

Descriptions of Four New Species of Predatory Nematodes (Mononchida) From Korea

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韓國產 捕食線蟲 (Mononchida: Nematoda)의 4 新種 기재

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ABSTRACT

Four new and a known species of the order Mononchida were described and illustrated. *Iotonchus obtusus* sp. n. was 2.8 mm long, $a = 33$, $b = 4.2$, $c = 61$, $V = 68\%$, buccal cavity = 61×45 μm , and is characterized by having basally situated dorsal tooth, presence of vulval papillae and in having short, hemispherical tail with thick cuticle at terminus. *Miconchus vulvapapillatum* sp. n. was 2.7-3.6 mm long, $a = 29-36$, $b = 4.1-4.5$, $c = 18.4-21$, $V = 65-69\%$, buccal cavity = $53-61 \times 29-33$ μm , spicules = 132-137 μm , ventromedian supplements 28-31, and was characterized by having 5-8 pre- and post vulval papillae in contiguous series, and three pairs of vulval glands. *Clarkus koreanus* sp. n. was 1.1-1.3 mm long, $a = 27.5-28.8$, $b = 3.5-3.9$, $c = 12-14.5$, $V = 60-64\%$, buccal cavity = $24-28 \times 13.5-15$ μm , and was characterized by well offset lip region, amphids situated well below to dorsal tooth apex, and vulva elevated, with vulval flap. *Coomansus ulsani* sp. n. was 1.2-1.5 mm long, $a = 23.5-26$, $b = 3.4-3.8$, $c = 13.6-14.8$, $V = 65-68\%$, buccal cavity = $36-39 \times 21-23$ μm and was characterized by well offset lip region and a thin longitudinal ridge on vertical walls of stoma.

Key words : Mononchida, *Iotonchus obtusus* sp. n., *Miconchus vulvapapillatum* sp. n., *Clarkus koreanus* sp. n., *Coomansus ulsani* sp. n.

INTRODUCTION

Soil samples collected from Sangju in Kyongsangbuk Province; Chinju and Ulsan in Kyongsangnam Province and Sorak mountain in Kang-won Province of Korea yielded four new species of mononchs, which were described and illustrated in this paper.

MATERIALS AND METHODS

The nematodes were isolated from soil samples by Cobb's sieving methods and centrifugal sugar-flotation method. Nematodes were killed and fixed in hot (70°C) F:G 4-1 fixative and dehydrated by Seinhort's rapid glycerine method. Measurements and drawings were made with a drawing tube attached.

DESCRIPTIONS

Iotonchus obtusus sp. n. (Figs. 1, 2)

Measurements

Holotype (Female): $L = 2.8$ mm; $a = 33$; $b = 4.2$; $c = 61$; $c' = 0.98$; $V = 68\%$.

Female: Body large, slightly ventrally curved on fixation, 85 μm wide. Cuticle smooth 2-3 μm thick at mid-body and 7.5 μm on tail. Musculature in anterior region well developed. Lip region demarcated by slight depression, 58 μm wide and 17 μm high, labial papillae prominent. Amphids cup-shaped with oval aperture, situated at 18 μm from anterior end. Buccal cavity roomy, barrel shaped, thick-walled, 61 μm long and 45 μm wide. Dorsal vertical wall of buccal cavity bearing a small anteriorly pointed tooth, situated at its base or at 79% of total

buccal cavity length from anterior end. Dorsal and subventral vertical walls with two foramina each. Excretory pore faint, located at 212 μm from anterior end of body. Oesophagus cylindrical, with strong musculature, 662 μm long, expanded at basal part of stoma. Nerve ring located at just above the excretory pore, 191 μm from anterior end. Oesophageal lumen distinctly widening just below the base of stoma. Oesophago-intestinal junction tuberculate. Intestine with wide lumen, comprising of hexagonal/ polygonal cells, filled with dark granules. Reproductive system didelphic-amphidelphic, both sexual branches equally developed. Ovaries reflexed, oviduct with narrow distal and enlarged proximal parts. Sphincter present between oviduct and uterus. Vagina short muscular, provided with radiant muscles. Prominent triangular cuticularized pieces present between vulva and vagina. Vulva transverse. One pre- and two post vulval papillae present. Rectum muscular, 47 μm or equal to anal body width long. Tail short, hemispherical, 46 μm or almost equal to anal body width long, surrounded with very thick cuticle at terminus. Caudal glands, pores and spinneret absent.

Male: Not found.

Differential Diagnosis and Relationship: *Iotonchus obtusus* sp. n. was distinctive by its basally located dorsal tooth, roomy buccal cavity, presence of vulval papillae and short, hemispherical tail, and with very thick cuticle at terminus. It comes close to *Iotonchus rotundicaudatus* Santiago & Jimenez-Guirado, 1991 and *I. magyar* Andrassy, 1973 in the shape of tail. But differs from former in the shape of lip region, in having larger buccal cavity, lesser 'a' and 'b' values and in the presence of vulval papillae (Lip region offset by deep constriction, buccal cavity = 32-45 \times 23-25 μm , a = 45-63, b = 5.9-7.7 and vulval papillae absent in *I. rotundicaudatus*). The new species differs out from *I. magyar* in having smaller body, larger buccal cavity, relatively longer tail with hemispherical terminus, and in the absence of vulval papillae (L = 4.2 mm, buccal cavity = 51 \times 26 μm , c = 86 and tail with rounded terminus and vulval papillae absent in *I. magyar*).

Type habitat and locality: Soil sample was collected from around the rhizosphere of *Juglans sinensis* Dode at Sangju, Kyongsangbuk Province, Korea. Collected in August, 1991.

Type specimen: Holotype female on slide *Iotonchus obtusus* sp. n. deposited in the nematode collection of the Department of Agricultural Biology, College of Agriculture, Kyungpook National University, Teagu, Korea.

***Miconchus vulvapapillatum* sp. n.**

(Figs. 3, 4)

Measurements:

Holotype (Female): L = 2.9 mm; a = 36; b = 4.4; c = 21; c' = 2.9; V = 68%.

Paratype (Females, n = 6): L = 3.1 \pm 0.4 (2.7-3.6) mm; a = 34.1 \pm 2.6 (29-36); b = 4.3 \pm 0.1 (4.1-4.5); c = 19.8 \pm 1.1 (18.4-21); c' = 2.9 \pm 0.2 (2.7-3.2); V = 65% \pm 1.3 (65-69).

Paratype (Male, n = 2): L = 3.4-3.7 mm; a = 33-34; b = 4.2-4.6; c = 2-24; c' = 1.8.

larvae (n = 1): L = 2.9 mm; a = 35; b = 4.4; c = 21; c' = 2.4.

Female: Body large, ventrally curved upon fixation, 80-100 μm wide at the base of oesophagus. Cuticle smooth 2-3 μm thick. Lip region demarcated by slight depression, 52-54 μm wide and 19-23 μm high, slightly wider than adjoining body width. Labial papillae prominent. Amphids small, 5-7 μm wide, situated at 14-23 μm from anterior end of body. Buccal cavity roomy, thick walled, barrel-shaped, 53-60 μm long and 33-35 μm wide. Dorsal and ventrosublateral teeth similar in size and shape, large, with forward directed apexes. Dorsal and ventral tooth located at 39-44% and 44-47% of total buccal cavity length from anterior end, respectively. Two ventrosublateral foramina present at the basal part of buccal-cavity. Oesophagus cylinderoid with strong musculature, 656-800 μm long. Nerve ring located at 184-228 μm from anterior end of body. Excretory pore located just below the nerve ring, 205-239 μm from anterior end of body. Oesophago-intestinal junction tuberculate. Intestine with wide lumen, epithelium comprising of hexagonal cells filled with dark granules. Reproductive system didelphic-amphidelphic, both sexual branches equally developed. Ovaries reflexed, oviduct with a well developed pars dilatata and large sphincter at oviductuterus junction. Vagina cylindrical extending to 1/3 of corresponding body width deep, heavily sclerotized pieces present at vagina-vulva junction. Vulva a short transverse slit, 5-8 prominent pre- and post-vulval papillae present in contiguous series. Three pair of glands present at both side of vagina. Rectum 45-53 μm long. Tail elongate conoid, ventrally curved, 2.6-3.6 times anal body width long with subtruncate terminus. Two pairs of caudal pores present on each side. Caudal glands and spinneret absent.

Male: Similar to female in general morphology but posterior part of body more strongly curved. Testes paired, opposed with elongate, spindle-shaped spermatozoa. Vas deferens and ejaculatory duct separated by a constriction. Spicules slender, ventrally curved, 1.5-1.7 times as long as anal body

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diameter. Gubernaculum 36-43 μm long; lateral guiding pieces 22-24 μm long with bifid terminus. Ventromedian supplements 28-31 in numbers, more or less regularly spaced. Copulatory muscles strongly developed. Tail elongate conoid, 1.8-2.0 times of anal body width long, proximally conoid, gradually tapering into a bluntly rounded tip. Caudal glands and spinneret absent. A pair of caudal pores present on each side of tail.

Differential Diagnosis and Relationships: The new species was distinctive in having 5-8 pre- and post-vulval papillae, three pairs of vulval glands and greater number of ventromedian supplements. It showed affinity with *M. crenicauda* Gagarin, 1984 but differed from it in having vulval papillae, vulval glands, longer spicules and more number of ventromedian supplements (vulval papillae and glands absent, spicule 105-110 μm long, and ventromedian supplements 21-23 in *C. crenicauda*).

Type habitat and locality: Soil samples were collected from around rhizosphere of *Abies nephrolepis* at Chinju, Kyongsangnam Province, Korea. Collected in July, 1986.

Type specimens: Holotype female and paratype females and males on slides *Miconchus vulvapapillatum* sp. n. deposited in the nematode collection of the Department of Agricultural Biology, College of Agriculture, Kyungpook National University, Taegu, Korea.

Clarkus koreanus sp. n. (Figs. 5 A-C, 6)

Measurements:

Holotype (Female): L = 1.2 mm; a = 28.1; b = 3.6; c = 12.8; c' = 3.4; V = 62%.

Paratype (Females, n = 7): L = 1.2 mm \pm 0.05 (1.1-1.3); a = 28 \pm 0.4 (27.5-28.8); b = 3.6 \pm 0.1 (3.5-3.9); c = 13.2 \pm 0.8 (12-14.5); c' = 3.1 \pm 0.3 (2.7-3.4); V = 61.7% \pm 1.4 (60-64).

Female: Body medium sized, ventrally curved on fixation, 42-46 μm wide at base of oesophagus. Body cylindrical, truncated anteriorly and gradually tapering towards posterior extremity into tail. Cuticle smooth, 3-4 μm thick throughout the body. Lip region clearly demarcated from adjacent body, 23-26 μm wide and 9-11 μm high. Labial papillae prominent. Amphids cup-shaped with oval apertures, located below dorsal tooth apex, 16-17 μm from anterior end of body. Buccal cavity 24-28 μm long and 13.5-15 μm wide. Dorsal tooth large, with apex directed forward, apex located at 15-22% of buccal cavity length from anterior end. A thick longitudinal ridge, 15-16 μm long present on ventrosublateral walls

of buccal cavity, originated at the level of dorsal tooth. Two foramina present near the base of buccal cavity. Posterior quarter of stoma embedded in the fore end of oesophagus. Excretory pore inconspicuous. Oesophagus slightly expanded anteriorly then narrowing a little at nerve ring, 308-357 μm long. Nerve ring located at 80-109 μm from anterior end of body. Oesophago-intestinal junction simple, non-tuberculate. Intestine with wide lumen, epithelium comprising of hexagonal/polygonal cells, filled with dark granules. Reproductive system didelphic-amphidelphic, both sexual branches equally developed. Ovaries reflexed. Vulva a transverse slit, elevated, provided with well developed vulval flap. Rectum 24-28 μm long, 6 rectal glands present. Tail 85-102 μm or 3-3.5 times of anal body width long, strongly ventrally curved, gradually tapering to a rounded terminus. Three poorly developed caudal glands lying in a row. Spinneret absent.

Male: Not found.

Differential diagnosis and relationship: The new species was characterized by having well offset lip region, posteriorly located amphids, elevated vulva with flap. *Clarkus koreanus* sp. n. resembled to *C. papillatus* (Bastian, 1865) Jairajpuri, 1970 and *C. propapillatus* Clark, 1960 but differed from them in having well offset lip region, amphids situated well below to apex of dorsal tooth, elevated vulva, with flaps and in the absence of caudal papillae (lip region scarcely offset, amphids located at or anterior to dorsal tooth apex, vulva flushed with body surface, without flap, and two pairs of lateral caudal papillae present in *C. papillatus* and *C. propapillatus*). It further differs from *C. propapillatus* in having simple stoma and longer tail (stoma indented ventrally at the level of dorsal tooth and tail 2.5 anal body widths long in *C. propapillatus*).

Type habitat and locality: Soil samples were collected from around rhizosphere of *Quercus acutissima* Carr. at Sorak mountain, Kang-won, Province, Korea.

Type specimens: Holotype and paratype females on slides *Clarkus koreanus* sp. n. deposited in the nematode collection of the Department of Agricultural Biology, College of Agriculture, Kyungpook National University, Taegu, Korea.

Coomansus ulsani sp. n. (Figs. 5 D-F, 7)

Measurements:

Holotype (Female): L = 1.5 mm; a = 26; b = 3.7; c = 13.6; c' = 3.2; V = 65%.

Paratype (Female n = 2): L = 1.2-1.4 mm; a = 23.5-26; b = 3.4-3.8; c = 14.2-14.8; c' = 2.7-3; V = 67-68%.

Juvenile (n = 1): L = 1.2 mm; a = 29; b = 3.4; c = 13.3; c' = 3.4.

Female: Body medium sized, ventrally curved after fixation, 51-59 μm wide at mid body. Cuticle smooth, 2-3 μm thick. Lip region well demarcated by constriction, 31-34 μm wide and 13-15 μm high. Labial papillae prominent. Amphids caliciform with oval opening, located just below the beginning of buccal cavity, 12-13 μm from anterior end of body. Buccal cavity 36-39 \times 21-23 μm or 1.6-2.1 times longer than wide, tapering at the base. Dorsal tooth well developed, at middle region of stoma, with apex located in 36-42% of buccal cavity from anterior end. A thin longitudinal ridge opposit to dorsal tooth present, originated at beginning of ventral wall. Two foramina present near the base of ventrosublateral walls of buccal cavity. Oesophagus cylindrical, 357-417 μm long. Nerve ring located at 130-142 μm from anterior end of body. Excretory pore faintly visible, located at 140-147 μm from anterior end. Oesophago-intestinal junction simple, non-tuberculate. Intestine with wide lumen, composed of large hexagonal cells. Reproductive system didelphic-amphidelphic, ovaries reflexed. Oviduct with narrow distal and dilated proximal parts. Each oviduct subterminally connected to an ovary. Vulva a transverse slit with sclerotized lips. Vagina strongly muscular, about 2/5 of corresponding body width deep. Rectum 25-33 μm long. Tail 89-113 μm or 3-3.2 times anal body width long, ventrally arcuate, gradually tapering to a narrow and bluntly rounded terminus. Caudal glands and spinneret absent.

Diagnosis and differential diagnosis: *Coomansus ulsani* sp. n. was characterized by having well set off lip region, a thin longitudinal ridge, two distinct foramina present near the base of ventrosublateral plates. The new species resembled to *C. pretoriensis* (Coetzee 1968) Jairajpuri & Khan, 1977 and *C. indicus* Jairajpuri & Khan, 1977 but differs from former in the absence of lateral body pores, caudal cuticular pores, caudal glands, in the position of dorsal tooth and in having longer stoma and tail (paired lateral body pores present in neck region, caudal glands and three pairs of caudal pores present, stoma about 1.5 times as longer as wide, dorsal tooth apex located at 39% of stoma length and c = 15-18 in *C. pretoriensis*). It differed from *C. indicus* in the shape of stoma in having anteriorly located dorsal tooth and vulva, in the absence of caudal glands and longer tail (Buccal cavity slightly flattened at base (an unusual feature), dorsal tooth comparatively smaller and located at 45-48% of stoma from anterior end, vulva situated at 70-72%, tail 2-2.5 times anal

body width long and caudal glands present in *C. indicus*).

Type habitat and locality: Soil samples were collected from around rhizosphere of *Pinus densiflora* S. et Z. at Ulsan, Kyongsangnam Province, Korea. Collected in July, 1986.

Type specimens: Holotype and paratype females on slides *Coomansus ulsani* sp. n. deposited in the nematode collection of the Department of Agricultural Biology, College of Agriculture, Kyungpook National University, Taegu, Korea.

Acknowledgement: One of the authors, Zakauallah Khan is thankful to the Kyungpook National University, Taegu for providing Post-Doctoral Fellowship to carry out research work on "Systematics of predatory nematodes (Mononchida) from Korea" at the Institute of Agricultural Sciences and Technology.

적 요

捕食線蟲目 (Mononchida)의 4신종을 기재하였다; *Iotonchus obtusus* sp. n.는 체장이 2.8 mm, a = 33, b = 4.2, c = 61, V = 68, 口腔은 61 \times 45 μm 이고, 背部齒는 基部에 있고, 陰門突起가 있으며, 꼬리는 짧고 반원형이며 末端部の 표피는 두꺼운 것이 특징이다. *Miconchus valvapapillatum* sp. n.는 體長이 2.7-3.6 mm, a = 29-36, b = 4.1-4.5, c = 18.4-21, V = 65-69, 口腔은 53-61 \times 29-33 μm , 交接刺는 132-137 μm , 復中央補助突起는 28-31개이며, 陰門 前後方에 5-8개의 연속적인 돌기를 가지며, 3쌍의 陰門腺이 있다. *Clarkus koreanus* sp. n.는 體長이 1.1-1.3 mm, a = 27.5-28.8, b = 3.5-3.9, c = 12-14.5, V = 60-64, 口腔은 24-28 \times 13.5-15 μm 이고, 口脣部는 잘 區劃졌고, 雙器는 背部齒에 대해서 후방에 있으며, 陰脣을 가진다. *Coomansus ulsani* sp. n.는 體長이 1.2-1.5 mm이고, a = 23.5-26, b = 3.4-3.8, c = 13.6-14.8, V = 65-68, 口腔은 36-39 \times 21-23 μm 이고, 口脣部는 잘 區劃졌고 口腔壁은 1줄의 가는 세로 隆起部가 있다.

검색어: 捕食線蟲目, *Iotonchus obtusus* sp. n., *Miconchus valvapapillatum* sp. n., *Clarkus koreanus* sp. n., *Coomansus ulsani* sp. n.

REFERENCES

- Andrassy, I. 1973. 100 neue Nematodenarten in der ungarischen Fauna. *Opusc. Zool. Budapest*, **11**: 7-48.
- Bastian, H.C. 1865. Monograph on the Anguillulidae, on free nematoides, marine, land and fresh water; with descriptions of 100 new species. *Tr. Linn. Soc. London* **25**: 73-184.
- Clark, W. 1960. Redescription of *Mononchus truncatus*, Bastian, *M. papillatus* Bastian and *Prionchulus muscorum* (Dujardin) (Enoplida, Nematoda). *Nematologica* **5**: 184-198.
- Coetzee, V. 1968. Southern African species of the genera *Mononchus* and *Prionchulus* (Mononchidae). *Nematologica* **14**: 63-76.

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- Gagarin, V.G. 1984. New species of free-living nematodes from the Angara river Basin. *Zool. Zhurn.* **63** : 607-609.
- Jairajpuri, M.S. 1970. Studies on Mononchida of India. II. The genera *Mononchus*, *Clarkus* n. gen and *Prionchulus* (Family Mononchidae) Chitwood, 1973 *Nematologica* **16** : 213-221.
- Jairajpuri, M.S. and W.U. Khan. 1977. Studies on Mononchida of India. IX. further division of the genus *Clarkus* Jairajpuri, 1970 with the proposal of *Coomansus* n. gen (Family Mononchidae Chitwood, 1937) and description of two new species. *Nematologica* **23** : 89-96.
- Pena-santiago, R. and D. Jimenez-Guirado. 1991. Mononchid nematodes from Spain. description of *Iotonchus rotundicaudatus* sp. n. and observations on *I. zschokkei* (Menzel 1913) Altherr, 1955. *Revue Nematol.*, **14** : 353-360.

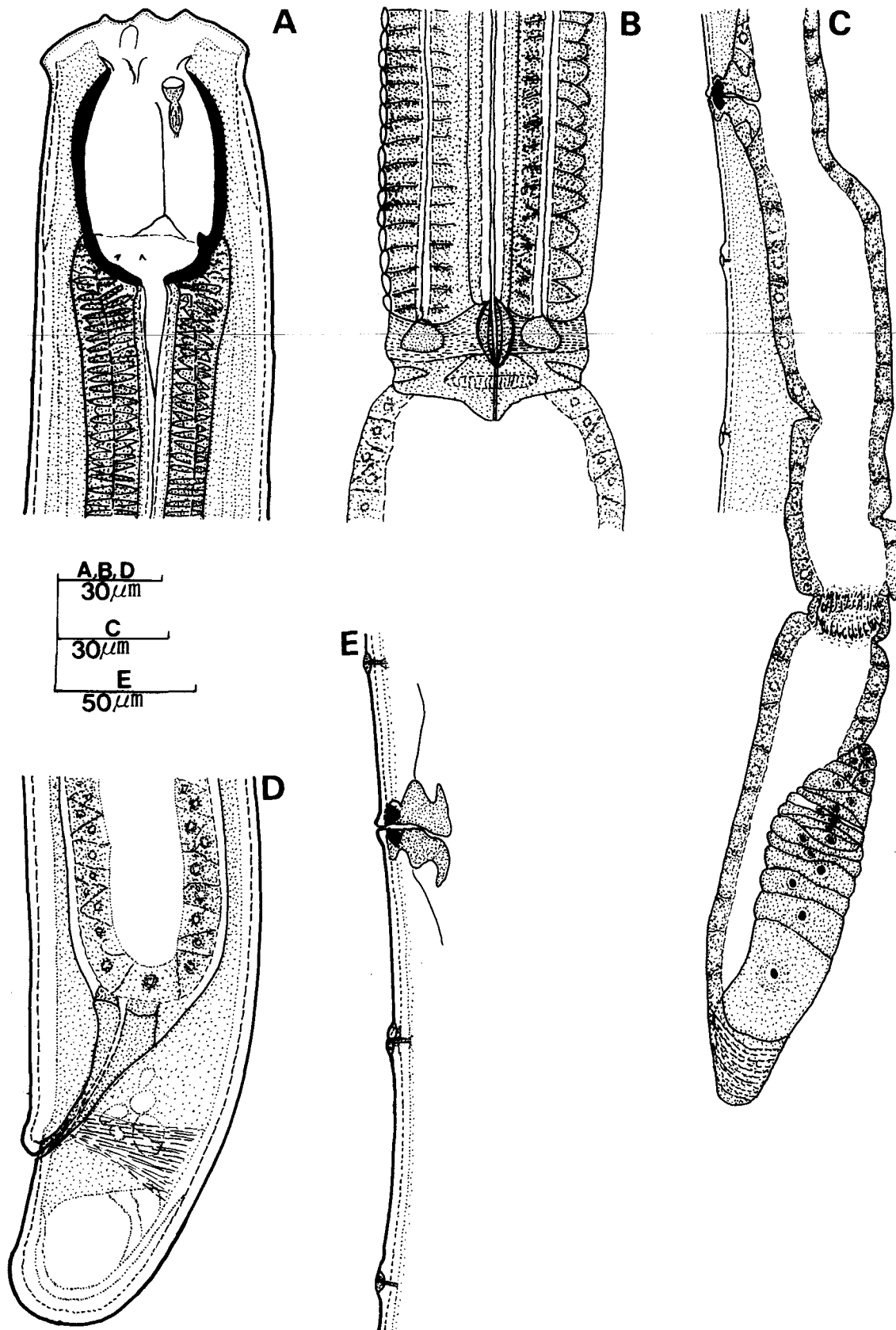


Fig. 1. *Iotonchus obtusus* sp. n., A: Anterior region; B: Oesophago-intestinal junction; C: Posterior gonad; D: Vulval region showing papillae. E: Posterior end.

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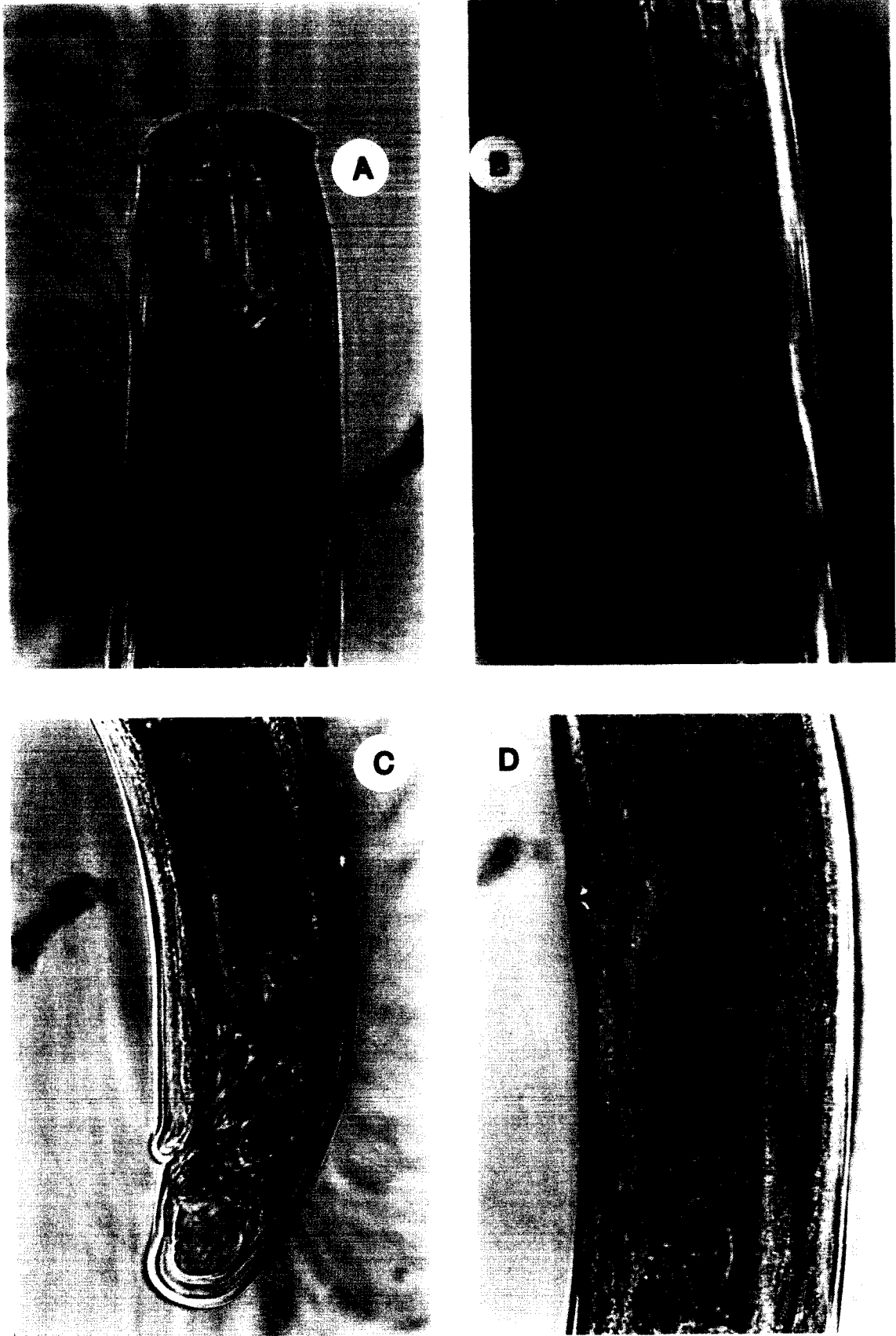


Fig. 2. *Iotonchus obtusus* sp. n., A: Anterior region; B: Oesophago-intestinal junction; C: Posterior end; D: Vulval region

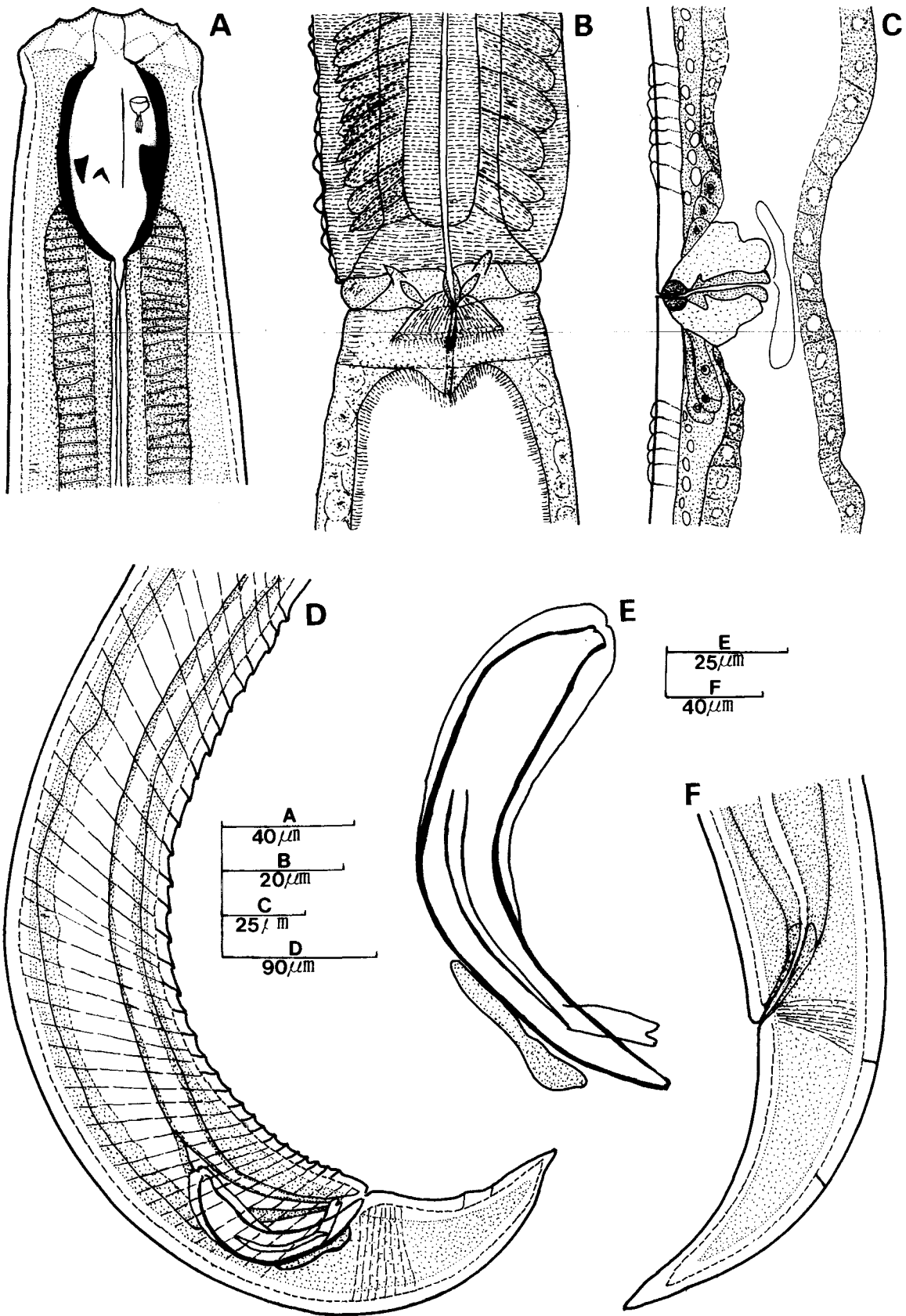


Fig. 3. *Michonchus vulvapapillatum* sp. n., A: Anterior region; B: Oesophago-intestinal junction; C: Vulval region; D: Male posterior region; E: Spicules; F: Female posterior region.

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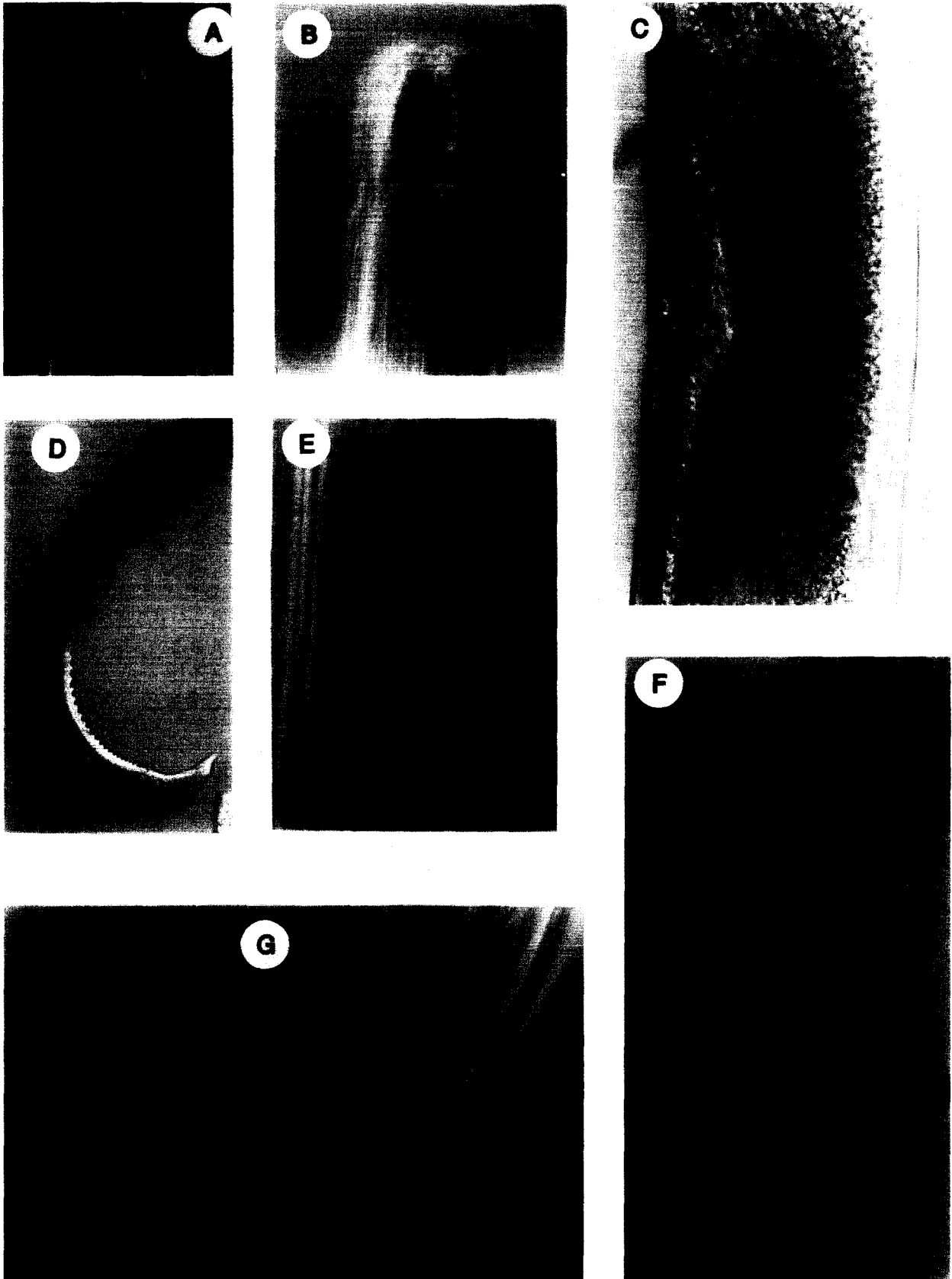


Fig. 4. *Michonchus vulvapapillatum* sp. n., A & B: Anterior region; C: Vulval region. D: Male posterior region; E: Oesophago-intestinal junction; F: Male copulatory apparatus; G: Female posterior region.

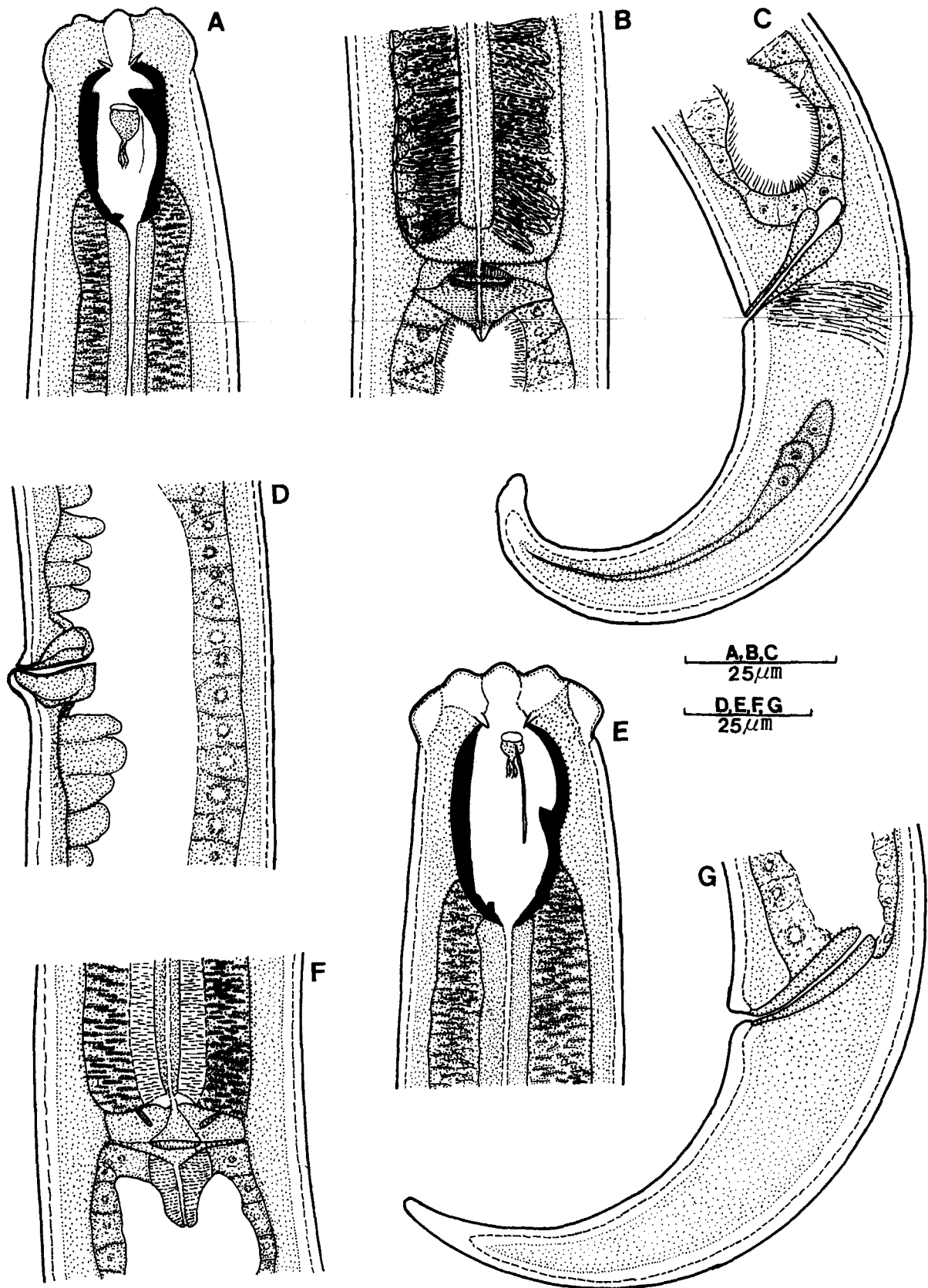


Fig. 5. A-D: *Clarkus koreanus* sp. n., A: Anterior region; B: Oesophago-intestinal junction; C: Female posterior region; D: Vulval region; E-G: *Coomansus ulsani* sp. n., E: Anterior region; F: Oesophago-intestinal junction; G: Female posterior region.

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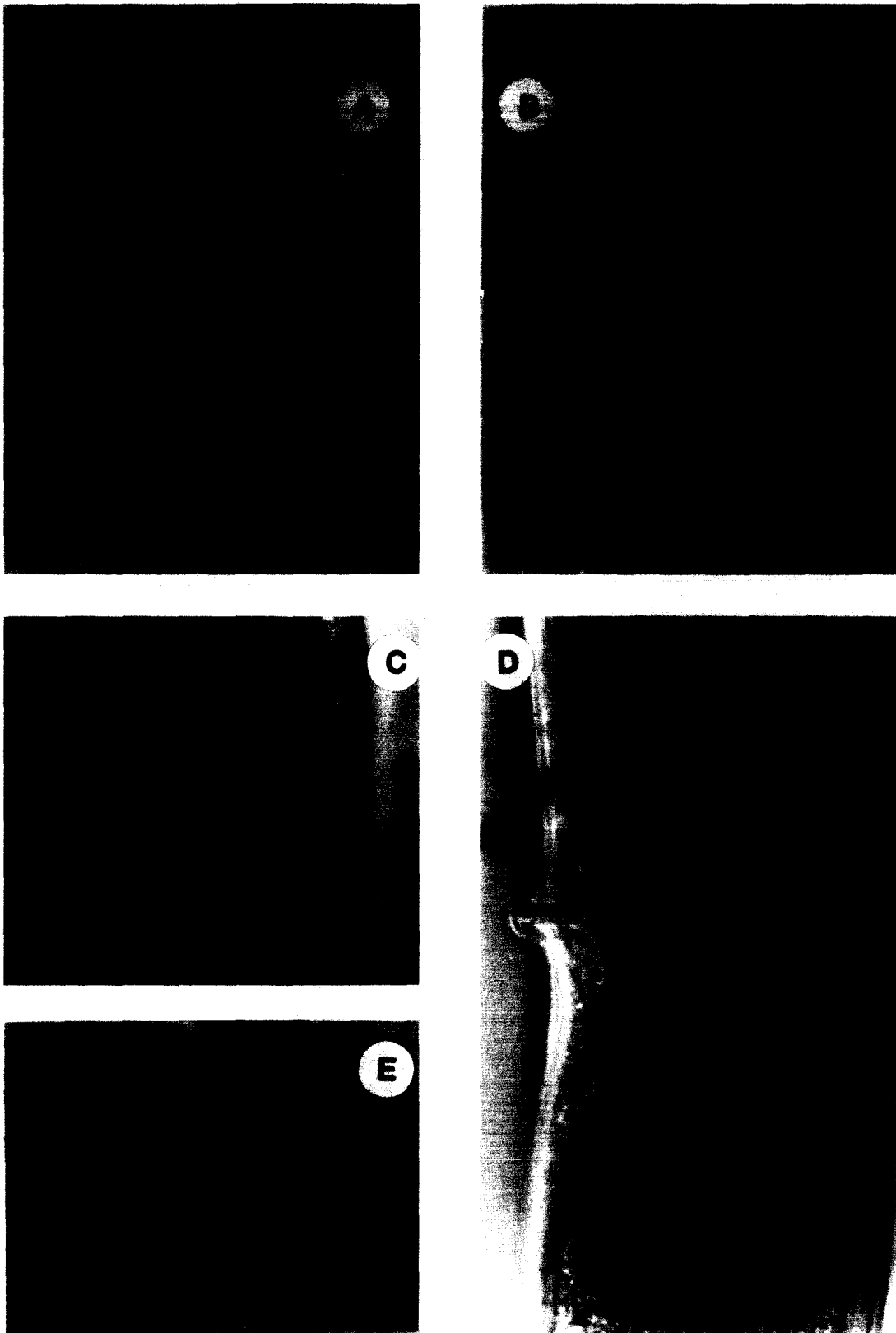


Fig. 6. *Clarkus koreanus* sp. n., A & B: Anterior region; C: Oesophago-intestinal junction; D: Vulval region; E: Female posterior region

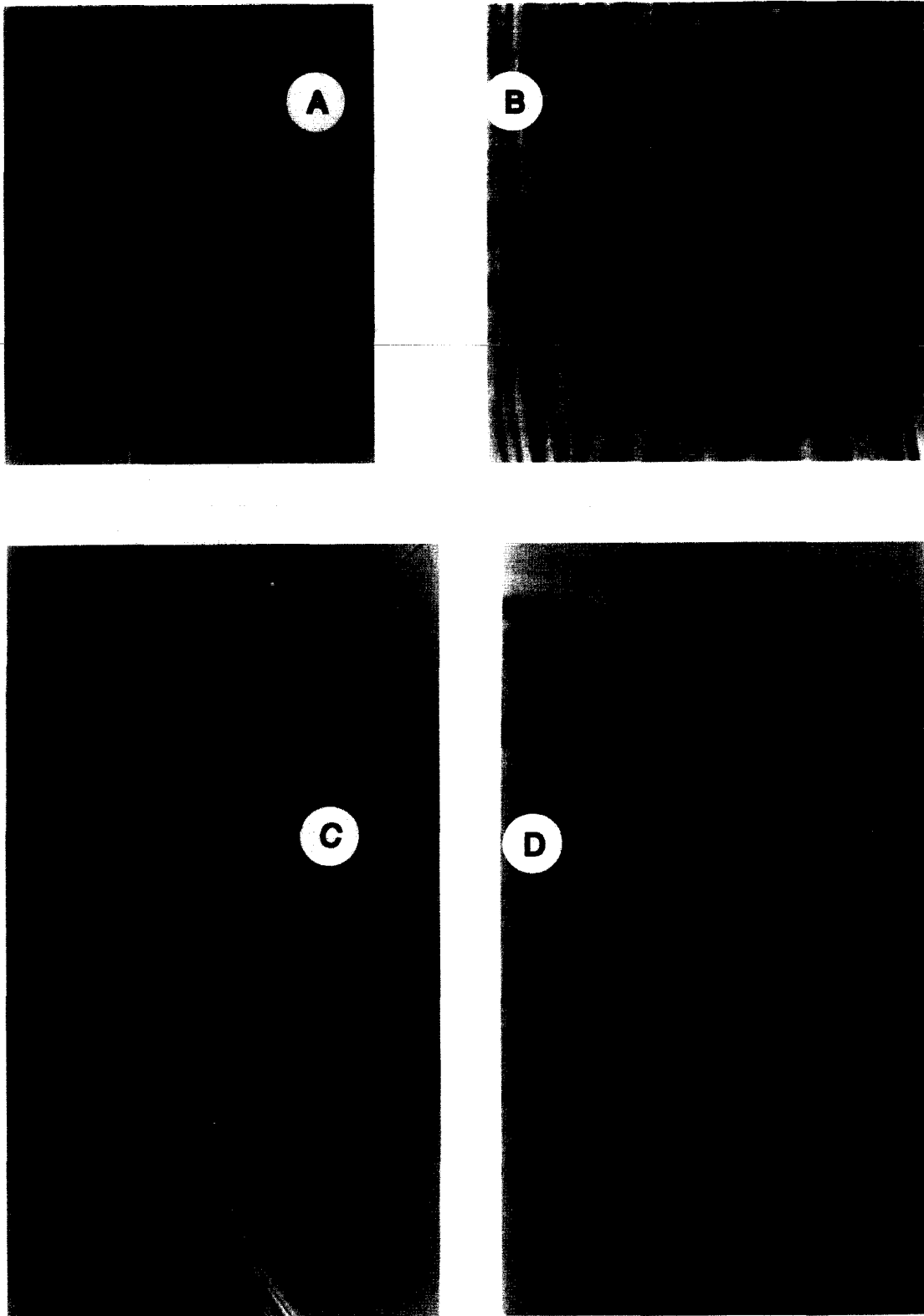


Fig. 7. *Coomansus ulsani* sp. n., A: Anterior region; B: Oesophago-intestinal junction; C: Vulval region and gonads; D: Female posterior region.