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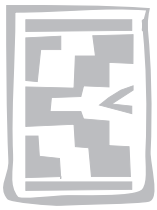

Studies on the genus *Setaria* Viborg, 1795 in South Africa. III. *Setaria thwaitei* Mönnig, 1933

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ABSTRACT

WATERMEYER, R., BOOMKER, J. & PUTTERILL, J.F. 2004. Studies on the genus *Setaria* Viborg, 1795 in South Africa. III. *Setaria thwaitei* Mönnig, 1933. *Onderstepoort Journal of Veterinary Research*, 71:107–111

Mönnig (1933) described *Setaria thwaitei* from a sable antelope, *Hippotragus niger,* the type host, as well as from roan antelope, *Hippotragus equinus,* and waterbuck, *Kobus ellipsiprymnus*. Yeh (1959) considered *Setaria thwaitei* to be synonym of *Setaria hornbyi*. Material collected from roan antelopes, sable antelopes and gemsbuck, *Oryx gazella,* from several localities in the north and south of South Africa, together with Mönnig's (1933) material, were re-examined. Measurements of the adult worms obtained in this study were compared with those in the original description of the species. Scanning electron microscopy of the anterior and posterior regions of the female worms confirmed *S. thwaitei* as a valid species.

Keywords: Nematodes, *Setaria thwaitei*, wildlife

INTRODUCTION

Mönnig (1933) created the species *Setaria thwaitei* for worms that were collected from the peritoneal cavity of a sable antelope, *Hippotragus niger,* from Limpopo Province, South Africa, but Yeh (1959) considered *S. thwaitei* conspecific with *Setaria hornbyi*. Since Mönnig's (1933) description of *S. thwaitei* only two records of this species are mentioned in the literature, namely those of Van den Berghe & Vuylsteke (1936) and Vuylsteke (1956) from roan antelopes, *Hippotragus equinus*, from the Congo and Angola respectively.

Material recovered from roan antelopes, sable antelopes and gemsbuck, *Oryx gazella,* from two nature reserves and three game farms as well as Mönnig's (1933) type specimens from a sable antelope, roan antelope and waterbuck, *Kobus ellipsiprymnus*, were re-examined. Specimens of *S. hornbyi* from gemsbuck, previously recovered by Ortlepp (1961) and Basson, Kruger, McCully & Van Niekerk (1966), was also re-examined. The scanning electron microscopic appearance, together with the measurements of *S. thwaitei* and *S. hornbyi* are presented here and compared with the Mönnig's (1933) findings.

MATERIAL AND METHODS

The specimens originated from the helminthological collection of the National Collection of Animal Helminths (NCAH) as well as those collected by one of us (JB), and are currently housed in the Department of Veterinary Tropical Diseases, Uni-

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versity of Pretoria. The following specimens were examined: two females from a gemsbuck from Pilanesberg Nature Reserve, North West Province; five females from a gemsbuck from a game farm "Nseufu Ranch", Vivo, Limpopo Province; one male and five females from a gemsbuck from a game farm in the Eastern Cape Province, one male and four females from a gemsbuck from Namibia, NCAH No. S2149; three females from a gemsbuck from Namibia, NCAH No. S2150; eight males and 19 females from two roan antelopes, Nylsvley Nature Reserve, Limpopo Province; two females from a roan antelope, NCAH, No. S1431; one female from a sable antelope from a game farm "Welgevonden", Mokopane, Limpopo Province; four males and 13 females, Mönnig's (1933) type material, from a sable antelope, NCAH No. T2072 and one female from a waterbuck, NCAH No. S1333.

Because of the large size of the worms, the approximate length was determined by placing them on a transparent ruler and measuring them using a stereoscopic microscope. The nematodes were then cleared in lactophenol and examined using a compound microscope with differential interference contrast illumination. Drawings were made with the aid of a *camera lucida*. Measurements were derived from the drawings and all are given in millimetres. Specimens for scanning electron microscopy were dehydrated through graded ethanol series and critical point dried from 100 % ethanol through carbon dioxide. They were mounted onto viewing stubs and sputter-coated with gold. The examinations and photography were done using a Hitachi S-2500 scanning electron microscope operated at 8 kV.

RESULTS AND DISCUSSION

Of the 69 helminths examined, 47 proved to be *S. thwaitei.* The 19 specimens from one roan antelope from Nylsvley were identified as *S. hornbyi.* Mönnig's (1933) material from the waterbuck and roan antelope was not suitable for identification due to severe shrinkage. In Table 1 the measurements of *S. thwaitei* from the different South African hosts are compared to measurements of the species made by Mönnig (1933). The measurements of *S. thwaitei* and *S. hornbyi* are compared in Table 2.

With the exception of the oesophagi which are shorter, measurements of *S. thwaitei* examined in this study corresponded closely to those of Mönnig (1933). However, the length of one specimen from gemsbuck exceeded Mönnig's (1933) findings. Apart from the oesophagi, which are considerably shorter in *S. thwaitei*, the measurements of *S. thwaitei* and *S. hornbyi* are almost similar. *Setaria thwaitei* has a ratio of oesophagus:body length of 1:25, while that of *S. hornbyi* is 1:11. The distances between the cephalic elevations in lateral view are also shorter than those of *S. hornbyi.*

The scanning electron microscopic appearances of *S. thwaitei* and *S. hornbyi* are presented in Fig.1 and 2.

It is evident from the scanning electron micrographs that the description of *S. thwaitei* given by Mönnig (1933) is accurate. In apical view the oval mouth opening of *S. thwaitei* is relatively large and is surrounded by a prominently raised peribuccal crown, which has dorsal and ventral undivided cephalic elevations. There is a gradual incline from the mouth opening to the apex of the elevations (Fig. 1C). The elevations are equidistant from each other and thus appear similar, whether viewed from a lateral or ventral aspect (Fig. 1A, B). *Setaria hornbyi* has a small, round mouth opening which is surrounded by a slightly raised peribuccal crown with four sturdy elevations (Fig. 2C). In lateral view the elevations of *S. hornbyi* are positioned further apart than in ventral view (Fig. 2A, B).

The promontories on which the deirids are situated are rugous in *S. thwaitei*. The deirids have a rough, almost tubercular, surface and end in a bifid tip (Fig. 1D and E). The promontory of *S. hornbyi* appears relatively smooth and dome-shaped, and supports a deirid which appears lightly scaled and has a single pointed tip (Fig. 2D and E). Although the promontories supporting the deirids of *S. thwaitei* appear more rugous than those of *S. hornbyi*, it is also apparent that shrinkage, possibly because of long storage in 70 % ethanol or during the preparation for SEM viewing (critical point drying), or both, even though both species were treated identically during all preparation steps, has taken place in the *S. thwaitei* specimen shown in Fig. 1A–F.

Mönnig (1933) described the posterior extremity of *S. thwaitei* as ending in three blunt tips and Yeh (1959) that of *S. hornbyi* as a small terminal knob. These features are illustrated in Fig. 1F and 2F.

Setaria thwaitei has been described from sable antelope but has also been recorded from roan antelopes (Mönnig 1933; Van den Berghe & Vuylsteke 1936; Vuylsteke 1956), waterbuck (Mönnig 1933), and gemsbuck (this paper). Ortlepp (1961) and Basson *et al.* (1966) recorded *S. hornbyi* from gemsbuck. The material of these authors was re-examined and found to be *S. thwaitei*.

TABLE 1 Comparative measurements (in mm) of *Setaria thwaitei*

Criterion	Males			Females		
	This paper (*n* = 5)	Mean	Mönnig (1933)	This paper (*n* = 16)	Mean	Mönnig (1933)
Length	63.00–82.00	71.4	88.00–98.00	115.00–321.00	204.69	215.00–280.00
Width	0.48–0.61	0.54	0.66–0.68	0.86–1.41	1.13	0.95–1.28
Muscular oesophagus, length	0.39–0.48	0.46	0.51–0.55	0.51–0.75	0.63	0.73–0.91
Glandular oesophagus, length	6.15–6.32	6.25	6.88–8.45	6.23–9.31	8.06	11.77–11.89
Total oesophagus length	5.30–6.80	6.34	7.30–9.00	6.77–10.06	8.69	12.50–12.80
Nerve ring from anterior end	0.28–0.29	0.28	*	0.26–0.51	0.33	*
Deirids from anterior end	0.62–0.71	0.65	*	0.54–0.77	0.68	0.49–0.64
Vulva, distance from anterior end	–	–	–	0.43–0.68	0.53	0.51–0.62
Tail, length	0.24–0.28	0.25	*	0.55–0.87	0.65	0.64–0.84
Caudal appendages from tail tip	–	–	–	0.04–0.09	0.07	*
Caudal appendages, length	–	–	–	0.016–0.034	0.03	*
Right spicule, length	0.17–0.21	0.19	0.21–0.23	–	–	–
Left spicule shaft, length	0.27–0.29	0.28	*	–	–	–
Left spicule blade, length	0.12–0.16	0.14	*	–	–	–
Total left spicule, length	0.39–0.45	0.42	0.42–0.49	–	–	–
Distance between cephalic elevations, lateral view	0.06–0.07	0.06	*	0.07–0.09	0.08	*
Distance between cephalic elevations, ventral view	0.06–0.07	0.06	*	0.07–0.09	0.08	*

\- Not applicable

* Measurements not given by author

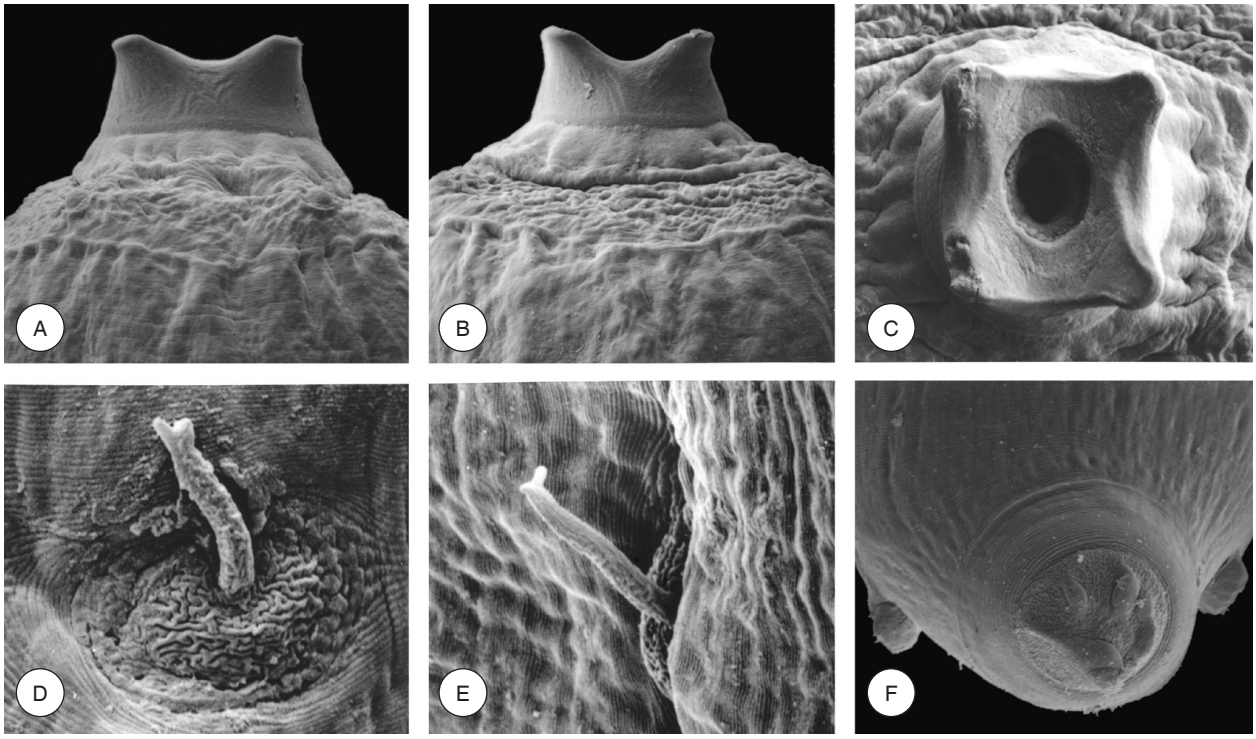

FIG. 1 *Setaria thwaitei*

(A) Lateral view of cephalic elevations, x 600; (B) ventral view of elevations, x 600; (C) apical view of elevations, x 600; (D) apical view of deirid, x 3 000; (E) lateral view of deirid, x 3 000; (F) terminal knob of female tail, x 1 500

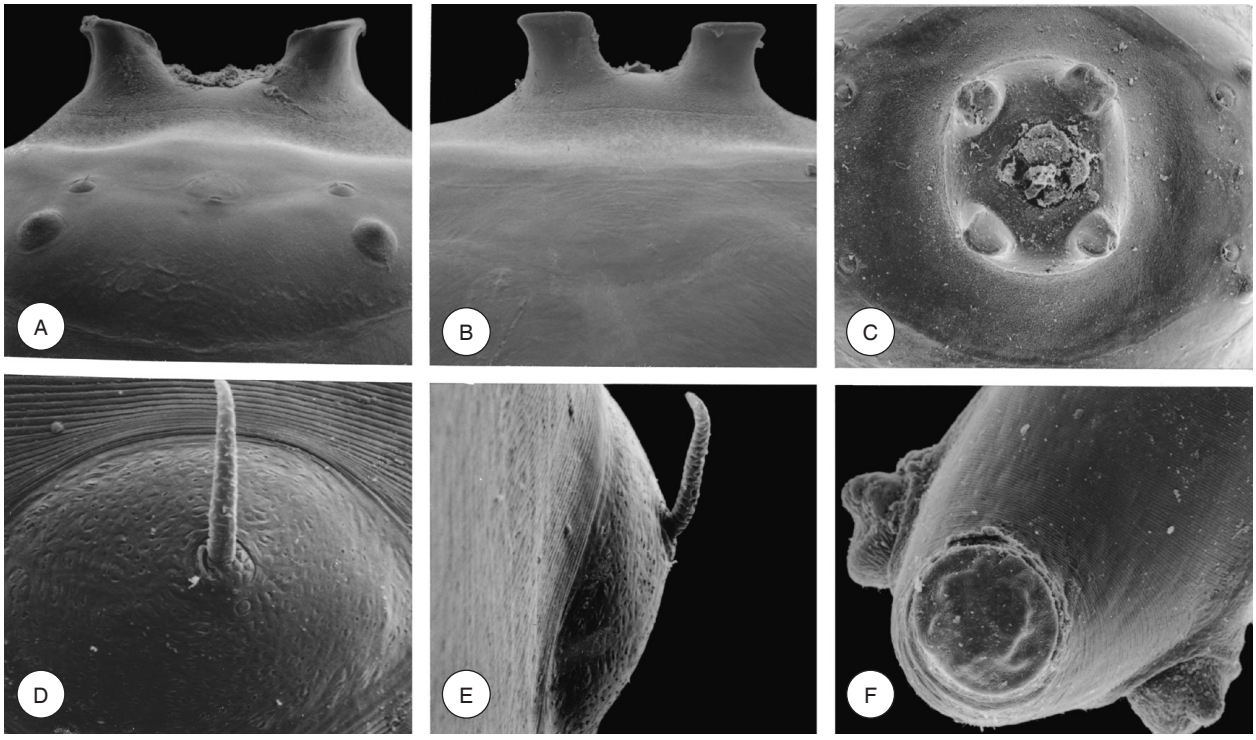

FIG. 2 *Setaria hornbyi*

(A) Lateral view of cephalic elevations, x 600; (B) ventral view of elevations, x 600; (C) apical view of elevations, x 600; (D) apical view of deirid, x 3 000; (E) lateral view of deirid, x 3 000; (F) terminal knob of female tail, x 1 500

TABLE 2 Comparative measurements (in mm) of the South African Setaria hornbyi and of *Setaria thwaitei*

Criterion	Males		Females	
	S. hornbyi	*S. thwaitei*	*S. hornbyi*	*S. thwaitei*
Length	83.00–87.00	63.00–82.00	157.00–212.00	115.00–321.00
Width	0.55–0.74	0.48–0.61	0.72–1.26	0.86–1.41
Muscular oesophagus, length	0.47–0.63	0.39–0.48	0.60–0.95	0.51–0.75
Glandular oesophagus, length	14.12–17.49	6.15–6.32	14.28–17.25	6.23–9.31
Total oesophagus length	14.59–18.12	5.30–6.80	15.00–18.12	6.77–10.06
Nerve ring from anterior end	0.25–0.31	0.28–0.29	0.30–0.37	0.26–0.51
Deirids from anterior end	0.55–0.73	0.62–0.71	0.63–0.92	0.54–0.77
Vulva, distance from anterior end	–	–	0.47–0.64	0.43–0.68
Tail, length	0.21–0.22	0.24–0.28	0.56–0.73	0.55–0.87
Caudal appendages from tail tip	–	–	0.05–0.08	0.04–0.09
Caudal appendages, length	–	–	0.017–0.019	0.016–0.034
Right spicule, length	0.18–0.20	0.17–0.21	–	–
Left spicule shaft, length	0.24–0.29	0.27–0.29	–	–
Left spicule blade, length	0.19–0.20	0.12–0.16	–	–
Left spicule sclerotized membrane	0.44–0.48	0.39–0.45	–	–
Distance between cephalic elevation, lateral view	0.11–0.13	0.06–0.07	0.11–0.13	0.07–0.09
Distance between cephalic elevation, ventral view	0.06	0.06–0.07	0.08–0.09	0.07–0.09

– Not applicable

Thwaite (1927) examined a large number of *Setaria* spp. from a variety of hosts. He concluded that there was considerable variation in the length of the specimens as well as in the "depth of the buccal ring and its protrusion in front of the head... even in worms from the same host". This could be because of the presence of more than one species of *Setaria*, in all probability both *S. hornbyi* and *S. thwaitei*. Yeh (1959) states: "Mönnig (1933), when he found the true *Artionema hornbyi* which Boulenger described, took the trouble to name it *Setaria thwaitei* new species with his only cited reference being Thwaite (1927)". This statement should be treated with reserve, since it appears that Boulenger (1921) described the "true" *S. hornbyi*, while Mönnig (1933) was quite correct in describing *S. thwaitei* as a separate new species.

Setaria thwaitei can be distinguished from *S. hornbyi* using several characteristic features. The cephalic elevations are distinct and the constriction at the level of the nerve ring, as described by Mönnig (1933), is much more prominent in *S. thwaitei.* Furthermore, *S. thwaitei* has a shorter oesophagus: body length ratio and the deirids have bifid tips. In view of these differences, we conclude that *S. thwaitei* is a separate and distinct species and it is herewith reinstated as such.

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