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**ON *SPICULOPTERAGIA YAMASHITAI* N. SP. AND  
*RINADIA JAPONICA* N. SP. (NEMATODA:  
TRICHOSTRONGYLIDAE) FROM THE YESO ISLAND DEER  
*CERVUS NIPPON YESOENSIS* (HEUDE)**

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Small nematodes were collected from the contents of the upper small intestine of a Yeso Island deer *Cervus nippon yesoensis* (HEUDE) on March 17, 1965. The deer was obtained at Hidaka district, south-eastern Hokkaido. Numerous specimens belonging to the genus *Spiculoptera* (ORLOFF, 1933) TRAVASSOS, 1937, and eight male specimens of the genus *Rinadia* GRIGORIAN, 1951 were found. Nematode species of the genera *Spiculoptera* and *Rinadia* are new to Japan. The author described these nematodes as two new species; the specimens are preserved in the Department of Parasitology, Faculty of Veterinary Medicine, Hokkaido University.

*Spiculoptera yamashitai* n. sp.

Host: *Cervus nippon yesoensis* (HEUDE)

Habitat: Small intestine

Locality: Hidaka district, Hokkaido, Japan

Description of the species Small thin nematodes. Cuticle has longitudinal striation over the entire body length except anterior end. At the head portion, delicate annulation with occasional slight thickening of cuticle. Head end slightly expanded and mouth very small.

Male: Length of body 6.23~6.95 mm (average 6.69 mm); maximal width in front of bursa, 0.125~0.140 mm (0.133 mm). Esophagus 0.545~0.625 mm (0.589 mm). Cervical papillae 0.265~0.290 mm (0.279 mm) from head end; excretory pore 0.230~0.265 mm (0.251 mm) from head end. Prebursal papillae well-developed. Bursa consists of two large lateral lobes and a small dorsal lobe. Antero-ventral ray thin; postero-ventral ray massive and bends ventrally; the tips of both rays approximate at the edge of bursa. Lateral rays fairly thin and straight; antero-lateral ray shorter and does not reach the bursal edge. Antero- and medio-lateral rays run parallel, but the tip of postero-lateral ray, the longest ray, separates from other lateral rays. Externo-dorsal ray stout and bent. Dorsal ray long and bifurcated, 0.060~0.072 mm (0.066 mm) together with branches; its trunk short, about a third of the total length; each branch splits into two branches, the external branch bends in an S-shape, the internal one is straight with a minute external protuberance. Rays of accessory bursal membrane thin, long

and parallel; the distal portion of each bends laterally, then turns anteriorly at the tip.

Spicules equal in size and shape, yellowish brown in color. Length 0.175~0.195 mm (0.186 mm); width 0.020~0.024 mm (0.022 mm) at the bifurcating portion and 0.016~0.018 mm (0.017 mm) at the proximal expanded portion. Anterior portion, about two thirds of the spicule length, is tubular and constricted at a distance of 0.040~0.047 mm (0.045 mm) from the proximal end. Each spicule bifurcated distally. The main branch, a continuation of the trunk, is thick, its length 0.060~0.078 mm (0.071 mm); the proximal half diverges medio-ventrally and the distal half stretches posteriad; the distal end bends ventrally where it reveals a fan-like membrane with radial striations. At a distance of 0.033~0.045 mm (0.038 mm) from distal end, two minute spines are embedded at the medio-dorsal area. The second thin branch branches off at the medio-dorsal portion, length 0.045~0.053 mm (0.048 mm), diverges medio-dorsad, then the distal portion turns externo-laterally. The turning portions of the branch of both spicules nearly contact each other. Each spicule bears a band-like membranous ridge with transverse striation, of less than 0.10 mm width. The ridge starts from the proximal constricted portion, margins the tubular trunk longitudinally, and does the thin branch medio-laterally, then turns at the tip and margins the externo-lateral side of the branch; at the tip of the branch the membranous ridge becomes fan-shaped with radial striations. The spicules bear another transparent membrane without striations. The membrane covers the tubular portion of the spicule, becomes band-like, and runs posteriad contacting the dorsal surface of the thin branch, then stretches independently curving ventrad; the distal ends of both sides fuse together. From the medial side at the distal portion of each transparent membrane, a band-like membranous branch stretches to the tip of the thin branch of spicule. The fan-shaped membrane fused with this branch and two tips are connected also. Gubernaculum absent.

Female: Length of body 7.21~9.80 mm (8.98 mm); width in region of vulva 0.090~0.160 mm (0.131 mm). Length of esophagus 0.510~0.750 mm (0.589 mm); cervical papillae 0.255~0.325 mm (0.284 mm) from head end and excretory pore 0.233~0.290 mm (0.260 mm) from head end. Vulva opens as a transverse slit, 1.20~1.71 mm (1.61 mm) from tail end. Vagina short. The vulval region usually bears a unilateral flap with delicate transverse striations; the length of the flap is 0.150~0.200 mm and the maximal width is 0.060~0.080 mm; the flap attaches longitudinally to the body and the vulva opens at the posterior third of the flap. In about 10% of the specimens, the flap shows variety; more than three flaps, one which covers the vulval opening; two flaps bilaterally; and without flaps. Length of ovejector, including sphincters, 0.200~0.293 mm (0.239 mm). Anus 0.190~0.240 mm (0.231 mm) from tail end. Tail constricted toward the tip. At a distance of 0.030~0.040 mm from the tip, there is a swelling with annulation. The tip of tail is pointed; in some specimens, however, there is a minute button-like expansion. Occasionally, the cuticle of tail becomes thinner about 0.070 mm from the tip. Uterine eggs oval; 0.072~0.077 mm × 0.035~0.043 mm.

Discussion: This species shows a characteristic structure in the spicules and dorsal ray. The spicules are equal in size and shape. The distal portion is bifurcated; the thick branch has a fan-like membrane with radial striations at the distal end; the thin branch is margined by a band-like membranous ridge with transverse striations bilaterally; and at the distal end, the ridge manifests a fan-like

structure. Other transparent band-like membranes stretch posteriad, and are fused with the distal portion; these membranes branch off toward the distal end of the thin branch of spicules and connect both ends.

TRAVASSOS (1937) included 7 species in the genus *Spiculopteragia*; *S. spiculoptera* (GUSCHASKAJA, 1931) ORLOFF, 1933; *S. asymmetrica* (WARE, 1925) ORLOFF, 1933; *S. schulzi* (RAJEWSKAJA, 1930) ORLOFF, 1933; *S. houdemeri* (SCHWARZ, 1926) ORLOFF, 1933; *S. cervi* (CAMERON, 1931) ORLOFF, 1933; *S. hamata* (MÖNNIG, 1932) TRAVASSOS, 1937 and *S. trinitatis* (CAMERON, 1935) TRAVASSOS, 1937. SERJABIN et al. (1954), however, transferred the species *S. houdemeri*, *S. cervi* and *S. hamata* to the genus *Skrjabinagia* (RUDAKOV, 1937) ALTAEV, 1953; *S. asymmetrica* and *S. hamata* to the genus *Ostertagia* (RANSOM, 1907) ORLOFF, 1933 and *S. trinitatis* to the genus *Mazamastrongylus* CAMERON, 1935. They also included other species to the genus *Spiculopteragia*: *S. alcis* SCHULZ, KADENAZII, EVRANOVA et SCHALDYBIN, 1952; *S. böhmi* (GEBAUER, 1932) ORLOFF, 1933; *S. kotkascheni* ASADOV, 1952; and *S. mathevossiani* RUCHLJADEV, 1948.

The spicules of *S. schulzi* are equal in size and bifurcated. The distal end of the right long branch is pointed at the tip without the fan-like membrane; short branches of both sides are connected by a membrane with striations only in this species, with exception of the present species, another type of membrane with distal fusion is not described. The discussed species differs from *S. schulzi* in the above-noted characteristics, and in the length of the dorsal ray. In *S. spiculoptera*, *S. böhmi* and *S. kotkascheni*, the right spicule differs from the left in structure; no membranous fusion of branches is recorded and the length of dorsal ray is less than 0.060 mm. The dorsal ray bifurcates and each branch splits again into two branches. The spicules of *S. alcis* are tubular almost of equal width over the entire length and are large in size, 0.244~0.258 mm. Structures of the female are described in *S. alcis* and *S. schulzi*; *S. alcis* differs from the subject species being of larger size and the structure of the flap in vulval area: *S. schulzi* bears no flap and the egg is large.

SARWAR (1957) divided species of the genus *Spiculopteragia* into two groups and proposed a new genus *Altaevia* for *S. schulzi* together with *Skrjabinagia dagestanica* ALTAEV, 1952: he included *S. spiculoptera*, *S. asymmetrica*, *S. houdemeri* and *S. cervi* to the genus *Spiculopteragia*. The subject species must be included with the genus *Spiculopteragia* because of the structure of spicules, but its branching of the dorsal ray is similar to that of the genus *Altaevia* SARWAR, 1957. JANSEN (1958) transferred *S. alcis* to the genus *Mazamastrongylus* CAMERON, 1935; the esophagus of the subject species is not divided into two parts.

Appendix: Anomaly was observed in a male specimen. Dysgenesis of the spicules

was noted. Length of body 6.9 mm; maximal width in front of bursa, 0.13 mm. Esophagus 0.61 mm in length. Cervical papillae 0.275 mm from the head end. Excretory pore 0.25 mm from head end. The bursa and its rays showed characters of this species, however the dorsal ray was shorter than normal, its length was 0.050 mm together with its branches. Other bursal rays were normal. The cloacal chitinous structure was about half the normal length. At the portion where the spicules exist, incomplete spicules were formed for a distance of 0.090 mm; the spicules were only a group of fragmental or filiform structures which were weakly chitinized, colorless, and arranged disorderly.

*Rinadia japonica* n. sp.

Host: *Cervus nippon yesoensis* (HEUDE)

Habitat: Small intestine

Locality: Hidaka district, Hokkaido, Japan

Description of the species

Male: Small thin nematodes. Cuticle has longitudinal line pattern almost over the whole body length. Anterior end slightly expanded and mouth very small. Cuticle at anterior portion, except the end, shows annulation with occasional slight thickening. Body length 7.20~7.69 mm (average 7.44 mm); width in front of bursa 0.110~0.135 mm (0.123 mm). Length of esophagus 0.560~0.625 mm (0.592 mm); cervical papillae 0.300~0.310 mm (0.302 mm) from head end; excretory pore 0.260~0.280 mm (0.272 mm) from head end. Prebursal papillae well-developed. Lateral lobes of bursa well-developed. Accessory bursal membrane absent. Postero-ventral ray of bursa thick and bends ventrally; tips of ventral rays approximate at the edge of bursal membrane. Antero-lateral ray shorter and does not reach the bursal edge. Distal ends of antero- and medio-lateral rays not apart. Externo-dorsal ray fairly thick and bends. Dorsal lobe becomes conic with a wide base, of which the axis is dorsal ray; underneath a very thick cuticle sheath, the dorsal ray is surrounded by a weakly chitinized layer which expands to the body end as a thin layer. The dorsal ray 0.030~0.035 mm (0.033 mm) in length; its root thick, distal portion constricted near the tip, and the tip divergent and bifurcated by a shallow incision. Spicules are equal in size and shape; length 0.185~0.205 mm (0.196 mm), maximal width at the middle, 0.024~0.035 mm (0.030 mm). Spicules well chitinized, brown in color. Each spicule branches off into three branches; one thin and two thick. The first externo-ventral branch is a continuation of the chief trunk and plate-like at distal portion; the distal end bends ventrally in a shoe-like fashion with a pointed tip and covered by oval transparent membrane. The edge and tip of this branch is well-chitinized; the former is a continuation from the trunk and its sharp end 0.020~0.030 mm from the tip of the branch. Length of the first branch 0.075~0.080 mm (0.078 mm). The second branch diverges from a medial surface at a base of the first branch. The second branch is thin and thread-like, 0.053~0.065 mm (0.060 mm) in length; it undulates weakly. This branch is margined medially by a band-like membranous ridge with transverse striations; the ridge is a continuation of a ridge which starts from proximal constricted portion of the trunk. The longest branch, the third, is well-chitinized, 0.105~0.118 mm (0.110 mm) in length, the width is almost identical over the whole length, and it branches off medio-dorsally from the constricted portion of the trunk. The tip is blunt and bears a transparent membrane; the

branch ends at a level slightly anterior to the end of the first thick branch. The tip of the second thin branch is fused with that of the third. Gubernaculum is present, but weakly chitinized and colorless; it is a simple plate, 0.015~0.020 mm in length.

Female: Unknown.

Discussion: The dorsal lobe and ray of the genus *Rinadia* GRIGORIAN, 1951 are peculiar. The dorsal lobe is conic, cuticular thickening is remarkable and the dorsal ray bifurcates at the distal end only. The accessory membrane is absent. The general structure, however, is the same as in other ostertagian nematodes.

SKRJABIN et al. (1954) included only one species *Rinadia schulzi* GRIGORIAN, 1951 to the genus *Rinadia*. JANSEN (1958) transferred *Spiculopteragia mathevossiani* RUCHLJADEV, 1948 to this genus and he proposed the synonymy of *R. schulzi* to *R. mathevossiani*. DUNN (1965), in his study of the gastro-intestinal helminths of roe deer, accepted JANSEN's combination, *R. mathevossiani* (RUCHLJADEV, 1948) JANSEN, 1958. The subject species is similar to *R. mathevossiani* or *R. schulzi* in structure, but the spicules are different. The spicules are equal in size and shape in the subject species. Each spicule trifurcated; the thin short branch and the thick branch fuse at the distal end; the latter branch, the longest, is more than 0.100 mm, and not a continuation from the trunk. In *R. mathevossiani*, each spicule trifurcates, but the length of the branch is less than 0.083 mm; the longest one is a continuation of the chief trunk. ASADOV (1955) described another species, *R. caucasica*; this species differs from the subject species in the structure of the spicules; the spicules of the former split into 4 processes.

#### ACKNOWLEDGMENT

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## EXPLANATION OF PLATES

## PLATE I

*Spiculopteragia yamashitai* n. sp.

Figs. 1 & 2 Anterior end of male

Fig. 3 Posterior end of male; ventral view

Fig. 4 Posterior end of male; lateral view

Fig. 5 Spicules; dorsal view

Fig. 6 Posterior end of female

Figs. 7 & 8 Vulval region; fig. 8 is usual type.

Each calibration is 0.1 mm.

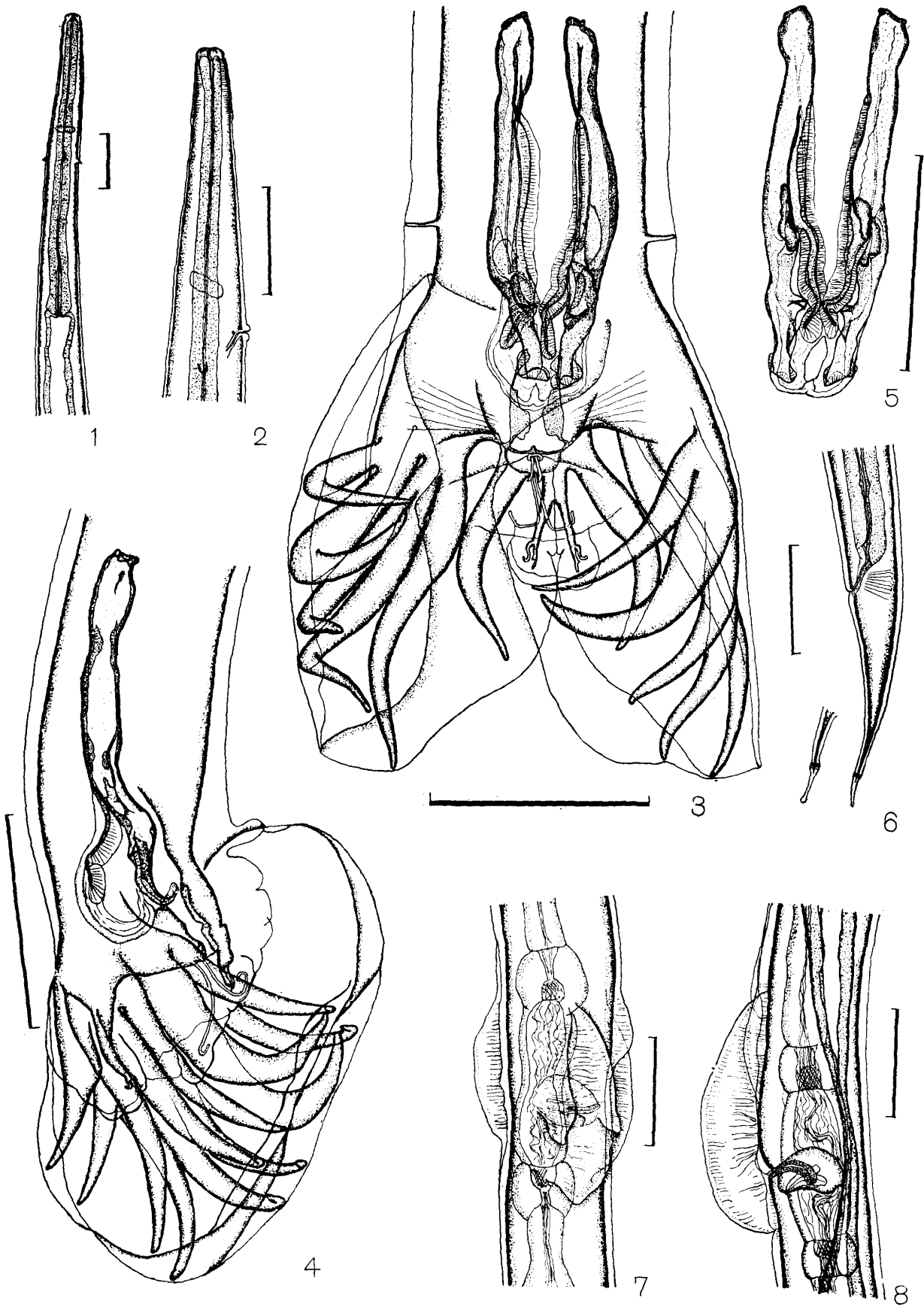


PLATE II

*Spiculopteragia yamashitai* n. sp.

Figs. 9~11 Vulval region

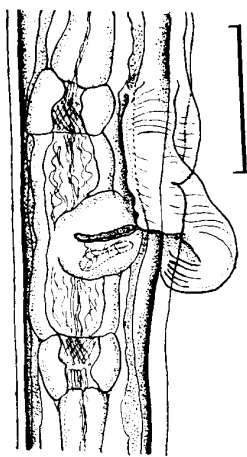
*Rinadia japonica* n. sp.

Fig. 12 Anterior end of male

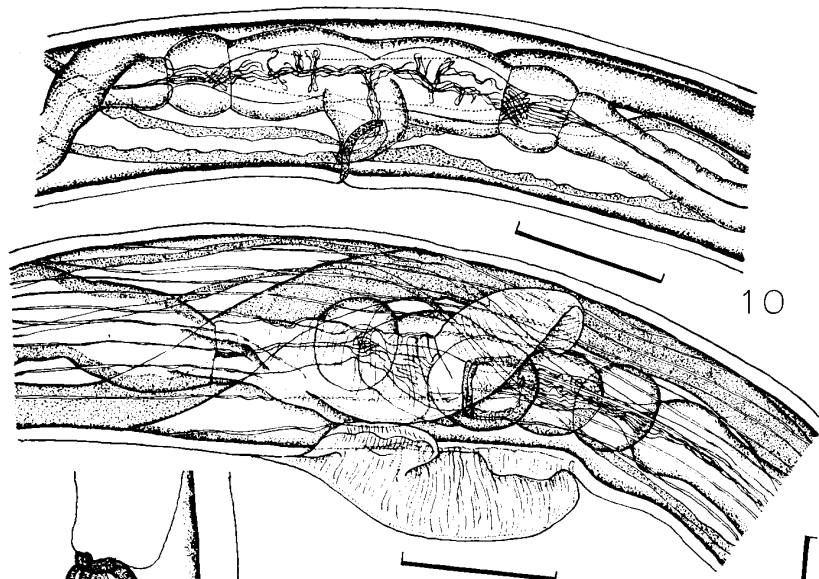
Fig. 13 Posterior end of male; ventral view

Fig. 14 Posterior end of male; sublateral view

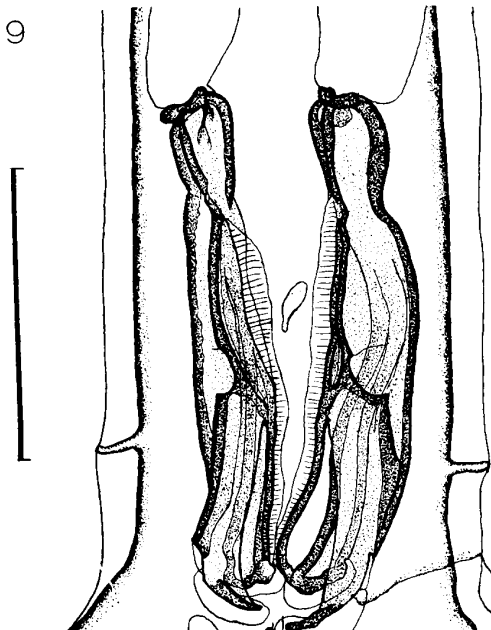
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9



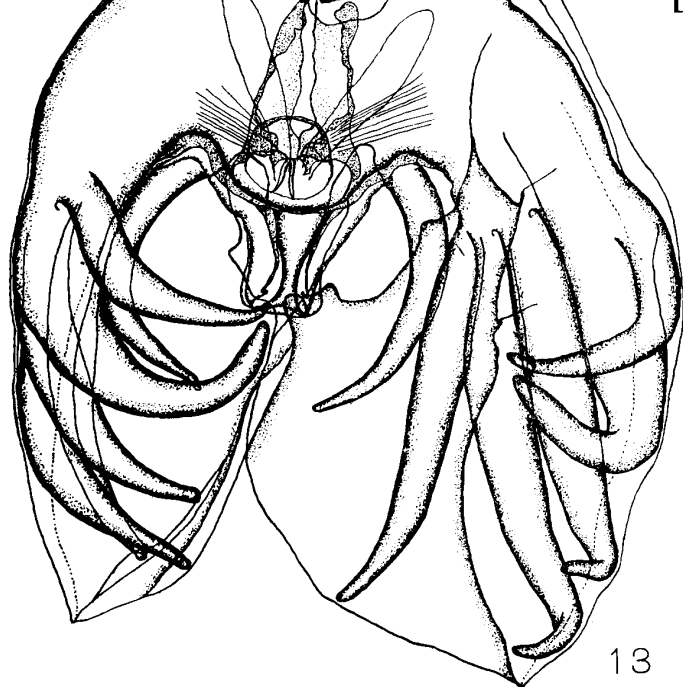
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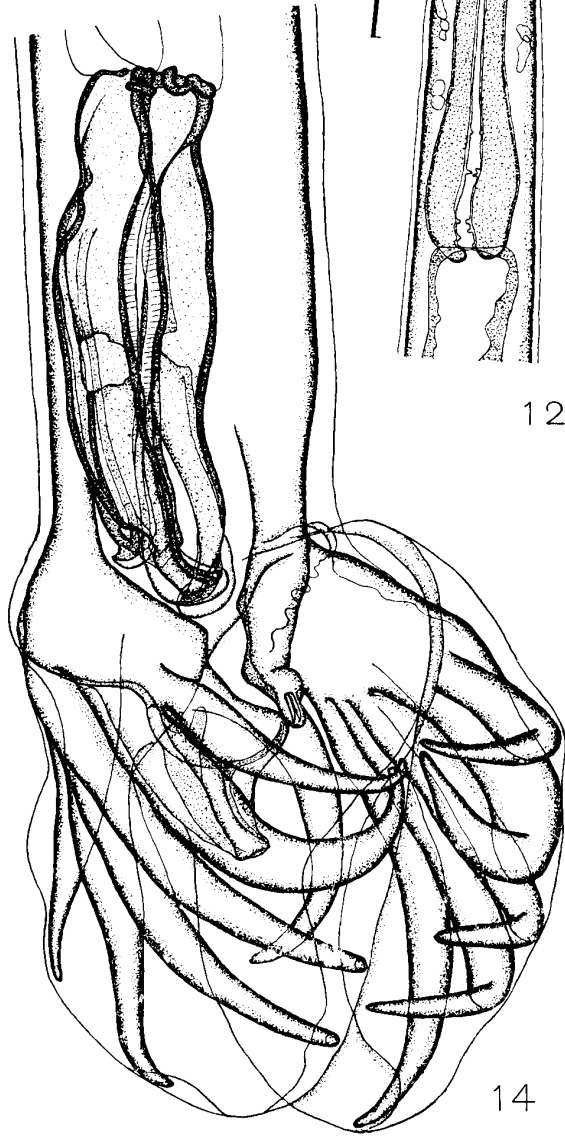
11



12



13



14

PLATE III

*Spiculopteragia yamashitai* n. sp.

Fig. 15 Posterior end of male; ventral view

Fig. 16 Spicules showing band-like membrane

Fig. 17 Spicules showing membranous ridges (R), fan-shape membrane of thin branches (F) and band-like membrane (M)

Fig. 18 Vulval region

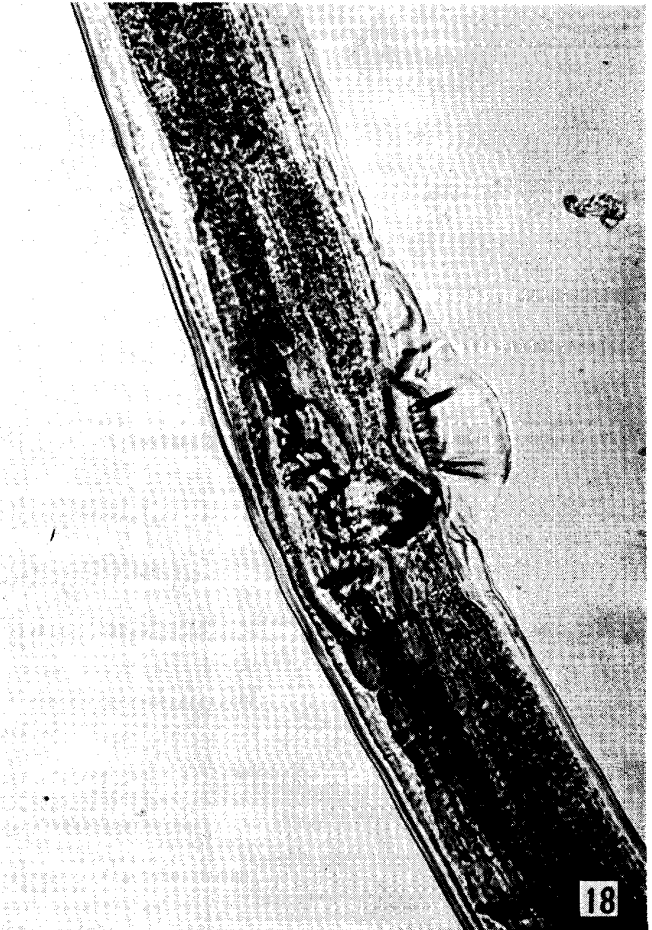
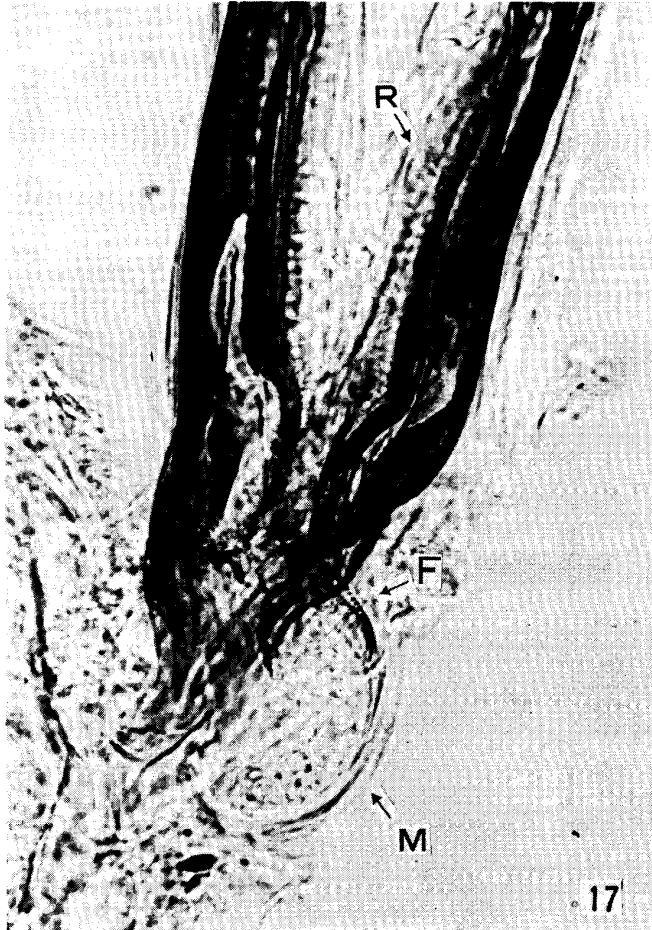
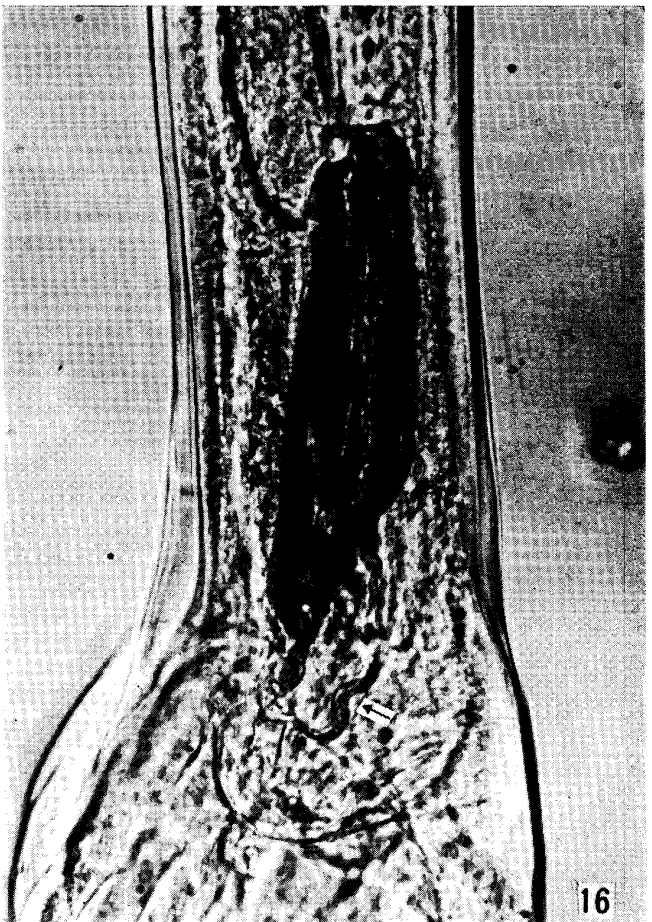
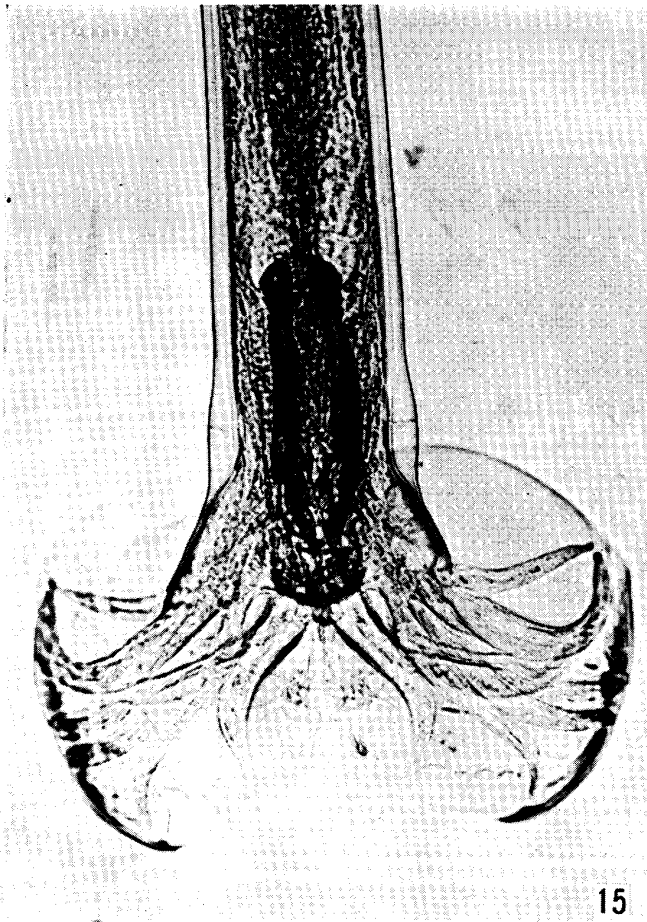


PLATE IV

*Rinadia japonica* n. sp.

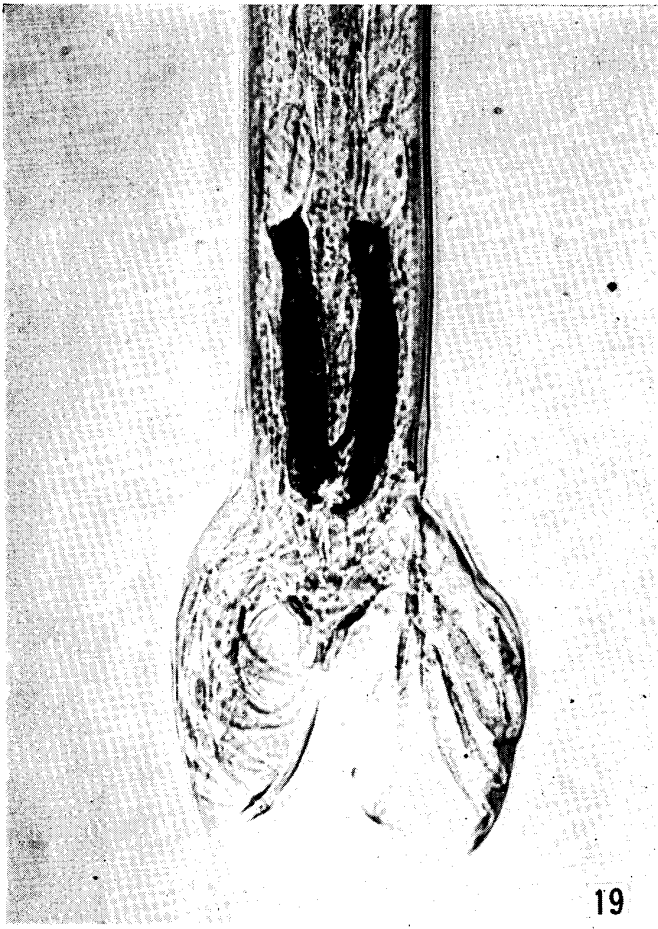
Fig. 19 Posterior end of male; ventral view

Fig. 20 Posterior end of male showing spicules and conic dorsal lobe

*Spiculopteragia yamashitai* n. sp.

Figs. 21 & 22 Dysgenesis of spicules observed in a male

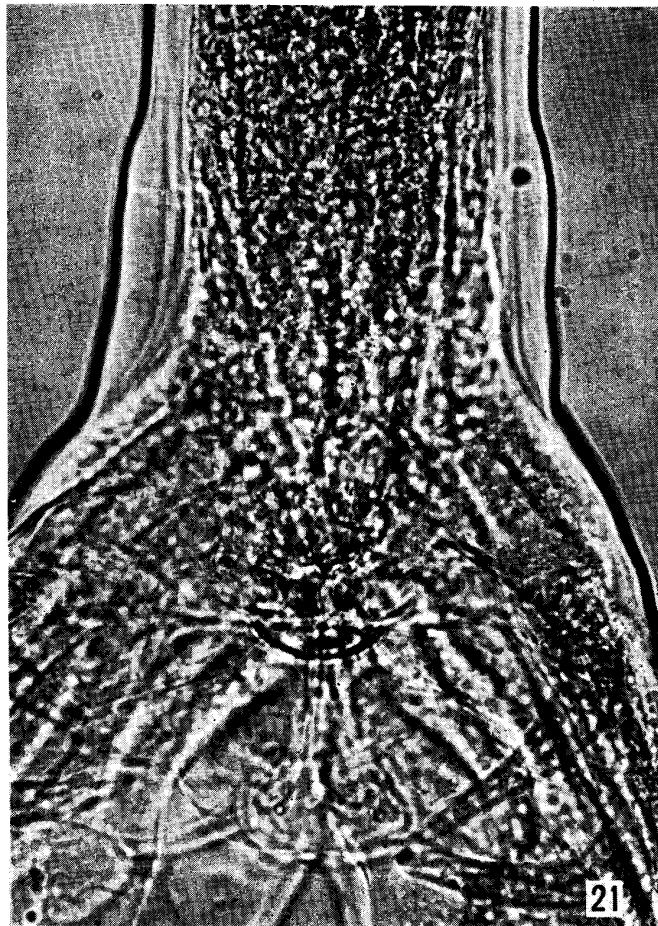
The calibration in fig. 22 is 0.05 mm



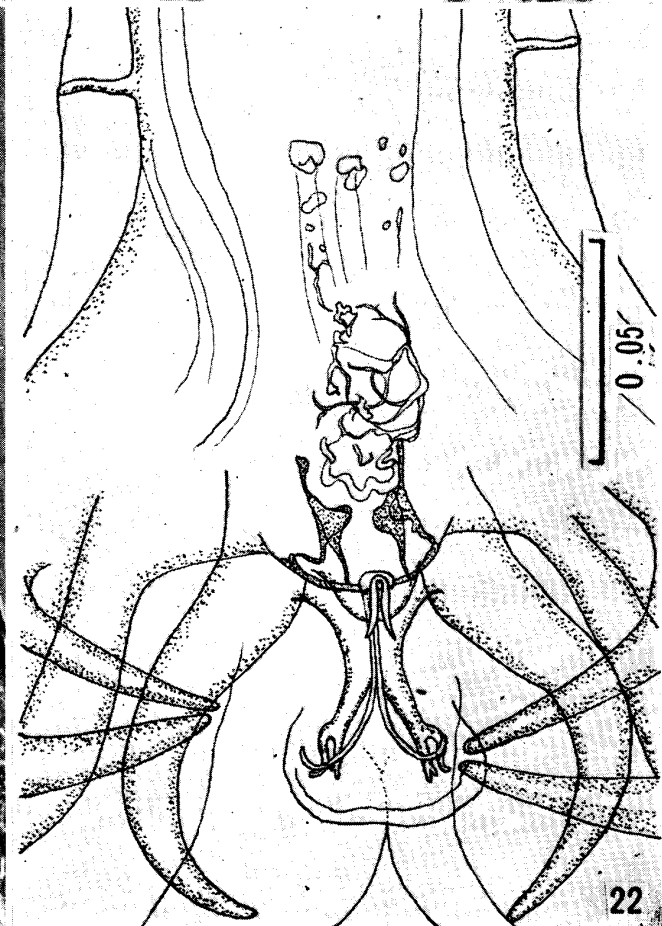
19



20



21



22