

Species of the genera *Oxydirus*, *Dorylaimellus* (*Axodorylaimellus*), *Laimydorus* and *Rhabdolaimus* from rivers in the Kruger National Park (Nematoda: Dorylaimida and Araeolaimida)

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Descriptions are given of *Oxydirus gangeticus* Siddiqi, 1966, *Laimydorus africanus* spec. nov. and *Rhabdolaimus terrestris* De Man, 1880, recorded for the first time from South Africa. New distribution records are given for *Dorylaimellus* (*Axodorylaimellus*) *caffrae* (Kruger, 1965). Additional information is given and morphometric data are tabulated and where appropriate, illustrations are also given.

Key words: Nematoda, *Oxydirus*, *Dorylaimellus* (*Axodorylaimellus*), *Laimydorus*, *Rhabdolaimus*, taxonomy, South Africa, Kruger National Park.

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Introduction

This is the fifth in a series of papers on nematodes from rivers in the Kruger National Park. The previous papers (Botha & Heyns 1991, 1992a, 1992b, 1992c), dealt with species of various genera from these rivers. The present paper reports on species of *Oxydirus*, *Dorylaimellus* (*Axodorylaimellus*), *Laimydorus* and *Rhabdolaimus*.

Materials and Methods

Specimens were killed by gentle heat, fixed in FAA, processed into glycerine by Thorne's slow method, and mounted on permanent slides. Measurements and drawings were done with the aid of a Zeiss Standard 18 research microscope equipped with a drawing tube. All measurements, except the total body length which is in millimeter, are given in micrometers in the tables as well as in the text. Curved structures, eg. spicules, were measured along the curved median line.

All specimens are deposited in the collection of the Department of Zoology, Rand Afrikaans University, Johannesburg.

Descriptions

Family: Oxydiridae Thorne, 1964

Oxydirus gangeticus Siddiqi, 1966
(Fig. 1A–I).
Morphometric data in Table 1.

Female

Medium-sized nematode with slender body. Heat-relaxed body posture almost straight (Fig. 1I). Cuticle thin: 1,5–2 μm on the neck; 2–2,5 μm at mid-body; and 3–4 μm on dorsal side of tail. Cuticle with faint transverse striations rather more prominent towards neck. Cuticle thickened at anterior end. Lateral chords about one fifth body diameter at base of oesophagus, not very prominent. Lateral, ventral and dorsal body pores obscure, except for the anteriormost two or three pores which are distinct.

Lip region confluent with the body and about one fourth as wide as body at base of oesophagus. Lips rounded and amalgamated (Fig. 1A–C). Amphid stirrup-shaped, its aperture

Table 1
Morphometric characters of *Oxydirus gangeticus* Siddiqi, 1966

Locality	Sabie River	Type population (According to Siddiqi, 1966)	
		Holotype Female	3 Females
<i>n</i>	10 Females		
L(mm)	1,57(1,47–1,68)	1,57	1,34–1,66
a	49,4(46,9–52,5)	42	41–45
b	6,4(6,0–6,7)	6,4	6,0–6,4
c	5,8(5,1–6,9)	7	6–7
c'	14,2(12,3–15,6)	–	–
V%	37,3(30,9–39,9)	37	35–37
Lip region width	8(7–9)	–	–
Odontostyle length	7(5,5–8)	6–7	–
Guiding ring from anterior end	6(5–7)	–	–
Nerve ring from anterior end	97(94,5–99)	–	–
Basal oesophageal bulb length	108(99–129)	115	–
Basal oesophageal bulb width	13(12–15)	19	–
Oesophagus length	247,5(230–275)	–	–
Body width at vulva	32(28–34,5)	–	–
Tail length	273(242,5–304)	–	–
Anal body diameter	19(18–20,5)	–	–
Rectum length	25,5(24–29)	–	–
Prerectum length	129,5(70,5–174)	–	–
L'	1,30(1,18–1,44)	–	–
a'	40,8(38,1–42)	–	–
b'	5,3(5,0–6,0)	–	–
V%'	45,9(43,7–48,4)	–	–

$$L' = \text{total body length} - \text{tail length} \quad a' = \frac{L'}{\text{width of body at vulva}}$$

$$b' = \frac{L'}{\text{length of oesophagus}} \quad V\% = \frac{\text{length of body from anterior end to vulva} \times 100}{L'}$$

about two-thirds lip region width. Odontostyle short and thin, its length slightly less than lip region width. Guiding ring single and weakly sclerotized. Odontophore not very well developed, short and slightly expanded at its base. Anterior part of oesophagus which surrounds odontophore set off from rest of oesophagus by a shallow constriction. Oesophagus a slender tube, enlarging a little behind its middle to form a strongly muscular cylindroid bulb, which occupies 42–47% of total neck length. Basal bulb surrounded by a relatively well-developed spiral muscular sheath. Cardia tongue-shaped, 7–12 µm in

length. Nerve ring well developed, situated at 99,5–129 µm from anterior end. Oesophageal gland nuclei and their openings obscure.

Intestinal cells packed with small to medium-sized greenish granules; intestine about eight cells in circumference. Junction between intestine and prerectum distinct. Sphincter at junction of prerectum and rectum not clearly observed in all specimens. Much variation in length of prerectum; 3,5–9,2 times anal body diameter. Rectum length about 1,2–1,6 times anal body diameter. Tail elongate — filiform with acute terminus (Fig. 1E & F). Caudal

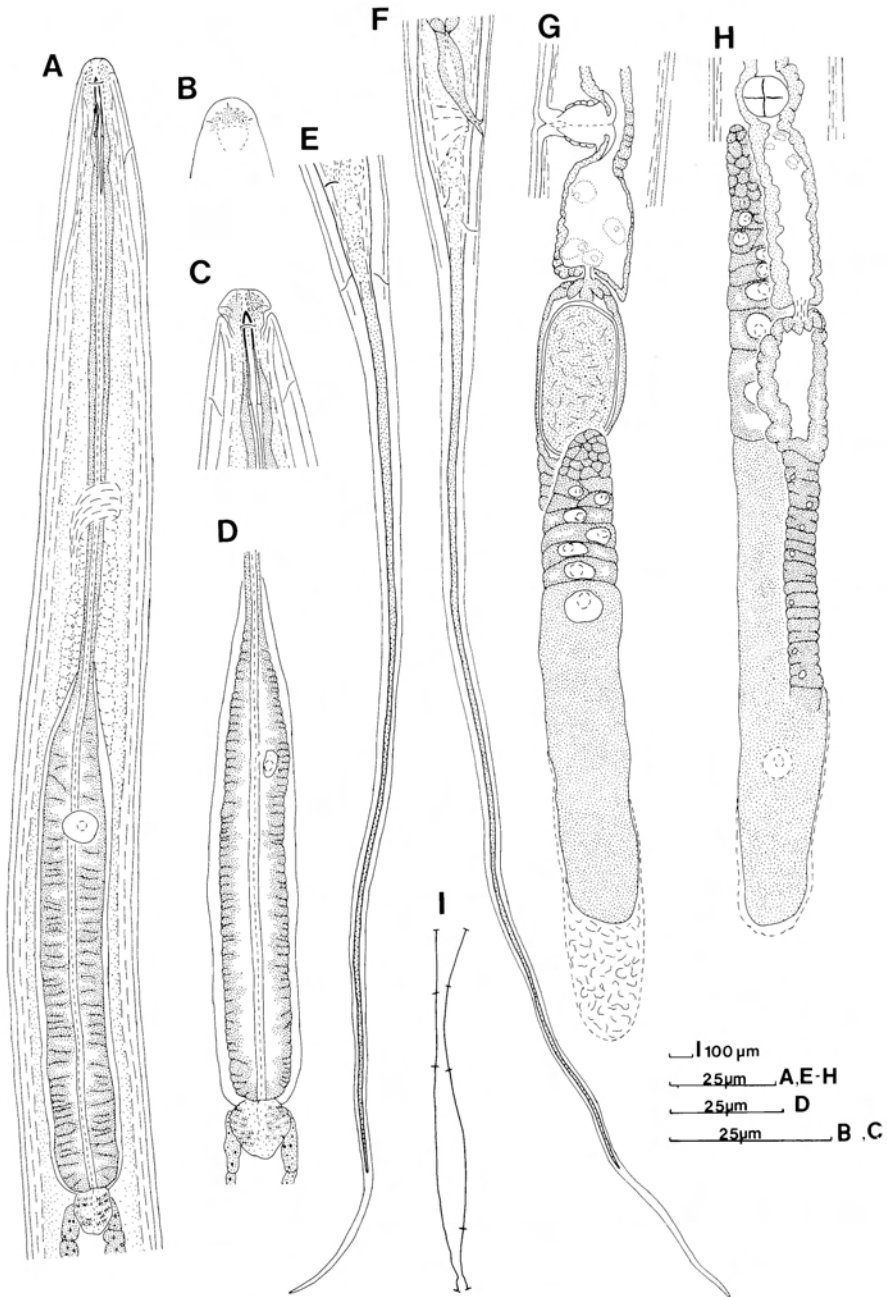


Fig. 1 *Oxydirus gangeticus* Siddiqi, 1966: A. Anterior body region of female; B. Shape and position of amphid; C. Dorso-ventral view of head; D. Basal bulb of oesophagus; E and F. Female tail; G. and H. Posterior branch of female reproductive system; I. Heat-relaxed body posture of two females.

Table 2
Morphometric characters of Dorylaimellus (Axodorylaimellus) caffrae (Kruger, 1965)

Locality	Sabie River	Type population (According to Siddiqi, 1966)
<i>n</i>	6 Females	3 Females
L(mm)	0,47(0,41-0,58)	0,44-0,47
a	26,4(24-27,6)	26-27
b	2,9(2,6-3,4)	2,4-3,0
c	29,5(25,6-38,7) ⁽ⁿ⁼⁵⁾	27-29
c'	1,4(1,2-1,7) ⁽ⁿ⁼⁵⁾	-
V%	57(54,9-58,4)	57-61
Lip region width	5,5	-
Odontostyle length	5(4,5-5,5)	-
Length of spear extensions	9(7,5-10)	-
Amphid aperture	5 ⁽ⁿ⁼⁵⁾	-
Nerve ring from anterior end	50	-
Oesophagus length	159,5(150-167)	-
Distance from head to vulva	27(23-33)	-
Tail length	16(15,5-16,5) ⁽ⁿ⁼⁵⁾	-
Anal body width	11,5(10-13) ⁽ⁿ⁼⁵⁾	-
Rectum length	14(11-17,5) ⁽ⁿ⁼³⁾	-
Prerectum length	33(21,5-45) ⁽ⁿ⁼³⁾	-
Cuticle width: on the neck	1	-
: at mid-body	1(1-1,5)	-
: at dorsal side of tail	1(1-1,5)	-
: around tail tip	3,5(3-4)	-

papillae not very well developed, apparently two pairs of papillae present, one pair situated ventrally slightly more than one anal body diameter from anus and another pair sublaterally about one anal body diameter from anus.

Female didelphic, amphidelphic (Fig. 1G & H). Ovaries distinct, reflexed. *Pars dilatata oviductus* separated from uterus by a prominent sphincter muscle. Oviduct long and well-developed with about 20 relatively distinct cells. Uterus short, not differentiated into ovejector and *pars dilatata*. Vagina muscular, reaching 55–58% of the corresponding body diameter. Vulva a transverse slit, 5–6 µm long, without sclerotized labia. One egg observed in *pars dilatata oviductus* measuring 34,5 µm x 17 µm (*n* = 1). No sperm cells observed in uterus.

Male not found.

Remarks

The original description of *Oxydirus gangeticus* was based on females collected from soil around the roots of grass on the bank of the Ganges River, India by Siddiqi (1966). The present specimens from the Kruger National Park are similar to the types except for a slightly larger a-ratio (*a* = 46,9–52,5 compared with *a* = 41–45); and a slightly larger c'-ratio (c' = 12,3–15,6 compared with 12–13). It is also very similar to the specimens from Indiana (Ferris *et al.* 1980) except for a longer tail (242,5–304 µm compared with 224–249,6 µm), a slightly more anteriorly situated vulva (V = 30,9–39,9 % compared with V = 37–39%), a slightly shorter odontophore (9–11,5 µm compared with 15

Table 3
Morphometric characters of *Laimydoros africanus spec. nov.*

Locality	Levuvhu River		
	Holotype	Paratypes	
<i>n</i>	Female	3 Females	2 Males
L(mm)	1,40	1,45(1,43-1,47)	1,34 ; 1,32
a	33,3	31(29,1-33,3)	33,5 ; 34,3
a'	38,9	40,3(39,2-41,7)	41,2 ; 41,3
b	4,6	5,0(4,9-5,1)	5,6 ; 4,4
c	15,2	14,7(13,7-15,9)	89,3 ; 94,3
c'	5,3	5,6(5,3-5,9)	0,8 ; 0,7
V%	44,3	46,8(45,6-47,9)	- ; -
Lip region width	8	8(8-9)	8,5 ; 9
Odontostyle length	18	11,5(16,5-18)	18 ; 16
Odontostyle width	2	2	2 ; 2
Odontophore length	18	16(14-17,5)	12,5 ; 14
Odontostyle aperture	4	5(5-5,5)	5,5 ; 4,5
Stylet aperture as % of stylet length	22,2	29(27,8-30,3)	27,8 ; 28,1
Guiding ring from anterior end	10	10(10-11)	10 ; 11
Amphid aperture			- ; -
Nerve ring from anterior end	121	119,5(112-124)	107,5 ; 115,5
Oesophagus length	305	287(280-300)	240 ; 300
Body width	42	47(43-50,5)	40 ; 38,5
Tail length	92	99(90-107)	15 ; 14
Anal body diameter	17,5	18(17-19)	19 ; 20
Rectum length	30,5	37(35,5-38,5)	- ; -
Prerectum length	65	72(64-78)	224 ; 190
Spiculus length	-	-	39 ; 38,5
Length of lateral guiding pieces	-	-	7 ; 8,5
Number of ventromedian supplements	-	-	18 ; 19
Number of subventral papillae	-	-	11 ; 11

µm) and a slightly longer basal bulb (99–129 µm compared with 99,2–105,6 µm).

Locality and habitat

Ten females collected from three different localities in the Sabie River: in sand from the river bank between the Nkuhlu picnic-area and Lower Sabie Camp, in sand between *Phragmites* just east of Skukuza Camp, and in river sediment near the weir of the Lisbon Estates, collected by A. Botha and J. Heyns in February, 1990.

Specimens

Specimens on slides W2542, W2557, W2571, W2573, W2644, W2645 and W2660.

Family: Dorylaimellidae (Jairajpuri, 1964) Thorne, 1964

Dorylaimellus (*Axodorylaimellus*) *caffrae*
(Kruger, 1965) Jairajpuri & Ahmad,
1980.
Morphometric data in Table 2.

The original description of *Dorylaimellus* (*Axodorylaimellus*) *caffrae* was based on specimens collected in agricultural fields and

compost heaps in several localities in South Africa (Kruger 1965). The present specimens from the Kruger National Park agree well with the type population except for a slightly longer body ($L = 0,41-0,58$ mm compared with $L = 0,44-0,47$ mm), a slightly larger c-ratio ($c = 25,6-38,7$ compared with $c = 27-29$) and a slightly more anteriorly situated vulva ($V = 54,9-58,4$ % compared with $V = 57-61$ %).

Locality and habitat

Specimens from two sampling points in the Sabie River: from sand among the roots of *Phragmites* near the weir east of the Lower Sabie Camp and in sand just east of Skukuza Camp, collected by A. Botha and J. Heyns in February, 1990.

Specimens

Specimens on slides W2584, W2598 and W2654.

Family: Dorylaimidae De Man, 1876

Laimydorus africanus spec. nov.

(Fig. 2A-I).

Morphometric data in Table 3.

Female

Medium-sized nematode with relatively slender body. Heat-relaxed body posture almost straight (Fig. 2H). Cuticle thin: $2-2,5$ μm on the neck; $2-3$ μm at mid-body and $2-3$ μm at dorsal side of tail. Exocuticle with faint transverse striae. Lateral chords about one fourth as wide as body at base of oesophagus; granular and with small cells. Lateral, dorsal and ventral body pores obscure.

Lip region set off by a shallow constriction, about one fifth to one fourth as wide as body at base of oesophagus. Lips amalgamated and rather angular in outline, with protruding papillae (Fig. 1A-C). Amphid stirrup-shaped, its aperture slightly more than one half the lip region width. Odontostyle distinct and slender, about twice as long as lip region width,

its aperture slightly less than one third stylet length. Stylet width about one ninth stylet length. Odontophore not very distinct, about equal to stylet in length. Guiding ring appearing double, weakly sclerotized. Hemizonid situated posterior to nerve ring, which is situated at $112-124$ μm from anterior end. Basal bulb of oesophagus enveloped by a thin muscular sheath. Cardia elongate-conoid, variable in length (Fig. 1A & D). Oesophageal gland nuclei not observed; openings of glands observed in one female ($n = 1$) $DO = 61,2$; $S_1O_2 = 78,2$; $S_2O_1 = 90,1$; $S_2O_2 = 90,5$; S_1O_1 obscure.

Intestine about eight cells in circumference, cells packed with numerous small to large yellowish-brown granules. Junction between intestine and prerectum distinct. Sphincter at junction of prerectum and rectum relatively well-developed. Prerectum length about $3,7-4,8$ times anal body diameter. Rectum length about $1,7-2,3$ times anal body diameter. Anal muscles relatively prominent, consisting of four to five bands. Tail elongate-conoid with an acute terminus (Fig. 2F). Only one pair of caudal papillae observed, situated laterally at about one and a half anal body diameters posterior to anus. Hyaline part of tail tip varies from $19-25$ μm in length.

Female didelphic, amphidelphic (Fig. 2G). Ovaries very long, distinct and reflexed. Ovary of posterior reproductive branch of one female reflexed twice (second flexure of ovary at germinal zone). Oviduct relatively short but well-developed. The *pars dilatata oviductus*, which is large and packed with sperm cells, is separated from the uterus by a weakly developed sphincter muscle. Uterus relatively long, divided into three parts: first part nearest to vagina, long and wide and packed with sperm cells; the second part forms a weakly developed α -differentiation (Fig. 2G), with strongly muscular walls and weakly sclerotized structures in the lumen; and the third part a weakly developed *pars dilatata uteri*, which is packed with sperm cells. Ovejector not clearly differentiated. Vagina muscular, reaching about 64% of the

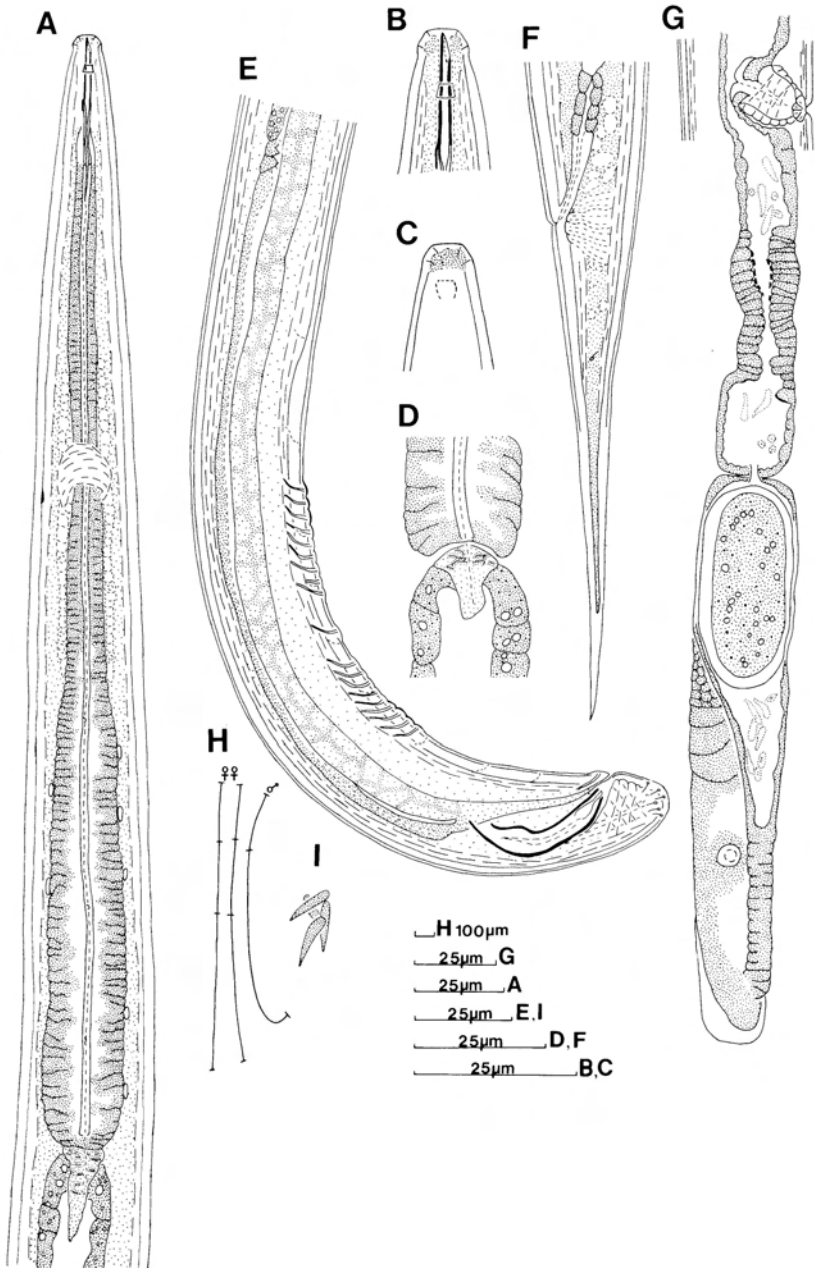


Fig. 2. *Laimydorus africanus* spec. nov: A. Anterior body region of female; B. Lateral view of head region; C. Shape and position of amphid; D. Cardiac region; E. Posterior region of male body; F. Female tail; G. Posterior branch of female reproductive system; H. Heat-relaxed body posture of two females and one male; I. Sperm cells.

corresponding body diameter. Weakly sclerotized pieces present between vagina and vulva. Vulva a small longitudinal slit. Uterus with one egg at a time, measuring 57–62 μm x 22,5–23 μm ($n = 4$), and one egg observed in *pars dilatata oviductus* of one female. Eggs measure 55–65 μm x 22–23 μm ($n = 3$). Measurements exclude width of egg shell, which varies from 2,5 μm to 4 μm .

Male

Male similar to female except posterior part of body may be more strongly ventrally curved, in the shape of the letter J (Fig. 2H). Male diorchic, testes opposed and outstretched; anterior testis reaching base of oesophagus. Length of posterior and anterior testes 250,5–342 μm and 286–339 μm respectively. Sperm cells elongate, acute at one end and bluntly rounded at other end, 12–14 μm long (Fig. 2I). Spicules relatively slender, 38,5–39 μm long. Lateral guiding pieces 7–8,5 μm long. Supplements consisting of an adanal pair and 18–19 ventromedians, the latter arranged in two fascicles with a solitary supplement between the fascicles; the anterior fascicle consisting of nine and posterior fascicle of eight to nine contiguous supplements. Subventral papillae 11 pairs irregularly spaced, extending 36,5 μm beyond anterior fascicle. Copulatory muscles reaching just beyond subventral papillae. Pre-rectum-intestine junction situated far beyond anterior fascicle. Tail convex-conoid, with a bluntly rounded terminus (Fig. 2E). Seven pairs of caudal papillae present near the terminus. Pre-rectum length 9,5–11,8 times anal body diameter.

Diagnosis

Laimydorus africanus spec. nov. has a relatively short body with a long and slender odontostyle. Female reproductive system with weakly developed z -differentiation and weakly sclerotized pieces between vagina and vulva. The ventromedium supplements of male arranged in two fascicles with a solitary supplement between the two fascicles.

Differential diagnosis

Laimydorus africanus spec. nov. is close to *L. cryptosperma* (Loof, 1969) Baqri & Coomans, 1973 and *L. stenopygus* (Andrássy, 1968) Siddiqi, 1969. It differs from *L. cryptosperma* by having a shorter body (Female: $L = 1,40\text{--}1,47$ mm vs. $L = 1,94\text{--}2,30$ mm; Male: $L = 1,34$ & $1,32$ mm vs. $L = 1,80\text{--}2,13$ mm), a larger c -ratio (Female: $c = 13,7\text{--}15,9$ vs. $c = 10\text{--}12$; Male: $c = 89,3$ & $94,3$ vs. $c = 64\text{--}84$); a shorter odontostyle (16–18 μm vs. 20–22 μm); a shorter odontophore (12,5–18 μm vs. 33–35 μm); smaller eggs (55–65,8 μm x 22–23 μm vs. 71–90 μm x 31–36 μm); shorter spicules (39 & 38,5 μm vs. 52–58 μm); shorter lateral guiding pieces (7 & 8,5 μm vs. 16 μm), less ventromedian supplements (18 & 19 vs. 21–25), less subventral papillae (11 pairs vs. 14 pairs) and the lips are amalgamated with protruding papillae compared with well-developed lips without protruding papillae.

Laimydorus africanus spec. nov. differs from *L. stenopygus* by being shorter (Female: $L = 1,40\text{--}1,47$ mm vs. $L = 1,90\text{--}2,22$ mm) and by having a larger b -ratio (Female: $b = 4,6\text{--}5,1$ vs. $b = 4,0\text{--}4,3$); Male: $b = 5,6$ & $4,4$ vs. $b = 4,0\text{--}4,2$); a larger c -ratio (Female: $c = 13,7\text{--}15,9$ vs. $c = 11,1\text{--}11,5$); a shorter odontostyle (16–18 μm vs. 25–29 μm); a shorter odontophore (12,5–18 μm vs. 32–34 μm); larger eggs (55–65 μm x 22–23 μm vs. 30–35 μm x 16–18 μm); smaller spicules (39 & 38,5 μm vs. 48–50 μm); and less ventromedian supplements (18 & 19 vs. 28–29).

Laimydorus africanus spec. nov. differs also from the abovementioned species by the presence of a z -differentiation in the uterus. This is the first time that a z -differentiation is observed in a *Laimydorus* species.

Type locality and habitat

Type specimens collected from a stagnant pool east of Pafuri by J. Heyns in February, 1991.

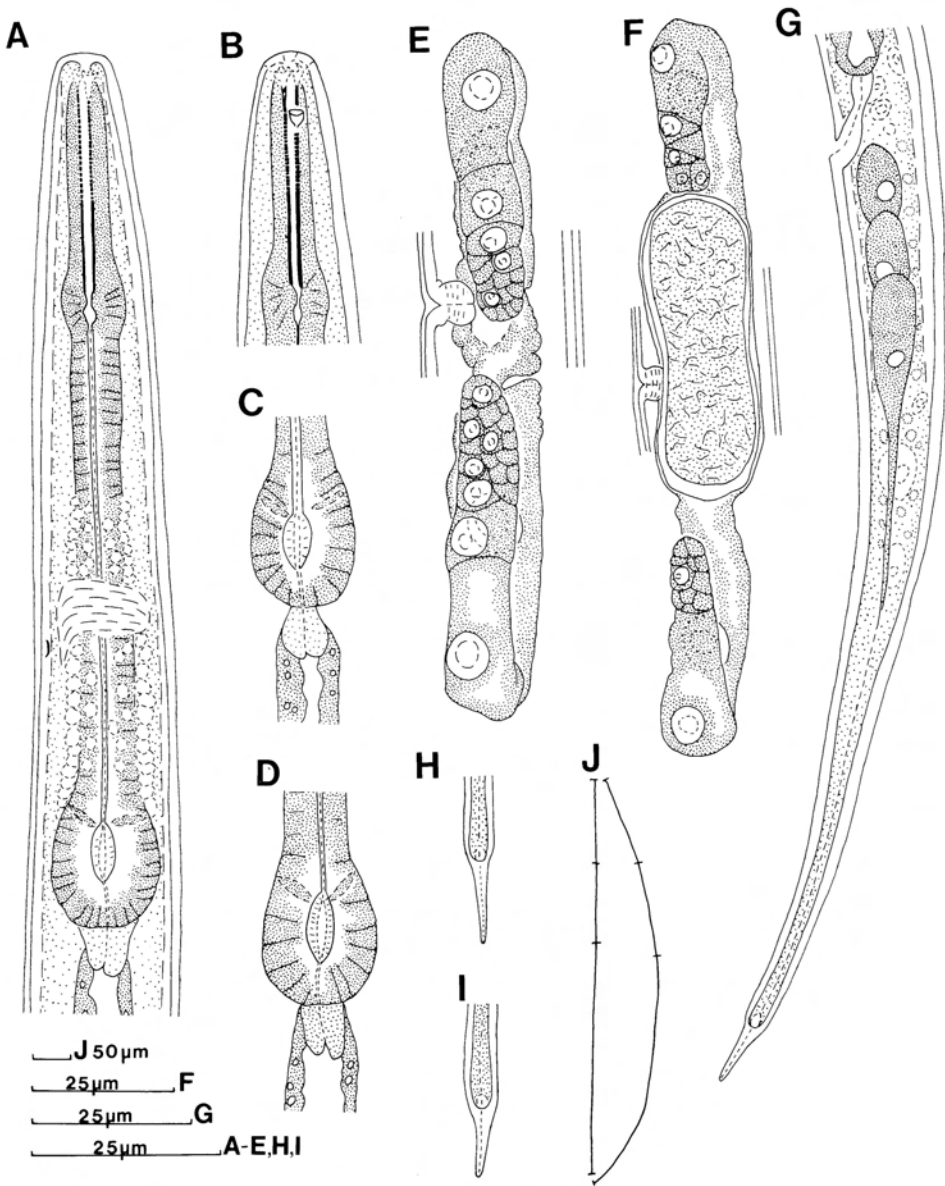


Fig. 3. *Rhabdolaimus terrestris* De Man, 1880: A. Anterior body region of female; B. Lateral view of head region; C and D. Basal bulb of oesophagus; E and F. Reproductive system of female; G. Female tail; H and I. Variation in spinneret length; J. Heat-relaxed body posture of two females.

Table 4
Morphometric characters of Rhabdolaimus terrestris De Man, 1880

	Sabie River	According to Khera (1972)
<i>n</i>	10 Females	4 Females
L(mm)	0,57(0,44-0,64)	0,49-0,56
a	24,8(23,1-28,1)	23-25
b	4,9(4,0-5,4)	4,5-5,1
c	3,9(3,7-4,1)	3,5-4
c'	8,1(7,5-9,4)	-
V%	41,9(40,5-44,8)	39-43
Lip region width	8(7,5-10)	-
Stoma length	29,5(27-32,5)	-
Stoma width	1,5	-
Amphid	2 (<i>n</i> =1)	-
Hemizonid from anterior end	73,5 ; 77,5	-
Oesophagus length	112(105-117,5)	-
Basal bulb length	20(18-23)	-
Basal bulb width	14,5(13,5-16,5)	-
Body width	22(19-26)	-
Distance from head to vulva	23(19,5-26)	-
Vagina length	8(7-9)	-
Tail length	143(115,5-160,5)	-
Anal body diameter	18(15-20)	-
Rectum length	11(9-12)	-
Spinneret length	10(9-12)	-
Egg: length	55,5 (<i>n</i> =1)	-
width	17 (<i>n</i> =1)	-

Type specimens

Holotype on slide W2840; paratypes on slide W2859.

Family: Rhabdolaimidae Chitwood, 1951

Rhabdolaimus terrestris De Man, 1880
 (Fig. 3A-J).
 Morphometric data in Table 4.

Female

Relatively small nematode, with robust body. Heat-relaxed body posture almost straight to slightly ventrally curved posteriorly (Fig. 3J). Cuticle thin: 1–1,5 µm on the neck; 1–2 µm at mid-body, and 2 µm on dorsal side of tail. Exocuticle appearing smooth; subcuticle with faint transverse striae. Lateral chords slightly more than one fourth as wide as body

at base of oesophagus; granular with small cells.

Lip region confluent with body, about one fifth to one fourth as wide as body at base of oesophagus (Fig. 3A & B). Lips fused and rather rounded in outline. Papillae indistinct. Amphid narrow, stirrup-shaped, situated at about 9 µm from anterior end, its aperture very small, and indistinct. Stoma tubular, its walls sclerotized and the anterior half of stoma walls striated. Posterior to the base of the stoma there is a small interruption in the normal contour of the oesophageal lumen (Fig. 3A & B). Small denticles present at anterior end of stoma.

Anterior part of oesophagus almost cylindrical, expanding slightly in region of stoma base to form a short probulbus. Basal bulb of oesophagus muscular with a valve apparatus.

Walls of valve striated. At the anterior end of the valve there is a transverse interruption in the musculature of the basal bulb. Cardia about one third as long as body width at base of oesophagus (Fig. 3C & D). Hemizonid situated opposite nerve ring.

Intestine about six cells in circumference, cells with medium-sized light green granules. Rectum length about 0,5–0,7 times anal body diameter. Tail elongate-conoid, tapering gradually to a bluntly rounded terminus (Fig. 3G). Three well-developed caudal glands present, lying in tandem, opening with a duct in a terminal spinneret, varying in length (Fig. 3H&I).

Female didelphic, amphidelphic (Fig. 3E & F). Genital system short. Ovaries reflexed ventrally or dorsally, relatively well-developed. Oviduct broad, cells not clearly differentiated; part nearest to vagina slightly expanded, no distinct *pars dilatata oviductus* or sphincter observed. Uterus when not containing an egg, very short and indistinct. Vagina strongly muscular. Vulva a small transverse slit. One egg observed in uterus, measuring 55,5 µm x 17 µm.

Remarks

Rhabdolaimus terrestris is a cosmopolitan species which was first reported from the Netherlands (De Man 1880). The specimens from the Kruger National Park agree more closely with the specimens reported from India by Khera (1972). They differ from the Indian population by being slightly longer (L = 0,44–0,64 mm vs. L = 0,49–0,56 mm) and having slightly larger eggs (55,5 µm x 17µm vs. 48 µm x 15 µm).

In view of the magnitude of variation reported in different populations of *R. terrestris* and the possibility that we may be dealing with a group of closely-related species, we considered it best to give a full description of our specimens.

Locality and habitat

Specimens collected in three sampling points in the Sabie River, namely: in river sediment east of the confluence of the Nwatinlopfu Spruit and Sabie River, in water and sand among the roots of *Phragmites* near the confluence of the Sabie Rivers, and in sand among the roots of *Phragmites* just east of Skukuza Camp; all collected by A. Botha and J. Heyns in February 1990.

Specimens

Specimens on slides W2606, W2608, W2609, W2631, W2633, W2634 and W2652.

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