

# The genus *Xiphinema* in South Africa. XXVI. New information on *X. bolandium*, with description of the four juvenile stages (Nematoda: Longidoridae)

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A population of *Xiphinema bolandium* from the Baviaanskloof Wilderness Area in the Eastern Cape Province was studied, and the four juvenile stages described and figured for the first time. New distribution records are listed from several localities in the Western Cape Province, mostly from vineyards and peach orchards, as well as from fynbos.

Key words: Nematoda, *Xiphinema bolandium*, juvenile stages, morphology, distribution.

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## Introduction

A large population of *Xiphinema bolandium* Coomans & Heyns, 1985 was collected by the author in February 1999 among the roots of *Portulacaria afra* and *Crassula ovata* on the mountains surrounding the Geelhoutboom Rest Camp in the Baviaanskloof Wilderness Area in the Eastern Cape Province. This offered an opportunity to study the hitherto unknown juvenile stages of this species, a member of the *X. meridianum* subgroup of subdigitate *Xiphinema* species. The new population is briefly compared with the type specimens from Paarlberg. All specimens are housed in the National Collection of Nematodes, Plant Protection Research Institute, Pretoria. All measurements in Table 1 are in  $\mu\text{m}$ , except body length, which is in mm. Ratio a was consistently calculated using the corrected body diameter, as described by Geraert (1961).

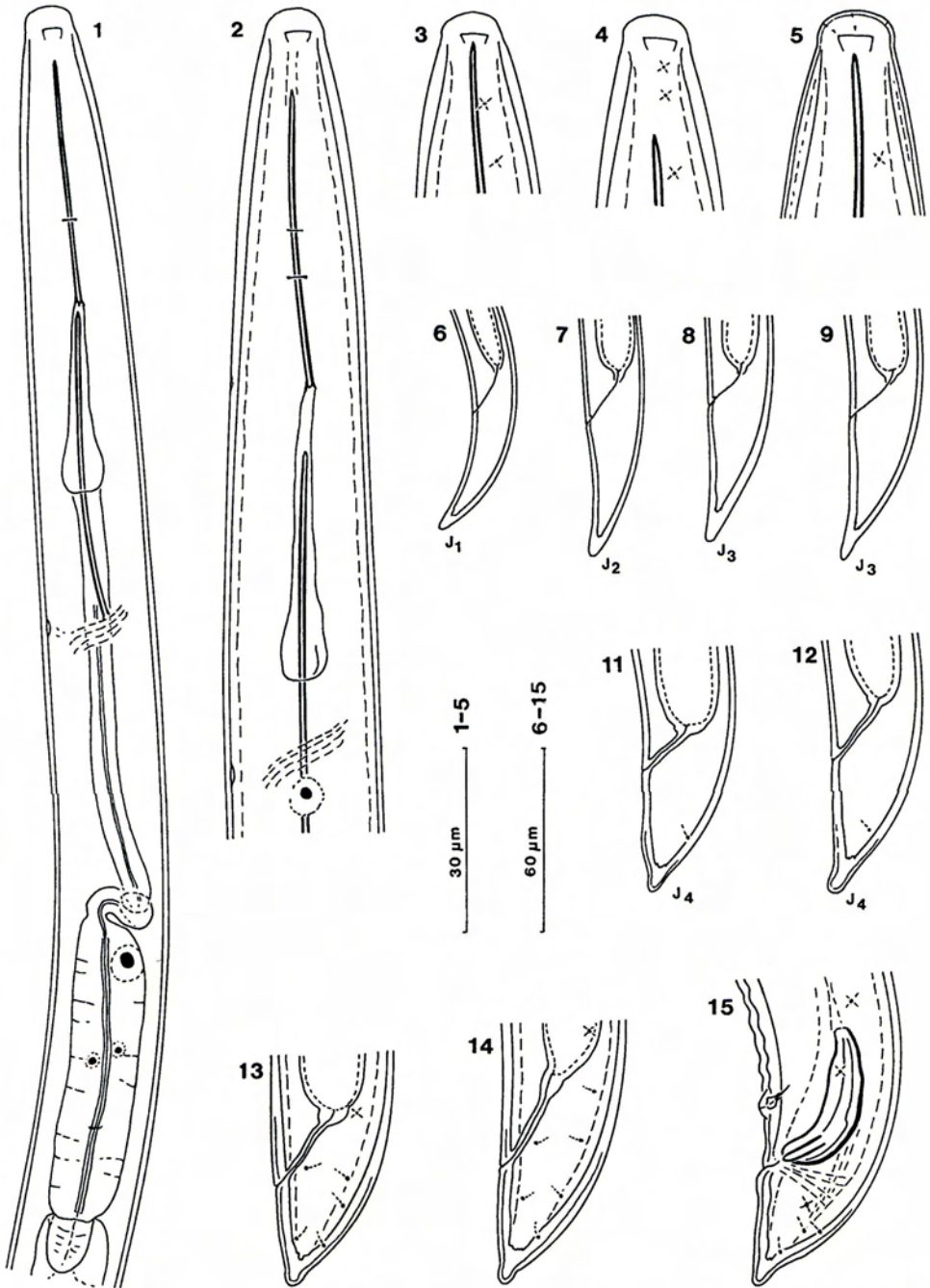
## Description and discussion of juvenile

### stages (Figs 1-12; Table 1)

Only one  $J_1$  specimen was found. The tail of this specimen is elongate-conoid and ventrally arcuate. Of the  $J_2$  stage as well one speci-

men only was present in the sample. In this specimen the tail is somewhat broader, elongate-conoid, only slightly ventrally arcuate. Some small variation in tail shape occurs in both  $J_3$  and  $J_4$  stage. Maximum variation observed in  $J_3$  is illustrated in Figs. 8 & 9, the specimen in Fig. 9 showing a slight narrowing of the hyaline tail tip, foreshadowing the subdigitate condition which becomes evident in  $J_4$  (Figs. 11 & 12). The absolute length of the tail remains constant throughout the first three stages, and then shows a slight decrease in  $J_4$ , and a further decrease in the adult stage. This results in a gradual increase in the value of ratio c, and a decrease in ratio c'. Ontogeny of the tail thus agrees with that described for *X. capriense* Hutsebaut, Heyns & Coomans, 1988, *X. lacrimaspinæ* Hutsebaut, Heyns & Coomans, 1988 and *X. malawiense* Brown, Luc & Saka, 1983, the only other species of the *X. meridianum* subgroup for which all juvenile stages are known, as well as with other subdigitate species from areas outside southern Africa (see Coomans *et al.* 2001).

There is little change in the shape of the head during development, except perhaps a slight increase in the degree to which the lip region is set off from the adjoining body. An



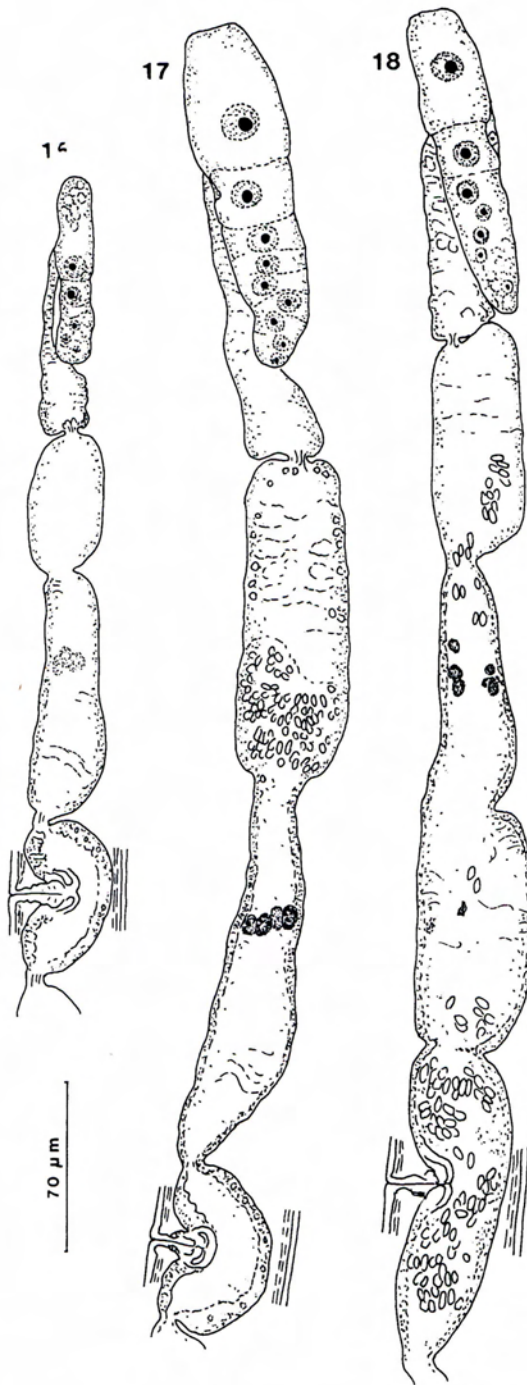
Figs. 1 – 15. *Xiphinema bolandium*. Specimens from Baviaanskloof. 1: oesophageal region of J<sub>1</sub>; 2: anterior neck region of J<sub>2</sub>, with incompletely formed replacement odontostyle embedded in odontophore; 3-5: head end of J<sub>3</sub>, J<sub>4</sub> and adult female, respectively; 6-12: tail shape in J<sub>1</sub>, J<sub>2</sub>, J<sub>3</sub> and J<sub>4</sub>, as indicated on the plate, showing maximum variation observed in J<sub>3</sub> and J<sub>4</sub>; 13 & 14: variation in tail shape of female; 15: tail shape in male.

Table 1  
*Morphometrics of Xiphinema bolandium:*  
*Baviaanskloof population compared with type specimens from Paarlberg*

	Baviaanskloof					Type specimens (Coomans & Heyns, 1985)		
	J <sub>1</sub>	J <sub>2</sub>	J <sub>3</sub>	J <sub>4</sub>	F	M	F	M
<i>n</i>	1	1	5	8	10	10	variable 1-10	variable 4-10
L(mm)	0.75	1.31	1.55(1.30-1.72)	2.11(1.86-2.34)	2.87(2.40-3.12)	2.88(2.57-3.16)	2.63(2.43-2.78)	2.63(2.28-2.93)
a	42	51	48(44-50)	54(49-65)	63(57-65)	67(61-70)	69(65-75)	60(58-61)
b	3.8	5.2	5.4(4.9-5.7)	6.0(5.0-6.9)	8.3(7.2-9.3)	8.2(7.5-9.3)	7.0(6.6-8.2)	7.2(6.3-7.9)
c	17	29	35(29-40)	53(47-68)	90(79-104)	89(76-105)	77(67-86) <sup>a</sup>	63(58-69)
c'	3.38	2.25	2.05(1.78-2.31)	1.40(1.13-1.54)	1.02(0.88-1.23)	1.03(0.91-1.13)	1.24(1.11-1.37) <sup>a</sup>	1.30(1.10-1.45)
V			45.8(42.7-48.6)				48.6(47.2-49.8)	
Lip region width	8	9	9-10	10-11	12.2(11.5-13)	12.6(12-13)	12.5(12-13) <sup>a</sup>	12.6(12-14)
Odontostyle	40	48.5	66(63-71)	81(76-88)	99(92-105)	98(91-107)	94(92-96.5)	94(88-101)
Odontophore	29	35	45(41-50)	56(53-59)	64(62-67)	62(58-66)	65(63-72)	66(52-71)
Total stylet length	69	83.5	111(107-121)	137(129-145)	164(155-170)	161(153-174)	160(155-168)	157(147-171)
Replacement odontostyle	50	60.5	80(77-85)	101(93-105)				
Flanges width	7	8	8-10	10-12	12.1(11.5-13)	11.5(11-12)	12.3(10-14)	11.6(11-12.5)
Guiding ring					91(86-97)	95(88-101)	80.5(74-84)	75.5(70-86)
Hemizonid					183(170-197)	186(182-196)	179(171-183)	185(163-209)
Basal bulb: length					98(95-102)	97(88-101)	105(92-112)	109(97-118)
: width					23(20-26)	22.5(20-24)	26(24-29)	24(20-25)
Prerectum					359(280-400)	420-430	220-330	276-426
Rectum					32(28-36)		37(34-42)	
Tail length	44	45	44(41-47)	40(37-43)	32(29-37)	33(27-36)	37(32-40) <sup>a</sup>	42(40-44)
Ovejector					64(58-74) <sup>b</sup>		80.5(73-87.5)	
Spicules								56(50-61)
Lateral guiding pieces								13.3(10-15)

<sup>a</sup> New data obtained from five paratype females

<sup>b</sup> In one female the ovejector was filled with sperm cells and measured 140 µm



Figs 16-18: *Xiphinema bolandium*. Specimens from Baviaanskloof. 16: anterior branch of reproductive system of a young, unimpregnated female; 17: typical appearance of reproductive system in mature, impregnated female; 18: reproductive system, probably an old female. See discussion in text.

interesting observation is the gradual shifting in position of the amphid aperture, which is situated in the slight depression behind the lip region of the  $J_1$ , and then slowly moves forward through the successive juvenile stages to its final position on the lip region in the adult stage. Another interesting feature of the  $J_1$  is the exceptionally large cardia. From  $J_2$  onwards, it is much smaller, same as in the adult (compare Fig. 1 with Figs. 3A & 3F in Coomans & Heyns (1985)). Figure 2 shows the replacement odontostyle of the  $J_2$  specimen embedded in the odontophore, as is normal in the first juvenile stage. This may indicate that the specimen is close to or in the process of molting. However, this seems unlikely since the replacement odontophore is actually still incompletely formed, with the nucleus of the stylet-forming cell clearly visible near its posterior end. There is also no other indication of molting, such as the presence of the third stage cuticle. At the same time its biometrics leave little doubt that this is in fact a  $J_2$ , most probably an aberrant specimen.

#### Adult

(Figs 13-18; Table 1)

Although most of the biometrics of the new population are in close agreement with those of the type population, there are a few discrepancies: although tail shape is fairly similar, tail length is somewhat less, especially in the male, which results in a larger ratio  $c$  and smaller ratio  $c^1$ ; the guiding ring is situated slightly more posterior; the rectum is shorter; and the ovejector is also slightly

smaller than in the type population. The reproductive system in both female and male is in close agreement with the original description. Note in this regard the remarkable similarity between Fig. 3E in Coomans & Heyns (1985) and Fig. 17 in this publication. Also illustrated here are the anterior reproductive branches of two other females of the Baviaanskloof population. Figure 16 shows the anterior branch of an apparently young unimpregnated female, with small rather undeveloped ovary, short oviduct with small *pars dilatata*, and uterus also relatively short with small *pars dilatata*. The four granular structures in the pseudo-z-organ are barely visible, apparently still in the process of formation. Figure 18, on the other hand, shows the anterior branch of a female which has been impregnated, but with most of the spermatozoa still in the much distended ovejector. Since both the ovary and the *pars dilatata* uteri are smaller than those in Fig. 17, one might suspect this to belong to a younger female. However, the fact that the granular bodies in the pseudo-z-organ have disintegrated into smaller fragments might indicate just the opposite.

#### Distribution

The type specimens of *X. bolandium* were collected under indigenous vegetation on Paarlberg, with a single female from a vineyard in Rawsonville (Coomans & Heyns 1985). Shortly afterwards Van Reenen & Heyns (1986) recorded the species from vineyards in Paarl and Piketberg, and Barbercheck & Heyns (1986) from a vineyard in Worcester. The following unpublished records are from the files of the nematode collections of the Plant Protection Research Institute and the Rand Afrikaans University: Peach orchards in Worcester, Elgin and Piketberg; vineyards in Groot Drakenstein (Rhodes Fruit Farms) and Hermanus (Hamilton Russell Vineyards); honeybush (*Cyclopia* sp.) in Vredendal; fynbos in Citrusdal and the Fernkloof Nature Reserve at Hermanus; virgin veld at Worcester, Onrusrivier and Caledon. It has also been identified from the

rhizosphere of spekboom (*Portulacaria afra*) at Blomnek near De Rust in the Little Karoo (A.J. Meyer *pers. comm.*). The distribution map for *Xiphinema* in Fig. 5 of Hutsebaut & Heyns (1989) indicates a single record for *X. bolandium* in an area slightly north or northwest of Baviaanskloof. Unfortunately, no information on the precise locality could be traced in the files of either of the abovementioned two institutions.

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