Oncholaimus sahariensis sp.n. (Nematoda) from the Algerian Sahara

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Keywords: Nematoda, *Oncholaimus,* Sahara, freshwater

Abstract

Oncholaimus sahariensis sp.n. is described from an oasis in the Algerian Sahara. It differs from *O. aquaedulcis* Schneider, 1937 and *O. deconincki* Heyns & Coomans, 1977, the only other freshwater species in the genus, in the more posteriorly situated vulva, the spicules which are longer than in *O. deconincki* but shorter than in *O. aquaedulcis,* and various other characteristics. The new species is unusual in that the whole female reproductive system as well as the demanian system are located on the left side of the intestine, whereas the reproductive system is normally to the right in Oncholaimoidea. Problems concerning the validity and differentiation of *Oncholaimium* Cobb, 1930 are discussed, at the same time explaining why the new species is placed in *Oncholaimus* rather than in *Oncholaimium.*

Introduction

Heyns & Coomans (1977) described *Oncholaimus deconincki* from a freshwater habitat in South Africa. The only other truly freshwater *Oncholaimus* is *O. aquaedulcis* Schneider, 1937, from East Java. The present species, from a small oasis in Algeria, thus constitutes the third freshwater species in this group.

Oncholaimus sahariensis sp.n.

Measurements

Holotype female: L = 3.07 mm; a = 63; b = 7.3; c = 45.5; c′ = 1.67; V = 70.9; G = 13; mid body width = 49 μm; anal body width = 40 μm; neck length = 421 μm.

Paratype female: L = 3.27 mm; a = 56; b = 7.8; c = 44.5; c′ = 1.83; V = 73.8; G = 18; mid body width = 58 μm; anal body width = 40 μm; neck length = 420 μm.

Paratype male: L = 2.72 mm; a = 75; b = 7.4; c = 50; c′ = 2.24; T = 41; mid body width = 36 μm; anal body width = 24 μm; neck length = 367 μm.

Description

Female (Figs. 1D, E, G, I, J–M; 2A–D, H–I) (measurements or other data of paratype in brackets when different from those of holotype).

Body almost straight or forming loops upon fixation. Cuticle smooth, showing little differentiation in optical section. Inner layer double in lip region, forming a cephalic capsule. Sparse sublateral somatic setae present throughout the body, but mainly near both ends. Of the nine sublateral setae in the neck region, six are in front of the nerve ring (Fig. 1G). Between the anterior end and the nerve ring there are also four subdorsal and five (four) subventral setae. Epidermis with tessellated appearance (Fig. 1H); nuclei of the chord cells mostly clear though less so than in the juveniles, the anteri-

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Hydrobiologia 107, 193–201 (1983).

ormost one is a ventral chord nucleus, whereas the most anterior lateral nucleus is further back than the most anterior dorsal chord nucleus. Glandular organs occur at irregular intervals, mainly in the lateral chords. Metanemes not seen.

Head continuous with body contour; six lips with a circlet of six inner labial papillae (i.l.p.) and a circlet of six longer (7–9 μm) outer labial setae (o.l.s.) and four shorter (6.5 μm) cephalic setae (c.s.). The exact length of the setae, especially the o.l.s., may be difficult to measure due to foreshortening. I.l.p. and o.l.s. 7.5 μm apart. Amphids with stirrup- or cup-shaped, shallow fovea and bent oval apertures 7.5 μm wide, situated at 16.5 (15.5) μm posterior to the lateral i.l.p. and 7.5 (8.0) μm posterior to the lateral o.l.s. Comparison of Figs. 2A and 2B shows that the distances from the setae or the amphid aperture to the anterior end cannot be accurately measured when the head is bent upwards or downwards; the same applies for the position of the amphid with reference to the teeth. Head width at level of setae: 27.5 (28.5) μm.

Buccal cavity 34 μm deep and 17 (19) μm wide; its walls about 3 μm thick, heavily cuticularized and composed of three sets of plates: anterior oblique cheilorhabdia, vertical plates and oblique basal plates. The three vertical plates each bear a tooth of which the dorsal and right ventrosublateral ones are about equal in size and the left ventrosublateral one is considerably longer. Each tooth is perforated by the subterminal outlet of the corresponding pharyngeal gland. Several muscles control the protrusion and retraction of the buccal capsule: (1) *labial muscles* that insert on the labial cuticle of the cephalic capsule and on the vertical plates of the stoma; upon contraction these muscles pull the lips backwards; thus bringing the buccal capsule and the teeth forward; (2) *stomatal muscles* running from the vertical plates to the body wall; upon contraction they bring the protruded buccal capsule back to the resting position. Three of these muscles insert on the teeth.

Pharynx cylindrical, anteriorly surrounding the base of the buccal capsule; strongly muscular, with at least three and probably five pharyngeal glands, the nuclei of which are in the basal portion (Fig. 2D), but only the ventrosublateral nuclei having the typical appearance of gland nuclei (see also Fig. 2E of a juvenile specimen). Pharyngo-intestinal junction cordiform to convex-conoid, 18.5 (22) μm long and 24 (27) μm wide, surrounded by intestinal tissue (Fig. 2D). Intestine with twelve cells in circumference, sometimes bearing long, faint and loosely arranged microvilli (or lamellae?) at the anterior end (Fig. 2D), further backward with an irregular and denser covering of short, thick microvilli. Rectum slightly longer (slightly shorter) than anal body width. Anus a long transverse slit with caudally curved ends. One dorsal or subdorsal and one or two subventral setae occur in the region of the rectum.

Excretory pore 61 (62) μm from anterior end. Nerve ring at 42.5 (41) % of the neck length.

Tail broadly convex for about one anal body width, then abruptly narrowing to a long peg of roughly the same length as the broad basal part (Fig. 2H, I). A subventral and/or subdorsal seta occur(s) close to the tail terminus; another seta is present subventrally about halfway the broad part of the tail (not present in paratype). In addition to these some 9 (7) minute setiform protrusions occur subventrally and subdorsally in the caudal region of the female, five of them situated on the broad part of the tail, one at the junction of both parts of the tail, while the others are preanal. Each of them is located in a small depression and some seem to be connected to a small ampulla or a long anteriorly directed duct. Since such structures are not found in the male nor in juveniles, they probably represent the terminal parts of the demanian system (see below). Spinneret small, terminal.

Female monodelphic, with only the anterior reproductive branch developed, lying on the left side of the intestine. Ovary long, growing oocytes in single file, younger cells packed together near the apex; 5 (10) cell nuclei present at the anterior end of the mature oocyte (Fig. 1I). Two intra-uterine eggs in the paratype measured 92 × 52.5 μm and 80.5 × 52.5 μm. Vagina a simple, slightly anteriorly bent tube, leading to the uterus of which the distal part has a cuticularized wall. The ductus uterinus of the demanian system opens here. This ductus is 641 (587) μm long, at first rather weakly developed with flattened cells surrounding a central lumen (Fig. 1E, J), then more strongly differentiated with closely packed cells containing prominent nuclei (Fig. 1E, L). The ductus uterinus extends on the left side of the intestine to 5 (4.5) body widths in front of the anus where the ductus joins the uvette. The uvette consists of about 20 cells (Fig. 1M); it connects the

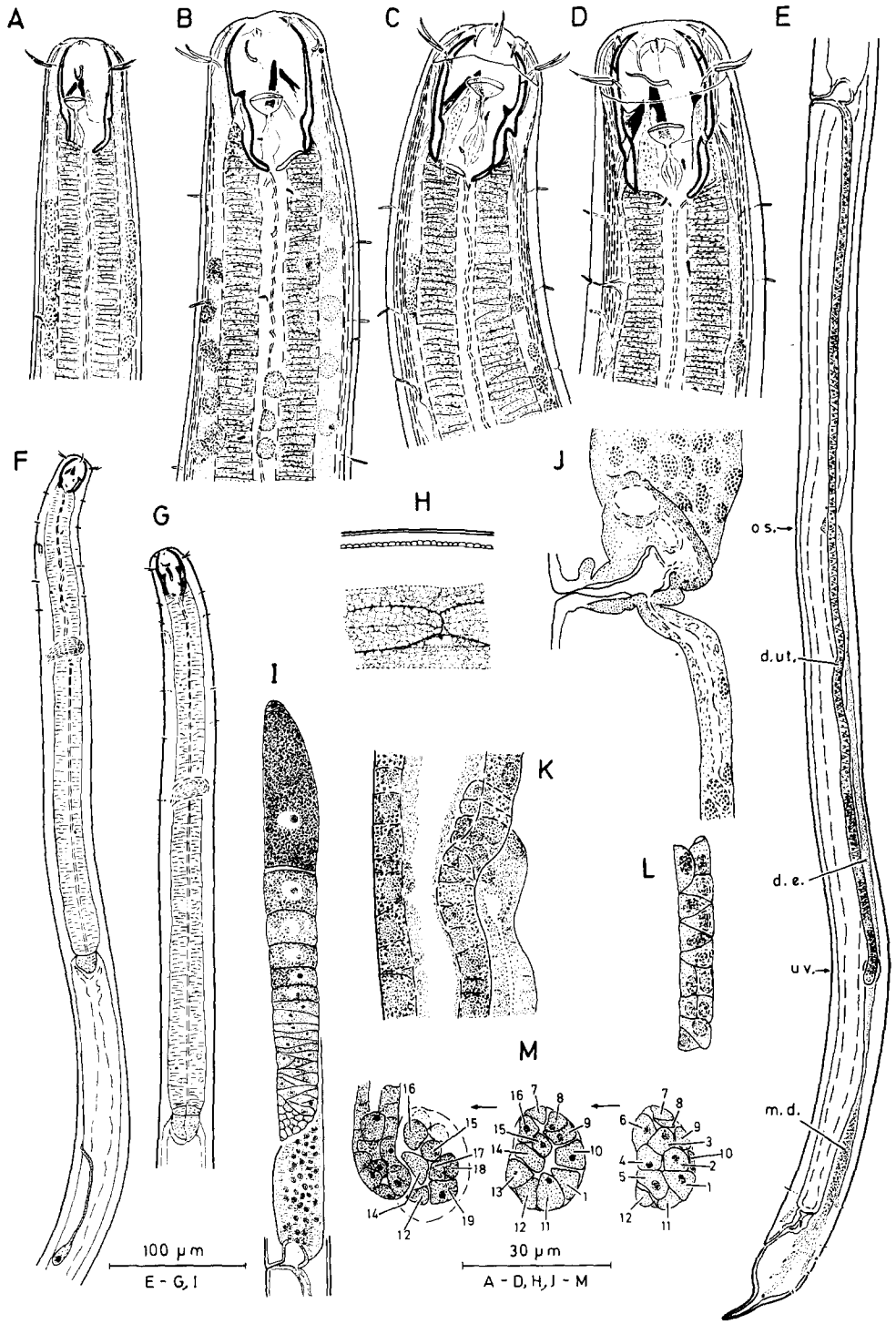

Fig. 1. O. sahariensis sp.n. A: Head end of younger juvenile (3rd stage?). B: Head end of older juvenile (4th stage). C: Head end of male. D: Head end of female (holotype). E: Demanian system of holotype. F: Anterior body region of male. G: Neck region of holotype. H: Epidermis in optical longitudinal section and in surface view. I: Reproductive system of holotype female. J: Vaginal region of holotype. K: Junction of osmosium and intestine (holotype). L: Ductus uterinus (holotype). M: Uvette in three consecutive optical sections (paratype), with cells numbered from most internal to most external position.

Abbreviations: *d.e.* = ductus entericus; *d.ut.* = ductus uterinus; *m.d.* = main duct; *os.* = osmosium; *uv.* = uvette.

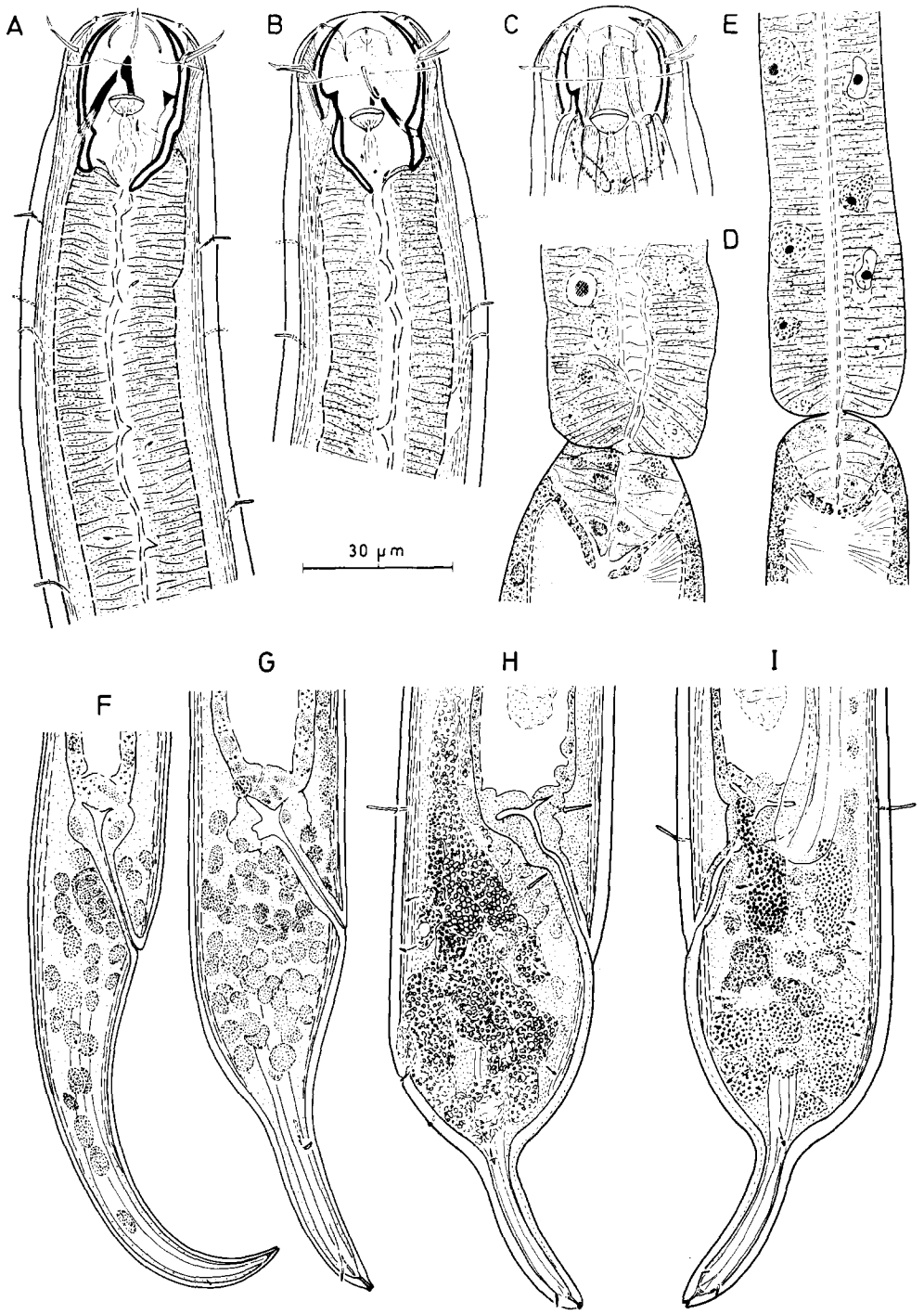

Fig. 2. O. sahariensis sp.n. A: head end of paratype female, as seen from the left. B: Same, as seen from the right. C: Same, showing labial and stomatal musculature. D: Pharyngo-intestinal junction in paratype female. E: Pharyngo-intestinal junction in fourth stage juvenile. F–I: Tails of: F: Younger male juvenile. G: Fourth stage female juvenile. H: Female paratype, right side. I: Same, left side.

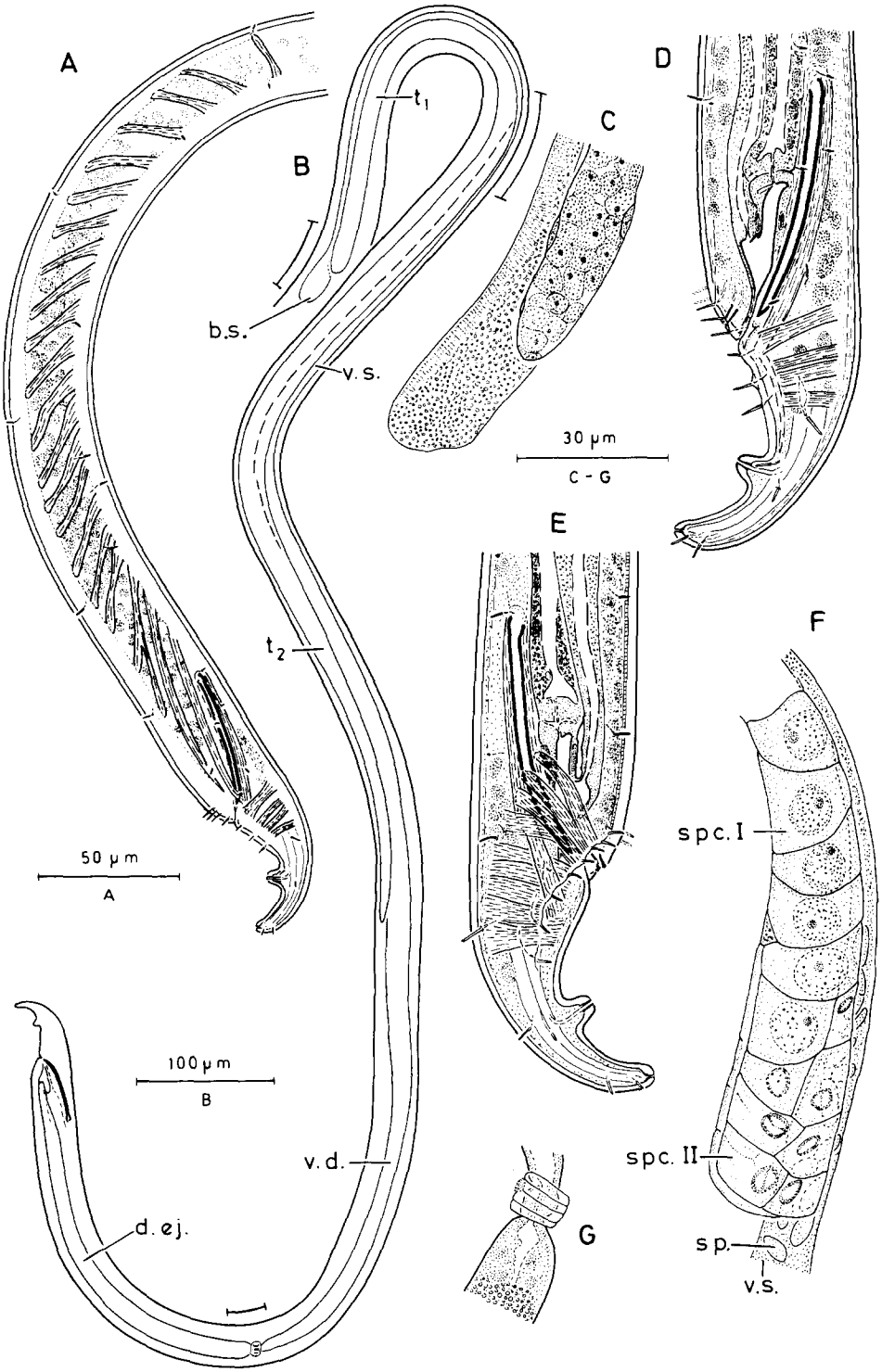

Fig. 3. O. sahariensis sp.n. Male. A: Posterior body region showing copulatory and accessory copulatory muscles. B: Outlines of reproductive system with indications of the regions enlarged in Figs C, F and G. C: Apical end and blind sac. D: Male tail, left side (muscles omitted, except protractor spiculi and caudal accessory copulatory muscles). E: Same, right side (only copulatory muscles omitted). F: Part of anterior testis with primary (spc. I) and secondary (spc. II) spermatocytes, partially covering the anteriormost portion of the vesicula. G: Sphincter between vas deferens and ductus ejaculatorius.

Abbreviations: *b.s.* = blind sac; *d.ej.* = ductus ejaculatorius; *sp* = spermatozoon; *spc. I* = primary spermatocyte; *spc. II* = secondary spermatocyte; t_1 = anterior testis; t_2 = posterior testis; *v.d.* = vas deferens; *v.s.* = vesicula seminalis.

ductus uterinus to left side of the remainder of the demanian system. The latter portions which are more dorsally situated, are less distinct and comprise the ductus entericus, leading to an osmosium (Fig. 1E, K) which lies about halfway between the uvette and the vagina, and a glandular main duct running towards the tail. The terminal ducts of the system are not clear and as explained above, they apparently lead to several minute protrusions in the caudal and precaudal region.

Male (Figs. 1C, F; 3)

Similar to female in gross morphology, but differing in several dimensions, tail shape and sexual characteristics.

Inner labial papillae 6 μm anterior to o.l.s.; o.l.s. 7.5 μm long; c.s. 6 μm long; lateral o.l.s. 6 μm and lateral i.l.p. 13 μm anterior to amphid aperture. Head 22.5 μm wide at level of setae. Amphid aperture 7 μm wide. Buccal cavity 27 μm deep and 14.5 μm wide. Excretory pore 68.5 μm and ventral gland cell 584 μm from anterior end (Fig. 1F). Nerve ring at 39% of neck length. Pharyngo-intestinal junction 16.5 μm long and 17 μm wide.

Tail conoid, ventrally arcuate. A large ventromedian tubercle (5 μm high) occurs just posterior to the middle of the tail. Cloacal opening surrounded by 16 genital setae, the bases of which are connected by a faint cuticular ridge. In addition there are four subdorsal and one lateral caudal setae. Preanal supplementary organ present but rather weakly developed. Spinneret as in female (Fig. 3D, E).

Genital musculature complex, at each side consisting of 21 preanal copulatory muscles (Fig. 3A), 5–6 adanal and caudal accessory copulatory muscles and three additional muscles running from the lateral body side to the anterior cloacal lip (Fig. 3D, E).

Male diorchic with the two testes about equally long. Anterior testis on the right side of the intestine, posterior one also mainly on the right side but its apical end dorsal to the intestine. Spermatogonia and young primary spermatocytes small, packed together near the blind end of the testes (Fig. 3C); fully grown primary spermatocytes very big, each with a large nucleus; arranged in a single row; followed by smaller secondary spermatocytes containing smaller nucleic with condensed chromatin (Fig. 3F) and arranged first in two then in three or four rows. The anterior testis is flanked by a long glandular caecum ('accessory to gonad' of Cobb, 1930 & 1932) that extends slightly beyond the apical end of the testis (Fig. 3B, C). Both testes and the caecum join at the vesicula seminalis that contains a number of broadly oval spermatozoa and that further leads to the vas deferens. The posterior portion (272 μm) of the latter is set off from the main part by a sphincter (Fig. 3B, G) and corresponds to the ductus ejaculatorius of other oncholaims although it appears to be more glandular than muscular. This ductus joins the rectum from the ventral side, thus forming the cloaca (Fig. 3D, E). The whole vas deferens is situated on the right and ventral side of the intestine. Spicules 47.5 μm long, slightly ventrally curved, with pointed tip and slightly cephalated proximal end.

Juveniles (Figs. 1A, B; 2E–G)

Measurements: see Table 1.

Six juveniles were found, five of which seem to belong to the same stage (possibly third), while the sixth belongs to the fourth stage. The most obvious differences are total length, c and c' ratio's, amphid width, tail shape and size of buccal cavity. The genital primordium of the male juveniles (nos. 3 and 5 in Table 1) is on the right side and that of the female juveniles (nos. 4 and 6) is on the left side of the intestine.

Bionomics: the intestinal contents consist of a variety of organic material, with several cuticular remnants (e.g. a mastax of a bdelloïd rotifer) and in the female paratype a first stage juvenile of *Mononchus*. The species is probably omnivorous.

Type locality: slowly running water (pH: 7.5) with coarse sediment in a small oasis along the Oued En-Nanmous, close to Ain Sefra, Algeria. Collected by A. Coomans, April 1980.

Type specimens: holotype female and fourth stage juvenile on slide 465, paratype female on slide AC S4a45 and paratype male on slide AC S4a46, juveniles on slides AC S4a, 10, 17, 44, 48 and 50, all in the collection of the Instituut voor Dierkunde, Rijksuniversiteit Gent, Belgium.

Differential diagnosis: Oncholaimus sahariensis sp.n. differs from the two other freshwater species in the shape of the female tail and the pronounced

Table 1. Dimensions of juveniles of *Oncholaimus sahariensis* sp.n.

Measurements	Juv. 1	Juv. 2	Juv. 3	Juv. 4	Juv. 5	Juv. 6
L (mm)	1.16	1.28	1.38	1.45	1.57	2.31
a	48.5	58	57.5	52.5	61	66
b	3.9	4.8	4.6	5.5	4.8	5.6
c	13.5	15	16	–	17.5	31
c'	5	5	5	–	4	2.4
Amphid aperture (μm)	5	4.5	5	–	4.5	7
Amphid →→→ l.i.l.p. (μm)	9.5	10.5	10	–	12.5	12.5
Amphid →→→ l.o.l.s. (μm)	5.5	6	5.5	6	7	6.5
Cephalic width at setae (μm)	17	16.5	17	17.5	19	24
Buccal cavity (μm) - length	19	21	20	22.5	21	29.5
- width	9	9	9.5	9.5	9.5	15
Excretory pore from anterior end (μm)	62.5	55.5	49	–	61.5	65
Nerve ring - from anterior end (μm)	151	131	144	125.5	151	171.5
- % of neck	51	48.5	47.5	48	46	42
Neck (μm)	295	269	302	262	328	410
Rectum (μm)	22	24	25	23	31	33.5
Anal body width (μm)	17.5	17	17.5	22	22	31
Gonad primordium (body side)	–	–	R	L	R	L
- length (μm)	–	–	26.5	22	43	123
- width (μm)	–	–	17	16.5	14	23
Tail (μm)	87.5	85	87.5	–	89	74

sexual dimorphism in tail shape, and in the more posterior vulva position (V = 63 in *O. aquaedulcis* and 63–67 in *O. deconincki*). It further differs from *O. aquaedulcis* W. Schneider, 1937 in the length of the spicules (100 μm in *O. aquaedulcis*) and from *O. deconincki* Heyns & Coomans, 1977 in its smaller body size (L = 3.72–4.13 mm in ♀ and 3.20–3.77 mm in ♂ of *O. deconincki*), length of spicules (35–41 μm in *O. deconincki*) and details of the demanian system, e.g. much longer ductus enteric us and larger number of terminal pores.

Discussion

The newly described species presents some unusual characteristics. In both females the whole reproductive system as well as the demanian system is situated on the left side of the intestine. Lorenzen (1981) indicates that the reproductive system in Oncholaimoidea is situated on the right side and considers this to be a synapomorphy of the group. It should be mentioned that two female juveniles had the genital primordium on the left side of the intestine, whereas male juveniles and males have the reproductive system on the right side. The ventral gland was only observed in the male where it was located on the left side of the intestine, again contrary to Lorenzen's statement that this gland is on the right side of the intestine. Where male oncholaims usually possess either a preanal supplementary organ or a ventral caudal papilla, the male of *O. sahariensis* sp.n. possesses both.

Cobb (1930) erected the genus *Oncholaimium* and differentiated it from *Oncholaimus* by the presence of a preanal supplementary organ (called appendicule by Cobb). Schuurmans-Stekhoven (1935) regarded *Oncholaimium* as a synonym of *Oncholaimus*. Chitwood (1960) and Wieser & Hopper (1967) regarded the presence of a preanal supplement as insufficient to separate *Oncholaimium* from *Oncholaimus*, and this view is also held by Rachor (1969 & 1970) who found a small preanal supplement in *Oncholaimus skawensis* Ditlevsen, 1921. This species apparently lacks a demanian system, whereas the latter system is said to be well-developed in *Oncholaimium* (cf. Kreis, 1934). Gerlach & Riemann (1974) agree with Rachor (l.c.). The Russian authors Belogurov and Belogurova (several papers) still consider *Oncholaimium* a valid genus, e.g. Belogurova (1978) differentiates both genera on the basis of the number of terminal pores (2 in *Oncholaimus*, more than 2 in *Oncholaimium*) and the presence (*Oncholaimium*) or absence (*On-*

cholaimus) of a large ventral papilla on the male tail. In their key Belogurov & Belogurova (1978b) use only the first of these characteristics to differentiate between these genera and indeed Belogurov *et al.* (1975) described *Oncholaimium olium* Belogurov, Belogurova & Pavlyuk, 1975 without a large ventral papilla on the male tail, but with a preanal supplementary organ. Although Belogurov & Belogurova (1977) have doubts about the validity of *Oncholaimium* as a separate genus, they (Belogurov & Belogurova, 1978a) retain it as such in their subtribe Oncholaiminini. In the latter paper *Oncholaimium* is differentiated from *Oncholaimus*, mainly by the number of terminal ducts and pores (see above), the presence of a single testis and the presence of either a precloacal motile accessory organ and/or two large ventral caudal papillae in the male of *Oncholaimium*. The presence of only one testis in *Oncholaimium* versus two in *Oncholaimus* may be a useful characteristic to separate these genera. However, Belogurov & Fadeeva (1980) describe a new *Oncholaimium* species (*O. paraolium* Belogurov & Fadeeva, 1980) and report a male specimen with two testes, while other males are described with a single anterior, very long but reflexed testis. The latter situation is so unusual for oncholaims that we believe that these males also have two testes; this interpretation is supported by the original illustration (Fig. 1A).

From the literature it appears that the genus *Oncholaimus* comprises a number of subgroups, and that a thorough and comparative study of these could lead to the establishment of some subgenera of which *Oncholaimium* may be one. Such a study should preferably also include the related genera. This explains why we have put our new species in the genus *Oncholaimus* although it presents most of the characteristics considered to be diagnostic for *Oncholaimium*.

Acknowledgements

The authors gratefully acknowledge financial support from the Nationaal Fonds voor Wetenschappelijk Onderzoek.

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Received 26 January 1983; accepted 14 March 1983.