

Description of *Radopholus sanoi* n. sp. from Kyushu, Japan

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Radopholus sanoi n. sp. is described from Kyushu district of Japan. This species differs from the following known species with characteristically shortened posterior ovary: from *Radopholus triversus* by annulated tail tip, four lateral incisures; from *R. litoralis* by longer spear (16.5–19.8 μm) and shape of head (elevated, dome-shaped); from *R. laevis* by size and thickness of spear, shape of head (not flattened anteriorly), annulated tail terminus and long hyaline part of tail. The nematode is associated with *Miscanthus sinensis* and/or *Sasa* sp. *Jpn. J. Nematol.* 18 : 39–44 (1989).

GOTOH²⁾ mentioned a *Radopholoides* species occurring in Kyushu district (western Japan), having lateral field with indistinct inner lines and tail terminus similar to *Pratylenchus zaei*. This was published, after a decade, as a new species, *Radopholoides triversus*, by MINAGAWA³⁾. An additional species has since been collected from natural grassland in Kyushu district by Mr. Zen'ichi SANO of the Kyushu National Agricultural Experiment Station. This nematode showed in general dimensions close affinity to *R. triversus*, but had some qualitative differences. The genus *Radopholoides* DE GUIRAN has recently been synonymized with *Radopholus* THORNE⁴⁾. This action is accepted and the new species is placed under the genus *Radopholus*.

The specimens measured and illustrated were killed by gentle heat, fixed by TAF and dehydrated and mounted according to SEINHORST⁵⁾.

RADOPHOLUS SANOI N. SP.

(Fig. 1 A–N, Fig. 2 A–F)

Holotype (female): L=491 μm ; a=25.2; b=6.5; b'=3.5; c=11.3; c'=3.1; V=66.1%; V'=72.6%; spear=18.5 μm ; G₁=25.5%; G₂=8.1%; U=2.2; T/V-a=35.5%; E. P. =16.3%; P. h.=92.4%. Dimensions of paratypes: see Table 1.

Description: Female (n=20): Body almost straight when heat-relaxed, rather slender. Lip region of medium height, 2.2 (2.0–2.4) μm high and 8.3 (7.3–9.2) μm wide, assumes dome with shallowly notched apex and slightly offset from body contour, with three or four annules (Fig. 1, B–D). Labial framework strong and arched. Spear stout and long, 2.2 (2.0–2.4) times as long as head width; knobs large, 4.6 (4.0–5.3) μm wide, cupped anteriorly (Fig. 1, E, F). Dorsal esophageal gland orifice 2.0 to 5.3 μm (3.5 \pm 0.8) behind spear base. Cephalid invisible. Median bulb oval, 13.0 (10.6–15.8) μm long 9.4 (8.3–12.5) μm across, 1.1 to 1.8 (1.4 \pm 0.15) times as long as wide; valve conspicuous, 42.9 to 59.8 μm (52.9 \pm 4.3) from anterior body end, or 44.8 to 68.0% (60.2 \pm 7.0) of esophagus length. Esophageal gland massive, extending 116 to 182 μm (153 \pm 17) from anterior body end, overlapping the intestine 44 to 88 μm (64 \pm 13) or a distance of 2.1 to 5.0 (3.4 \pm 0.9) times the corresponding body diameter; dorsal gland nucleus near middle of lobe, subventral nuclei in the posterior portion. Excretory pore in the vicinity of esophago-intestinal junction or at 62.4 to 118.3% (93.1 \pm 12.2) of esophagus length, 54 to 65 annules (57.8 \pm 3.3) behind the anterior body end. Hemizonid 3 to 6 μm or two to three annules long, immediately to three annules before the excretory pore; hemizonion one annule long, at 8 (5–12) annules and 7.9 to 15.2 μm (12.1 \pm 2.3, n=11) behind the excretory pore. Gonad

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outstretched, 136.2 (94.4–184.8) μm long or 22.2 to 44.0% (27.4 ± 5.4 , $n=18$) of body length; spermatheca rounded to squarish, 10.0 (7.3–11.9) μm long, 8.8 (6.6–11.9) μm across, 1.0 to 1.5 (1.1 ± 0.17 , $n=12$) times as long as wide, usually empty but occasionally packed with rod-like sperm. Posterior ovary much degenerated with vestigial ovary distally. Vagina tubular, perpendicular to body axis, 7.9 (5.9–10.6) μm long or 34.4 to 51.9% (45.9 ± 4.7) of vaginal body diameter. Annules between vulva and anus (RVan) 78 to 103 (92 ± 8 , $n=19$) in number. Tail rather elongated and conoid tapers to narrow terminus which normally notched or crenate with up to four annules (Fig. 1, I–N), hyaline part of tail 5.9 to 9.2 μm (8.2 ± 0.96 , $n=17$) long; phasmid centered in lateral field at upper half of tail, i. e. 2 to 13 μm (8 ± 3 , $n=17$) behind anus. Lateral field 5.7 (4.7–8.6) μm wide, i. e. 26 to 38% (31 ± 4.5 , $n=10$) of corresponding body diameter near vulva, consisting of four incisures or three bands; inner band narrower than outer ones and usually becoming very narrow on the tail, but often remaining beyond phasmid; lateral field may closed near tail terminus.

Male ($n=4$): Body straight to arched when heat-relaxed. Lip region high and widest at base, constricted from body contour, bearing five to six annules. Lips in three (normal?) individuals, 4.6 to 4.8 μm high, 6.9 to 7.3 μm across, tapering slightly to broadly rounded anterior margin (Fig. 2, B), though one (abnormal?) individual showed balloon-like lip region, 5.6 μm high, 8.3 μm across (Fig. 2, C). Spear shorter and thinner than that of female; basal knobs may absent. Dorsal esophageal gland orifice difficult to see. Median bulb thin, 1.6 to 2.0 times as long as wide; valve indistinct, narrow. Esophagus 66 (58–74) μm . Basal esophageal lobe short, extending 100 to 118 μm from anterior body end, 31 to 45 μm overlapping intestine. Excretory pore 58 annules ($n=3$) from anterior body end, posterior to esophago-intestinal junction, or 119.8 (110.9–133.7)% of esophagus length. Lateral field 2.6 to 5.0 μm wide, with four incisures. Spicule arch-shaped; gubernaculum long, distal half may have double walls (Fig. 2, E, F). Tail with 25 and 26 annules, evenly tapers but abruptly narrowed at the hyaline part. Hyaline part 11 to 12 μm long, its posterior half bent ventrally ending in rounded terminus (Fig. 2, E), while bilobed tail terminus observed in one male with balloon-like lip. Bursal alae 63 to 72 μm long, crenate on margins, enveloping tail terminus. Phasmid on bursa at anterior half of tail, i. e. 11 to 13 μm behind cloaca. Testis outstretched, 31.0 (21.9–38.9)% of body length; length of anterior cellular portion (germinal zone + growth zone?) vary considerably from 7.9 to 83.8 μm ; succeeding sac (seminal vesicle?) filled with rod-shaped spermatozoa, 54.0 (42.9–69.3) μm long (Fig. 2, D).

Type material: Collected on September 12, 1988 by Mr. Zen'ichi SANO, a nematologist of the Kyushu National Agricultural Experiment Station, after whom the species is named. Holotype (female: Type no. 26–1) and paratypes (20 females and 4 males) are deposited at the Herbarium and Insect Museum of the National Institute of Agro-Environmental Sciences, Tsukuba City, Ibaraki, Japan.

Type host and locality: Specimens were collected from mixed rhizosphere of *Miscanthus sinensis* ANDERSS. and *Sasa* sp. at Teradoko, Kuju-machi, Kuju-gun, Oita (Kyushu distr.), Japan.

Diagnosis and relationships: *Radopholus sanoi* n. sp. most resembles *R. triversus*⁵⁾ showing large overlap in major dimensions (Table 1.) and having characteristics such as dome-shaped head and relatively long post uterine branch, but distinguished by annulated tail terminus, four lateral incisures, high P.h. value (81.3% vs. 72.0% in average) and absence of spear knobs in male. New species also differs from *R. litoralis*³⁾ by longer spear (16.5–19.8 μm vs. 14–17 μm), longer post uterine branch and shape of head (elevated in *sanoi* vs. low in *litoralis*). From *R. laevis*¹⁾, the new species differs by spear character-states in size and relative thickness, shape of lip region (anteriorly flattened in *laevis*), annulated tail terminus and long hyaline part of tail.

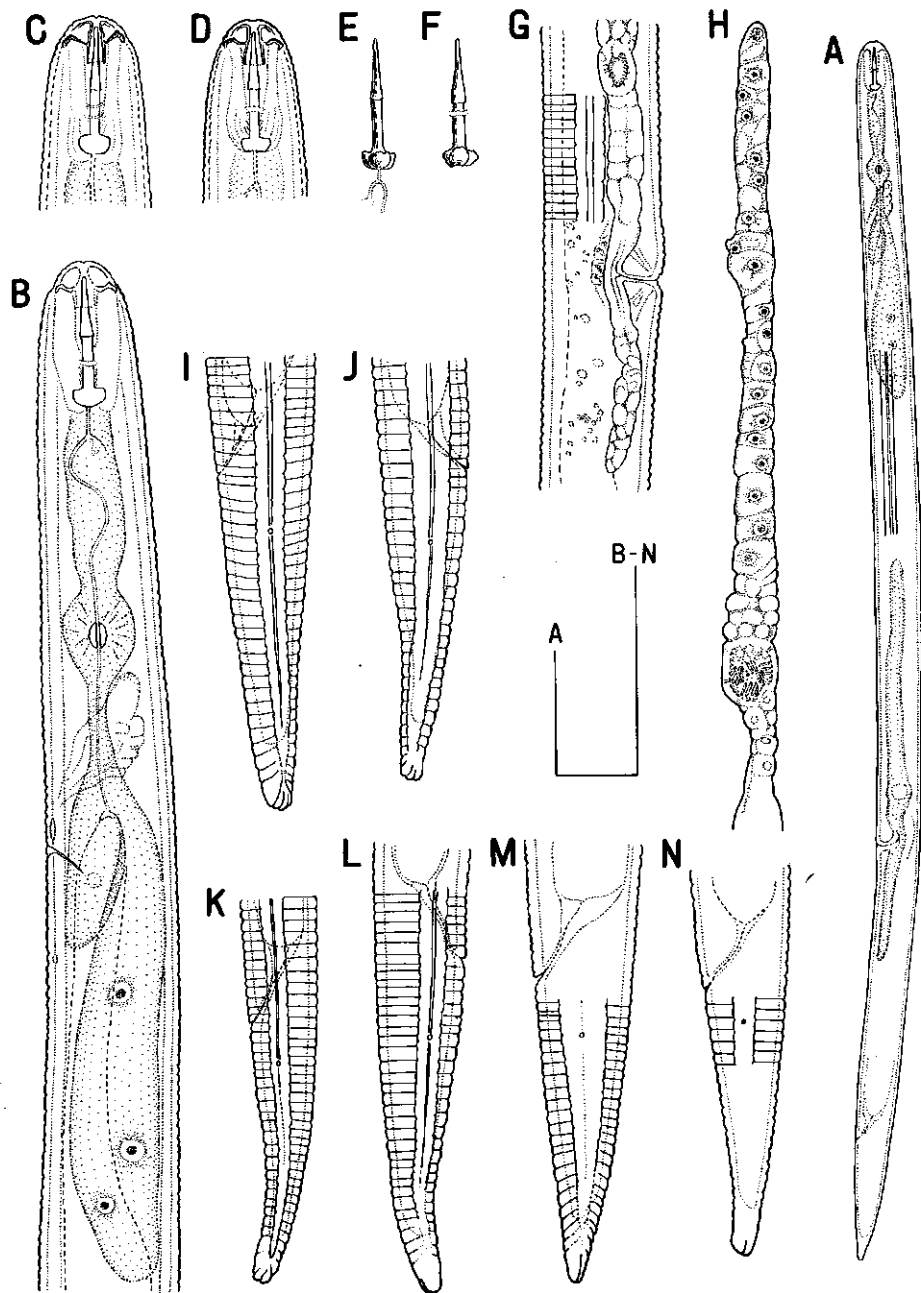


Fig. 1. *Radopholus sanoi* n. sp. Female. A: Full length; B: Anterior end to end of esophageal lobe; C-D: Cephalic regions; E-F: Full spears of further individuals; G: Vulvar region showing lateral field and empty spermatheca; H: Anterior ovary of inseminated female; I-N: Tails showing variation in a population. Scales: A, 50 μ m; B-N, 30 μ m.

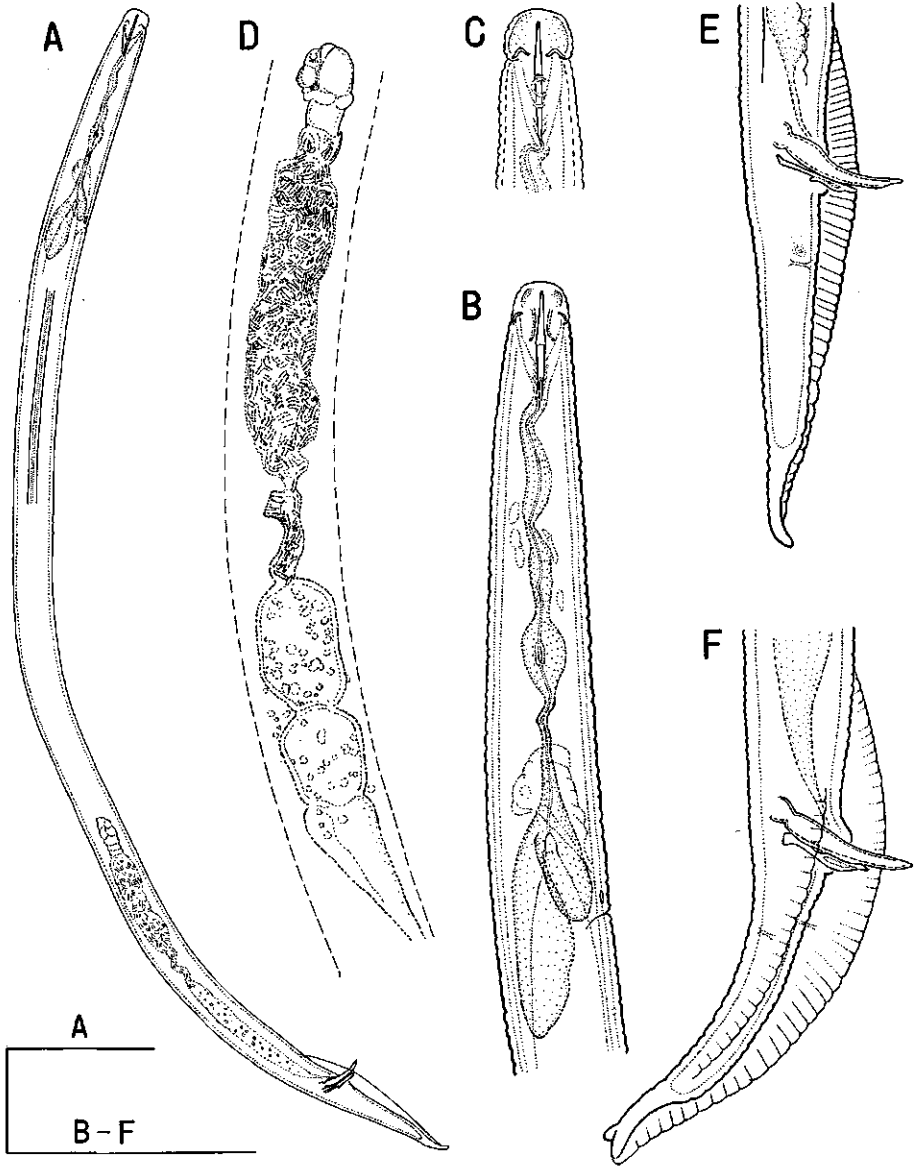


Fig. 2. *Radopholus sanoi* n. sp. Male. A: Full length; B: Anterior end to end of esophageal gland; C: Abnormal? balloon-like head; D: Testis with short germinal zone (vas deferens is partially illustrated); E-F: Bursal alae and tails. Scales: A, 50 μ m; B-F, 30 μ m.

Table 1. Comparison of dimensions of *Radopholus sanoi* and *R. triversus*

Criteria	<i>R. sanoi</i>		<i>R. triversus</i>		
	n. sp.		MINAGAWA (1984)	GOTOH (1972)	
females (n)	20		25	?	
L (μm)	401—598	(504 \pm 60)*	277—599	(422 \pm 60)	450—560 (490)
a	22.3—30.1	(26.6 \pm 2.1)	19.3—29.3	(23.7 \pm 2.9)	22—31 (26)
b	3.4—7.1	(5.8 \pm 0.9)	4.4—6.7	(5.8 \pm 0.6)	
b'	2.2—4.1	(3.3 \pm 0.5)	2.1—3.6	(2.9 \pm 0.3)	3.3—3.7
c	10.8—12.9	(11.6 \pm 0.7)	10.7—14.6	(13.2 \pm 1.0)	10—12 (11)
c'	3.1—4.1	(3.5 \pm 0.3)	1.9—3.2	(2.7 \pm 0.3)	2.9—3.8 (3.3)
V (%)	65.6—70.9	(67.5 \pm 1.4)	67.5—72.6	(69.3 \pm 1.6)	66—71 (69)
V' (%)	72.1—77.5	(73.9 \pm 1.4)		(75.0)*	(75.9)*
spear (μm)	16.5—19.8	(18.0 \pm 0.8)	14.3—19.5	(16.9 \pm 1.2)	15—18 (16.5)
conus (μm)	7.3—10.2	(8.9 \pm 0.75)	7.2—9.9	(8.5 \pm 0.7)	
m (%)	44.0—60.0	(49.4 \pm 3.3)		(50.3)*	
Eso. (μm)	70.0—117.5	(89.1 \pm 12.9)	56.2—89.1	(73.1 \pm 8.2)	
Ex. pore. (μm)	66.7—95.0	(81.7 \pm 6.3)	59.7—84.3	(71.5 \pm 7.0)	
E.P. (%)	13.9—19.0	(16.3 \pm 1.3)	13.3—21.6	(17.0 \pm 1.6)	
G ₂ (%)	4.6—10.7	(7.5 \pm 1.6)		(7.9)*	
post uter. (μm)	23.1—49.5	(37.7 \pm 7.4)	8.9—42.9	(33.5 \pm 6.4)	
U	1.3—3.0	(2.2 \pm 0.5)	1.2—3.0	(2.0 \pm 0.4)	
tail (μm)	34.3—51.5	(43.6 \pm 4.9)	23.1—41.4	(32.1 \pm 4.0)	(44.5)*
vulva-anus (μm)	93—145	(121 \pm 18)		(97.5)*	(107.5)*
T/V-a (%)	32.4—41.8	(36.4 \pm 2.8)		(32.9)*	37—43 (39.5)
annule (μm)	1.0—1.5	(1.3 \pm 0.16)			(1.4)
tail annules	22—29	(26 \pm 1.8)	17—26	(21 \pm 2.1)	23—26
P.h. (%)	72.0—94.6	(81.3 \pm 6.7)		(72.0)*	
males (n)	4		10	not found	
L (μm)	449—497	(473)	358—454	(415 \pm 26)	
a	29.5—33.5	(31.5)	24.0—32.9	(29.4 \pm 3.1)	
b	6.1—7.9	(7.3)	4.8—6.6	(5.9 \pm 0.6)	
b'	3.8—5.0	(4.5)	3.0—4.6	(4.1 \pm 0.5)	
c	10.2—11.2	(10.6)	10.8—13.9	(12.1 \pm 0.9)	
c'	4.2—4.9	(4.5)	2.6—3.7	(3.3 \pm 0.4)	
testis (μm)	108.9—189.4	(146.2)	76.4—113.7	(96.0 \pm 11.8)	
spear (μm)	12.5—15.5	(13.4)	9.5—13.9	(11.5 \pm 1.6)	
conus (μm)	5.6—8.6	(6.8)	5.7—8.2	(7.0 \pm 0.7)	
m (%)	42.5—55.3	(50.1)		(60.9)*	
ex. pore (μm)	74.6—82.5	(78.0)	68.2—80.2	(74.6 \pm 3.8)	
E.P. (%)	16.1—16.9	(16.5)	16.6—19.6	(18.0 \pm 0.8)	
spicule (μm)	14.5—17.8	(16.3)	13.3—17.7	(15.8 \pm 1.3)	
gube. (μm)	9.6—11.9	(10.9)	8.2—10.1	(9.7 \pm 0.7)	
spicule/spear	1.10—1.32	(1.22)		(1.37)*	
tail (μm)	43.6—45.5	(44.5)		(34.3)*	

*: range (mean \pm standard deviation).

*: calculated from means of other available dimensions.

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和文摘要

九州産ラドフォルス属線虫 *Radopholus sanoii* (新種) の記載

水久保隆之

大分県玖珠郡九重町寺床のススキ・ネザサ根圏土壌から検出された *Radopholus* 属線虫の形態を精査した結果、新種と判断されたので *Radopholus sanoii* と命名、記載した。本種は後部卵巣が著しく退化しているため、*Pratylenchus* 属の種と混同され易いが、後部食道腺葉が体の背側で腸に重なり、V値が70%以下と低い点等に注意すれば、ネグサレセンチュウから識別できる。本種に最も近似する *Radopholus triversus* (MINAGAWA, 1984) は、3本の側線と概して丸い尾端を持っており、この点からここで扱った新種と区別されたが、諸計測値の重なりは概して大きかった。