

On Cestodes Genus *Bothridium* Obtained from Reptiles Died in the Amazonland at Beppu City during 1970

(With 8 Plates)

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The helminths dealt with in the present paper were collected during 1970 by Kugi from the reptiles died in the Amazonland at Beppu City, Ôita Prefecture. The reptiles were imported into Japan from South America and Southeast Asia, and most of them died during several months after the import. They died, it was found, due to enterohepatitis caused by many endoparasites. It is reasonable to suppose that the reptiles were not infected with the helminths in Japan, but were imported into Japan after being infected with them in the natural habitats.

The species of reptiles examined and the number of endoparasites are illustrated in Table 1, and Table 2 gives the species of *Bothridium* infected with. All type specimens are in the Biological Laboratory of Nara University of Education.

Table 1. List of species of reptiles examined and number of endoparasites

Species examined	Date of autopsy	Number of parasites infected with		
		Trematodes	Cestodes	Nematodes
(1) <i>Eunectes murinus</i>	5. V.	0	123	numerous
(2) <i>Epicrates cenchrus</i>	6. V.	0	5	0
(3) <i>Caiman crocodilus</i>	14. V.	0	3	0
(4) <i>Eunectes murinus</i>	21. V.	23	numerous	0
(5) <i>Eunectes murinus</i>	28. V.	39	13	0
(6) <i>Python molurus</i>	6. VI.	0	numerous	numerous
(7) <i>Tupinambis teguixin</i>	25. VI.	0	0	2
(8) <i>Varanus salvator</i>	29. VI.	0	numerous	0
(9) <i>Varanus salvator</i>	4. VII.	0	6	0
(10) <i>Python reticulatus</i>	7. VII.	0	numerous	0
(11) <i>Tupinambis teguixin</i>	9. VII.	0	0	0
(12) <i>Varanus niloticus</i>	18. X.	0	0	5
(13) <i>Varanus niloticus</i>	20. X.	0	12	numerous
(14) <i>Tupinambis nigropunctatus</i>	5. XI.	0	0	32
(15) <i>Epicrates cenchrus</i>	10. XI.	0	0	1
(16) <i>Tupinambis nigropunctatus</i>	12. XII.	0	0	8

Table 2. List of hosts and cestodes infected with

Host	Cestodes infected with
(1) <i>Eunectes murinus</i>	<i>Crepidobothrium macroacetabula</i> kugi and Sawada, 1972 <i>Bothridium kugii</i> n. sp.
(2) <i>Epicrates cenchris</i>	<i>Bothridium sawadai</i> n. sp.
(6) <i>Python molurus</i>	<i>Bothridium longicephalus</i> n. sp. * <i>B. pithonis</i> Blainville, 1824 <i>B. microdisciformis</i> n. sp. <i>B. longiovum</i> n. sp.
(9) <i>Varanus salvator</i>	<i>Scyphocephalus longae</i> Sawada and Kugi, 1973
(10) <i>Python reticulatus</i>	<i>Bothridium orientalis</i> n. sp. <i>B.</i> sp. i. <i>B.</i> sp. ii. <i>B.</i> sp. iii.

*Synonym of *Bothridium pithonis*

- Bothridium arcuatus* Baird, 1865
B. ditrema Leblond, 1836
B. grandis Creplin, 1839
B. laticeps (Duvernoy, 1833)
B. megacephalus Dies, 1850
B. megalcephalus Grepl, 1839
B. obovatum (Mol., 1858)
B. ovatum (Dies, 1850)

Bothridium kugii n. sp.

(Plate I)

The worms measure 240 to 295 mm in length and have a maximum width of 0.85 to 0.97 mm. The strobila consists of about 180 to 200 segments, which are all broader than long. A few of the posterior segments are narrower and longer. The margins of segments are serrate.

The scolex measures about 5.0 to 5.2 mm in width and 4.0 to 4.3 mm in length. It consists of two tubular bothria, one lying dorsally and the other ventrally. They are attached to each other throughout their whole length by a broad membrane. They are flat funnel-shaped and possessed the opening at both ends, the posterior opening being smaller and directed inwardly. Each bothrium is provided with sphincter muscles at its anterior and posterior ends. The neck measures 10 to 13 mm long and 0.6 to 0.8 mm wide. The testes are 130 to 160 in number; 0.053 to 0.060 mm in size and are arranged in longitudinal rows in medullary parenchyma on each side of median line. The vagina opens immediately behind the cirrus sac into a common atrium situated at the junction of the first and second of the segment. The cirrus sac is pre-equatorial, directed at right angle to the ventral surface, it measures 0.304 mm long and 0.194 to 0.207 mm wide. The uterine pore is situated at slightly anterior to the middle between cirrus sac and ovary. The ovary is V-shaped, 0.304 to 0.402 mm in

width, located at the posterior border of segment. A shell gland, 0.179 to 0.207 mm by 0.166 to 0.194 mm, lying immediately posteroventral to ovary. The uterus lies in two loops on each side of the median line. The eggs measure 0.042 to 0.05 mm by 0.06 to 0.07 mm and operculated.

Discussion

We have compared the present specimen with those reported in the literature of all known species of *Bothridium*. As the result, it stands very close to *Bothridium pithonis* var. *parvum* from *Python reticulatus*, but it can be readily distinguished from the latter by longer and more slender strobila, scolex with flatter and thinner bothria and a greater number of testes. It is proposed to name it *Bothridium kugii* n. sp.

Host : *Eunectes murinus*

Habitat : Small intestine.

Bothridium sawadai n. sp.

(Plate II)

The strobila length is up to 915 mm; maximum width 0.8 to 1.3 mm, in the region of posterior segments. The segments are all broader than long except the posterior ones which are narrower and longer. The margins of segments are serrate. The scolex sets off from the rest of body, measuring 3.6 to 4.0 mm long and 3.1 to 3.5 mm wide. It consists of two cylindrical muscular tubes. They are flat and shallow funnel-shaped. The neck is pretty long and 0.46 to 0.50 mm in width. The testes are 185 to 200 in number; 0.049 to 0.063 mm in diameter, distributed irregularly in medullary parenchyma. The cirrus sac is located at the anterior border of segment, measuring 0.277 mm long and 0.249 to 0.304 mm wide. The ovary is V-shaped, 0.415 to 0.483 mm in greatest length. A shell gland lies immediately posteroventral to ovary. The uterus lies in two loops on each side of the median line. The eggs are 0.07 mm by 0.063 mm in size.

Discussion

The present species closely resembles *Bothridium pithonis*, but it differs from the latter in the total length of worms, which measures up to 900 mm as contrasted with 650 to 700 mm in *pithonis*, in the size of scolex, which measures 3.6 to 4.0 mm long and 3.1 to 3.5 mm wide as contrasted with 4.5 to 6.0 mm long and 5.1 to 5.4 mm wide in *pithonis*, and in the width of neck, which measures 0.46 to 0.50 mm as contrasted with 2 mm in *pithonis*.

Host : *Epicrates cenchrus*

Habitat : Small intestine

Bothridium longicephalum n. sp.

(Plate III)

Strobila 280 to 310 mm long by a maximum width 3.2 to 3.4 mm, segments margins serrate. Scolex 6.3 to 6.5 mm long and 2.7 to 3.0 mm wide. It consists of two longicylindric muscular tubes, the posterior opening being smaller and directed outwardly. Neck absent, segmentation begins directly behind scolex, Testes 90 to 120 in number, 0.041 to 0.069 mm in diameter. Cirrus sac 0.070 mm by 0.053 mm. Ovary pretty small, 0.132 to 0.140 mm long and 0.046 to 0.053 mm wide. Shell gland 0.049 to 0.056 mm in diameter, lying immediately to ovary. Eggs 0.042 to 0.046 mm by 0.063 to 0.070 mm.

Discussion

We have compared the present species with the known species of *Bothridium* and it is found that it differs from them in the length of the scolex and in the testis number.

Host : *Python molurus*

Habitat : Small intestine

Bothridium pithonis Blainville, 1824

(Plate IV)

Strobila length 650 to 700 mm, maximum breadth 6.0 to 6.5 mm. Scolex 4.5 to 5.0 mm in length and 5.1 to 5.4 mm in width; bothria tubular, each with a small, slit-like aperture anterior, and a smaller one posterior. Testes number 200 to 230, and situated in two lateral fields on each side of median line posterior to cirrus sac. Ovary V-shaped, measuring 0.553 to 0.593 mm in width. Shell gland 0.083 mm by 0.138 mm. Eggs 0.049 to 0.056 mm by 0.063 to 0.077 mm.

Host : *Python molurus*

Habitat : Small intestine

Bothridium microdisciformis n. sp.

(Plate V)

Worm length 100 to 120 mm and greatest breadth 0.9 to 1.2 mm. Scolex with two muscular bothria, measuring 3.0 to 3.2 mm long and 2.2 to 3.5 mm wide. Scolex sharply sets off from the rest of strobila, segmentation begins just behind scolex. Testes 100 to 120 in number, 0.056 to 0.063 mm in diameter. Cirrus sac 0.098 to 0.112 mm long and 0.098 mm wide, located at middle field of segment. Ovary V-shaped, 0.126 to 0.140 mm wide, located at posterior border of segment. Shell gland, 0.07

to 0.08 mm in diameter, lying immediately posteroventral to ovary. Uterus lies in two loops on each side of median line. Eggs 0.042 to 0.049 mm by 0.056 to 0.063 mm.

Discussion

The present species markedly differs from any of the other members of the genus in the smaller form and the situation of the cirrus sac.

Host : *Python molurus*

Habitat : Small intestine

Bothridium longiovum n. sp.

(Plate VI)

Worm length 70 to 90 mm by a maximum width 0.9 to 1.1 mm, posterior border of segment overlapping, so that margin of strobila appears serrate, all wider than long with relatively slight increase in length in gravid segment. Scolex consisting of two cylindrical muscular tubes, the posterior opening being smaller and directly outwardly, measuring 3.5 to 3.8 mm long by 2.4 to 2.6 mm wide. Neck absent, segmentation begins just behind scolex. Testes 120 to 140 in number, 0.035 to 0.042 mm in diameter. Cirrus sac, spherical, measuring 0.049 mm in diameter. Ovary fairly small, not separated two parts by a narrow isthmus, measuring 0.105 to 0.112 mm by 0.105 mm. Uterus lies in two loops on each side of median line of segment. Uterine pore situated at middle between cirrus sac and ovary.

Discussion

The present species distinctly differs from any of the other species of the genus in the shape of scolex and that of ovary. Accordingly, it should be identified with the new species.

Host : *Python molurus*

Habitat : Small intestine

Bothridium orientalis n. sp.

(Plate VII)

Strobila length 240 to 270 mm and greatest breadth 4.5 to 5.2 mm. Scolex tetragonal, 3.5 mm by 3.5 mm (6.0 mm long and 7.5 mm under cover glass pressure). Scolex sharply sets off from the rest of strobila, and segmentation begins just behind scolex. All segments broader than long and margins of segments are serrate. Testes 320 to 350 in number, measuring 0.112 to 0.119 mm by 0.075 to 0.084 mm. Cirrus sac 0.248 to 0.277 mm by 0.304 to 0.318 mm, located at one-third anterior of segment.

Ovary in posterior field of segment, median, flattend transversely with two parts connected by a narrow isthmus, 0.664 to 0.830 mm in greatest length. Shell gland, 0.277 to 0.346 mm wide and 0.221 to 0.249 mm long, lying immediately posteroventral to ovary. Eggs 0.07 mm by 0.049 mm.

Discussion

The present species markedly differs from any of the other species of the genus in the shape of scolex, the larger number of testes and the larger width of ovary. Accordingly, it should be identified with the new species.

Host : *Python reticulatus*

Habitat : Small intestine

Bothridium sp. i.

(Plate VIII, Figs. 1—3)

Strobila length 250 to 280 mm, maximum width 5.1 to 5.6 mm. Scolex 4.0 to 4.3 mm long and 3.6 to 3.8 mm wide. Neck absent, segmentation begins just behind scolex.

Bothridium sp. ii.

(Plate VIII, Figs. 4—6)

Strobila length 160 to 180 mm by a maximum width 3.2 to 3.8 mm. Scolex 4.0 to 4.2 mm in length and 3.0 to 3.3 mm in width. Each bothrium is possessed the aperture at both ends, the posterior aperture being smaller and directed outwardly. Neck absent, segmentation begins just behind scolex. Outset of segmentation just behind scolex extremely wide.

Bothridium sp. iii

(Plate VIII, Figs. 7—9)

Strobila length 75 to 86 mm by a maximum width 1.1 to 1.5 mm. Scolex 3.0 to 3.1 mm long and 1.5 to 2.1 mm wide. Neck absent, segmentation begins just behind scolex.

The shape of scoleces of the above-mentioned three species do not agree with those of any recorded species of *Bothridium*. But, because of the extreme constriction of all strobilas, the present three forms do not possess characteristics sufficient to differentiate them from other known species. Accordingly, they are left unnamed.

Host : *Python reticulatus*

Habitat : Small intestine

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Plate I. *Bothridium kugii* n. sp.

- Fig. 1. Strobila ($\times 1$)
- Fig. 2. Stained scolex under cover glass pressure, lateral view ($\times 10$)
- Fig. 3. Cross section through slightly anterior part to middle of scolex ($\times 12$)
- Fig. 4. Cross section through middle of scolex ($\times 12$)
- Fig. 5. Immature segments ($\times 35$)
- Fig. 6. Young mature segments ($\times 35$)
- Fig. 7. Ripe segments ($\times 37$)
- Fig. 8. Eggs ($\times 230$)
- Fig. 9. Uterus and seminal receptacle ($\times 100$)
- Fig. 10. Ovary and shell gland ($\times 130$)

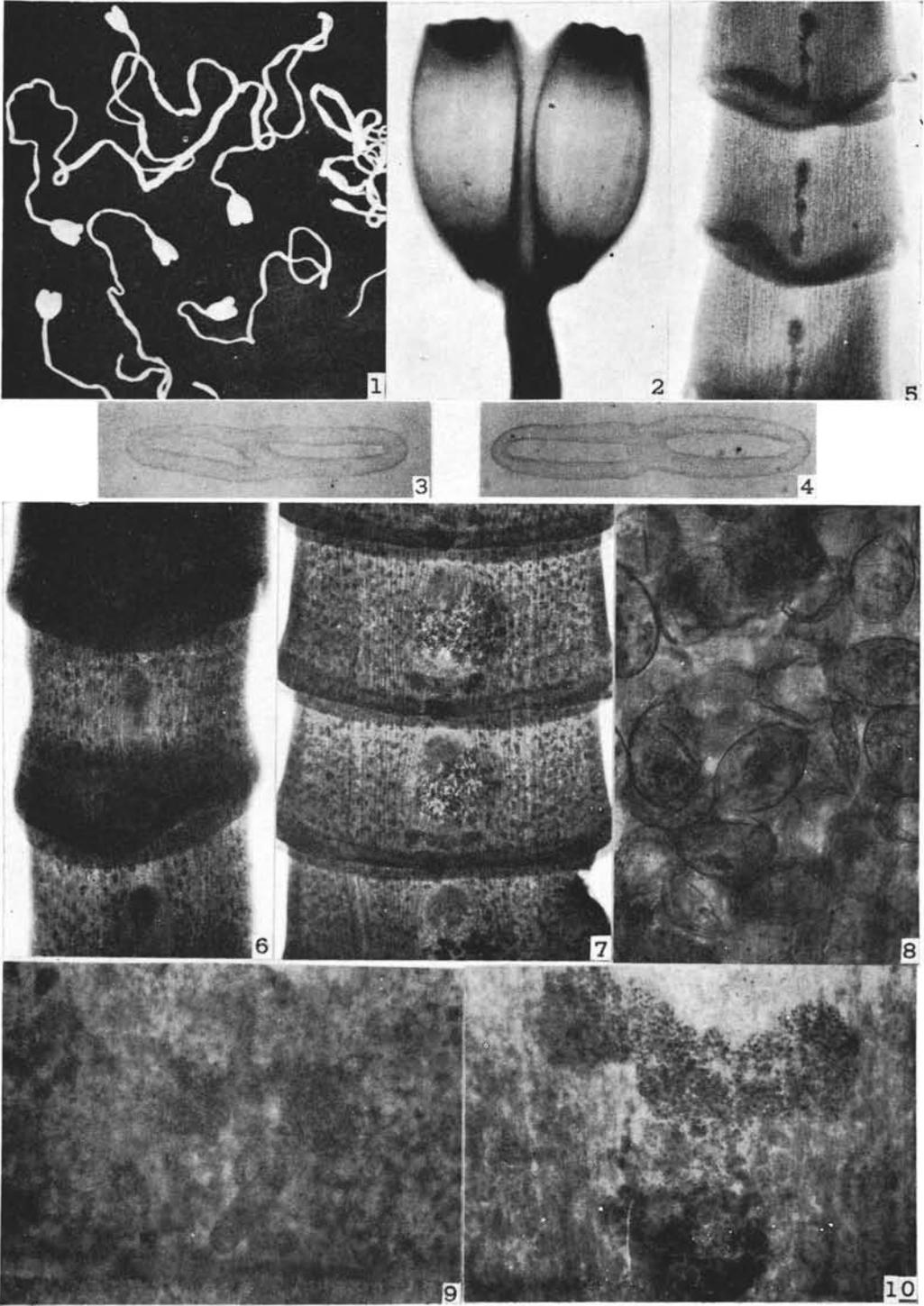


Plate I. *Bothridium sawadai* n. sp.

- Fig. 1. Scolex, lateral view ($\times 8$)
- Fig. 2. Stained scolex under cover glass pressure, lateral view ($\times 8$)
- Fig. 3. Immature segments ($\times 10$)
- Fig. 4. Ripe segments ($\times 15$)
- Fig. 5. Senile segments ($\times 8$)
- Fig. 6. Eggs ($\times 120$)

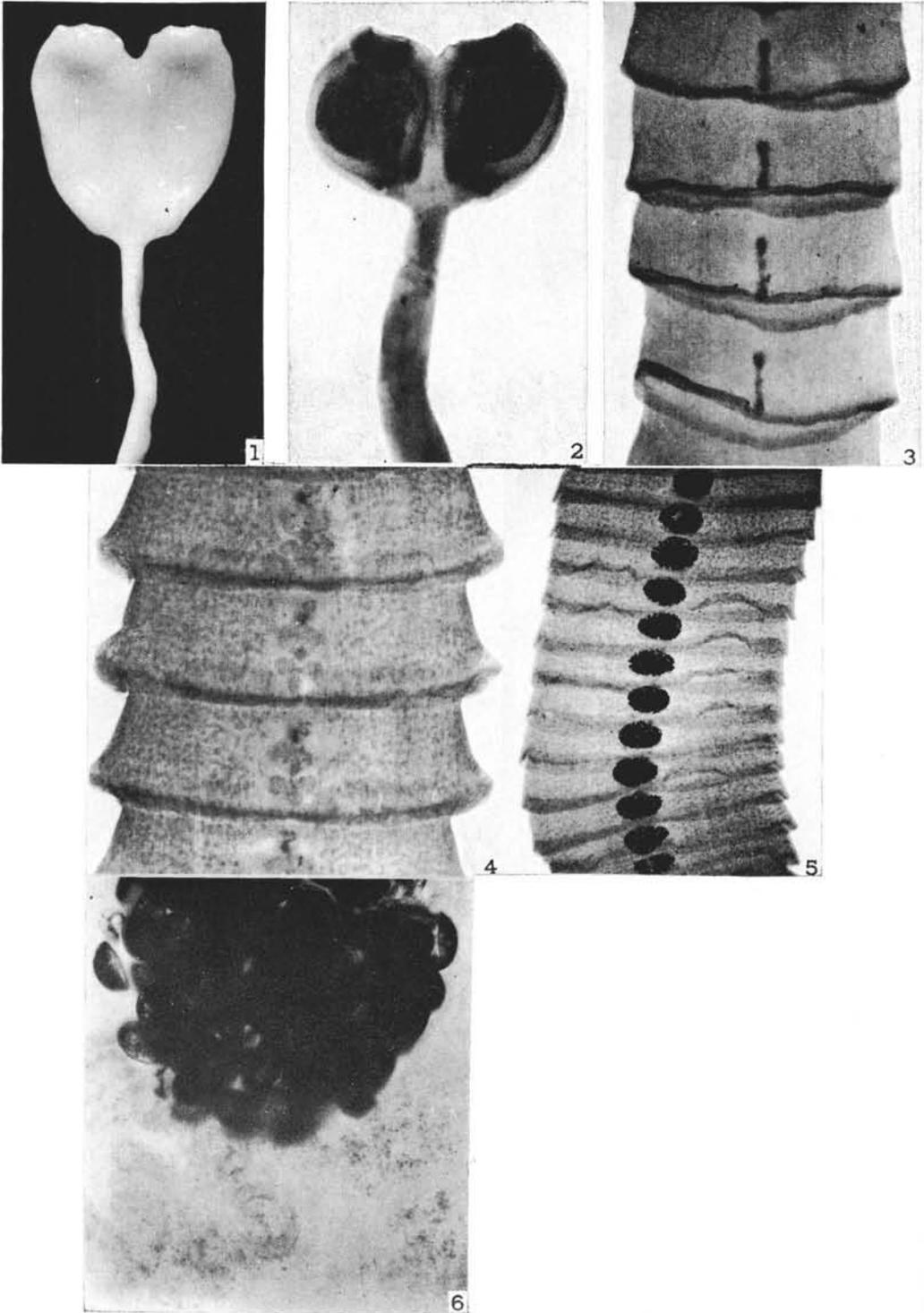


Plate III. *Bothridium longicephalum* n. sp.

- Fig. 1. Scolex, lateral view ($\times 8$)
Fig. 2. Stained scolex under cover glass pressure, lateral view ($\times 8$)
Fig. 3. Immature segments ($\times 25$)
Fig. 4. Ripe segments ($\times 40$)
Figs. 5. and 6. Senile segments (Fig. 5, $\times 35$; Fig. 6, $\times 45$)

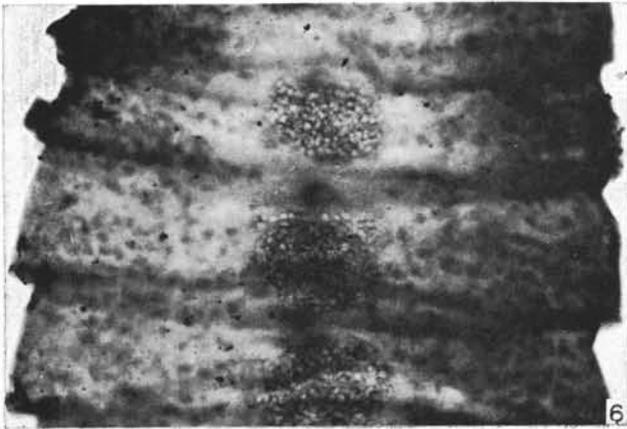
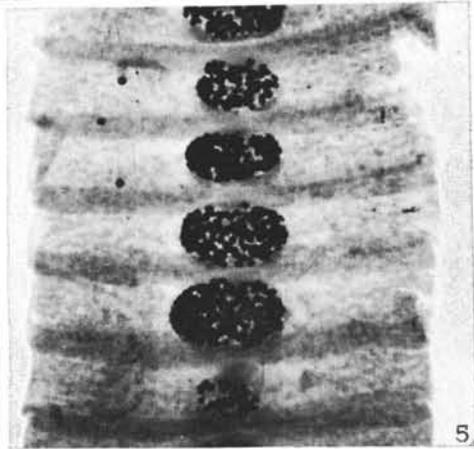
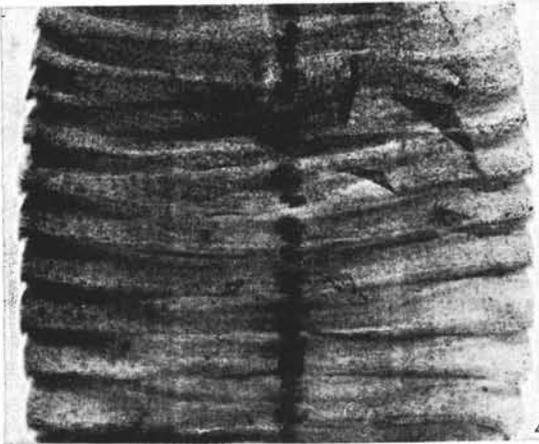
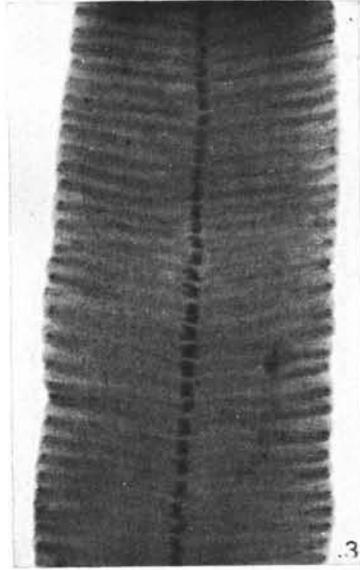
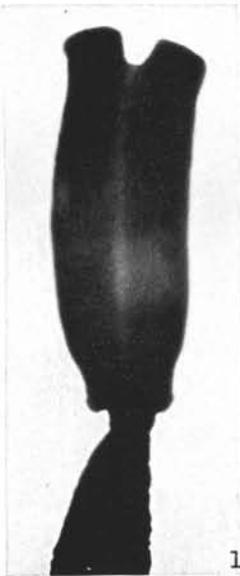


Plate IV. *Bothridium pithonis* Blainville, 1824

- Fig. 1. Scolex, lateral view ($\times 10$)
- Fig. 2. Stained scolex under cover glass pressure, lateral view ($\times 13$)
- Fig. 3. Cross section through slightly anterior part to middle of scolex. Showing sphincter muscles at it's anterior ($\times 20$)
- Fig. 4. Cross section through middle of scolex ($\times 20$)
- Fig. 5. Ripe segments ($\times 12$)
- Fig. 6. Genital organs ($\times 50$)
- Fig. 7. Transection through cirrus sac ($\times 150$)
- Fig. 8. Transection through egg sac ($\times 50$)
- Fig. 9. Senile segments ($\times 8$)

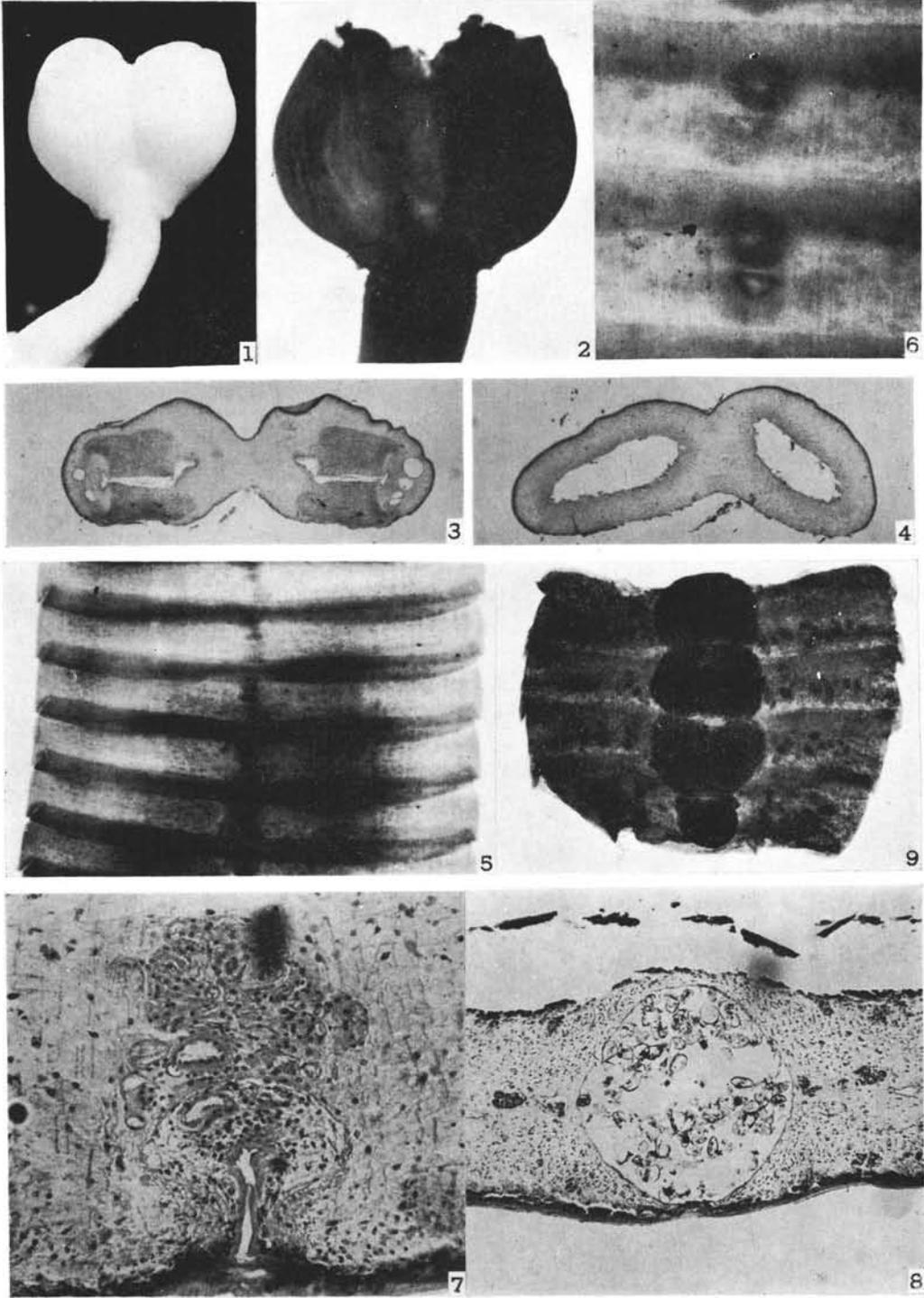


Plate V. *Bothridium microdisiformis* n. sp.

- Fig. 1. Scolex, lateral view ($\times 20$)
- Fig. 2. Stained scolex under cover glass pressure, lateral view ($\times 20$)
- Fig. 3. Immature segments ($\times 40$)
- Fig. 4. Young mature segments ($\times 30$)
- Fig. 5. Ripe segments ($\times 25$)
- Fig. 6. Genital organ ($\times 250$)
- Fig. 7. Senile segments ($\times 25$)
- Fig. 8. Egg sac ($\times 120$)

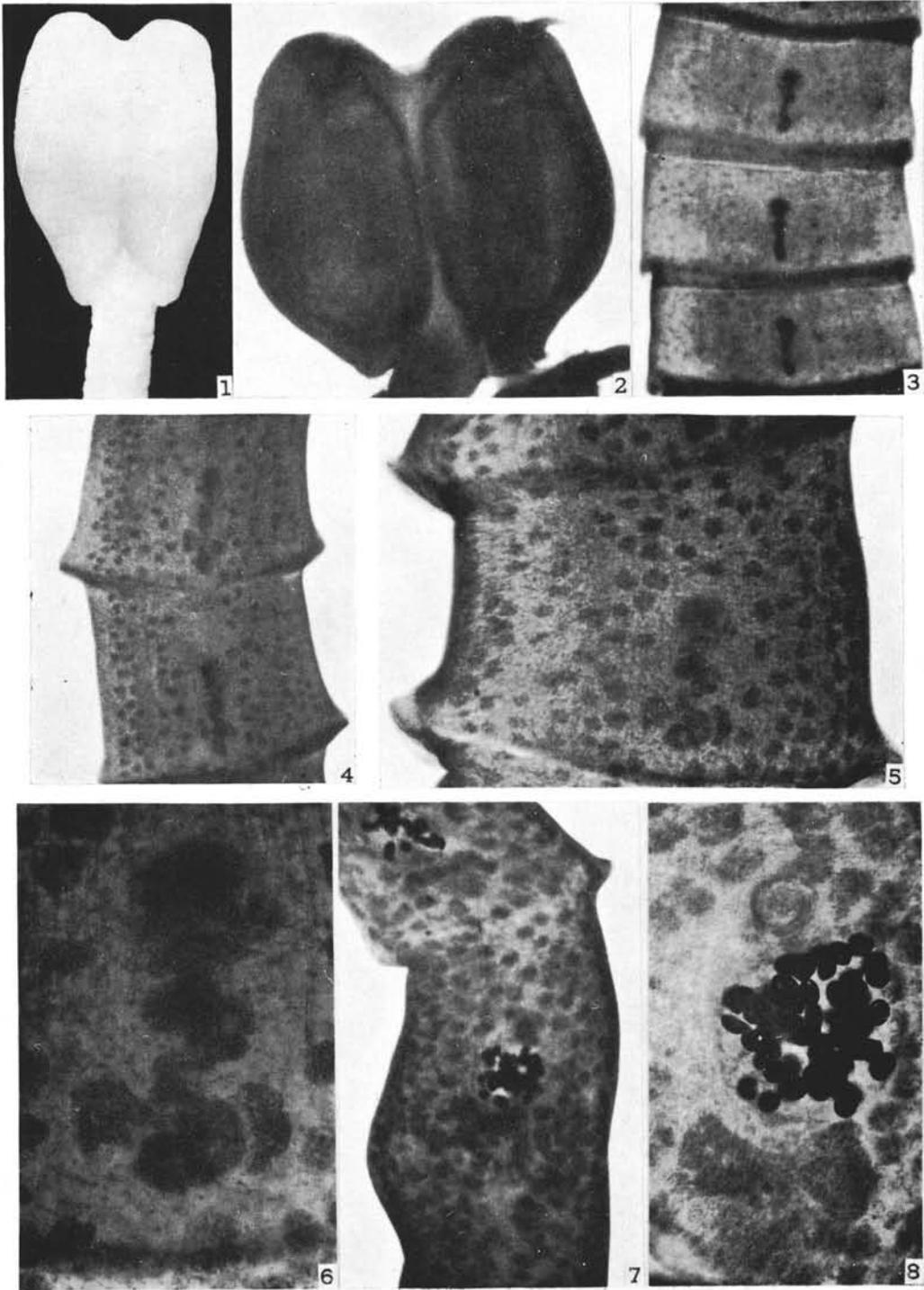


Plate. VI. *Bothridium longiovum* n. sp.

- Fig. 1. Scolex, lateral view ($\times 7$)
- Fig. 2. Stained scolex under cover glass pressure, lateral view ($\times 7$)
- Fig. 3. Immature segments ($\times 40$)
- Fig. 4. Young mature segments ($\times 40$)
- Fig. 5. Ripe segments ($\times 40$)
- Fig. 6. Genital organs ($\times 200$)

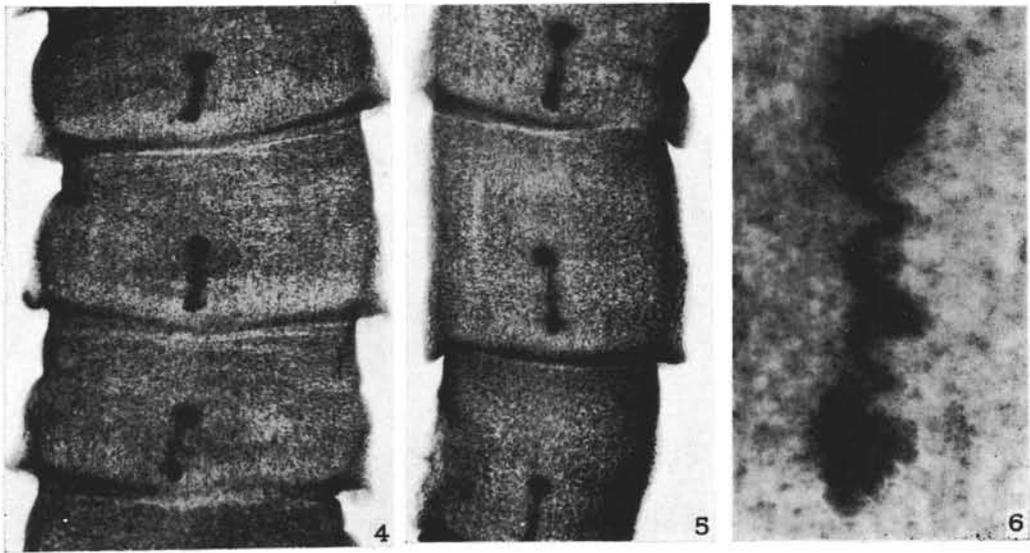
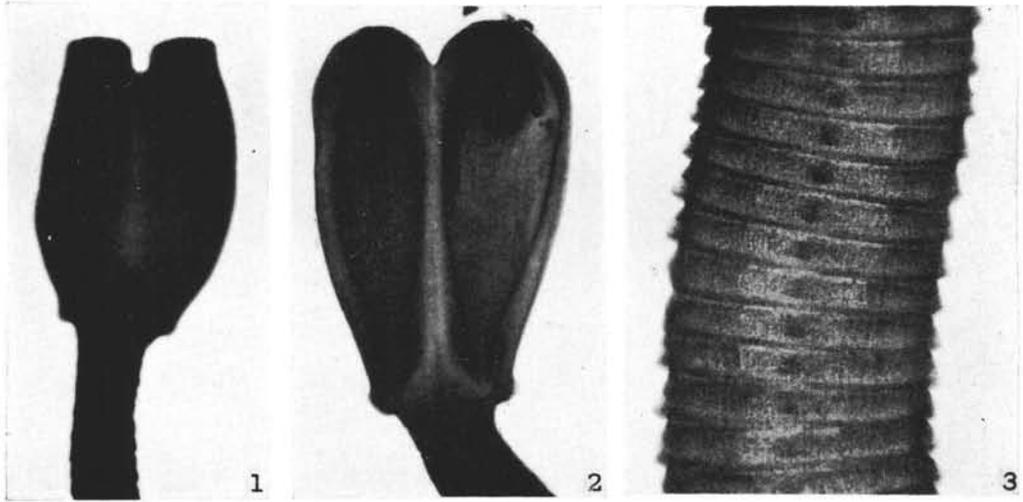


Plate VII. *Bothridium orintalis* n. sp.

- Fig. 1. Scolex, lateral view ($\times 6$)
- Fig. 2. Stained scolex under cover glass pressure, lateral view ($\times 6$)
- Fig. 3. Cross section through slightly posterior part to top of scolex. Showing sphincter muscles at it's anterior ($\times 8$)
- Fig. 4. Cross section through middle of scolex ($\times 8$)
- Fig. 5. Cross section through basal part of scolex ($\times 8$)
- Fig. 6. Immature segments ($\times 9$)
- Fig. 7. Ripe segments ($\times 8$)
- Fig. 8. Genital organs ($\times 80$)
- Fig. 9. Egg sac ($\times 100$)

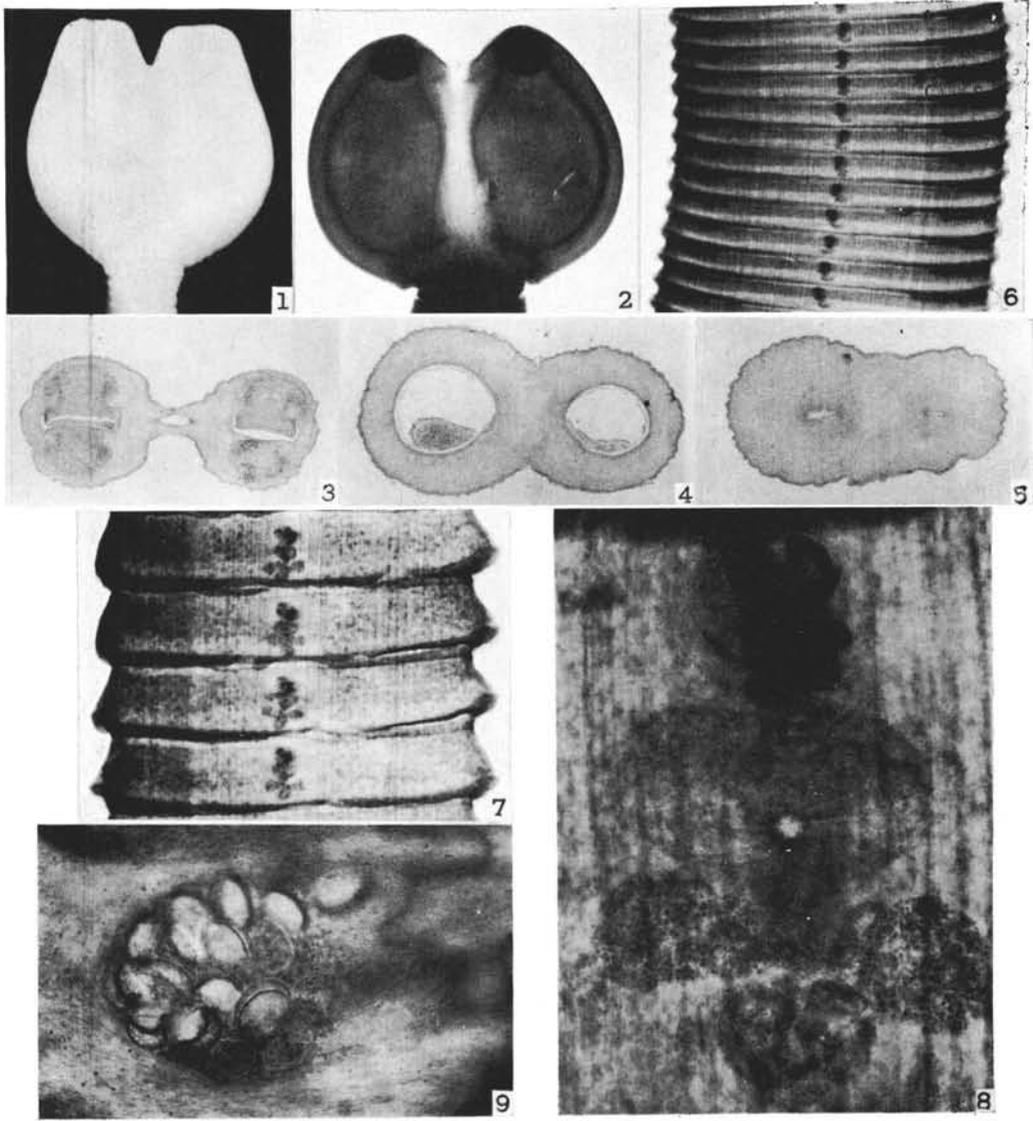


Plate VIII. *Bothridium* sp.*Bothridium* sp. i.

- Fig. 1. Scolex, lateral view ($\times 7$)
Fig. 2. Stained scolex under cover glass pressure, lateral view ($\times 9$)
Fig. 3. Immature segments ($\times 14$)

Bothridium sp. ii.

- Fig. 4. Scolex, lateral view ($\times 10$)
Fig. 5. Stained scolex under cover glass pressure, lateral view ($\times 10$)
Fig. 6. Immature segments ($\times 15$)

Bothridium sp. iii.

- Fig. 7. Scolex, lateral view ($\times 12$)
Fig. 8. Stained scolex under cover glass pressure, lateral view ($\times 12$)
Fig. 9. Immature segments ($\times 15$)

