Freshwater nematodes of the genera *Thornenema* and *Mesodorylaimus* from the Kruger National Park with a diagnostic species compendium for South African species of the genus *Mesodorylaimus* (Nematoda: Dorylaimida)

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Complete descriptions are given of *Mesodorylaimus potus* Heyns, 1963, a new record for the Kruger National Park and *M. aegypticus* (Andrássy, 1958) recorded here for the first time from South Africa. Additional information and new distribution records are given for *Mesodorylaimus* sp. cf. *paralitoralis* (Basson & Heyns, 1974) and *Thornenema baldum* (Thorne, 1939). A compendium is also presented for the 17 recognized *Mesodorylaimus* species from South Africa.

Keywords: *Thornenema*, *Mesodorylaimus*, Dorylaimida, Nematoda, taxonomy, South Africa, Kruger National Park.

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Introduction

In a previous paper we reported on various Dorylaimoidea (Botha & Heyns 1991) from several rivers in the Kruger National Park. The present paper deals with one *Thornenema* species and three *Mesodorylaimus* species which were also obtained from these rivers and the present report of *Thornenema baldum* (Thorne, 1939), is only the second record of this species from South Africa.

Although several species of the genus *Mesodorylaimus* Andrssy, 1959, have been recorded from South Africa by Heyns (1963), Van der Vegte & Heyns (1963), Heyns (1971), Basson & Heyns (1974) and Heyns & Kruger (1983), only one *Mesodorylaimus* species viz. *M. arvensis* Cobb in Thorne & Swanger (1936) has been reported from the park by Van der Vegte & Heyns (1963). Three more species are now reported from the park and one of these, *M. aegypticus* Andrssy, 1958, is a new record for South Africa, bringing the total number of South African species to seventeen (See list of species on page 41).

Materials and Methods

Specimens were killed by gentle heat, fixed in FAA and processed into glycerine by Thorne's slow method and mounted as permanent preparations. 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 mm, are given in μm in the tables as well as in the text. Curved structures, e.g. spicules, were measured along the curved median line. All specimens, except where otherwise stated, are deposited in the collection of the Department of Zoology, Rand Afrikaans University, Johannesburg.

Descriptions

Family: Thornenematidae Siddiqi, 1969

Thornenema baldum (Thorne, 1939)
Andrssy, 1959

Syn. *Dorylaimus baldus* Thorne, 1939

Morphometric data in Table 1.

Thornenema baldum has been reported by several authors from various parts of the world. It was first reported from South Africa by Carbonell & Coomans in 1986, from non-cultivated soil at Sibasa. The present speci-

Table 1
Morphometric characters of *Thornenema baldum* (Thorne, 1939).

Locality	Sibasa (After Carbonell & Coomans 1986)	Sabie River	Luvuvhu River
<i>n</i>	3 Females	8 Females	3 Females
L(mm)	0,95(0,92-1,0)	1,09(1,02-1,15)	1,11 (1,10-1,11)
a	24,7(23,7-26,1)	29,4(28-32,5)	30,3(29,7-30,8)
b	4,9(4,4-5,4)	5,0(4,7-5,3)	5,1(5,0-5,2)
c	6,7(6,3-7)	7,6(7,1-8,1)	7,1(6,8-7,4)
c'	6,8(6,5-7,1)	6,5(5,4-7,4)	7,4(7,2-7,6)
V%	33,3(32,3-35,5)	33,6(31,7-35,0)	32,7(30,1-35,0)
Lip region width	10,2(10-10,5)	11(10,5-11,5)	11
Odontostyle length	11,5	11,5(10,5-13)	11,2(11-11,5)
Odontostyle width	-	2	1,8(1,5-2)
Odontophore length	18,5	19(18-20)	20(18,5-21,5)
Stylet aperture length	-	3,5(3-4)	3,7(3,5-4)
Stylet aperture as % of stylet length	-	31(27-36)	32,8(31,8-34,8)
Guiding ring from anterior end	8	8(7,5-8,5)	8,8(8,5-9)
Nerve ring from anterior end	81(76-86,5)	94(91-100)	94,5(88-99)
Oesophagus length	188(177,5-198,5)	215(210-220)	218(215-220)
Body width	36,7(32,5-39)	37(34-38,5)	36,5(36-37)
Distance from head to vulva	-	36,7(35,5-39,5)	36,5(34,0-38,5)
Vagina length	-	16(15-17,5)	16,5(15,5-17,0)
Tail length	140(132-146)	142,6(135-149)	156(153-164)
Anal body diameter	20,3(20-20,5)	21,5(19,5-25,5)	21,2(21-21,5)
Rectum length	25,9(24,6-27,5)	25,5(22-27)	26(25-27,5)
Prerectum length	44,9(33,5-56,5)	44(37-57,5)	41(39,5-43,5)
Cuticle width: on the neck	-	2(1,5-2,5)	2,7(2,5-3)
: at mid-body	2	2,5(2-3)	2,2(2-2,5)
: dorsal side of tail	3,8(3,5-4)	3,7(3,5-4,5)	3(2,5-3,5)

mens from the Kruger National Park are similar to the Sibasa population, except for a slightly longer body ($L=1,02-1,15$ mm compared with $L = 0,92-1,0$ mm); a more posteriorly situated nerve ring ($88,0-100$ μ m from anterior end, compared with $76,0-86,5$ μ m from anterior end); a longer oesophagus ($210-220$ μ m compared with $177,5-198,5$ μ m); and a slightly longer tail ($135,0-164,0$ μ m compared with $132,0-146,0$ μ m). The shape of the lip region as well as the slightly triangular shape of the post-labial sclerotization are similar to those of the Sibasa population, and the body is also slightly ventrally curved upon fixation.

Locality and Habitat

Eight specimens from three different localities in the Sabie River, namely: in sand from

the river bank between the Nkuhlu picnic area and Lower Sabie Camp; in the sand between *Phragmites* at the weir east of Lower Sabie Camp and in sand near the weir of the Lisbon Estates west of Skukuza Camp; collected by A. Botha and J. Heyns in February, 1990. Three specimens from one locality in the Luvuvhu River, namely in mud from the bank near the picnic area north-west of Pafuri, collected by J. Heyns in February, 1991.

Specimens

Specimens from Sabie River on slides W2542, W2549, W2553, W2557, W2598 and W2664; specimens from Luvuvhu River on slides W2816, W2820 and W2821.

Table 2
Morphometric characters of *Mesodorylaimus* sp. and of *M. paralitoralis* Basson & Heyns, 1974

Locality	<i>M. paralitoralis</i> (After Basson & Heyns 1974)		<i>Mesodorylaimus</i> sp. from Luvuvhu River
	Holotype	Paratypes	
<i>n</i>	1 Female	7 Females	1 Female
L(mm)	1.28	1.15(1.07-1.21)	1.25
a	32	31(26-34)	34.2
b	5.1	4.4(3.7-5.1)	5.2
c	22	19(18-22)	26.9
c'	3.3	3(2.4-3.6)	2.2
V%	46	49(47-51)	51.2
Lip region width	13.5-15.7		12
Odontostyle length	12.4-15.1		10.5
Width of odontostyle	2.2-2.7		2
Odontophore length	17.3-21.1		16.5
Stylet aperture length	4.9-6.5		5
Stylet aperture as % of stylet length	-		47.6
Guiding ring from anterior end	7.6-10.3		8
Amphid aperture	4.3-5.9		5
Nerve ring from anterior end	81-108		91
Oesophagus length	235-285		240
Body width	-		36.5
Vagina length	20-22.2		19.5
Tail length	50-65		46.5
Anal body diameter	-		21
Combined length of prerectum and rectum	76-110		68.5
Cuticle width: on the neck	1.1-2.2		2
: at mid-body	-		2
: at dorsal side of tail	2.2-2.7		3
: hyaline part of tail	6.5-10.8		8

Family: Dorylaimidae De Man, 1876

Mesodorylaimus sp. cf *paralitoralis* Basson & Heyns, 1974 (Fig. 1A-F)

Morphometric data in Table 2.

Female

Small nematode, with relatively robust body. Heat-relaxed body posture slightly ventrally curved (Fig. 1F). Cuticle thin: 2 µm on the neck; 2.5 µm at mid-body; and 3.5 µm at dorsal side of tail. Subcuticle with relatively distinct transverse striae, rather more prominent towards lip region and around tail. Lateral chords one fourth body diameter at base of oesophagus, granular and with small cells. Dorsal, ventral and lateral body pores indistinct.

Lip region slightly set off by a shallow constriction, about one third as wide as body at base of oesophagus. Lips subangular, and amalgamated (Fig. 1A&B). Amphid narrow, stirrup-shaped (Fig. 1B), the aperture slightly less than half the lip region width. Odontostyle relatively slender, about as long as lip region width. Stylet width about one fifth stylet length. Aperture of odontostyle slightly less than half stylet length. Odontophore indistinct, slightly expanded at its base, about one and a half times as long as lip region width. Guiding ring single, weakly sclerotized. Hemizonid distinct, situated opposite nerve ring. Nerve ring conspicuous, situated 91 µm from anterior end. Anterior part of oesophagus which surrounds odontophore slightly expanded, appearing somewhat muscular. Cardia elongate-conoid, measuring 19x9 µm. Position of oesophageal gland nuclei and their openings as follows (*n*=1):

Fig. 1. *Mesodorylaimus* sp. cf. *paralitoralis* Basson & Heyns, 1974: A. Anterior region of female; B. Shape and position of amphid; C. Posterior branch of reproductive system of female; D. Posterior region of female; E. Detail of intestinal cells; F. Heat-relaxed body posture of female.

DO = 64,1; DN = 65,6; S₁O₁ = 79; S₁N₁ = 79,1; S₁O₂ = 82,7; S₁N₂ = 82,7; S₂O₁ = 91,1; S₂N₁ = 92,4; S₂O₂ = 91,3; S₂N₂ = 93,1.

Intestine four to five cells in circumference, cells large and packed with yellow-greenish granules; intestine wall thickened, appearing light yellow (Fig. 1E). Junction between intestine and prerectum distinct. Prerectum cells small, about 8 in circumference. Sphincter at junction of prerectum and rectum relatively indistinct. Prerectum length 1,7 times anal body diameter. Rectum length 1,4 times anal body diameter. Three coelomocyte-like structures situated posterior to rectum and prerectum junction. Tail convex-conoid in its anterior third, followed by a relatively distinct constriction at about the middle of the tail, then expanding slightly before tapering gradually towards a narrow, rounded tip (Fig. 1D). Anal body muscles very prominent. One pair of subventral and one pair of subdorsal caudal papillae present. Hyaline part of tail 8 µm.

Female didelphic, amphidelphic (Fig. 1C). Ovaries reflexed. *Pars dilatata oviductus* separated from uterus by a sphincter muscle. *Pars dilatata oviductus* relatively short, without sperm cells. Uterus divided into three parts; first part cellular, without sperm cells; second part relatively expanded to form a chamber-like structure packed with sperm cells; and a third tuboid part without sperm cells. *Pars dilatata uteri* not expanded. Vagina strongly muscular reaching 53,4 % of the corresponding body diameter, with a weakly sclerotized distal part. Vulva a transverse slit. No eggs observed. Ventral ad-vulvar pores absent.

Male not found.

Remarks

The present *Mesodorylaimus* specimen is close to *M. paralitoralis* Basson & Heyns, 1974. It can be distinguished from *M. paralitoralis* by a slightly shorter tail (46,5 µm compared with 50-65 µm); a slightly smaller c'-ratio (2,2 compared with 2,4-3,6); a shorter odontostyle (10,5 µm compared

with 12,4-15,1 µm); a shorter odontophore (16,5 µm compared with 17,3-21,1 µm); and a smaller lip region (12 µm compared with 13,5-15,7 µm). Lip region slightly set off by a shallow constriction, amalgamated and sub-angular compared with lip region more definitely set off by a deep constriction and cap-shaped. In view of these differences, we are reluctant to identify it as *M. paralitoralis*, even though it comes closer to this species than to any other known *Mesodorylaimus* species.

Specimen, locality and habitat

Female on slide W2854 collected from the sediment of the Luvuvhu River near the old Pafuri picnic area, north of Pafuri; collected by J. Heyns in February, 1991.

Mesodorylaimus potus Heyns, 1963 (Fig. 2A-O)

Syn: *Mesodorylaimus globiceps* Loof, 1964

Morphometric data in Table 3.

Female

Medium sized nematode, with relatively slender body. Heat-relaxed body posture almost straight (Fig. 2N). Cuticle relatively thin: 1,5-2,5 µm on the neck; 1,5-2,5 µm at mid-body and 2,5-3,5 µm on dorsal side of tail. Exocuticle without visible transverse striae; mesocuticle with distinct transverse striae, more prominent towards extremities. Lateral chord one sixth to one fifth body diameter at base of oesophagus, granular and with small cells. Lateral, dorsal and ventral body pores obscure.

Body tapering abruptly towards head in anterior third of neck. Lip region slightly angular in outline, set off by a slight constriction and only one fourth as wide as body at base of oesophagus (Fig. 2A). Slightly sclerotized areas are present just below the lip region, reminiscent of the characteristic sclerotized areas of the genus *Thornenema*. It seems as if these areas are situated in the anterior part of

Fig. 2. *Mesodorylaimus potus* Heyns, 1963: A. Anterior region of female; B. Shape and position of amphid; C. Lateral view of paratype female head; D. and E. Dorso-ventral and lateral views of female head (Ohrigstad population); F. and G. Lateral and sublateral view of female head (Kruger National Park population); H-J. Vulva region showing variation in the number of advulvar pores; K. Anterior branch of female reproductive system; L. Posterior region of male; M. Female tail; N. Heat-relaxed body posture of three females and three males; O. Sperm cells.

Table 3
Morphometric characters of *Mesodorylaimus potus Heyns, 1963* from the Kruger National Park

Locality	Sabie River			Olifants River			Crocodile River			Luvuvhu River		
<i>n</i>	3 Females	2 Males	7 Females	9 Males	1 Female	2 Males	14 Females	14 Males				
<i>L</i> (mm)	1,26(1,17-1,33)	1,00 ; 1,06	1,43(1,36-1,51)	1,21(1,06-1,30)	1,50	1,20 ; 1,19	1,26(1,15-1,46)	1,15(1,00-1,27)				
a	33,2(32,0-33,9)	33,9 ; 33	38,7(36,8-41)	35,8(34,0-38,2)	38	37,5 ; 35	35,7(31-38,9)	34,4(30,8-39,1)				
b	5,6(5,3-6)	4,8 ; 5	6,4(6-6,8)	5,6(5,1-5,9)	6,8	5,2 ; 5,7	6(5,5-6,8)	5,4(4,3-5,9)				
c	6,7(6,3-7)	51 ; 45	6,7(5,2-7,9)	62,5(53,1-69,4)	7,9	61,5 ; 70	7(5,9-8,2)	63(57-71,9)				
c'	9,2(8,8-10,1)	0,9 ; 1,1	10,7(8,9-14,7)	0,9(0,8-0,9)	9,5	0,9 ; 0,8	9,8(8,3-11)	0,9(0,8-1,0)				
V%	42,5(40,9-43,6)	- ; -	4,1(41,6-44,6)	-	44	- ; -	43,8(42-46,1)	-				
Lip region width	10(9-10,5)	9 ; 9,5	9(9-10)	9(9-10)	9,5	9 ; 9,5	9,5(8,5-10)	9,5(9-10)				
Odontostyle length	11(11-11,5)	11 ; 10	11(9-12)	11(10-12)	11,5	10,5 ; 10	10,5(9-11)	10(9-11)				
Odontostyle width	2,5	2,5 ; 2,5	2(2-2,5)	2(2-2,5)	2,5	2,5 ; 2	2(2-2,5)	2(2-2,5)				
Odontophore length	16	15 ; 16	17(16-19)	16(14-18)	17	17 ; 15,5	16,5(14,5-17,5)	17(14-19)				
Stylet aperture length	4(4-4,5)	4,5 ; 4	4,5(4-5)	4(4-5)	4	5 ; 3,5	4(4-5)	4(4-5)				
Stylet aperture as % of stylet length	38,6(36-40,9)	40,9 ; 40	41,7(36,4-47,6)	40,7(34,8-47,6)	34,8	47,6 ; 35	41,6(36,4-47,6)	42,8(36,4-45,5)				
Guiding ring from anterior end	7,5(6,5-9)	7,5 ; 7,5	8(7-9)	7,5(5,5-8,5)	7	8 ; 7,5	8(7-9)	7(6-8,5)				
Amphid aperture	3	- ; -	4(3,5-4)*	3,5*	-	- ; -	3,5(3-4)*	-				
Oesophagus length	220(210-240)	210 ; 210	225(220-240)	218(200-230)	220	230 ; 210	223(200-250)	215(195-235)				
Distance from head to vulva	53(51-57)	- ; -	63(60-67)	-	66	- ; -	60(48,5-66,5)	-				
Body width	38(34,5-41)	29,5 ; 32	37(36-38,5)	34(31,5-35,5)	39,5	32 ; 34	38(34-44,5)	34(29,5-37)				
Tail length	190(168-202)	19,5 ; 23,5	215(192-264)	19(18-21)	190	19,5 ; 17	196(172-232)	17(15,5-22,5)				
Anal body diameter	20,5(19,5-22,5)	21 ; 22	20(18-21,5)	22(21,5-22)	20	21 ; 21	20(18,5-21)	21(20-23)				
Rectum length	33(31,5-35)	- ; -	31(28,5-36)	-	33	- ; -	30(24,5-33)	-				
Prerectum length	59(57-62,5)	104 ; 103	68(44-94)	136(106-185)	64	126 ; 131	71(59-90)	117(92-153,5)				
Hyaline part of female tail	29(27-31)	- ;	41(30-58)	-	35,5	- ; -	42(25-52)	-				
Length of spicules	-	34 ; 34	-	36(32-40)	-	34 ; 34	-	33(30-36)				
Length of lateral guiding pieces	-	8 ; 8	-	11(10-12)	-	11 ; 10	-	9,5(8,5-11)				
Number of ventromedian supplements	-	15 ; 14	-	14(13-16)	-	14 ; 15	-	15(13-17)				

*n=3

the middle layer of the cuticle, but in a dorsoventral view it appears to be situated in the inner wall of the amphids (Fig. 2C-G). These sclerotizations are more prominent in some specimens than in others. Amphid narrow, stirrup-shaped (Fig. 2B), aperture about one third lip region width. Odontostyle distinct, about as long as the lip region width; the aperture varying from slightly less to one half stylet length. Stylet width about one fifth stylet length. Odontophore not very distinct, rod-like, not expanded at its base, and about twice lip region width. Guiding ring appearing single or double, weakly sclerotized. Hemizonid situated opposite nerve ring. Anterior part of oesophagus, which surrounds odontophore, very slightly expanded and muscular. Anterior slender part of oesophagus slightly narrower in region of nerve ring, which is distinct and situated at 87-101,5 μm from anterior end. Cardia conoid. Position of oesophageal gland nuclei and their openings as follows ($n=2$): DO=70,1; 71,3; DN=72,0; 73,3; S₁O₁=80,1; 83,2; S₁N₁=80,7; 83,4; S₁O₂=84,5; 84,8; S₁N₂=83,0; 85,0; S₂O₁=90,8; 91,9; S₂N₁=89,4; 90,1; S₂O₂=91,3; 92,4; S₂N₂=90,1; 90,6.

Intestine five to six cells in circumference, cells packed with numerous medium to large yellowish-brown granules. Junction between intestine and prerectum distinct. Sphincter at junction of prerectum and rectum obscure. Prerectum length 2,2-4,4 times anal body diameter. Rectum length 1,2-1,8 times anal body diameter. Anal muscles relatively prominent, consisting of four or five bands. Tail tapering rapidly for slightly more than one anal body diameter posterior to the anus, from there on it is very slender and tapered gradually towards the acute terminus (Fig. 2M). One pair of subdorsal and one pair of submedian caudal papillae present. Hyaline part of tail tip varies from 25-58 μm .

Female didelphic, amphidelphic (Fig. 2K). Ovaries reflexed. *Pars dilatata oviductus* and *pars dilatata uteri* separated by a distinct sphincter muscle. *Pars dilatata oviductus* and *pars dilatata uteri* packed with sperm cells; rest of uterus without any sperm cells.

Ovejector not clearly differentiated. Vagina muscular, reaching 42,7-50,6 % of the corresponding body diameter. Vulva a small transverse slit, 4,5 μm in length. Number of ventral advulvar pores variable, from completely absent to two pores on each side of the vulva (Fig. 2H-J). Uterus with one egg at a time, measuring 73-86 μm x 21-24 μm ($n=4$).

Male

Male similar to female except posterior part of body can be more strongly ventrally curved, in the shape of the letter J (Fig. 2N). Male diorchic, testes opposed and outstretched; posterior and anterior testes 129-241 μm and 140-269 μm respectively. Sperm cells spindle-shaped, 6-7,5 μm long (Fig. 2O). Spicules relatively robust, 30-40 μm long. Lateral guiding pieces 8,0-12 μm long. Supplements consisting of an adanal pair and a contiguous series of 13-17 ventromedians (Fig. 2L). Copulatory muscles relatively distinct, extending up to prerectum-intestine junction. Tail dorsally convex, ventrally slightly concave, bluntly rounded (Fig. 2L), with two pairs of subdorsal and one pair of submedian caudal papillae close to the terminus, and another pair of subdorsal caudal papillae slightly before the middle of the tail. A pair of papillae can also be seen on the terminus itself. Prerectum length 4,8-8,6 times anal body diameter. Cuticle width at the tail tip 1,5-3,0 μm .

Remarks

The original description of *Mesodorylaimus potus* was based on specimens collected from soil in the veld near Bethal, Transvaal. Basson & Heyns (1974) reported specimens from several additional localities in the Transvaal, namely Sibasa, Tshipise, Magalies River and Waterpoort and also from Paarl in the Cape Province. It was also reported from the Ohrigstad River, in eastern Transvaal by Heyns & Kruger (1983). *M. potus* was also reported from other countries namely from Venezuela by Loof (1964), as *M. globiceps* and from several localities in the Soviet Union by Gagarin in 1971.

Fig. 3. *Mesodorylaimus aegypticus* (Andrássy, 1958) Andrssy, 1959: **A**. Anterior region of female; **B**. Sublateral view of female head; **C**. Cardia region; **D**. Posterior branch of female reproductive system; **E** and **F**. Variation in posterior two thirds of female tail; **G**. Female tail; **H**. Heat-relaxed body posture of two females.

Table 4
A diagnostic compendium for the Mesodorylaimus species from South Africa (Figs 4A-Q and 5A-AA)

Species Reference Locality	<i>M. aegypticus</i> Our Measurements Kruger National Park South Africa	<i>M. arvensis</i> Basson & Heyns (1974) Transvaal and Natal South Africa	<i>M. bairnsi</i> Basson & Heyns (1974) Cape Province South Africa	<i>M. importunus</i> Basson & Heyns (1974) Transvaal South Africa
<i>n</i>	7 Females	9 Females	9 Females	6 Females
L(mm)	1,06-1,31	0,78-1,00	1,49-1,78	1,52-1,71
a	33,4-39,4	23-33	35-43	35-47
b	3,7-4,4	3,8-4,9	4,6-5,5	5,5-6,8
c	10,1-12,5	6-8	4-5	5,2-6,2
c'	5,1-6,2	6-9	14-21	13-16
V%	50-53	47-52	40-46	4-6
Lip region width	10-11,5	8,1-9,2	13,5-15,1	43
Odontostyle length	14-15,5	9,7-11,4	14,1-18,9	10,3-11,4
Odontostyle width	2-2,5	1,6-2,2	2,2-2,7	11,4-12,4
Odontophore length	15,5-25	12,4-15,1	22,7-26,5	1,6-2,2
Stylet aperture length	4,5-5	3,2-4,3	4,9-7	13,5-18,9
Guiding ring from anterior end	8-9	6,5-7,6	10,8-17,3	3,8-4,9
Nerve ring from anterior end	88-114	81-92	115-137	6,5-7,6
Oesophagus length	275-320	180-255	190-360	103-115
Cardia: length	19-23	8,1	14,6-22,1	243-298
: shape	elongate-conoid	conoid	elongate-conoid	11,4-13,5
Tail length	101-114	125-155	297-387	conoid
Anal body diameter	17-22,5	17-21	18-21	90-128
Hyaline part of female tail	7-16,5 1	6,2-29,7 -	51-103	22,5-27,5
Length of spicules	-	-	-	21,0-22,5
Length of lateral guiding pieces	-	-	-	12,4-16,8
Number of ventromedian supplements	-	-	-	-
Shape of lip region	Fig. 4A	Fig. 4B	Fig. 4C	37-41
Shape of tail region of female	Fig. 5A	Fig. 5B	Fig. 5C	8,6-9,2
				13

Table 4 (continues)

Species Reference Locality	<i>M. johanni</i> Basson & Heyns (1974) Cape Province, South Africa		<i>M. kowyni</i> Basson & Heyns (1974) Transvaal, South Africa		<i>M. margaritatus</i> Basson & Heyns (1974) Transvaal and Cape Province South Africa		<i>M. mesonyctius</i> Basson & Heyns (1974) Transvaal and Natal South Africa	
<i>n</i>	14 Females	1 Male	9 Females	10 Males	9 Females	8 Males	38 Females	20 Males
L(mm)	1,28-1,57	1,39	1,11-1,21	0,94-1,10	1,42-1,75	1,33-1,67	0,85-1,23	0,92-1,11
a	29-40	29	24-31	22-27	30-39	31-39	25-33	24-33
b	5,3-6,5	5,4	4,5-5,4	4,1-4,9	4,8-6,1	5,1-6,2	3,7-4,9	3,8-4,9
c	9-13	62	7-10	36-55	20-31	48-60	8-25	41-74
c'	5-9	1,0	6-8	0,7-1,1	2,4-3,6	0,8-1,2	3-8	0,7-1,0
V%	39-44	-	43-46	-	41-46	-	50-56	-
Lip region width	10,8-11,9		9,7-11,4		10,3-11,9		10,3-13,5	
Odontostyle length	10,8-13,5		9,2-10,8		9,2-12,4		9,7-13,5	
Odontostyle width	1,6-2,2		1,6-2,2		1,1-2,2		1,6-2,7	
Odontophore length	13,5-18,9		13,5-16,8		13-19		11,4-18,4	
Stylet aperture length	3,8-5,4		3,2-4,9		3,2-4,3		3,2-5,9	
Guiding ring from anterior end	6,5-8,6		5,4-7,6		6,5-8,1		6,5-8,6	
Nerve ring from anterior end	104-122		93-103		97-127		94-136	
Oesophagus length	223-277		208-255		220-303		225-288	
Cardia : length	13,5-18,4		10,1-16,2		8,6-14,1		13-20,5	
: shape	elongate-heart-shaped		elongate-conoid		heart-shaped		elongate-conoid	
Tail length	110-153	22,5	128-163	20-28	55-80	22,5-30	42,5-127,5	15-22,5
Anal body diameter	17-22	22,5	20-22,5	25,5-29	22-23	25-28	14-16	21-22,5
Hyaline part of female tail	11,9-21,6	-	14,6-22,7	-	3,3-5,4	-	7,6-20,5	-
Length of spicules	-	41	-	37-41	-	41-46	-	38-49
Length of lateral guiding pieces	-	9,2	-	7,6-9,7	-	8,6-10,3	-	7,6-10,8
Number of ventromedian supplements	-	11	-	11-14	-	12-16	-	9-12
Shape of lip region	Fig. 4E		Fig. 4F		Fig. 4G		Fig. 4H	
Tail shape of female	Fig. 5E-G		Fig. 5H		Fig. 5I-J		Fig. 5K-M	

Table 4 (continues)

Species Reference Locality	<i>M. transkeiensis</i> Basson & Heyns (1974) Transkei, South Africa		<i>M. usitatus</i> Basson & Heyns (1974) Transvaal, South Africa		<i>M. vaalensis</i> Heyns & Kruger (1983) Orange Free State, Transvaal and Cape Province, South Africa		<i>M. williamsi</i> Heyns & Kruger (1983) Transvaal, South Africa	
<i>n</i>	14 Females	4 Males	9 Females	9 Males	22 Females	9 Females		
L(mm)	0,97-1,23	0,95-1,11	1,02-1,44	0,90-1,35	1,02-1,33	1,42-1,53		
a	27-47	24-29	28-41	28-39	33-45	29-42		
b	3,9-4,9	3,8-4,4	3,8-4,8	4-7	3,3-4,6	4,3-4,7		
c	8-12	51-61	9-15	45-79	10,6-13,3	5,3-6		
c'	5,5-7	0,8-0,9	3,5-9	0,7-1,1	5,2-6,6	12-15		
V%	36-47	-	47-53	-	50-54	46-50		
Lip region width	8,1-9,2	10,3-11,9	10,3-11,9	-	8-9,5	9-11		
Odontostyle length	7-9,2	10,3-14,6	10,3-14,6	-	13-15,5	19,0-25		
Odontostyle width	1,6-2,2	1,6-2,2	1,6-2,2	-	-	2		
Odontophore length	9,7-15,1	10,8-18,9	10,8-18,9	-	18-24	20-23		
Stylet aperture length	2,7-3,8	4,3-7	4,3-7	-	-	-		
Guiding ring from anterior end	4,9-8,1	5,9-10,3	5,9-10,3	-	6-12	5,5-13		
Nerve ring from anterior end	82-105	86-111	86-111	-	125-130	50-55		
Oesophagus length	233-268	228-310	228-310	-	295-305	305-325		
Cardia : length	10,3-16,2	10,8-20	10,8-20	-	15-20	40-44		
: shape	elongated-heart-shape	elongate-conoid	elongate-conoid	-	elongate-conoid	elongate-conoid		
Tail length	98-128	92,5-110	92,5-110	15-22,5	86-195	240-270		
Anal body diameter	16-18	12-23	12-23	20,5-21,5	16,5-29,5	18-20		
Hyaline part of female tail	22,2-43,8	16,8-23,2	16,8-23,2	-	10	40-90		
Length of spicules	-	-	-	28,1-45,9	-	-		
Length of lateral guiding pieces	-	-	-	6,5-8,1	-	-		
Number of ventromedian supplements	-	-	-	5-9	-	-		
Shape of lip region	Fig. 4N	Fig. 4O	Fig. 4O	Fig. 4P	Fig. 4P	Fig. 4Q		
Tail shape of female	Fig. 5W	Fig. 5X	Fig. 5X	Fig. 5Y	Fig. 5Y	Fig. 5Z-AA		

Table 4 (continues)

Species Reference Locality	<i>M. paratoralis</i> Basson & Heyns (1974) RSA	<i>M. potus</i> Total measurements for various localities Transvaal, RSA	<i>M. pseudosubtilis</i> Basson & Heyns (1974) Transvaal, RSA	<i>M. rotundolabiatius</i> Basson & Heyns (1974) Transvaal and Natal, RSA	<i>M. sanctus</i> Basson & Heyns (1974) Transkei, RSA
<i>n</i>	8 Females	33 Females	18 Females	41 Females	10 Females
L(mm)	1,07-1,21	1,15-1,51	0,92-1,50	1,03-1,51	1,14-1,58
a	26-34	27,8-41	24-37	21-34	28-40
b	3,7-5,1	5,2-6,8	4,4-5	4,1-5,5	5,1-7,6
c	18-22	5,2-8,3	5-8	12-22	8-16
c'	2,4-3,6	7,2-14,7	7-12	2-4	5-10
V%	46-51	40,6-46,1	46-50	47-52	39,0-44
Lip region width	13,5-15,7	8,5-10,5	9,2-12	9,7-12,4	9,7-10,8
Odontostyle length	12,4-15,1	9-12	10,3-14,1	10,3-13,5	10,3-11,4
Width of odontostyle	2,2-2,7	2-3	1,6-2,2	1,6-2,2	1,6-2,2
Odontophore length	17,3-21,1	14,5-19	14,6-21,6	12,4-21,6	13,5-17,8
Stylet aperture length	4,9-6,5	4-6	4,3-5,9	3,2-5,9	3,2-4,9
Nerve ring from anterior end	7,6-10,3	6,5-9,5	6,5-9,2	6,5-9,2	5,9-7,6
Guiding ring from anterior end	81-108	87-108,5	87-118	100-119	89-103
Oesophagus length	235-285	200-255	205-300	268-300	235-288
Cardia : length	14,6-21,6	8-13,5	11-12	9,2-16,2	8,6-10,8
: shape	elongate-heart-shaped	tongue-shaped	slightly elongate-conoid	elongate-conoid	pear-shaped
Tail length	50-65	17,5-25	15,5-23,5	72,5-110	95-153
Anal body diameter	18-21	18-22,5	20-25	21-28	20-20,5
Hyaline part of female tail	6,5-10,8	25-58	29-52	8,1-21,6	10,8-16,7
Length of spicules	-	-	-	-	-
Length of lateral guiding pieces	-	33,5-42	30-36	-	38-40
Number of ventromedian supplements	-	9,7-11,9	8-12	-	7-8,6
Shape of lip region	-	17-20	13-17	12-15	11-15
Tail shape of female	Fig. 4I Fig. 5N-O	Fig. 4J Fig. 5P	Fig. 4K Fig. 5Q-R	Fig. 4L Fig. 5S-U	Fig. 4M Fig. 5V

Fig. 4. Outline drawings showing the head-shape of *Mesodorylaimus* species from South Africa: **A.** *M. aegypticus* (bar equals 6,7 μ m); **B.** *M. arvensis* (bar equals 6,2 μ m); **C.** *M. bainisi* (bar equals 10 μ m); **D.** *M. importunus* (bar equals 7,1 μ m); **E.** *M. johanni* (bar equals 7,2 μ m); **F.** *M. kowyni* (bar equals 7,2 μ m); **G.** *M. margaritus* (bar equals 7,9 μ m); **H.** *M. mesonyctius* (bar equals 7,6 μ m); **I.** *M. paralitoralis* (bar equals 9,3 μ m); **J.** *M. potus* (bar equals 7,7 μ m); **K.** *M. pseudosubtilis* (bar equals 7,1 μ m); **L.** *M. rotundolabiatus* (bar equals 8,4 μ m); **M.** *M. sanctus* (bar equals 8,4 μ m); **N.** *M. transkeiensis* (bar equals 7,1 μ m); **O.** *M. usitatus* (bar equals 8,6 μ m); **P.** *M. vaalensis* (bar equals 5,6 μ m); **Q.** *M. williamsi* (bar equals 6,7 μ m). For references see compendium.

Fig. 5. Outline drawings showing the female tails of *Mesodorylaimus* species from South Africa: **A.** *M. aegypticus* (bar equals 11,7 μ m); **B.** *M. arvensis* (bar equals 13,1 μ m); **C.** *M. biansi* (bar equals 14,4 μ m); **D.** *M. importunus* (bar equals 14,4 μ m); **E-G.** *M. johanni* (bar equals 11,3 μ m); **H.** *M. kowyni* (bar equals 13,7 μ m); **I-J.** *M. margaritus* (bar equals 15,7 μ m); **K-M.** *M. mesonyctius* (bar equals 11,2 μ m); **N-O.** *M. paralitoralis* (bar equals 12,4 μ m); **P.** *M. potus* (bar equals 17,4 μ m); **Q-R.** *M. pseudosubtilis* (bar equals 13,1 and 17,6 μ m); **S-U.** *M. rotundolabiatus* (bar equals 14,9 and 17,2 μ m); **V.** *M. sanctus* (bar equals 10 μ m); **W.** *M. transkeiensis* (bar equals 13,9 μ m); **X.** *M. usitatus* (bar equals 13,9 μ m); **Y.** *M. vaalensis* (bar equals 12,2 μ m); **Z-AA.** *M. williamsi* (bar equals 15 and 17,1 μ m). For references see compendium.

The present specimens are similar to the type population except for a slightly greater variation in length (Female: $L=1,15-1,51$ mm compared with $L=1,26-1,40$ mm; Male: $L=1,00-1,30$ mm compared with $L=1,11$ mm); a slightly bigger b-ratio (Female: $b=5,3-6,8$ compared with $b=5,2-5,8$; Male: $b=4,3-5,9$ compared with $b=4,8$); and a slightly longer female tail ($168-264\text{ }\mu\text{m}$ compared with $158-199\text{ }\mu\text{m}$).

The presence of the slightly sclerotized areas below the lip region was not reported by Heyns (1963), Basson & Heyns (1974) or Heyns & Kruger (1983), and therefore all these specimens were studied to see whether any sclerotization is present. This confirmed the absence of sclerotized areas in the type specimens, but its presence in the specimens of Basson & Heyns (1974) and Heyns & Kruger (1983). It appears that these sclerotizations are more prominent in some specimens than in others, as is the case in the present specimens.

Locality and habitat

Five specimens collected from two different localities in the Sabie River, namely: from sand among the roots of *Phragmites* near the weir east of the Lower Sabie Camp and in river sediment just east of Nwatindlopfu Spruit, collected by J. Heyns and A. Botha in February, 1990. Sixteen specimens collected from three different localities in the Olifants River namely: in river sediment west of weir, 25 km from the western border of the Kruger National Park; in river sediment just west of Olifants Camp and in sandy soil east of the western border of the Kruger National Park, collected by J. van Vuren in June, 1990. Three specimens from two different localities in the Crocodile River namely: from sand in a stagnant pool at the confluence of the Crocodile River and Wescott Spruit and from river sediment near the Crocodile Bridge, collected by A. Botha and W. Liebenberg in November, 1990. Fourteen females and fourteen males from four different localities in the Luvuvhu River namely: in mud from the river bank near the picnic area north-east of Pafuri, in a shallow stagnant pool west of

Pafuri, in river sediment near the old picnic area north of Pafuri and in moist soil from the river bank at the confluence of the Luvuvhu and Limpopo rivers, collected by J. Heyns in February, 1991.

Specimens

Specimens from Sabie River on slides W2598, W2601, W2628 and W2664; specimens from Olifants River on slides W2672, W2673, W2677, W2745, W2749, W2753, W2755-W2758, W2760, W2771 and W2772; specimens from Crocodile River on slides W2803 and W2806; specimens from Luvuvhu River on slides W2816, W2817, W2820, W2821, W2827, W2830, W2832, W2833, W2838-W2840, W2858 and W2871.

Mesodorylaimus aegypticus (Andrássy, 1958) Andrssy, 1959 (Fig. 3A-H)

Syn. *Dorylaimus aegypticus* Andrssy, 1958

Morphometric data in Table 4.

Female

Medium-sized nematode, with relatively slender body. Heat-relaxed body posture almost straight, sometimes slightly ventrally curved (Fig. 3H). Cuticle relatively thin: $2,0-2,5\text{ }\mu\text{m}$ on the neck; $2,5-3,0\text{ }\mu\text{m}$ at mid-body; and $3,0-3,5\text{ }\mu\text{m}$ on dorsal side of tail. Exocuticle appears smooth, mesocuticle with relatively distinct transverse striae, rather more prominent towards lip region and around tail (Fig. 3B&G). Lateral chord about one fourth body diameter at base of oesophagus, granular and with small cells. Dorsal, ventral and lateral body pores obscure.

Lip region slightly set off, about one third as wide as body at base of oesophagus. Lips almost rounded and completely amalgamated (Fig. 3A&B). Since all specimens present a dorso-ventral or semi-lateral view, it was not possible to get a lateral view of the amphid. Odontostyle distinct and relatively slender, its length about one and a half times the lip

region width. Aperture of odontostyle relatively small, about one third stylet length. Stylet width about one seventh stylet length. Odontophore not very distinct, rod-like, not expanded at its base, and about twice as long as lip region width. Guiding ring relatively distinct, and single. Anterior part of oesophagus, which surrounds odontophore, only very slightly expanded and apparently not muscular. Hemizonid situated opposite nerve ring. One pair of endolids situated anterior to nerve ring. Nerve ring situated at 88,0 - 114,0 μm from anterior end. Cardia large, elongate-conoid (Fig. 3C). Position of oesophageal gland nuclei and their openings as follows: ($n=1$): DO=56,7; DN=58,4; S₁O₁=75,9; S₁N₁=75,7; S₁O₂=80,0; S₁N₂=80,5; S₂O₁=92,2; S₂N₁=92,0; S₂O₂=92,6; S₂N₂=92,3.

Intestinal cells somewhat obscure due to the great number of small to medium-sized light yellowish-brown granules. Junction between intestine and prerectum distinct. Sphincter at junction of prerectum and rectum obscure. Prerectum length 2,0-4,0 times anal body diameter. Rectum length 0,8-1,8 times anal body diameter. Tail elongate-conoid, with a clavate terminus (Fig. 3E-G). One pair of subdorsal and one pair of subventral caudal papillae present, situated about one anal body diameter behind the anus. Length of hyaline part of tail varies from 7-16,5 μm .

Female didelphic, amphidelphic (Fig. 3D). Ovaries well developed, reflexed dorsally. Oviduct relatively long and distinct. *Pars dilatata oviductus* not very distinct; separated from the uterus by a sphincter muscle. *Pars dilatata uteri* and ovejector not clearly differentiated; uterus very short (Fig. 3D). Vagina muscular, reaching 46,1-50,8 % of the corresponding body diameter. Small, weakly sclerotized pieces present at base of vagina. Vulva a small transverse slit about 4,5 μm in length, without sclerotized labia. Uterus with 1-2 eggs at a time, measuring 59-75 μm x 21-25,5 μm ($n=5$). No sperm cells observed.

Male not found.

Remarks

The original description of *Mesodorylaimus aegypticus* was based on two females collected from Egypt. The present specimens of *M. aegypticus* are similar to the type specimens except for the posterior third of the tail which is less ventrally curved (Fig. 3E-G) than in the type specimens (Andrássy, 1958 Fig. 5C&D). In the description of the type specimens the vulva is said to be a longitudinal slit but the sketch of the vulva region (Andrássy 1958 Fig. 5C & D) is of a transverse slit, which is similar to that of the present specimens. According to the original description the odontostyle aperture occupies one half of the odontostyle length, but examination of the original sketches shows it to be about 40 %, which is closer to the 32-33 % of the present specimens.

Locality and habitat

Three females collected from two different localities in the Sabie River namely: sand under *Phragmites* near the junction of the Sabie and Sand rivers and in wet sand under *Phragmites* just east of Skukuza Camp, collected by A. Botha and J. Heyns in February, 1990. Four females collected from sediment in the Olifants River, near the weir, west of the Olifants Camp, by J. van Vuren in June, 1990.

Specimens

Specimens from Sabie River on slides W2635, W2644 and W2650; specimens from Olifants River on slides W2685, W2693 and W2701.

List of *Mesodorylaimus* species from South Africa

Mesodorylaimus aegypticus (Andrássy, 1958) Andrássy, 1959

syn: *Dorylaimus aegypticus* Andrássy, 1958

M. arvensis (Cobb in Thorne & Swanger, 1936) Andrássy, 1959

syn: *Dorylaimus arvensis* Cobb in
Thorne & Swanger, 1936

M. bainsi Basson & Heyns, 1974

M. importunus Basson & Heyns, 1974

M. johanni Basson & Heyns, 1974

M. margaritus Basson & Heyns, 1974

M. mesonyctius (Kreis, 1930) Andrassy, 1959

syn: *Dorylaimus mesonyctius* Kreis, 1930

M. paralitoralis Basson & Heyns, 1974

M. potus Heyns, 1963

syn: *M. globiceps* Loof, 1964

M. pseudosubtilis Basson & Heyns, 1974

M. rotundolabiatatus Basson & Heyns, 1974

M. sanctus Basson & Heyns, 1974

M. transkeiensis Basson & Heyns, 1974

M. usitatus Basson & Heyns, 1974

M. vaalensis Heyns & Kruger, 1983

M. williamsi Heyns & Kruger, 1983

syn: *Dorylaimus filicaudatus* Daday, 1905 apud Williams, 1959

nec: *M. filicaudatus* (Daday, 1905) Andrassy, 1969.

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References

ANDRÁSSY, I. 1958. Ergebnisse der zoologischen Aufsammlungen des Ungarischen Naturwissen-

schaftlichen Museums in Agypten in Jahre 1957. 2. Nematoden aus ägyptischen Gewässern. *Annales, Historico-Naturales Musei Nationalis Hungarici* 9: 135-150.

ANDRÁSSY, I. 1959. Taxonomische übersicht der Dorylaimen (Nematoda). I. *Acta Zoologica* 5(3/4): 191-240.

BASSON, Johanna and J. HEYNS. 1974. The genus *Mesodorylaimus* in South Africa (Nematoda: Dorylaimoidea). *Phytophylactica* 6(4): 261-288.

BOTHA, Annelize and J. HEYNS. 1991. Dorylaimoidea (Nematoda) from rivers in the Kruger National Park. *Koedoe* 34(2): 1-24.

CARBONELL, Elsa and A. COOMANS. 1986. The genus *Thornenema* Andrassy, 1959 (Nematoda: Thornenematidae). *Nematologica* 32(2): 125-245.

GARGARIN, V.G. 1971. New and rare nematode species from the Uchinsk, Dubossarsk and Mingchaursk water basins. Second communications. (Russian text). *Zoologicheskii Zhurnal* 50: 981-989.

HEYNS, J. 1963. New species of the superfamily Dorylaimoidea (Nematoda) from South African soils, with a description of a new genus *Kochinema*. *South African Journal of Agricultural Science* 6: 289-302.

HEYNS, J. 1971. *A guide to the plant and soil nematodes of South Africa*. Cape Town: Balkema.

HEYNS, J. and J.C. DE W. KRÜGER. 1983. Freshwater nematodes from South Africa. 6. *Mesodorylaimus* Andrassy, 1959. *Phytophylactica* 15(1): 47-53.

LOOF, P.A.A. 1964. Free-living and plant-parasitic nematodes from Venezuela. *Nematologica* 10(2): 203-300.

THORNE, G. and H.H. SWANGER. 1936. A monograph of the nematode genera *Dorylaimus* Dujardin, *Aporcelaimus* n.g., and *Pungentus* n.g. *Capita Zoologica* 6(4): 1-223.

VAN DER VEGTE, F.A. and J. HEYNS. 1963. A report on nematodes found in soil and root samples from the Kruger National Park. *Koedoe* 6: 134-136.