

Systematic Study of Criconematoidea from Korea*

I. Description of *Ogma koesanense* sp.n. and Four New Species for Korea

韓國産 環線蟲上科의 系統分類學的 研究

I. *Ogma koesanense* 1新種 및 4種의 韓國 未記錄種에 관하여

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ABSTRACT *Ogma koesanense* sp.n. has two head annuli. The first head annule is much larger than the second; blunt scales more or less in 17~19 longitudinal lines and acute tail. *Criconemella annulata*, *Criconema cardamomi*, *Ogma decalineatum*, *O. dryum* are newly recorded from Korea. Morphological characteristics of previously reported species, *Criconema demani* is discussed.

KEY WORDS Morphology, taxonomy, *Criconematinae*, host plants, Korea

초 록 한국산 환선충상과를 연구하는중 *Ogma koesanense* sp.n.는 두부에 2개의 주름을 가지고 있으며, 첫째주름은 둘째주름보다 훨씬 크고, 둔한 자편이 17~19줄의 종추선을 이루고 있으며 꼬리는 뾰족하므로 신중으로 발표한다. *Criconemella annulata*, *Criconema cardamomi*, *Ogma decalineatum*, *O. dryum* 등 4종은 한국미기록종으로 동정되었다. *Criconema demani*에 대한 형태적 특징을 재검토하였고, 각선충 종류별로 기주식물을 새로이 추가한다.

검색어 형태, 분류, *Criconematinae*아과, 기주식물, 한국

Criconemella annulata(Cobb in Taylor, 1936)
Luc & Raski, 1981
오대산가는주름선충(신칭)
(Fig. 1)

Measurements. Female(n=10): L=477.6±44 (415-572) μm; a=13.1±1.2(11.5-15.1); b=3.4±0.2 (3.1-3.8); Stylet=88.3±3.1(83-92) μm; R=133±3.9 (124-138); Rex=40.6±2.5(37-46), RV=8±0.7 (7-9); RVan=4.3±0.7(4-6); Ran=3.4±0.7(2-4); V=93.7± (91.1-94.5)%; G=43.2±5.3 (34.2-50.7)%; Head to excretory pore=130.9±9(113-147) μm; Oesophagus length=137.8±6(131-146) μm.

The specimens correspond with the description in the literature

Localities and host plants. Odaesan, Kangwon-do. (*Abies holophylla* Max, *Salix gracilistyla* Miq). Chirisan Paekmudong (*Abies holophylla* Max. *Taxodium distichum* (L.) Rich) Muju Kuch'ön-dong, Chöllabuk-do (*Abies holophylla* Max) Toam-myön, P'yongch'ang-gun, Kangwon-do (*Zelkova serrata* Makino)

Criconema cardamomi (Khan & Nanjappa, 1972)
Raski & Luc, 1984
무주뾰족주름선충(신칭)
(Fig. 2)

Measurements. see Table 1.

Discussion. Four korean populations differ from

*This paper was supported by NON DIRECTED RESEARCH FUND, Korea Research Foundaton, 1993(이 논문은 1993년도 한국학술진흥재단의 공모과제 연구비에 의하여 연구되었음)

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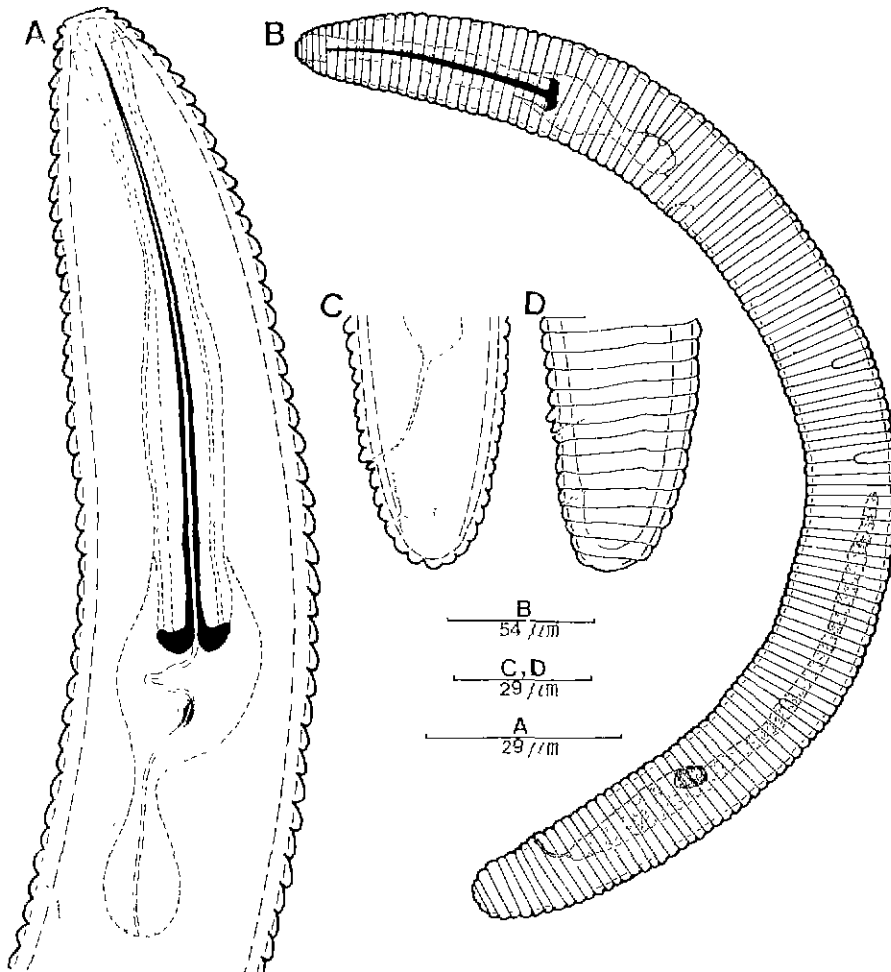


Fig. 1. *Criconema annulata*; A: Oesophageal region. B: Entire body C, D: Posterior region

the original population by the structure of the posterior vulva lip. For this reason a paratype was studied, Fig. 2 G shows that the vulva lip is broadly rounded in the paratype but shows a posterior prolongation in the Korean specimen (Fig 2 C, E & F) As no other differences were noticed, the Korean populations were identified as *C. cardamomi*.

Localities and host plants. Naejangsan (*Daphniphyllum macropodum* Miq, *Ulmus davidiana* Planch). Muju Kuch'on-dong, (*Acerpseudo-sieboldianum* Kom). Chirisan Paekmudong (*Elaeagnus umbellata* Thunb, *Morus bombycis* Koidz). Chirisan Chungsanri (*Elaeagnus umbellata* Thunb) Sobaeksan (*Taxus cuspidata* S. et Z.)

***Criconema demani* Micoletzky, 1925
(Fig. 3)**

Measurements. see Table 2. 3.

Discussion. This species has already been reported from Korea (Choi, Y.E. and Geraert, E. 1975) and was rediscovered in several samples (measurements in Table 2). In three other samples (measurements in Table 3) we found populations that shows a lateral notch all over the body (Fig. 3. A-C); as that was the only difference, we also consider these three populations as representatives of *C. demani* (Fig 3. D-F).

Localities and host plants. Do-dong Nammyon, Ullungdo (*Juniperus chinensis* L., *Torreya*

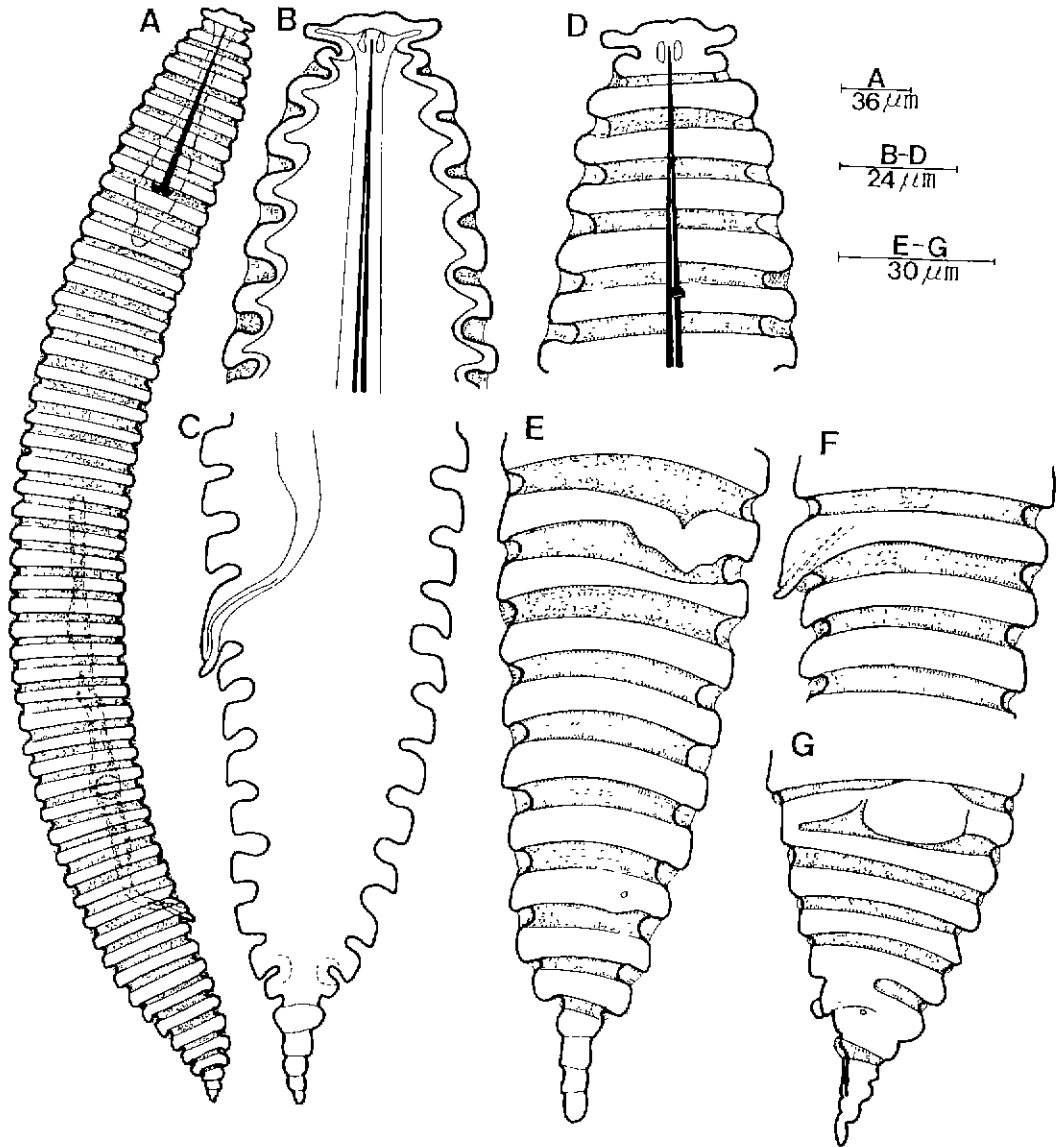


Fig. 2. *Criconema cardamomi*; A Entire body, B, D: Head region, C: Lateral view of female posterior region, E: Subventral view of posterior region, F: Lateral view at vulva, G: Paratype, ventral view of posterior region.

nucifera S. et Z. *Tsuga sieboldii* Carr. *Calanthe striata* L. Brown. *Quercus acutissima* Carr) Chôngyangsan (*Pinus densiflora* S. et Z.). Taeyul-ri Kamp'o-ùp, Wolsông-gun (*Sasa borealis* (Hack) Nak). Chirisan Paekmudong (*Lindera erythrocarpa* Makino). Chirisan Ch'ônwangbong (*Euonymus oxyphyllus* Miq., *Acer palmatum* var. *coreanum* Nak). Chirisan sojibong (*Pinus koraiensis* S. et Z.). Haeinsa (*Glycine max* Merr). Odaesan Wolchôngsa (*Abies holo-*

phylla Max.).

***Ogma decalineatum* (Chitwood, 1957)**

Andrassy, 1979

지리산비늘주름선충(신침)

(Fig. 4)

Measurements. Female(n=13): L=383.5± 37.3 (311-444) μm, a=10± 1.0(8.5-11.3); b=3.5± 0.4(3-

Table 1. Morphometric comparison of *Criconema cardamomi* from different hosts and localities

Host Localities	<i>Daphniphyllum macro-podium</i> Naejangsan	<i>Ulmus davidiana</i> Naejangsan	<i>Acer pseudo-sieboldianum</i> Muju	<i>Elaeagnus umbellata</i> Chirisan
Female	n=12	n=10	n=10	n=10
Length(μm)	637.2 ± 35.2(594-702)	666.4 ± 16.7(648-702)	588.9 ± 41.6(540-658)	536.2 ± 19.6(504-558)
a	10.6 ± 0.6(9.7-11.8)	10.7 ± 0.5(10-11.5)	9.5 ± 0.6(8.8-10.7)	9.9 ± 0.7(8.7-11.0)
b	4.6 ± 0.4(3.5-5.2)	4.7 ± 0.2(4.2-5.2)	4.3 ± 0.4(3.5-4.9)	3.6 ± 0.2(3.4-3.8)
c	14.9 ± 2(12.5-20)	—	17.3 ± 1.4(13.7-18.5)	16.8 ± 3.5(12.5-23.6)
V	85 ± 1.7(81.2-89)	84.9 ± 0.7(84.1-86.6)	83.3 ± 1.4(81.0-85.3)	86.2 ± 0.9(84.7-88)
R	55.2 ± 1.9(52-58)	55 ± 1.7(52-57)	55.3 ± 1.6(53-58)	63.1 ± 2.2(59-66)
RV	11.8 ± 0.8(10-13)	11.6 ± 0.5(11-12)	12.7 ± 0.9(11-14)	12.5 ± 1.1(11-14)
Rex	12.7 ± 0.3(12-13)	—	—	—
Ran	6.5 ± 0.6(6-8)	—	6.8 ± 0.6(6-8)	7.4 ± 1.1(5-9)
Stylet(μm)	95.6 ± 2.3(90-99)	94.8 ± 2.3(92-99)	99.3 ± 4.3(90-104)	105.7 ± 2(102-109)
Body annuli width(μm)	13.0 ± 0.9(10.8-14.4)	13.6 ± 0.6(12.6-14.4)	12.1 ± 0.8(10.8-13.5)	10.2 ± 0.7(9-10.8)
1st head anrilus (μm)	27.8 ± 1.1(25.2-28.8)	27.8 ± 1.1(26.1-29.7)	26.6 ± 1.3(24.3-28.8)	26.1 ± 0.7(25.2-27)
2nd head annulus	24.2 ± 1.5(21.6-25.2)	24.7 ± 0.8(23.4-26.1)	23.7 ± 1.4(20.7-26.2)	22.4 ± 0.9(20.7-23.4)

Table 2. Morphometric comparison of *Criconema demani* (without notch) from different hosts and localities

Host plants Localities	<i>Calanthe striata</i> Ullungdo	<i>Tsuga sieboldii</i> Ullungdo	<i>Acer ukurunduense</i> Odaesan	<i>Abis holophylla</i> Odaesan	<i>Euonymus oxyphyllus</i> Chirisan
Female	n=18	n=10	n=7	n=6	n=14
Length(μm)	408 ± 16.9(381-437)	439.7 ± 12.3(423-457)	422.9 ± 41.8(352-471)	363 ± 9.0(345-374)	418.8 ± 28.3(367-468)
a	10.8 ± 0.5(10.2-11.7)	11.4 ± 0.5(10.7-12.2)	11.2 ± 0.8(9.5-12.1)	9.3 ± 0.5(8.7-10.4)	10 ± 0.8(8.5-11.2)
b	4.1 ± 0.3(3.6-4.4)	3.9 ± 0.2(3.6-4.2)	4.2 ± 0.2(3.7-4.4)	3.6 ± 0.1(3.5-3.7)	3.8 ± 0.2(3.5-4.2)
c	13.9 ± 1.4(12-16.5)	12.6 ± 1.4(9.7-14.5)	—	—	—
V	86.2 ± 0.9(84.1-87.2)	86.1 ± 0.8(84.7-97.6)	84.5 ± 0.6(83.6-85.4)	83.1 ± 1.2(81.2-84.6)	83.3 ± 1.4(80-85)
Stylet(μm)	71.1 ± 3.6(66.2-77.7)	73.8 ± 2.5(69.1-77)	67.8 ± 2.5(63-72)	70.9 ± 1.6(68-72)	68.7 ± 1.8(64.8-72)
R	63.8 ± 2.1(61-68)	64.5 ± 1.8(61-67)	73.7 ± 3(70-80)	59.3 ± 1.6(58-62)	70.1 ± 1.6(67-72)
RV	12.3 ± 0.8(11-13)	12.4 ± 0.7(11-13)	13.7 ± 1.5(12-16)	11.7 ± 0.9(10-13)	12.5 ± 0.6(12-14)
RVan	4.9 ± 0.3(4-5)	4.7 ± 0.5(4-5)	—	—	—
Ran	7.4 ± 0.7(6-8)	7.6 ± 0.5(7-8)	—	—	—
Rex	20.4 ± 1.1(19-22)	20 ± 1.1(18-22)	20.9 ± 0.8(20-22)	—	21.6 ± 1.4(20-24)

4); c = 11.2 ± 1.2(8.9-13.1), Stylet = 74.9 ± 2.8(68.5-79) μm; R = 76.6 ± 2.6(72-81); RV = 11.2 ± 0.7(10-12); RVan = 2.4 ± 0.5(2-3), Ran = 8.8 ± 0.8(8-10); V = 88.6 ± 2.8(86.3-97.8)%; G = 59.8 ± 1.8 (56-62)%; Oesophagus length = 109.6 ± 4.2(99-113.4) μm; Tail length = 36.7 ± 4.5(23.5-43.5) μm.

The specimens correspond with the description in the literature

Localities and host plants. Chirisan Chungsanri

(*Pinus rigida* Mill, *Taxodium distichum* Rich). Puk'ansan, Seoul (*Larix gmelini* var. *principis-rupprechtii* (Mayr) Pilger)

***Ogma dryum* (Minagawa, 1979)**

Raski & Luc, 1987

대둔산비늘주름선충(신칭)

(Fig. 5)

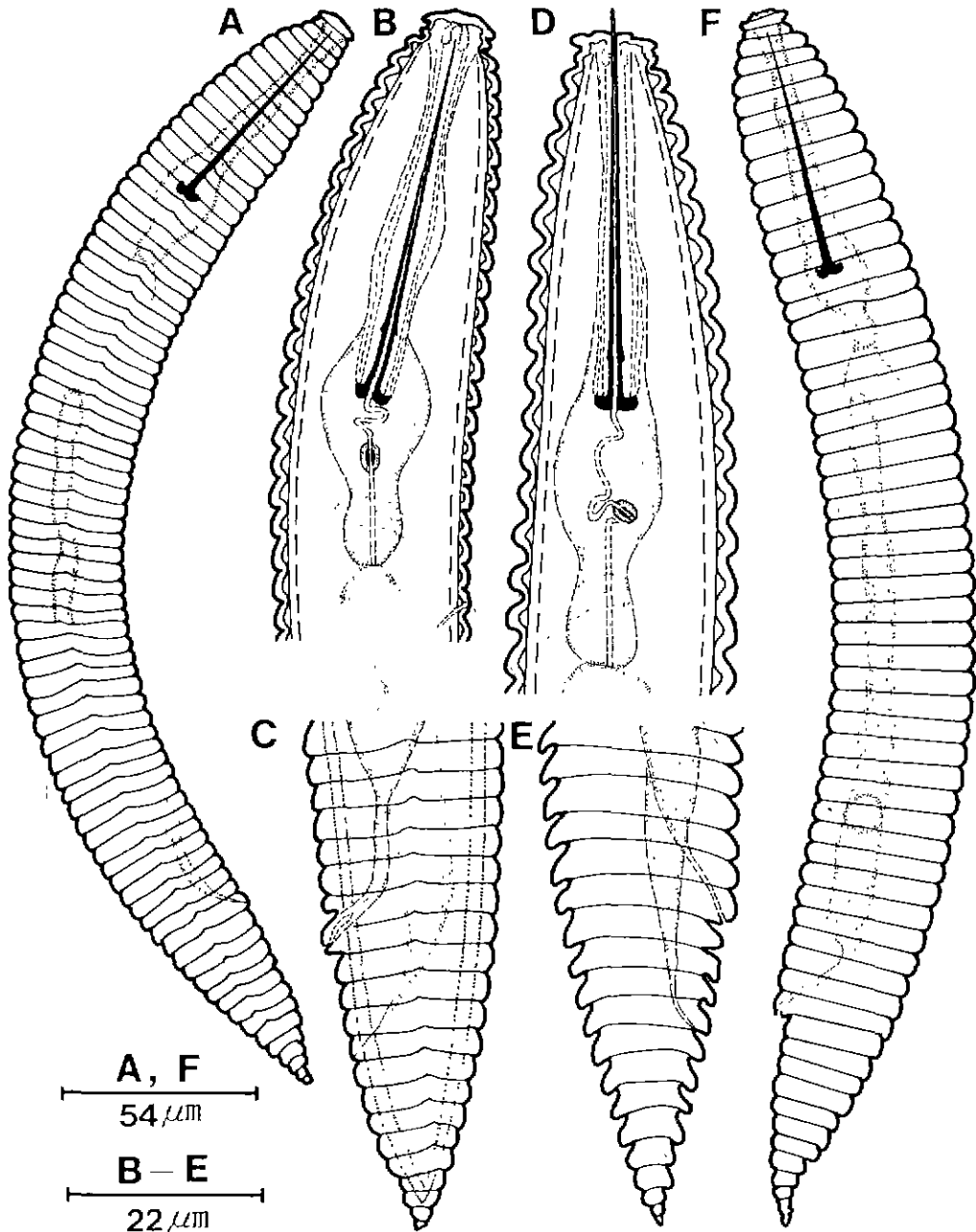


Fig. 3. *Criconema demani*; A. Entire body, shows a lateral notch all over the body, B, D: Oesophageal region, C: Female posterior region (with lateral notch), E: Female posterior region (without lateral notch), F: Entire body.

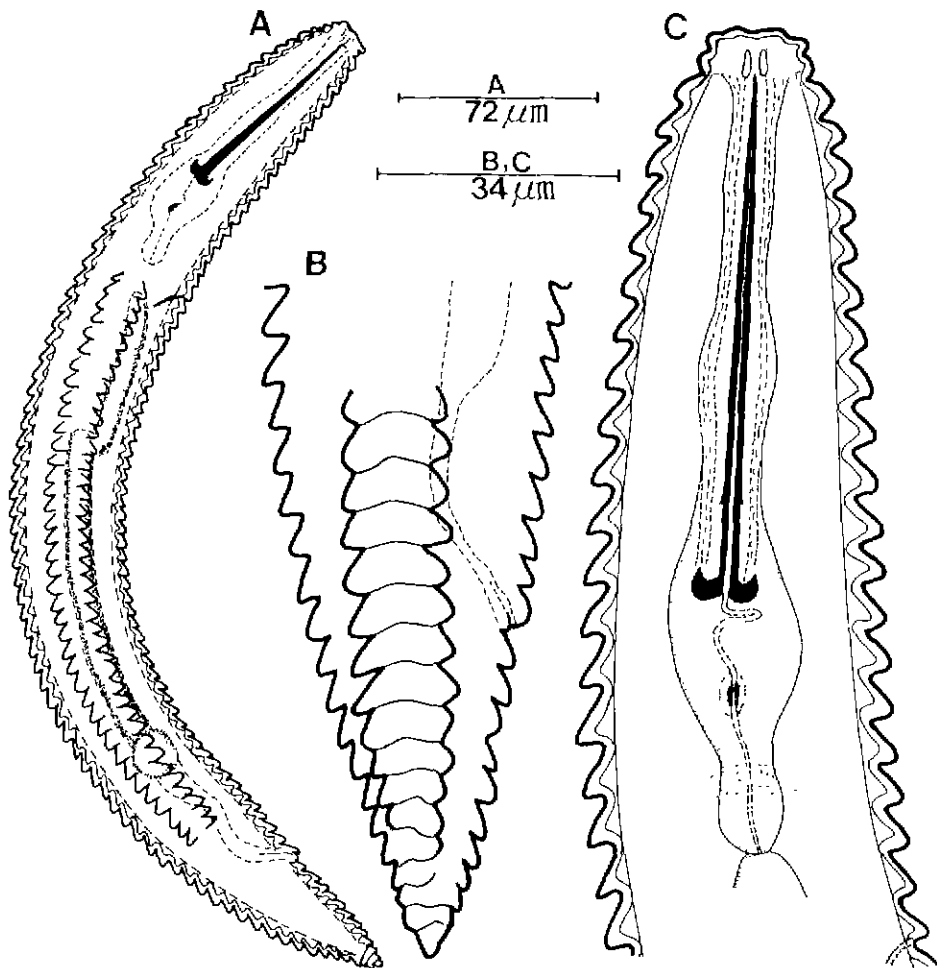
Measurements. Kyeryongsan (*Castanea crenata* S. et Z.), Female (n=7): L = 384.7 ± 30.9 (345-448) μm ; a = 8.3 ± 0.5 (7.5-9); b = 3.1 ± 0.2 (2.6-3.4); V(%) = 83 ± 1.6 (80.2-85.1); R = 53.6 ± 1.3 (52-56); RV =

10.6 ± 0.5 (10-11); Stylet = 100.3 ± 7.2 (90-110) μm .

Taedunsan (*Abies holophylla* Max), Female (n=5): L = 450 ± 72 (333-543) μm ; a = 9.9 ± 1.6 (8.2-12.3); b = 3.4 ± 0.5 (2.8-4.1); V(%) = 84 ± 1.5 (81.6-86); R =

Table 3. Morphometric comparison of *Criconema demani* (with notch) from different hosts and localities

Host	<i>Torreya nucifera</i>	<i>Juniperus chinensis</i>	<i>Pinus densiflora</i>
Localities	Ullungdo	Ullungdo	Chôngyangsan
Female	n=12	n=10	n=10
Length (μm)	333.8 \pm 10.4(320-352)	346.7 \pm 26.9(320-352)	342.4 \pm 15.8(318-369)
a	10 \pm 0.4(9.1-10.5)	10.5 \pm 0.8(9.2-11.5)	10.5 \pm 0.7(9.2-11.5)
b	37 \pm 0.1(3.3-3.9)	3.8 \pm 0.3(3.6-4.6)	3.8 \pm 0.1(3.6-4)
c	11.4 \pm 1.4(9.0-13.5)	10.7 \pm 0.6(9.8-11.8)	10.8 \pm 0.5(10.0-11.7)
V	84.5 \pm 1.3(82.5-86.7)	83.8 \pm 1.1(82.2-85.1)	84.0 \pm 1.3(82.2-86.3)
Stylet(μm)	62.5 \pm 1.9(58.3-66.6)	61.2 \pm 1.5(58.3-63.3)	61.3 \pm 1.5(57.6-63)
R	79 \pm 2(76-82)	79 \pm 1.8(76-82)	78.4 \pm 1.9(74-81)
RV	13.9 \pm 1(13-16)	14.0 \pm 0.7(13-15)	14.1 \pm 0.9(13-16)
RVan	5.0 \pm 0.6(4-6)	4.9 \pm 0.7(4-6)	5.0 \pm 0.7(4-6)
Ran	5 \pm 0.6(8-10)	9 \pm 0.0(9-9)	9.1 \pm 0.9(8-11)
Rex	24.8 \pm 1.9(21-29)	25.3 \pm 1.3(23-27)	24.4 \pm 0.5(24-25)

**Fig. 4. *Oigma decalineatum*; A: Entire body, B: Female posterior region. C: Oesophageal region.**

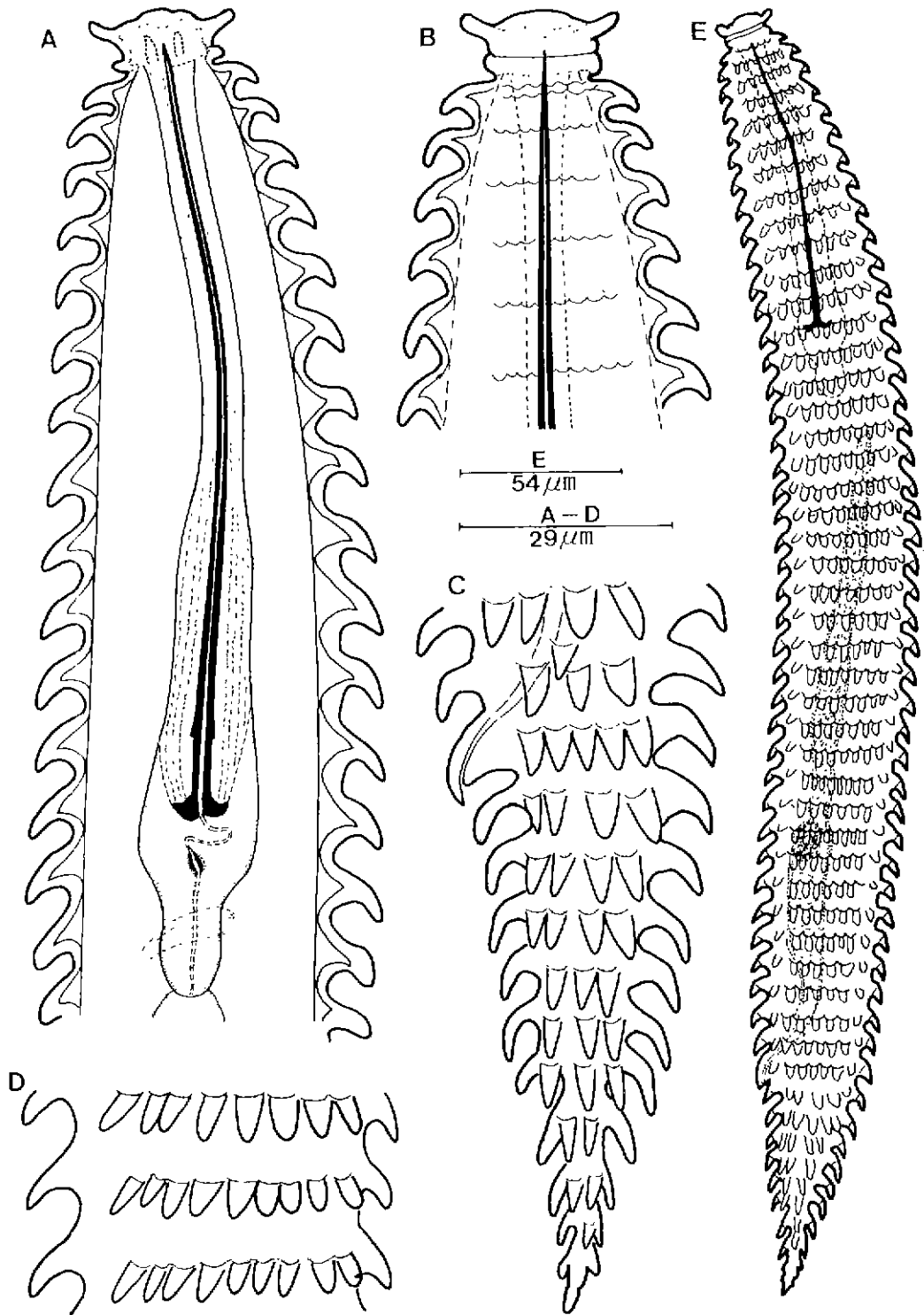


Fig. 5. *Ogma dryum*; A. Oesophageal region, B. Head region, C. Female posterior region, D. Surface view of mid-body. E. Entire body.

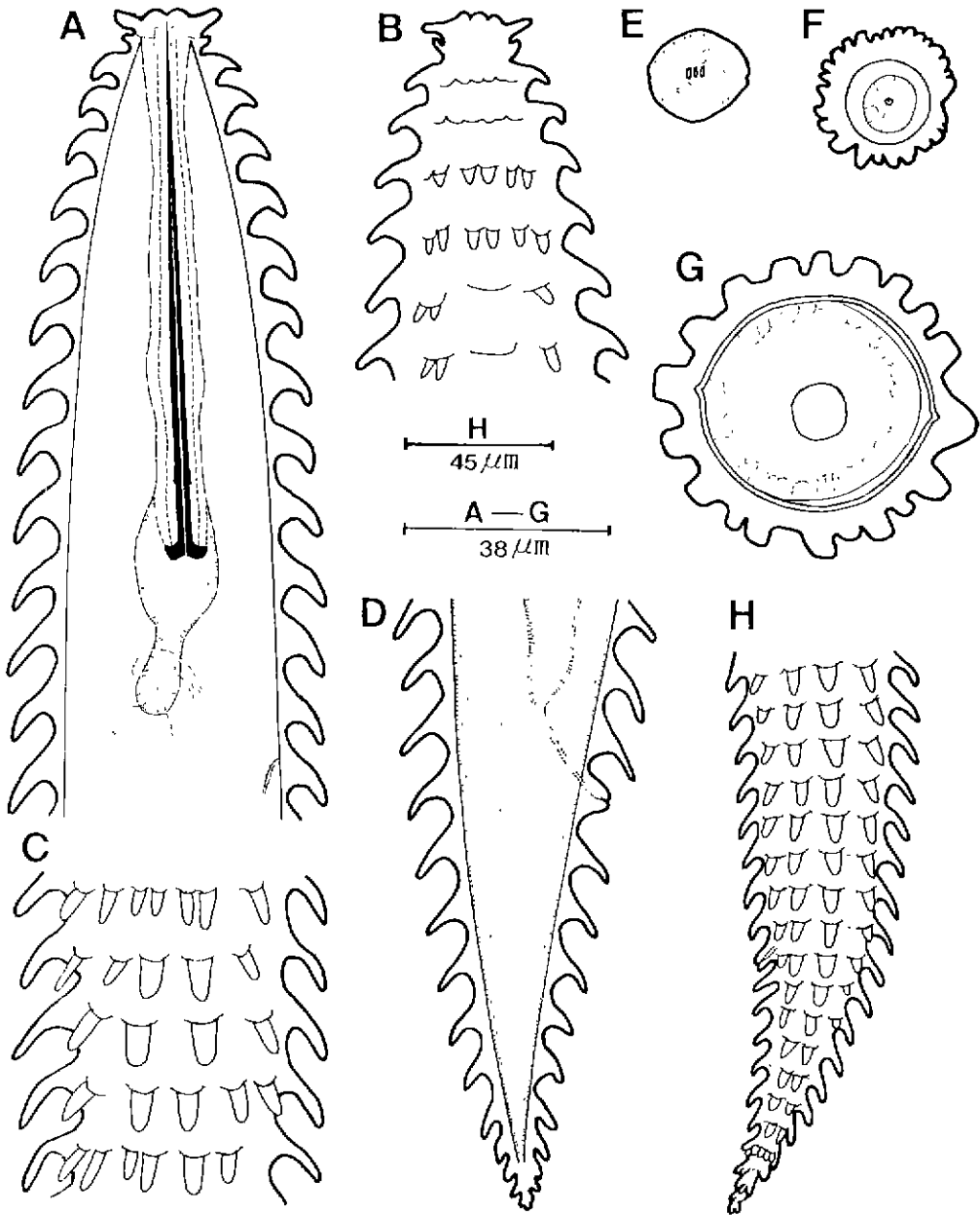


Fig. 6. *Oigma koesanense* sp.n., A. Oesophageal region, B: Surface view of head region, C: Surface view of mid-body, D: Female posterior region, E: En face view, F Cross section posterior to en face, G. Cross section at mid-body, H: Surface view of female posterior region

54.2±0.7(53-55); RV=11.2±0.7(10-12); Stylet=105.2±3.2(100-110) μm.

The specimens correspond with the original description.

Localities and host plants. Keyryongsan, Ch'ungch'ongnam-do. (*Castanea crenata* S. et Z.).

Taedunsan, Ch'ungch'ongnam-do. (*Abies holophylla* Max).

***Ogma koesanense* sp.n.**

괴산비늘주름선충(신칭)

(Fig. 6)

Measurements. Holotype female: L=446 μ m; a=7.5; a'=11.7; b=3.5; V=85%; Stylet=95.5 μ m; Oesophagus length=126 μ m; R=48; RV=11; Rex=14; Head to excretory pore=137 μ m; 1st head annulus width=21 μ m; 2nd head annulus width=14.5 μ m

Paratype females(n=6): L=447.8 \pm 25.2(414-502) μ m; a=8.1 \pm 0.3(7.5-8.6); a'=11.1 \pm 0.3(10.7-11.7); b=3.4 \pm 0.2(3.1-3.6); V(%)=83.3 \pm 1.0(81.9-85); Stylet=94.4 \pm 2.4(90-98) μ m; Oesophagus length=127.3 \pm 2.8(124-131) μ m; R=49.0 \pm 0.7(48-50); RV=11.1 \pm 0.6(10-12); Rex=15.5 \pm 1.1(14-17) μ m; 1st head annulus width=19.1 \pm 1.6(16.5-21) μ m; 2nd head annulus width=15.2 \pm 1.1(13.5-17) μ m.

Description. Body curved slightly, tapering posteriorly to acute tail. Head with two annuli, distinctly set off from body, the first annulus smooth, saucer-shaped with irregularly indented margins, directed forward, much larger than the second one. The second annulus collar-like shaped, sometimes directed forward, always without ornamentations. Lip region irregularly elevated. En-face view shows six lips. The oral opening is slightly raised and ovate. The consecutive annuli 3, 4 and 5 with a continuous fringe of about 27 broadly rounded cuticular projections. In the following annuli this continuous fringe disappears gradually and instead 17~19 longitudinal rows become apparent. Body annuli retrorse and bearing a fringe of rectangular or bluntly pointed, triangular shaped, scale-like spines rarely with a bifurcate margin, 17-19 spines on each annulus at mid-body. The blunt spines are not evenly spaced, some slight grouping of 2, 3 spines can occur. Stylet with anteriorly pointed knobs. Excretory pore on 126-140 μ m from anterior end. Vulva with rounded edges. Tail elongated, conical, with distinct annuli till top.

Diagnosis. *Ogma koesanense* sp.n is characterized by two head annuli which the first is much larger than the second, R=48-50, RV=10-12, Stylet=90-98 μ m; blunt scales more or less in 17~19

Discussion. Head and tail shape are similar in longitudinal lines and acute tail.

O. dryum (Minagawa, 1979) Raski & Luc, 1987; *O. octozonale* (Momota & Ohshima, 1974) Siddiqi, 1986. *O. duodevigintilineatum* (Andrassy, 1968) Andrassy, 1979; *O. seymouri* (Wu, 1965) Siddiqi, 1986 and *O. tenuicaudatum* (Siddiqi, 1961) Siddiqi, 1986; *O. octozonale* has 8~9 rows of predominantly 2 spines per row that gives a similar number of spines per mid-body annulus; measurements do not differ very much; R=50-60, RV=10-12, Stylet=97-112 μ m. *O. duodevigintilineatum* has a similar morphology but the measurements differ; R=67, RV=14, Stylet=77 μ m. More differences are found in the other 3 species. *O. seymouri* and *O. tenuicaudatum* have the spines, in groups of 2~3 forming 10~12 rows in *O. seymouri* and 14 in *O. tenuicaudatum*; both have also the measurements different (*O. seymouri* R=61-62, RV=13, Stylet=63-65 μ m; *O. tenuicaudatum* R=59-61, RV=11, Stylet=106-110 μ m). *O. dryum* has more spines per annulus (28~38) and the spines are not arranged in rows, moreover first head annulus is crenated; measurements are similar (R=50-55, RV=10-12, Stylet=86-121 μ m).

Type specimens. Holotype female on slide 86-55 in collection of Department of Agricultural Biology, College of Agriculture, Kyungpook National University, Taegu, Korea, paratype females on slide 86-55-1 same collection; slide 3739 in collection of the Instituut voor Dierkunde, Ledeganckstraat 35, Gent, Belgium.

Type host and locality. Doan-myön, Koesangun Ch'ungch'öngbuk-do (*Oryza sativa* L.).

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(Received June 13, 1994)