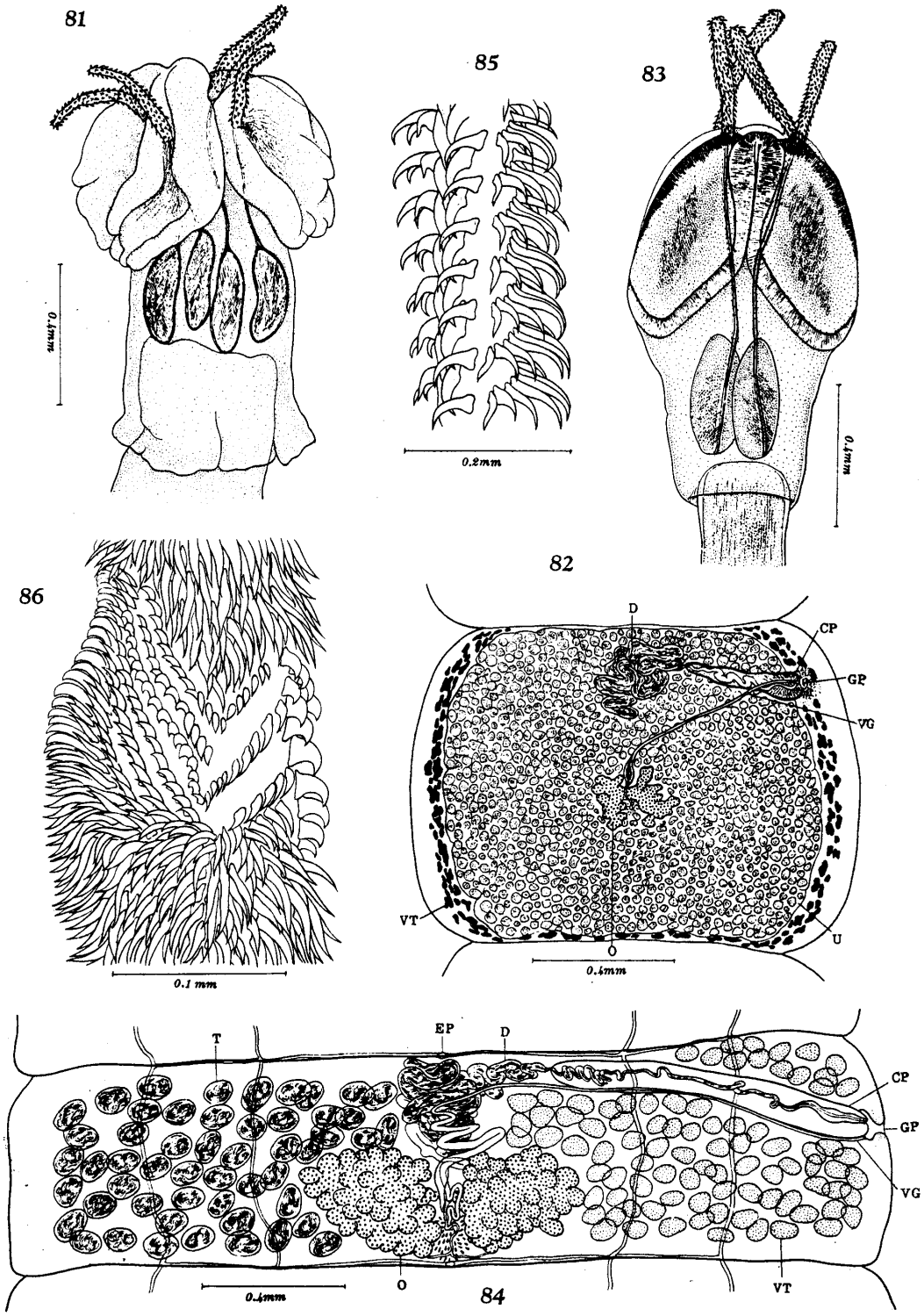

71
0.5 mm

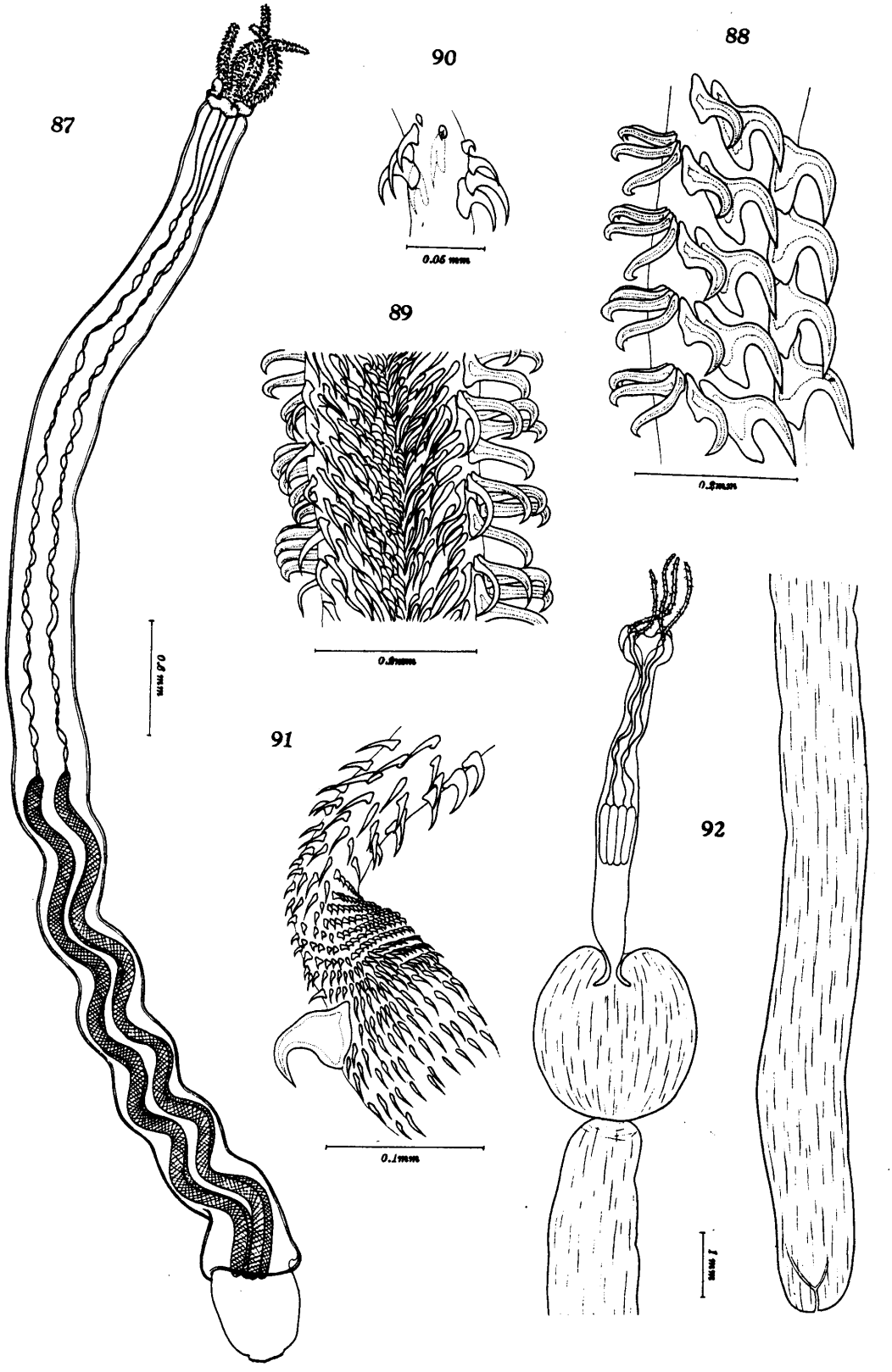

72
0.01mm

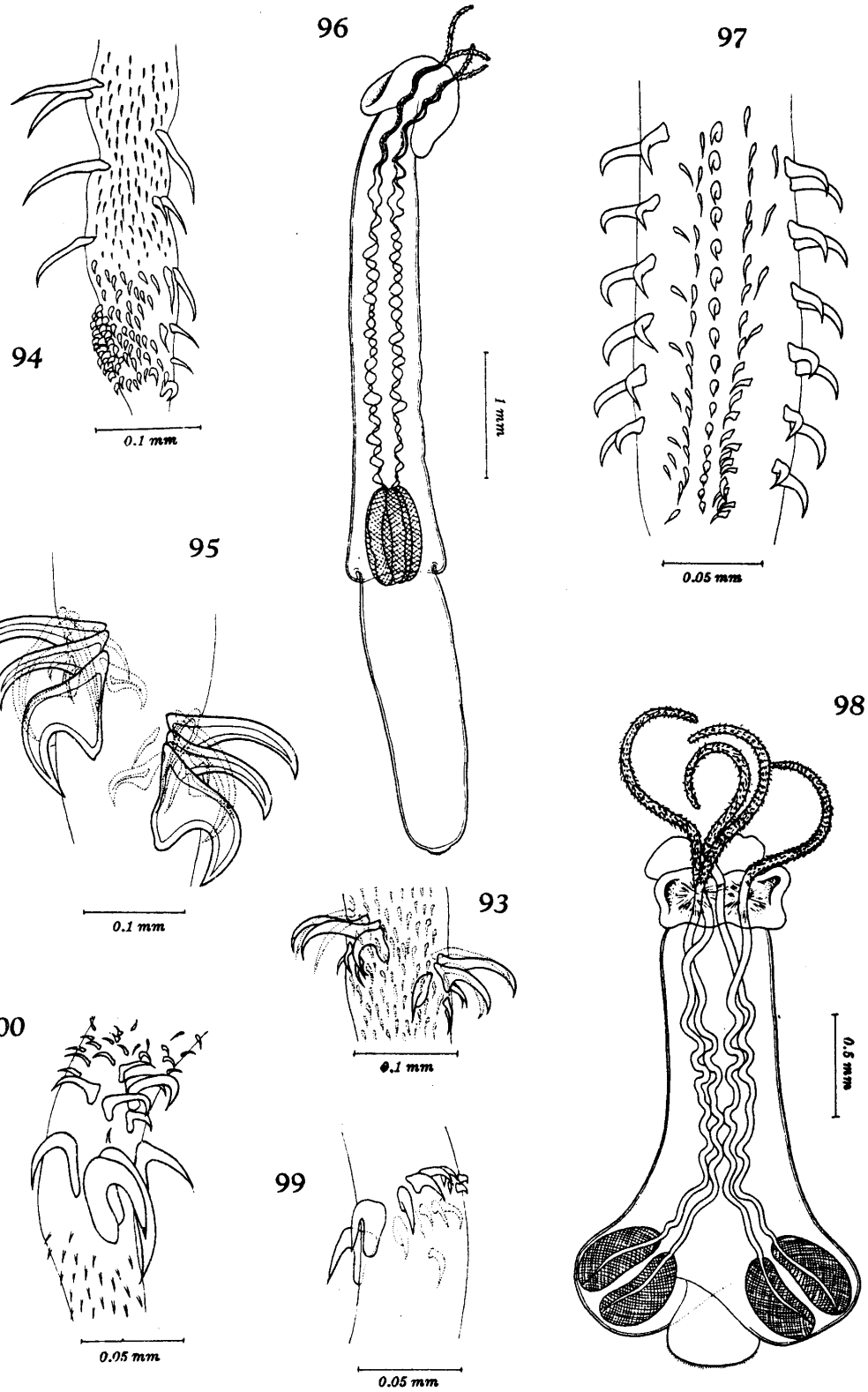

D
T
0.1mm
VG
V
CP
U
VT
O
SG
73

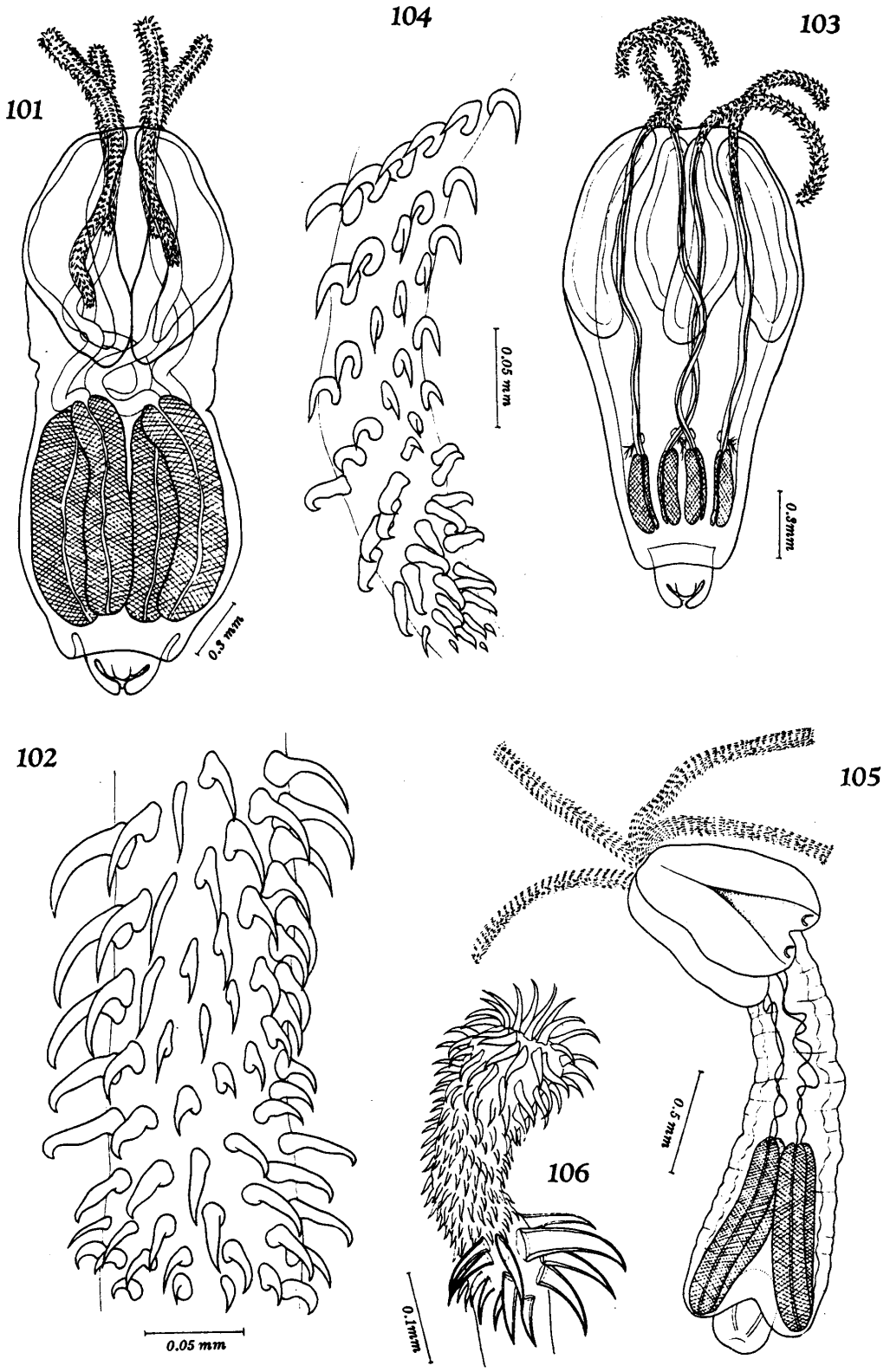

74
VG
OC
UD
GD
VD
RS
DS
SG
0.01mm

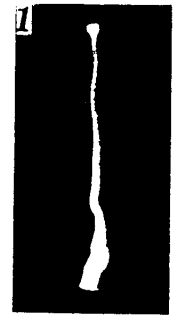

78
0.1 mm
75
0.1 mm
CP
GP
VG
U
VS
T
UD
0.2mm
O
SG
VD
80
76
0.1 mm
T
VT
D
U
VG
CP
SG
O
0.1mm
77
T
VT
VG
GP
CP
O
0.3 mm
79


81
0.1mm
85
0.2mm
83
0.1mm
86
0.1 mm
82
D
CP
GP
VG
VT
O
U
0.4mm
T
EP
D
CP
GP
VG
VT
O
0.4mm
84


87
90
0.06 mm
88
89
91
92
0.1 mm


96
97
94
0.1 mm
1 mm
0.05 mm
95
98
0.1 mm
93
0.1 mm
0.5 mm
100
99
0.05 mm
0.05 mm


101
0.3 mm
104
0.05 mm
103
0.5mm
102
0.05 mm
105
0.5 mm
106
0.1mm

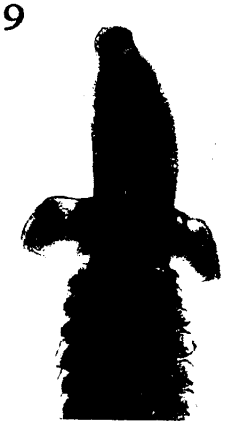

1


2


3


4

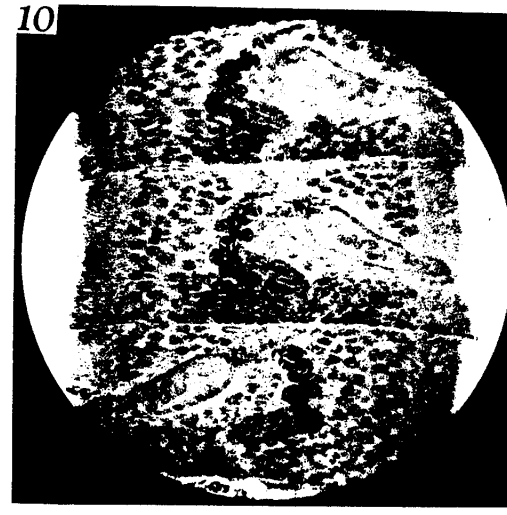

5


9


6


8

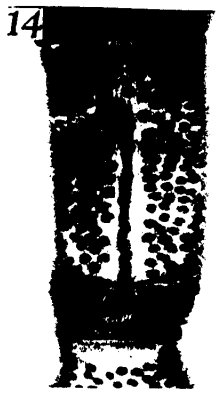

7


10


11


12

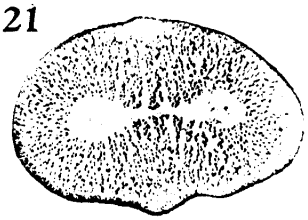

13


14

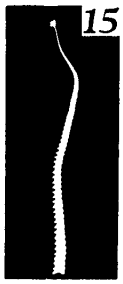

19

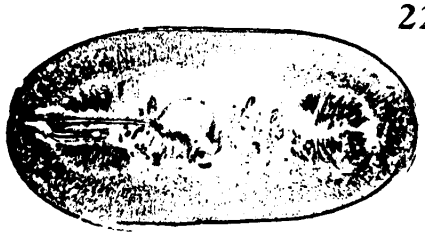

16


17


21


18


15


22

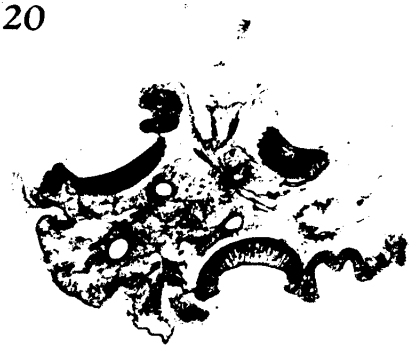

26


24


28


25

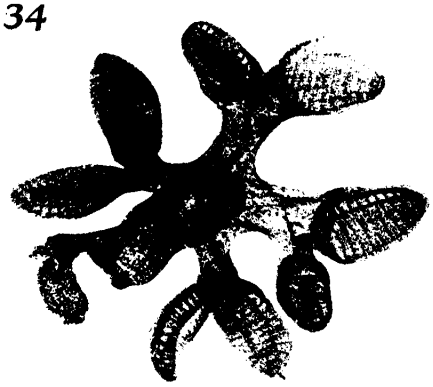

27


20


23

30

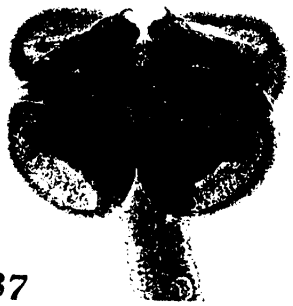
34



29

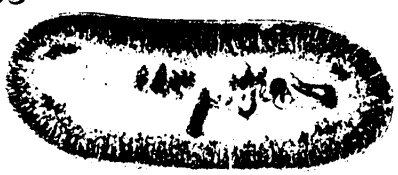
31

36



38

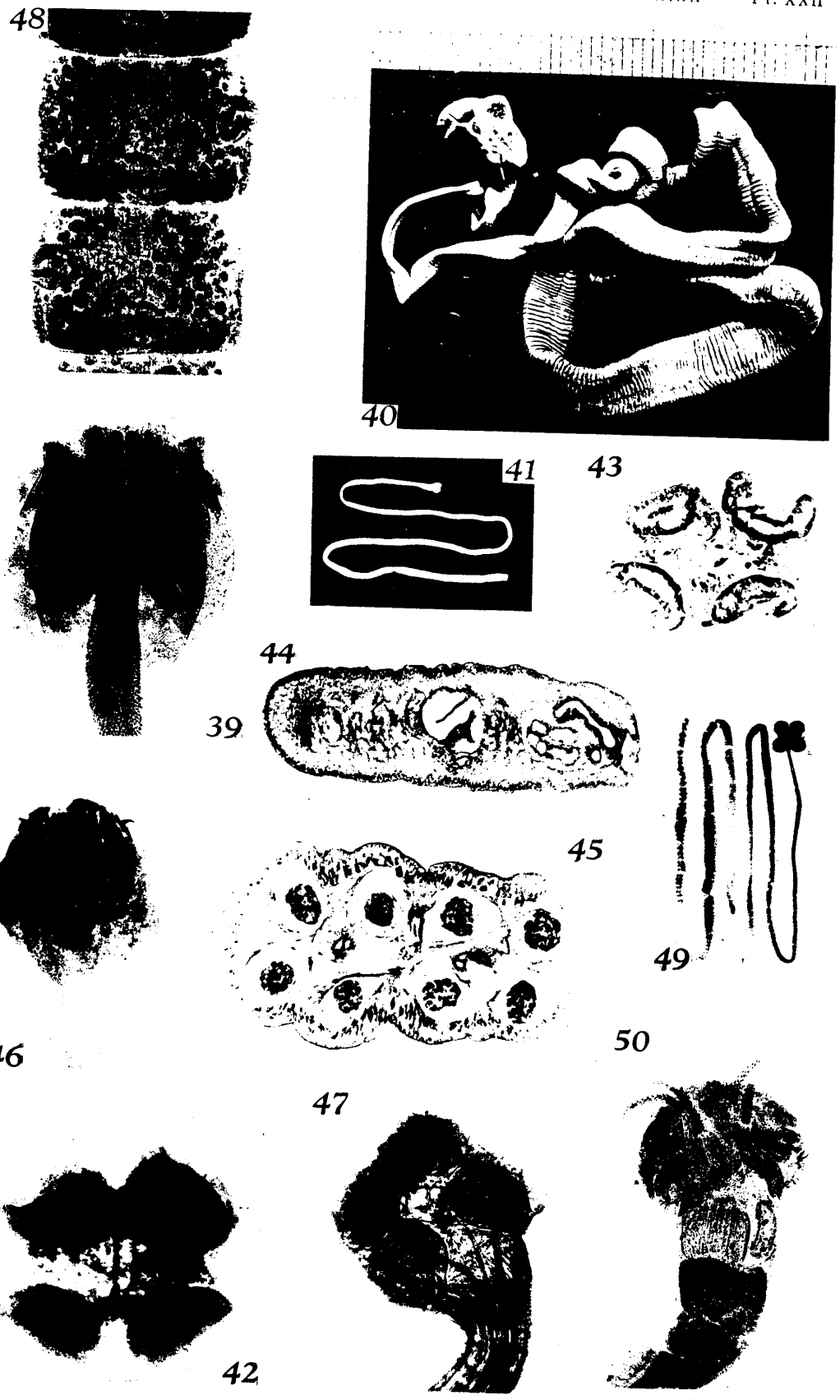
33



37

32

35


48
40
41
43
44
39
45
49
46
50
47
42