Kittydorylaimus gen. n. and *Kolodorylaimus* gen. n., two remarkable new genera of Dorylaimina (Nematoda)

By

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Abstract. Two new interesting genera of the suborder Dorylaimina are described from Africa. *Kittydorylaimus* gen. n. (with type-species *K. specialis* sp. n.) is unique in having a special combination of longitudinal cuticular ridges and shape of tail. *Kolodorylaimus* gen. n. (with type-species *K. vesiculosus* sp. n.) shows an unusual cellular-vesicular structure of intestine, a similar one not observed in dorylaims so far.

A wide scale of the most various morphological phenomena is known in dorylaimoid nematodes. Nevertheless, newer and newer forms are discovered from time to time which still give us a surprise in their morphology. As follows, two new terrestrial species of the suborder Dorylaimina are described from Africa (Tanzania, Kenya) which cannot be placed in any of the known genera. Because of their unusual characters, a new genus shall be proposed for either one of them: *Kittydorylaimus* gen. n. and *Kolodorylaimus* gen. n.

Kittydorylaimus gen. n.

Arctidorylaimidae (?). Body about 2 mm long, plump, strongly narrowing anteriorly. Cuticle very thick, provided with elevated longitudinal ridges. Head strongly offset, lips separate. Spear slightly sinuate, longer than labial width, but thinner than cuticle. Oesophagus gradually widening. Oesophageal gland nuclei well visible, and showing a special picture: D lying far behind the middle of oesophagus, AS_1 uncommonly close to D, hence very far from AS_2. Vulva longitudinal, female genital organ amphidelphic. Spicula dorylaimoid. Ventromedial supplements contiguous. Tail in both sexes short and blunt, in female and larvae with offset recurved tip, in male with bluntly rounded terminus.

Type-species: *Kittydorylaimus specialis* sp. n.

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Kittydorylaimus specialis sp. n.

(Figs. 1, 2 A–D and 3 A–E)

Holotype, female: L = 1.92 mm; a = 22; b = 4.1; c = 40; V = 52 %; c′ = 1.3.
Paratype, male: L = 2.03 mm; a = 22; b = 4.3; c = 54; c′ = 1.0.
Larva (L4): L = 1.35 mm; a = 21; b = 3.7; c = 21; c′ = 2.2.

Body about 2 mm long, fairly plump, 86–92 µm wide on its middle, strongly tapering anteriorly to a narrow lip region; body at posterior end of oesophagus 4.8–5.0 times as wide as head. Cuticle very thick, 10–12 µm on mid-body, seemingly consisting of 4–5 layers. In optical view, the common width of cuticles of both body sides amounts to nearly one-fourth of the entire body diameter. Cuticle surface marked by 36–38 well discernible longitudinal ridges which are somewhat reduced in number on neck and tail. The ridges begin at one to one and a half labial diameters posterior to head, and extend over the entire body; between the ridges the cuticle shows a fine transverse striation.

Labial region small, narrower than subsequent neck region, 16–17 µm wide and 5–6 µm high, sharply offset by a constriction. Head formed from rounded and separated lips bearing small papillae. Amphids funnel-shaped, about half as wide as neck at base of head.

Odontostyle dorylaimoid, slightly sinuate, 35–37 µm long and 3.5–4.0 µm thick, about 8 % of total oesophageal length, essentially longer (2.2–2.3 times) than labial diameter, but only half as thick as cuticle at the same level. Aperture one-third of spear length. Guiding ring simple and thin. Oesophagus 468–472 µm long, 23–24 % of body length, fairly muscular also in anterior half, gradually widening in 53–55 % of its length; cylindrus 220–240 µm long, moderately enlarged. Distance between posterior end of oesophagus and vulva only slightly (1.1 times) longer than oesophagus. Cardia conoid, 35–38 µm long. Intestine consisting of comparatively large cells giving a wavy contour to it. Prerectum 3.5 times, rectum 1.8 times as long as anal body width.

Oesophageal gland nuclei in Kittydorylaimus specialis

D = 60–62%	AS_1 = 6–8 %
	AS_2 = 32–40 %
	PS_1 = 62–63 %
K = 19–20 %	PS_2 = 63–64 %

All five oesophageal nuclei are well discernible, round, except for AS_2 which is oval. The „map" of the nuclei is very characteristic.[1] The dorsal nucleus (D) lies far behind the middle of oesophagus (in 14 % of the entire length of body); AS_1 is uncommonly close to D (at 17–23 µm only); AS_2 is located well anterior to the middle of the distance between D and posterior end of oesophagus; PS nuclei are at two-

[1] The location of the dorsal nucleus is expressed as a percentage of the distance between anterior end of body and posterior end of oesophagus; the positions of the four subventral nuclei are given as the percentage of the distance between dorsal nucleus and posterior end of cylindrus. (See also Andrássy, 1998 a, p. 555–556, Fig. 2, and Andrássy, 1998 b, p. 165–170, Figs. 1–3.)

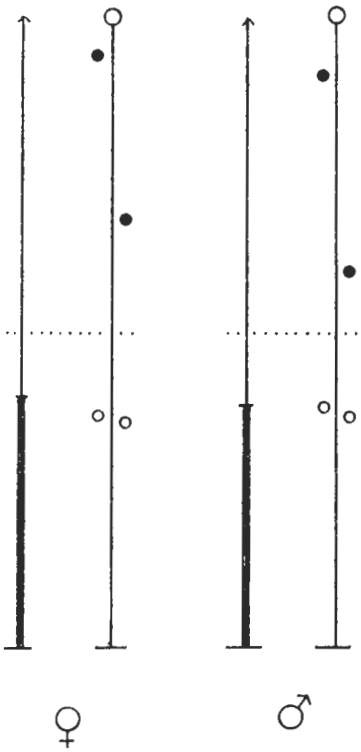

Fig. 1. Map of the oesophageal gland nuclei in a female and a male of *Kittydorylaimus specialis* sp. n. The left column of each specimen illustrates the comparative length of the glandularium, the right column shows the arrangement of the nuclei within the glandularium

third of the above distance, 66–70 µm from posterior end of oesophagus. K (position of AS_1 in percentage of the $D–AS_2$ distance) shows an unusually low value.

Vulva longitudinal, close to mid-body, its inner lips 20 µm wide, not sclerotized. Vagina 45 µm long. Reproductive system amphidelphic, occupying 37 % of body length; both branches lying on right side of the intestine. Anterior gonad 3.8 times, posterior 4.3 times as long as body width, or, anterior gonad 17 %, posterior 20 % of body length. Uterus on both ends tapering to an S-like tube, then expanding to a spermatheca. Ovaries reflexed close to vulva. Uterine eggs were not present.

Distance vulva–anus 18 times as long as tail. Female tail 50 µm, 2.6 % of entire length of body, showing the larval type, but being shorter, bluntly convex-conoid, with a small (6 µm) recurved tip.

Male gonad (from distal tip of anterior testis to cloaca) occupying 65 % of body length. Testes on the right side of intestine, each 3.8 times as long as body width, or 17 % of body length. Spermatozoa more or less oval, small, 4–5 µm, about 1/20 of body diameter. Spicula dorylaimoid, slender, 82 µm long; caput narrow, venter slightly swollen, sinus shallow, pes conoid-pointed; anterior half of spiculum somewhat longer than posterior. Comes slender. Adanal papillae close to cloaca.

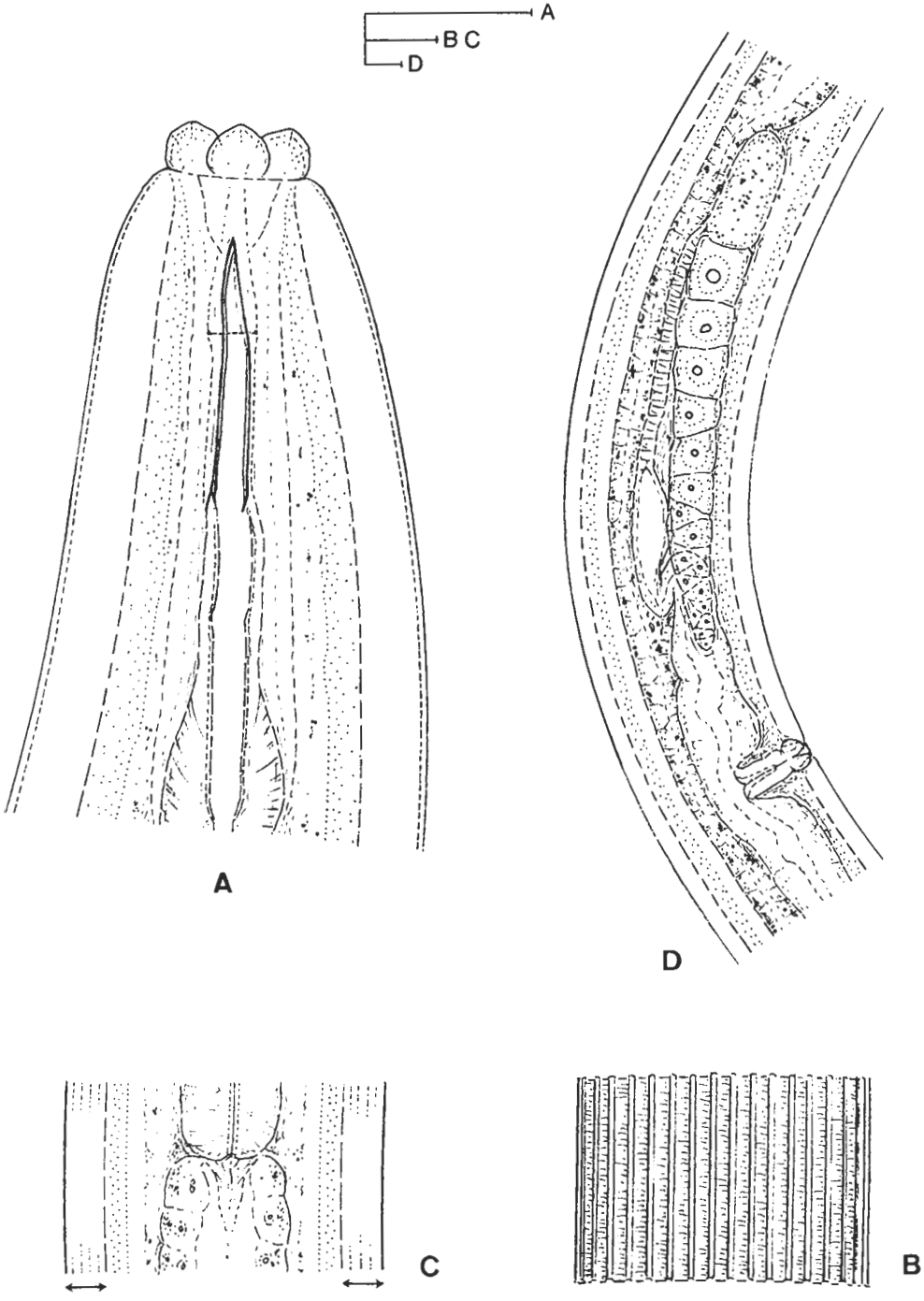

Fig. 2. *Kittydorylaimus specialis* sp. n. A: anterior end; B: cuticle surface with longitudinal ridges; C: how thick the cuticle is in comparison with body width: the cuticles of both sides together amount to about one-quarter body diameter; D: anterior female gonad and vulva. (Scale bars 20 µm each)

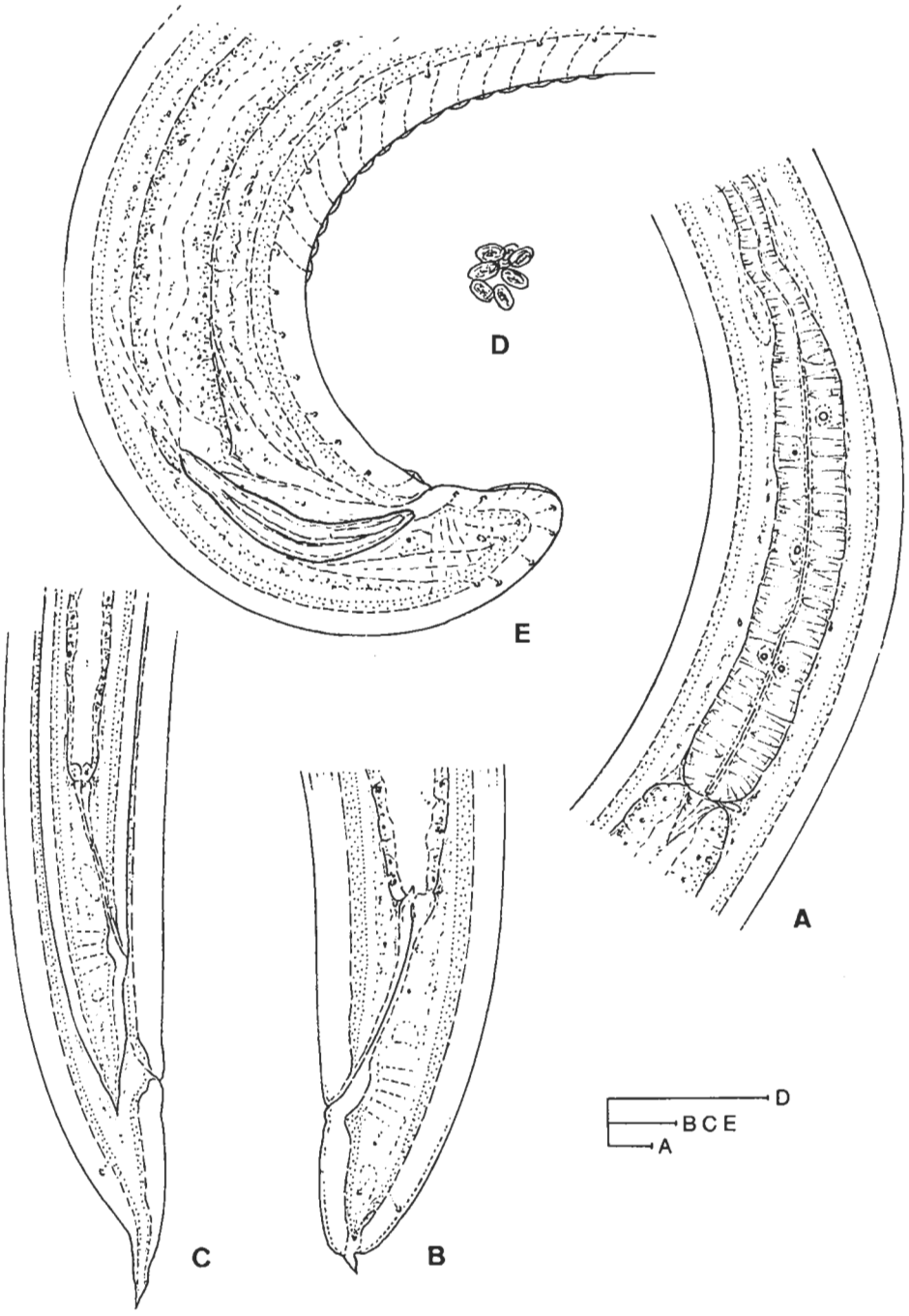

Fig. 3. *Kittydorylaimus specialis* sp. n. A: posterior region of oesophagus; B: female posterior end; C: posterior end of an L4 larva being under moulting (look at the tail and the still thin cuticle of the pre-adult in the exuvium); D: spermatozoa; E: male posterior end. (Scale bars 20 µm each)

Ventromedial supplements 15, contiguous, flat, occupying a distance of 118 µm. On the body region between the anteriormost supplement and cloaca, 15 pairs of small subventral papillae can be counted. A weak copulatory „pad" present. Prerectum beginning anterior to the supplements. Male tail 38 µm, 1.9 % of body length, bluntly conoid, with rounded terminus. It possesses a large ventral, subterminal „blister" (a similar feature can be observed on the male tails in the genus *Crocodorylaimus*). Caudal papillae 12 pairs.

Two larvae were also observed, an L3 and an L4 larva. The number of the longitudinal ridges on mid-body was 24 in L3 and 34 in L4. In the larva L3, the functional spear amounted to 20 µm, the replacement (or better: succeeding) spear embedded in oesophageal tissues (for L4) to 28 µm; in the larva L4, the functional spear was 27 µm, the succeeding spear (for adult) 36 µm. The tail was broken on tip in L3 larva, in L4 it was unwounded, 68 µm, longer than two anal diameters, conoid with a sharp, slightly dorsally curved tip. The L4 larva was under moulting. It was very remarkable that the developing pre-adult (female) within the L4 had still a much thinner cuticle than the larve itself (Fig. 3 B); all that means that the cuticle must increase in thickness after hatching from the exuvium.

Holotype: female on the slide No. 12476/A; paratypes: a male and two young specimens, all deposited in the nematode collection of the Eötvös Loránd University.

Type locality: Matombo, Morogoro Region, southern Tanzania, detritus and soil around *Pandanus* sp., February 1987, collected by S. Mahunka and A. Zicsi.

Remarks. There are two families within the suborder Dorylaimina where the cuticle may possess longitudinal ridges: Dorylaimidae and Actinolaimidae. In Dorylaimidae the species of the type subfamily, Dorylaiminae are marked by these ridges, in Actinolaimidae the members of two subfamilies, Actinolaiminae and Brittonematinae show such phenomena. All representatives of these groups are characterized by a sexual dimorphism well expressed in the shape of tail: the tail is elongate-conoid to filiform in females and short and broadly rounded in males. About 60 species have been described or placed in the mentioned groups so far, more closely in the genera *Dorylaimus, Ischiodorylaimus* (Dorylaiminae), *Actinolaimus* (Actinolaiminae), *Brasilaimus, Actinca, Parastomachoglossa, Practinocephalus* (Brittonematinae).

In 1979 Mulvey and Anderson discovered a dorylaimoid nematode species in the Canadian Arctic, which was not to be placed under any genera of either Dorylaimidae or Actinolaimidae. This very interesting nematode provided with longitudinal ridges on cuticle, *Arctidorylaimus arcticus*, differed from every representative of the above mentioned subfamilies in having no sexual dimorphism in the tail; this latter was similar in both sexes: short, conoid, ventrally curved. Another difference – if perhaps not so essential – could be found in the ventromedial supplements of male: they were few in number and well separated from one another (not numerous, and nor contiguous or in fascicles grouped as in Dorylaimidae and Actinolaimidae). Since *Arctidorylaimus arcticus* did not appear to show a close relationship to either these families or any other ones of the Dorylaimina, Mulvey and Anderson suggested a new family, Arctidorylaimidae, for this Arctic species.

It shall be noted that, in their book, Jairajpuri and Ahmad (1992) still placed *Arctidorylaimus* under the family Dorylaimidae; they accepted Arctidorylaiminae as a subfamily only. Whereas, I was (1988, in revising the Dorylaimidae) and am of the definite opinion that *Arctidorylaimus* may not be shifted to Dorylaimidae; it is thus better to retain the family Arctidorylaimidae for it.

Well, the present new genus, *Kittydorylaimus* does not correspond to the criteria of either the family Dorylaimidae or the family Arctidorylaimidae. The special shape of the tail immediately distinguishes it from every species of both families. If we compare the new genus with the genera of Dorylaiminae, *Dorylaimus* Dujardin, 1845 and *Ischiodorylaimus* Andrássy, 1969, the following differences can be found as characteristic for it: the head is sharply offset, guiding ring simple, vulva longitudinal, tail in both sexes short, besides, the spermatozoa are very small and ovoid. And, what is also very important, the gland nuclei in the oesophageal cylindrus show a quite different pattern.

Kittydorylaimus resembles *Arctidorylaimus* Mulvey & Anderson, 1979 in having a longitudinal vulva and a short tail in both female and male. It differs however in a good number of characteristics from that, *viz.* in thickness of cuticle, labial region offset by a deep constriction, arrangement of oesophageal nuclei, shape of spermatozoa, number and arrangement of ventromedial supplements, as well as in shape of the tail. The taxonomic position of *Kittydorylaimus* is rather uncertain. Nevertheless, I do not want to erect a separate family or subfamily for it; it shall be placed for the moment in the family Arctidorylaimidae.

Kittydorylaimus specialis sp. n. is unique among the dorylaimoid nematodes not only in the combination of the cuticular ridges and the shape of tail, but also in the arrangement of the oesophageal gland nuclei. The very anterior position of the AS_1 and, as a consequence, the comparatively unusually long distance between it and its partner nucleus (AS_2) are highly characteristic for the new species (Fig. 1). In this respect, our nematode differs from every representative of the order Dorylaimida where the "map" of the oesophageal nuclei is known. Running through the fundamental work of Loof and Coomans on the oesophageal gland nuclei of Dorylaimina (1970), only a few members of the family Aporcelaimidae show a similar picture concerning the nuclei AS_1 and AS_2 *(Sectonema, Aporcelaimium)*. However, the value of K is never so low in them (26 to 30 % as minimum) as in *Kittydorylaimus* (19–20 %).

It would be good to know what purpose the longitudinal ridges of cuticle serve? Their exact role is rather uncertain. Maybe they enlarge the surface of cuticle and make so respiration easier. An other possibility: they take part in locomotion. Longitudinal ridges predominantly occur in limnic species, but our new nematode is terrestrial!

Etymology. *Kittydorylaimus specialis* sp. n. was discovered in East Africa. The generic name, *Kittydorylaimus,* can be derived from the words *Kitty + Dorylaimus*. „Kitty" was the pet name of Kálmán Kittenberger (1881–1958), a well known Hungarian naturalist, animal collector and big game hunter in East Africa in the first decades of our century. The fascinating books on his wanderings in the former Tanganyika, Kenya, Uganda, Belgian Congo and Danakil Land had once belonged to the most favourite pieces of reading for the present author...

Kolodorylaimus gen. n.

Qudsianematidae (?). Body about 1.5 mm long, very plump. Cuticle moderately thick, smooth. Head small, sharply offset, lips separate. Amphids large. Spear slightly sinuate, slender, longer than labial diameter. Oesophagus quite suddenly expanded. Of the oesophageal gland nuclei, D lying posterior to oesophagus middle, AS_1 close to D. Intestine without discernible lumen, but consisting of unusually large vesiculose cells. Prerectum short. Female amphidelphic, vulva transverse, sclerotized. Uterus with two spheroid chambers. Spermatozoa elongate. Spicula dorylaimoid. Ventromedial supplements numerous. Tail similar in both sexes, short, conoid-rounded with small terminal peg.

Type-species: *Kolodorylaimus vesiculosus* sp. n.

Kolodorylaimus vesiculosus sp. n.

(Figs. 4, 5 A-D and 6 A-E)

Holotype, female: L = 1.47 mm; a = 21; b = 5.2; c = 54; V = 53 %; c′ = 0.9.

Females (n = 2): L = 1.34–1.43 mm; a = 20–22; b = 4.5–4.7; c = 49–52; V = 55–56 %; c′ = 0.9–1.0.

Male: L = 1.35 mm; a = 19; b = 4.7; c = 43; c′ = 0.8.

Body hardly 1.5 mm long, very plump, on mid-body 65–70 µm wide, strongly tapering to the anterior end. Cuticle smooth, 1.8–2.0 µm thick on most part of body, 4 µm thick on the preanal region and somewhat thicker on tail. Head strongly offset by a constriction, 15–16 µm wide, lips well separate with conspicuous papillae. Body at posterior end of oesophagus 3.5–4.2 times wider than head. Amphid funnel-shaped, nearly as wide as 3/4 corresponding neck diameter.

Odontostyle slightly but perceptibly sinuate, slender, 23–26 µm long, or 8–10 % of oesophagus length, 1.5–1.7 times as long as labial diameter, as thick as or somewhat thicker than cuticle at the same level. Aperture larger than 1/3 spear length. Oesophagus 280–312 µm long, 19–22 % of body length, weaving in its

Oesophageal gland nuclei in Kolodorylaimus vesiculosus

D = 58–63 %	AS_1 = 14–16 %
	AS_2 = 55–58 %
	PS_1 = 70–74 %
K = 25–28 %	PS_2 = 73–75 %

anterior half then quite suddenly enlarged in 51–56 % of its length. Cylindrus moderately wide, 126–143 µm long. Cardia hemispherical. All oesophageal gland nuclei conspicuous. D behind the middle of oesophagus (in 10–12 % of entire length of body); AS_1 much closer to D than to AS_2, the latter posterior to the middle of

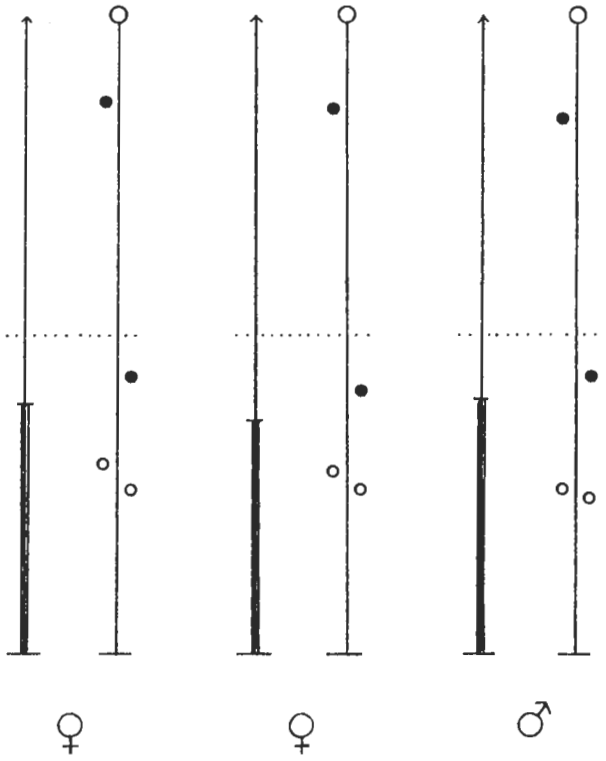

Fig. 4. Map of the oesophageal gland nuclei in two females and a male of *Kolodorylaimus vesiculosus* sp. n. The left column in each specimen illustrates the comparative length of the glandularium, the right column shows the arrangement of the nuclei within the glandularium

cylindrus, by far closer to PS_1–PS_2 than to its partner, the AS_1; PS nuclei 33–37 µm from posterior end of oesophagus. K value low. Distance between oesophagus terminus and vulva 1.5–1.7 times longer than the oesophagus itself.

The most striking morphological phenomenon can be seen in the structure of intestine. With exception of the prerectum, the intestine does not show a visible lumen at all, but it is composed of uncommonly large vesiculose cells. These cells begin in form of smaller (about 10 µm) bladders posterior to cardia, become then larger to very large (to 40, even 50 µm) in most part of intestine. At the prerectum they become smaller again, and appear like numerous small ovoid blisters. The specimens observed, thus females, male and juveniles, all showed, without exception, the same striking structure of intestine. Prerectum short, 1.5–1.8 times, rectum 1.4–1.6 times anal body width.

Vulva transverse, with 9–11 µm wide, strongly sclerotized inner lips. Vagina 25–27 µm, about 1/3 body width long. Amphidelphic. The exact structure of the female genital organ is difficult to observe owing to the dominant structure of the intestine. Uterus consisting of two 40–50 µm long spheroid chambers separated by a constriction from each other, filled with spermatozoa in each female. Gonads of medial length, ovaries reflexed. Uterine eggs not observed.

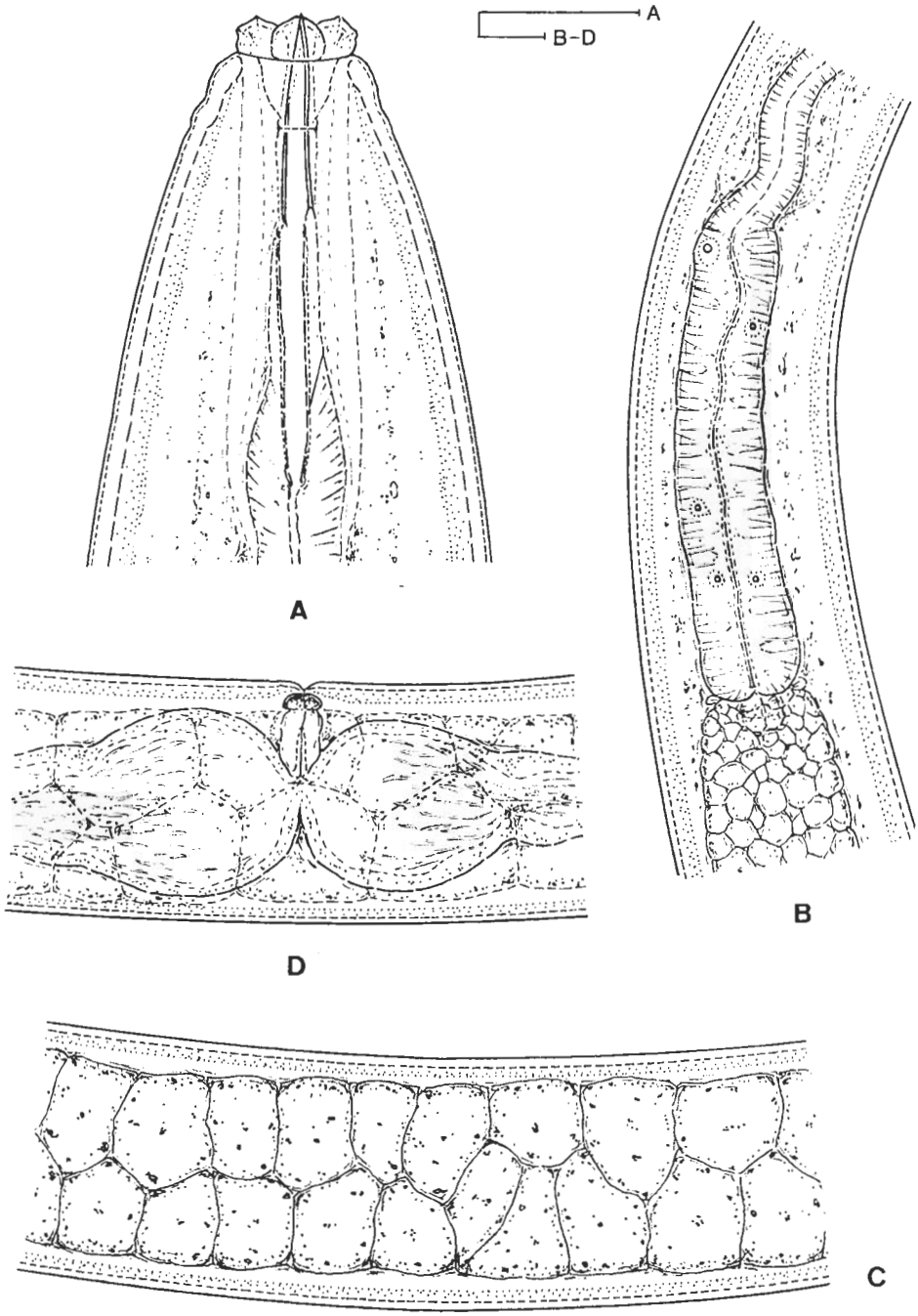

Fig. 5. *Kolodorylaimus vesiculosus* sp. n. A: anterior end; B: posterior region of oesophagus; C: mid-body showing the large intestinal cells; D: vulval region (intestinal cells only slightly indicated, in the validity they are much more strongly expressed). (Scale bars 20 µm each)

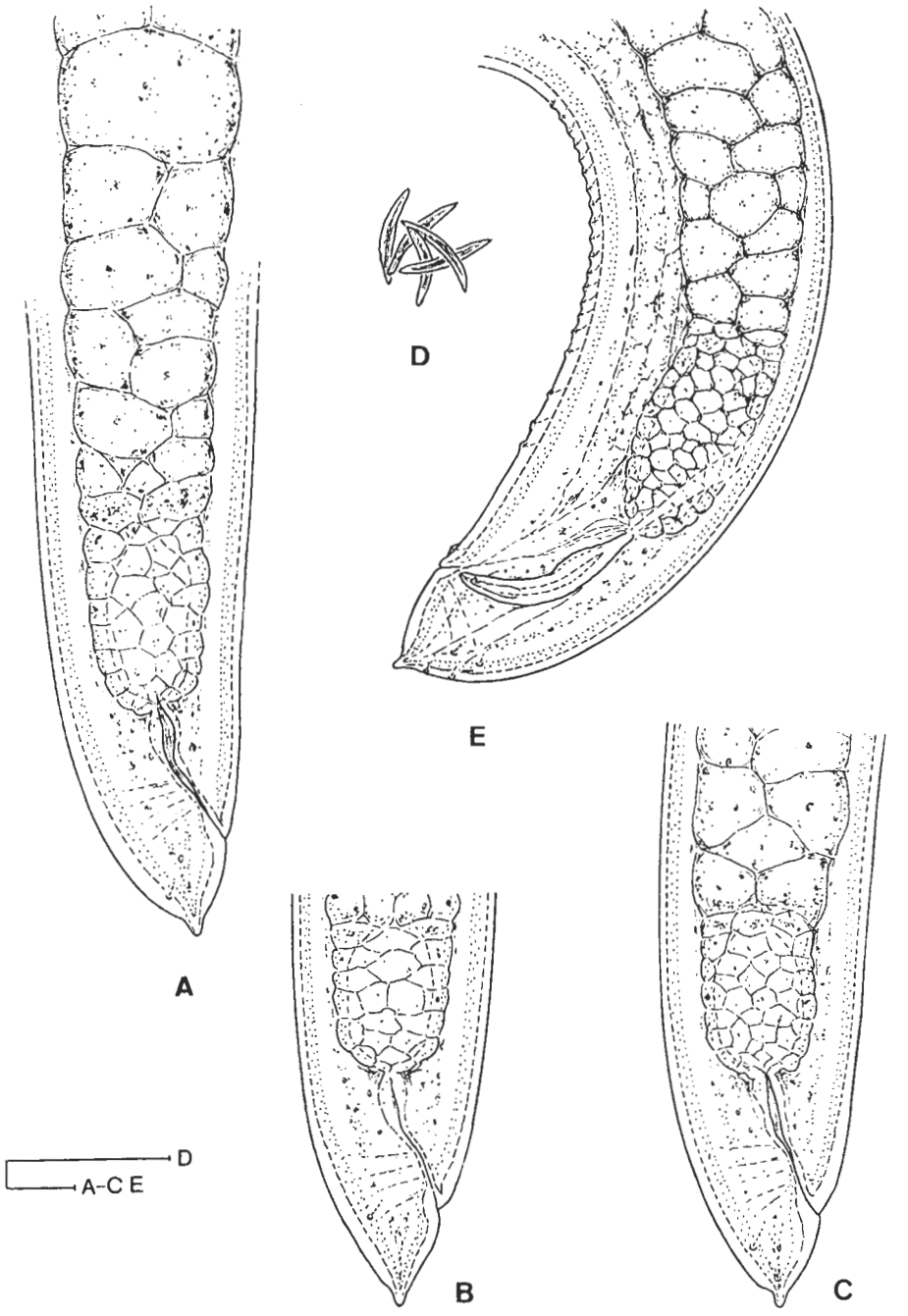

Fig. 6. *Kolodorylaimus vesiculosus* sp. n. A–C: variation in female posterior end; D: spermatozoa; E: male posterior end. (Scale bars 20 µm each)

Distance between vulva and anus 21–24 times as long as tail. Female tail short, 26–28 μm, 1.8–2.0 % of body length, conoid-rounded with a small mammiform tip, which is either straight or a little bent dorsad.

Testes two. Spermatozoa elongate, fusiform. Spicula dorylaimoid, slender, only slightly sclerotized, 56 μm long; caput narrowing, venter slightly widening, sinus shallow. Comes 14 μm long, distally hook-like. Ventromedial supplements 20, small, in most part contiguous or close to one another, the posterior three ones more separated, the posteriormost one levelling with spicula. Tail of male similar to that of female, 30 μm, 2.2 % of body length, with small mammiform tip.

Holotype: female on the slide No. 11669/A; paratypes: 2 females, 1 male and 4 juveniles, deposited in the author's collection at the university.

Type locality: Ukunda, Diani Persian Mosque, eastern Kenya, moss from a stone, September 1985, collected by S. Mahunka.

Remarks. The most peculiar morphological character for this nematode is the quite uncommon appearance of the intestine. Its vesicular-cellular structure can very well be observed also by low magnification. I am sure in it that this intestinal structure is no artificial product (by conservation or wrong preservation), namely: *a)* every specimen observed does show a quite similar picture of intestine; *b)* all the specimens of other dorylaimoid nematodes found in the same moss sample (*Mesodorylaimus* and *Eudorylaimus* spp.) have a simple, tubular appearance of intestine with the usual, finely expressed cellular structure. In the course of my half-a-century-old praxis on nematodes, I could never have observed such a phenomenon!

The new genus, *Kolodorylaimus* gen. n. shows certain affinities to the genera of the family Qudsianematidae, however, it differs from them not only in having that peculiar structure of the intestine, but also in the slender, sinuate spear, the shape of which is strange for this group. In addition, the ratio between the oesophagus nuclei AS_1 and AS_2 (Fig. 4), the shape of spermatozoa as well as the arrangement of the ventromedial supplements all distinguish our nematode from the general type of Qudsianematidae. In spite of these special characters, I would not like to propose a separate family or subfamily for *Kolodorylaimus vesiculosus,* but I place it provisionally under the family Qudsianematidae.

Etymology. The generic name can be derived from the words *Kolo(n) + Dorylaimus,* where the Greek word *„κωλον"* means: intestine. The species name *„vesiculosus"* (Latin) means: possessing bladders or vesicles.

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