

Contributions to the genus *Opisthodorylaimus* Ahmad & Jairajpuri, 1982 (Nematoda: Dorylaimida), with descriptions of two new species

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Abstract. Two new species of the genus *Opisthodorylaimus* are described. *O. mitis* sp. n. from Guadeloupe and Ecuador is characterized by a transverse vulva, very long egg, lack of an anterior uterine sac, and by a filiform tail. *O. papuanus* sp. n. from Papua New Guinea is distinguished by a longitudinal vulva, lack of a prevulval uterine branch, and by a long, filiform tail. Two known species of the genus are also presented: *O. cavalcantii* (Lordello, 1955) from Vietnam and *O. maqsoodi* Ahmad & Jairajpuri, 1982 from Seychelles. The taxonomic position of *Opisthodorylaimus* is commented, and the distribution of its ten species outlined. A key to species is added.

INTRODUCTION

The genus *Opisthodorylaimus* was established by Ahmad and Jairajpuri (1982) when they described the first three species, *O. caudatus* Ahmad & Jairajpuri, 1982, *O. chamoliensis* Ahmad & Jairajpuri, 1982 and *O. maqsoodi* Ahmad & Jairajpuri, 1982, and designated the latter as type. Carbonell and Coomans (1986) provided then the first comprehensive work on the genus. They placed *Dorylaimus cavalcantii* Lordello, 1955 and *Dorylaimus sylphoides* Williams, 1959 under *Opisthodorylaimus*, and redescribed them in detail. Besides, they described three new species, *O. baqrii* Carbonell & Coomans, 1986, *O. filicaudatus* Carbonell & Coomans, 1986 and *O. paracavalcantii* Carbonell & Coomans, 1986. Andrassy (1987) when revised the family Thornenematidae, redefined the genus *Opisthodorylaimus*, and provided a key to species. Subsequently, several authors added further informations on one or the other spe-

cies. Recently, Gagarin (2004) enriched the genus with a ninth species, *O. major* Gagarin, 2004.

In this article two known but rather rare species of *Opisthodorylaimus* – *O. cavalcantii* (Lordello, 1955) from Vietnam and *O. maqsoodi* Ahmad & Jairajpuri, 1983 from the Seychelles – are presented, and two new species, *O. mitis* sp. n. from the Caribbean and *O. papuanus* sp. n. from Papua New Guinea, described. Besides, some remarks on the taxonomic position of the genus are added, and a distribution pattern of its species is outlined. Finally, a new key to species is provided.

MATERIALS AND METHODS

The nematodes discussed herein were sampled by Hungarian scientists during their collecting trips to tropical regions of Earth between 1968 and 2000. The soil samples were

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fixed *in situ* with FAA, and washed out in the laboratory by flotation techniques and screens. The nematodes were picked out by hand and fixed again with FAA. Subsequently, they were processed to pure glycerine by a slow method, and finally mounted on permanent glass slides.

Measurements were taken by an ocular micrometer, curved structures were measured along the curved medial line. All nematode specimens, holo- and paratypes, are at moment preserved in the nematode collection of the author, but later they will be deposited at the Zoological Department of the Hungarian Natural History Museum, Budapest. It may be mentioned that also the oldest slides (nearly forty years) contained well-preserved, fresh-like animals.

DESCRIPTIONS

Opisthodorylaimus mitis sp. n.

(Fig. 1 A–E)

Holotype female: L = 1.32 mm; a = 36; b = 4.3; c = 4.6; c' = 14; V = 40 %.

Paratype females from Guadeloupe (n = 5): L = 1.23–1.34 mm; a = 34–36; b = 4.3–4.5; c = 4.2–4.4; c' = 14–16; V = 39–41 %.

Females from Ecuador (n = 4): L = 1.33–1.37 mm; a = 28–33; b = 4.3–4.7; c = 3.7–4.2; c' = 14–16; V = 38–40 %.

General description. Body mostly straight or nearly so after fixation, moderately slender, 35–40 µm wide at mid-region. Cuticle smooth, thin, 1 µm in most part of body and 2.5–3.0 µm on dorsal side of tail, consisting of a very thin outer and a somewhat thicker inner layer. In the narrowing part of tail the outer layer becomes thicker than the inner layer. Lip

region not set off in any manner, 10–11 (exceptionally 12) µm wide at level of labial papillae; lips completely amalgamated, rounded. Amphidial aperture one half the corresponding labial diameter or a little narrower.

Odontostyle cylindroid, rather robust, 15–17 µm long and 2.5–3.0 µm thick, about 6 times as long as thick, 1.5 times the labial width, or 5–6 % of oesophagus length; slightly sinuate with aperture occupying one-third of stylet length. Odontostyle much thicker than cuticle at the same level. Guiding ring thin, at proximal end of stylet aperture. Oesophagus 285–306 µm long, 21–23 % of entire length of body, at 55–57 % enlarged. Distance between posterior end of oesophagus and vulva 0.7–0.8 times as long as oesophagus, and 5.4–6.2 times as long as body diameter. Glandularium 115–123 µm long. Oesophageal gland nuclei rather inconspicuous due to the heavy muscular structure of cylindrus. Dorsal nucleus relatively small, at 13–14 % of total length of body. Posterior subventral nuclei comparatively far from posterior end of cylindrus. Cardia conical, 12–15 mm long. Intestine with straight walls. Prerectum 1.2–2.4, rectum 1.5–1.7 anal body widths long.

Oesophageal gland nuclei in Opisthodorylaimus mitis

D = 59–62 %	AS ₁ = 24–26 %
	AS ₂ = 36–38 %
	PS ₁ = 56–58 %
	PS ₂ = 57–59 %

Female. Vulva a long transverse slit with sclerotized, 8–9 µm wide inner lips. Vagina 15–16 µm, nearly half as long as body diameter. Genital system mono-opisthodelphic, with a very short, about only one-quarter body width long prevulval sack. Posterior gonad generally on left side of intestine, in younger females 2.8–3.8 body widths long or occupy-

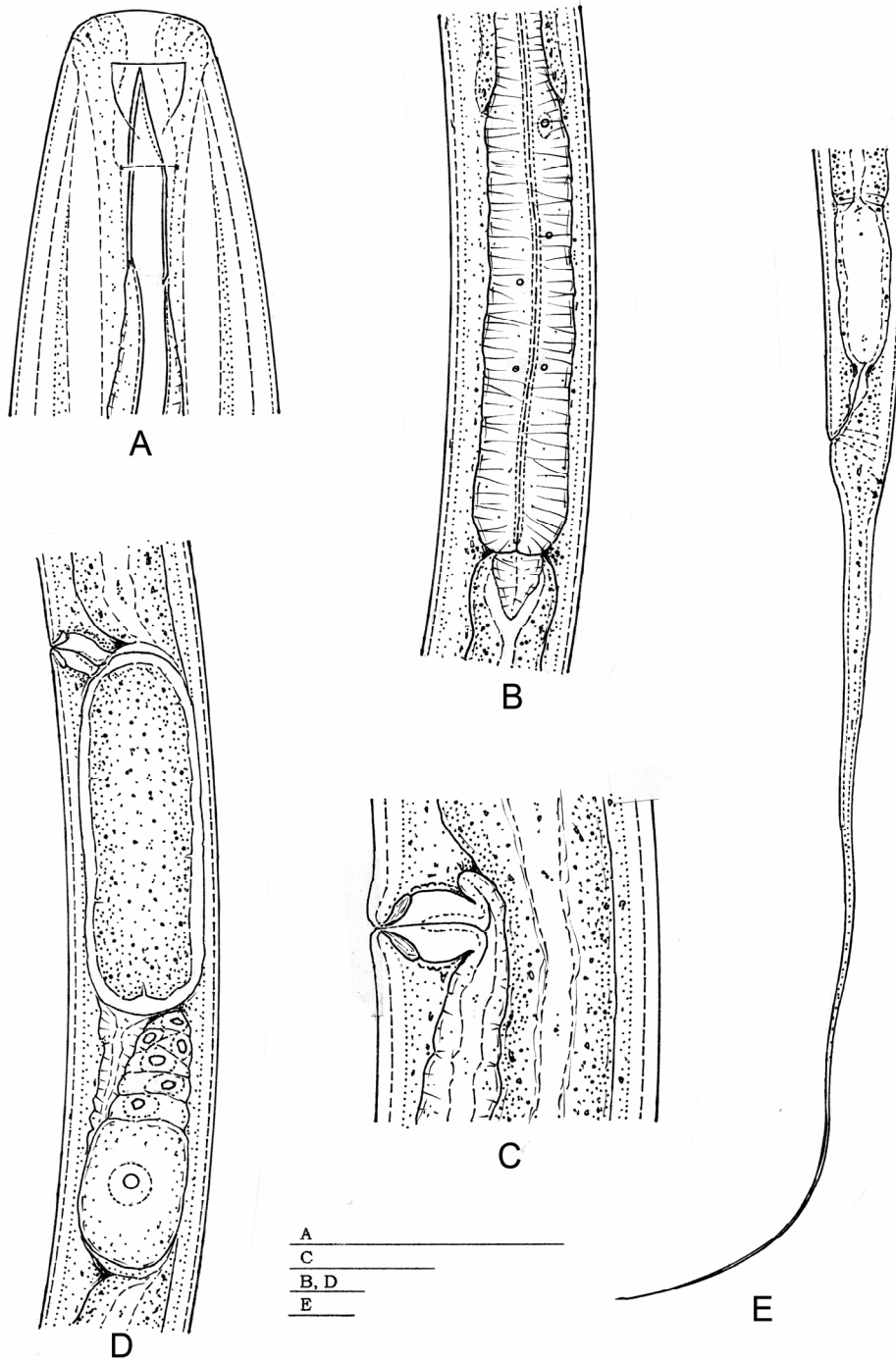


Figure 1. *Opisthodorylaimus mitis* sp. n. A = anterior end; B = posterior half of oesophagus; C = vulval region; D = genital organ; E = female tail. (Scale bars 20 μ m each)

ing 8–10 % of body length, in older females 5–7 body widths long or occupying 13–14 % of body length. Uterus hardly longer than one body diameter, distally with a sphincter muscle. Ovary consisting of few cells. Only one large egg in uterus: 90–97×28–31 μm , 2.4–2.7 times longer than body diameter. Spermatozoa not observed even in egg-bearing females. Vulva–anus distance equal to 1.5–1.8 tail lengths. Tail very long, 280–360 μm or 22–27 % of total length of body, initially conoid-rounded then attenuated, filiform, ending in a sharp tip. Two pairs of small caudal papillae at distal end of the conoid section.

Male. Not found.

Diagnosis and relationships. Body moderately long, head continuous with neck, cuticle thin, stylet medium-sized, vulva transverse with sclerotized lips, practically no prevulval sack, egg very large, tail long and filiform.

Among the members of the genus possessing a transverse vulva, the new species shares similarities with *O. maqsoodi* Ahmad & Jairajpuri, 1982. It can be differentiated from that by some constant characters as follows. The body is a little shorter (1.2–1.3 vs. 1.4–1.5 mm), labial region narrower (10–12 vs. 14–15 μm), stylet shorter (15–17 vs. 19–21 μm), glandularium shorter (115–123 vs. 135–150 μm), egg much longer (2.4–2.7 vs. 1.6–1.7 times the body width), and the tail is longer (14–16 vs. 8–12 anal body diameters).

Opisthodorylaimus mitis sp. n. can be distinguished also from the other three species with transverse vulva. So, it immediately differs from *O. cavalcantii* (Lordello, 1955) and *O. paracavalcantii* Carbonell & Coomans, 1986 by the well-sclerotized vulval lips (vs. unsclerotized), and from *O. baqrii* Carbonell & Coomans, 1986 by the conspicuously longer tail (14–16 vs. 6–8 times anal body width long).

Type specimens. Holotype female on slide No. 13551. Paratypes: five females and four juveniles. – Further specimens (from Ecuador): four females and two juveniles.

Type locality. Soufrière, Guadeloupe, Caribbean Islands, soil from rain forest at 800 m above sea-level, collected in August 1996 by A. Fodor. – Other locality: Triunfo, Prov. Pastaza, Ecuador, grassy soil in a clearing of a rain forest, collected in September 1987 by I. Loksa and A. Zicsi.

Etymology. The species epithet comes from the Latin and means: gentle or mild. *Opisthodorylaimus mitis* sp. n. appears to be a peaceful little animal.

***Opisthodorylaimus papuanus* sp. n.**

(Fig. 2 A–E)

Holotype female: L = 1.42 mm; a = 36; b = 4.1; c = 6.8; c' = 9.2; V = 46 %.

Paratype females (n = 5): L = 1.32–1.49 mm; a = 28–36; b = 4.1–4.6; c = 5.6–8.1; c' = 7.5–8.5; V = 40–46 %.

General description. Body slightly ventrally curved to almost straight when fixed, 40–48 μm wide at mid-region. Cuticle thin and smooth, 1.0–1.5 μm on most body, 2.5–3.5 μm thick on dorsal side of tail. Lips amalgamated, labial region at level of posterior papillae 12–13 μm wide, roundish, not offset in any manner. Body at posterior end of oesophagus 3.1–3.6 times as wide as head. Amphidial aperture occupying half width of corresponding body.

Odontostyle strong, twice as thick as cuticle at the same level, 17–18 μm long and 3.5 μm wide, about five times longer than wide, or 1.4 times as long as head diameter, occupying 5–6 % of oesophagus length; slightly sinuated with aperture occupying 1/3 or some-

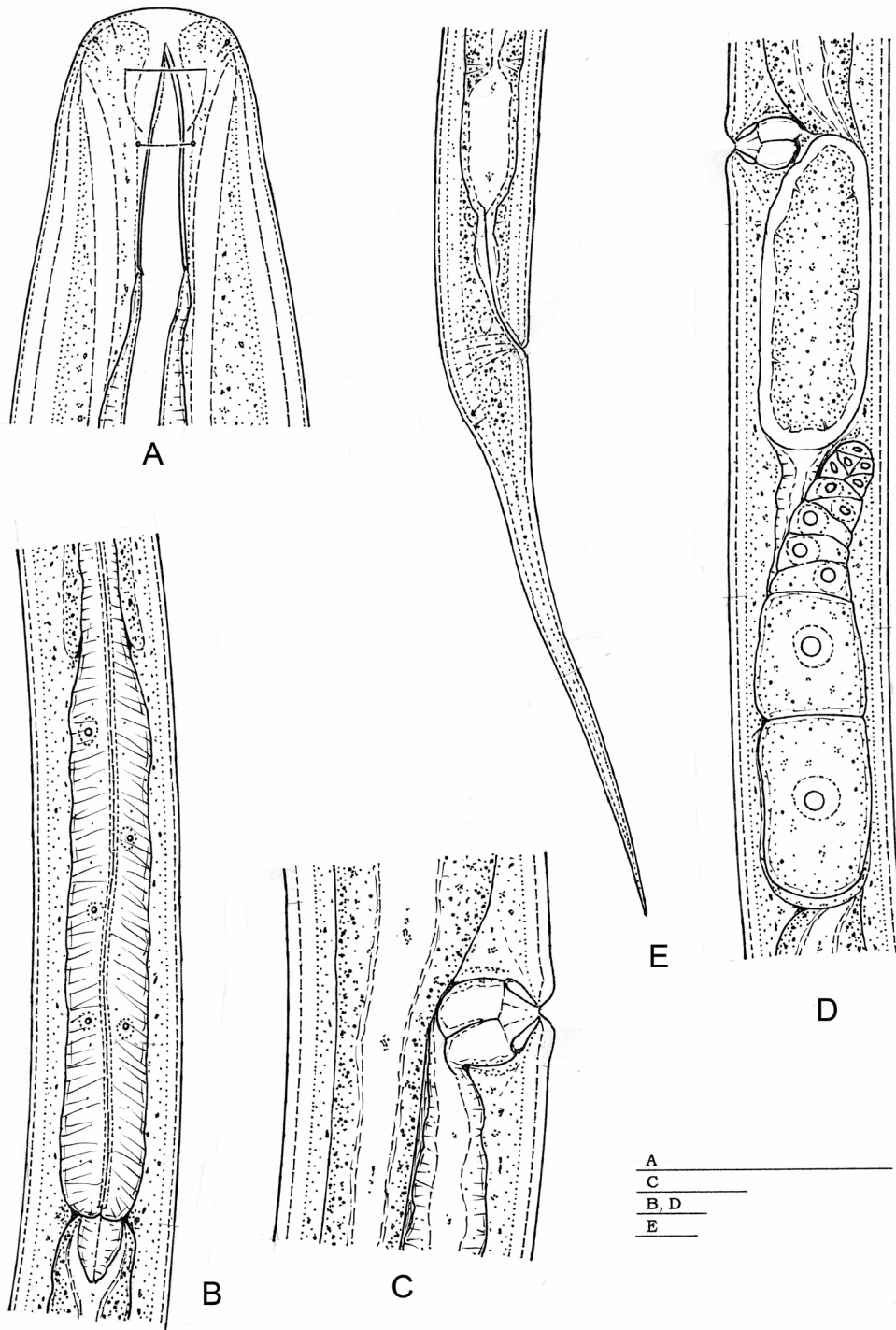


Figure 2. *Opisthodorylaimus papuanus* sp. n. A = anterior end; B = posterior half of oesophagus; C = vulval region; D = genital organ; E = female tail. (Scale bars 20 μ m each)

what more of its length. Guiding ring thin, located at first third of stylet length. Oesophagus 286–354 μm long, at 55–57 % widened. Musculature of cylindrus obliquely structured. Glandularium 127–138 μm long. Oesophageal gland nuclei less conspicuous, dorsal nucleus located at 13–15 % of entire length of body. Distance between posterior end of oesophagus and vulva 0.8–1.0 times as long as oesophagus. Cardia conical, 20–26 μm long. Intestinal walls moderately thick, covered by intima. Rectum 1.4–2.0 times, prerectum 1.4–2.8 times the anal body width long.

Oesophageal gland nuclei in Opisthodorylaimus papuanus

D = 58–60 %	AS ₁ = 23–24 %
	AS ₂ = 37–39 %
	PS ₁ = 60–64 %
	PS ₂ = 63–64 %

Female. Vulva longitudinal with well-sclerotized, 14–15 μm wide inner lips. Vagina straight or bent backwards, 16–18 μm long, penetrating into less than half width of body. Reproductive system opisthodelphic, without anterior uterine sac. Gonad in younger females 3.2–3.5 body widths long or occupying 9–10 % of body length, in egg-bearing females 4.0–5.6 body widths long or occupying 13–16 % of body length. One large egg at a time: 92–100×35–36 μm , 2.0–2.3 times the body width long. Uterus not containing spermatozoa. Vulva–anus distance equal to 2.4–3.4 tail lengths. Tail 180–220 μm long, 12–16 % of entire length of body, first elongate conoid-rounded, then filiform with pointed tip.

Male. Not observed.

Diagnosis and relationships. A medium-

sized species, with continuous head, thin cuticle, medium long and plump stylet, opisthodelphic gonad without anterior uterine sac, longitudinal and sclerotized vulva, and with filiform tail.

Of the eight known valid species of *Opisthodorylaimus* described so far, four possess a longitudinal vulva. Among them, this new species most closely resembles *O. chamo-liensis* Ahmad & Jairajpuri, 1982, but differs from it in having smooth cuticle, the head completely continuous with neck, plumper stylet (5 times vs. 7 times as long as wide), shorter tail (180–220 vs. 250 μm), and in having no anterior uterine sac.

From the other three species showing longitudinal vulva, *Opisthodorylaimus papuanus* sp. n. can be differentiated as follows. It differs from *O. caudatus* Ahmad & Jairajpuri, 1982 mainly in having a longer tail (180–220 vs. 90–114 μm , or 7.5–9.2 vs. 4–5 anal body diameters long); from *O. filicaudatus* Carbonell & Coomans, 1986 by the much shorter tail ($c' = 7.5\text{--}9.2$ vs. 20–30); from *O. sylphoides* (Williams, 1959) by the shorter body (1.3–1.5 vs. 1.7–2.4 mm), shorter tail (7.5–9.5 vs. 14–25 anal body widths), and by the lack of an anterior uterine branch.

Type specimens. Holotype female on slide No. 12964. Paratypes: 7 females and 3 juveniles. Further specimens: 3 females and 2 juveniles. All in the collection of the author.

Type locality and habitat. McAdam Parc, Wau, Papua New Guinea, wet leaf litter and humus from a rain forest (8 females and 3 juveniles). Further specimens: Mt. Kaindi, Wau, Papua New Guinea, from around the roots of *Pandanus* sp. near a rivulet (2 females, 2 juveniles); Masham River, Wau, Papua New Guinea, fallen leaves in a secondary rain forest (1 female). All the specimens were collected in August 1968 by J. Balogh.

Etymology. The species is named after the territory.

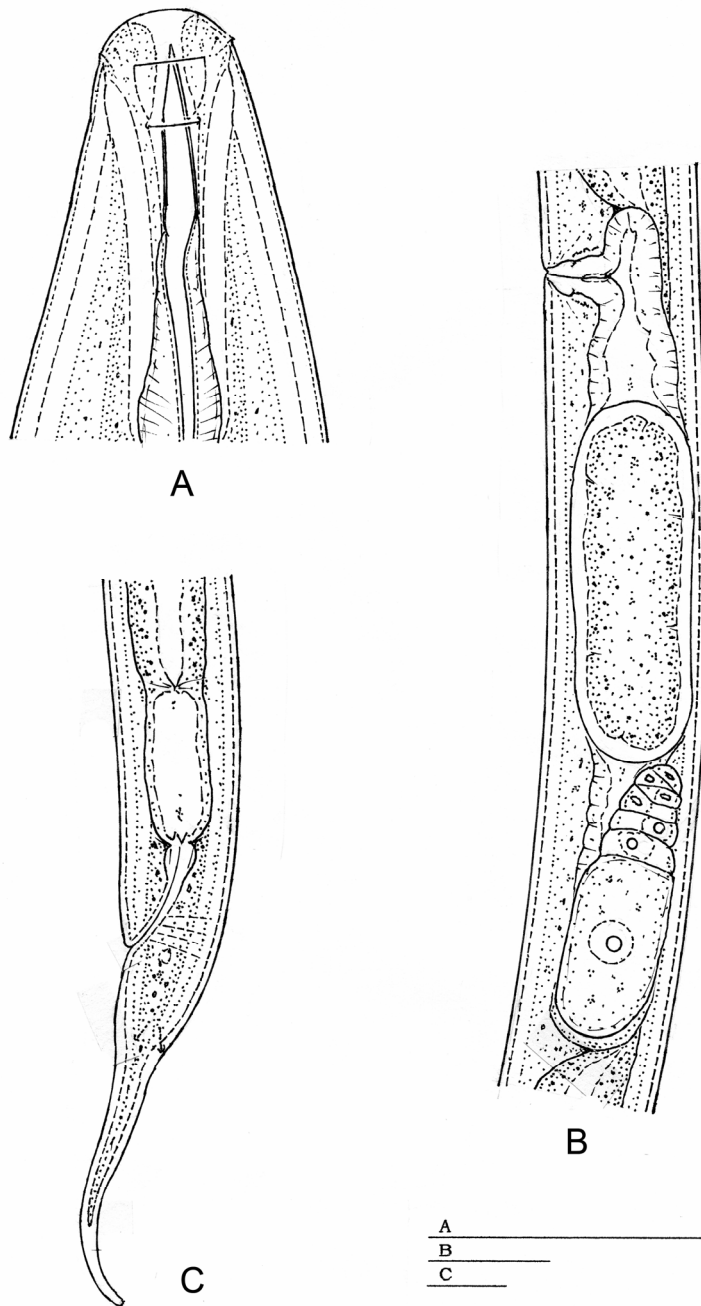


Figure 3. *Opisthodorylaimus cavalcantii* (Lordello, 1955) Carbonell & Coomans, 1986. A = anterior end; B = genital organ; C = female tail. (Scale bars 20 μ m each)

***Opisthodorylaimus cavalcantii* (Lordello, 1955) Carbonell & Coomans, 1986**

(Fig. 3 A–C)

Females ($n = 3$): $L = 1.00\text{--}1.17$ mm; $a = 25\text{--}30$; $b = 3.8\text{--}4.2$; $c = 10.0\text{--}11.2$; $c' = 4.7\text{--}5.2$; $V = 41\text{--}43$ %.

General description. Body nearly straight after fixation, $38\text{--}40$ μm wide at middle. Cuticle smooth, $1.5\text{--}2.0$ μm thick. Labial region practically continuous with adjacent body, $8\text{--}9$ μm wide at base. Lips amalgamated. Amphidial aperture half as wide as corresponding body. Odontostyle short and thick, $12\text{--}13$ μm , $1.3\text{--}1.5$ times the labial diameter long, or as long as $4.5\text{--}5.0$ % of oesophagus; nearly as thick as cuticle at the same level. Aperture occupying about $2/5$ of stylet length. Guiding ring thin. Oesophagus $266\text{--}276$ μm long, $23\text{--}24$ % of body length, at $57\text{--}58$ % enlarged. Oesophageal gland nuclei moderately distinct. Distance between posterior end of oesophagus and vulva $0.6\text{--}0.8$ times as long as oesophagus. Rectum $1.4\text{--}1.7$, prerectum $1.6\text{--}1.8$ anal body widths long.

Female. Mono-opisthodelphic with a quite short – $1/4$ or $1/3$ body width long – prevulval uterine sac. Vulva transverse, its inner lips narrow, not sclerotized. Vagina $14\text{--}15$ μm long, somewhat shorter than half width of body. Gonad $155\text{--}230$ μm long or $15\text{--}18$ % of body length. One uterine egg: 97×28 μm , 2.6 times as long as body width. Distance vulva–anus equal to $4.8\text{--}6.5$ tail lengths. Tail $98\text{--}104$ μm long, occupying $9\text{--}10$ % of total body length, first conoid-rounded, then tapered to the dorsally bent, finely rounded tip.

Locality and habitat. Santa Maria, 20 km from Bao Loc, Vietnam, fallen leaves from a secondary rain forest, collected in October 1988 by S. Mahunka and T. Vászárhelyi.

Remarks. This is the widest distributed representative of the genus, recorded from every continent except for Europe. It can easily be

identified by the transverse, not sclerotized vulva and the lack of a reduced anterior ovary. The present specimens well correspond to the previous descriptions.

***Opisthodorylaimus maqsoodi* Ahmad & Jairajpuri, 1982**

(Fig. 4 A–E)

Females ($n = 4$): $L = 1.41\text{--}1.47$ mm; $a = 28\text{--}29$; $b = 4.1\text{--}4.3$; $c = 4.8\text{--}5.7$; $c' = 10\text{--}11$; $V = 40\text{--}42$ %.

General description. Body varying in shape when fixed, $48\text{--}52$ μm wide at middle. Cuticle smooth, $1.0\text{--}1.5$ μm thick on most body, 2.5 μm thick on anterior region of tail. Labial region practically continuous with neck, $14\text{--}15$ μm wide; lips amalgamated. Body at posterior end of oesophagus $3.4\text{--}3.6$ times as wide as head. Odontostyle almost twice as thick as cuticle, slightly sinuate, $19\text{--}20$ μm long, or $5\text{--}6$ % of oesophagus length. Aperture occupying more than $1/3$ stylet length. Guiding ring thin and simple. Oesophagus $328\text{--}360$ μm long, occupying $23\text{--}24$ % of entire length of body, at $52\text{--}55$ % widened. Distance between posterior end of oesophagus and vulva about 70 % of oesophagus length. Oesophageal gland nuclei well discernible, glandularium $135\text{--}150$ μm long. Dorsal nucleus located at $13\text{--}14$ % of total body length. Cardia elongate conical, $25\text{--}27$ μm long. Intestine thick-walled with intima. Rectum $1.3\text{--}1.5$, prerectum $1.5\text{--}2.3$ anal body widths long. Intestine–prerectal junction tongue-like.

Oesophageal gland nuclei in Opisthodorylaimus maqsoodi

D = 56–58 %	AS ₁ = 23–30 %
	AS ₂ = 25–33 %
	PS ₁ = 54–56 %
	PS ₂ = 54–56 %

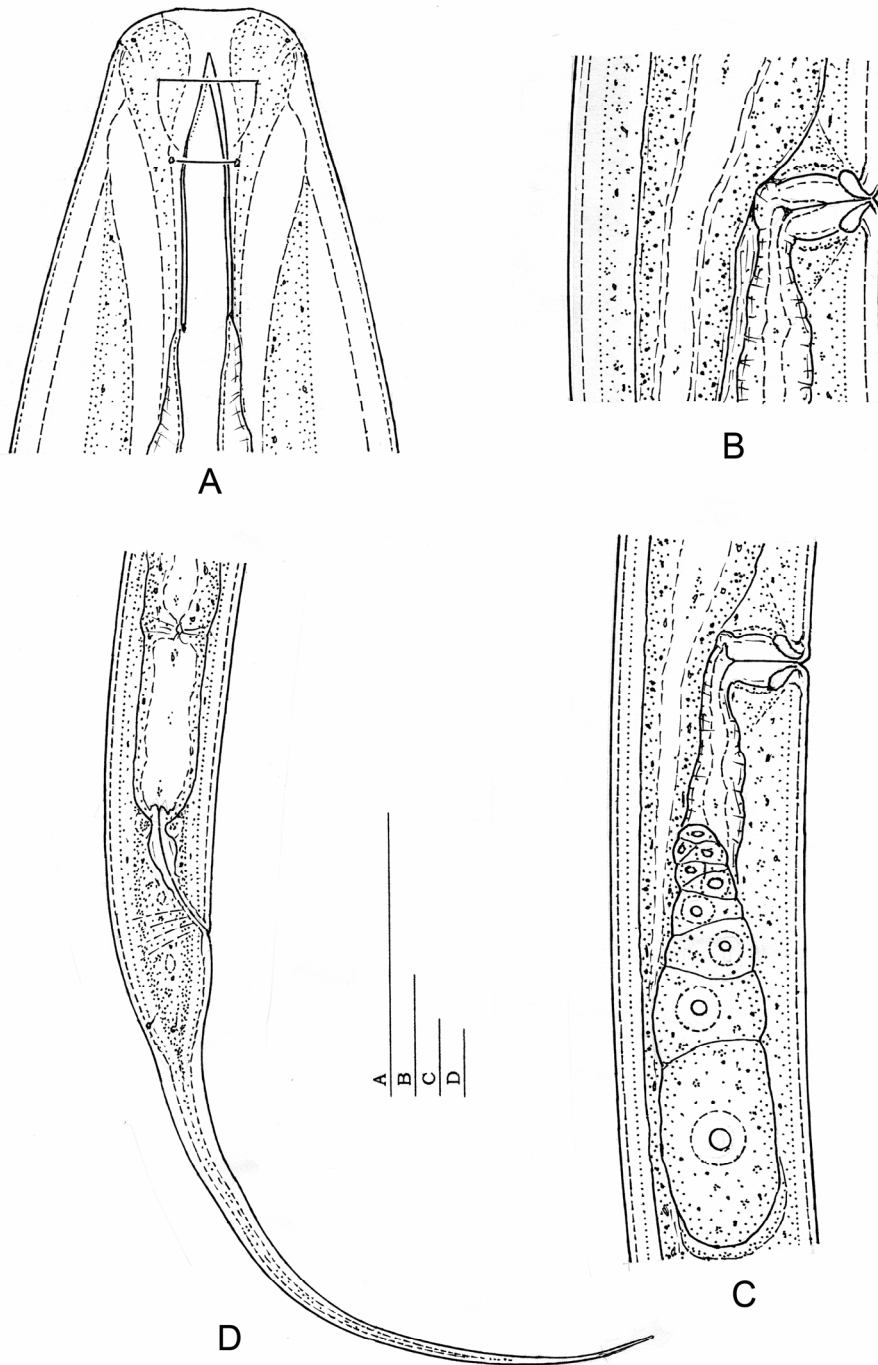


Figure 4. *Opisthodorylaimus maqsoodi* Ahmad & Jairajpuri, 1982. A = anterior end; B = vulval region; C = genital organ; D = female tail. (Scale bars 20 μ m each)

Female. Mono-opisthodelphic, without anterior uterine sac. Vulva a long transverse slit, with well-sclerotized inner lips. Vagina 17–19 µm long, shorter than half width of corresponding body. Gonad 3.0–3.7 body widths long, occupying 10–13 % of body length. No uterine egg observed. Vulva–anus distance equal to 1.8–2.3 tail lengths. Tail filiform, 260–304 µm long, occupying 17–21 % of entire length of body.

Locality and habitat. Northern region of Le Niol, Isle de Mahé, Seychelles Archipelago, leaf litter on the bank of a rivulet, collected in June 2000 by L. Hufnágel.

Remarks. This species is characterized by the medium-sized body, comparatively wide head, strong stylet, transverse and sclerotized vulva, and by a fairly long tail. It was described by Ahmad and Jairajpuri (1982) from grassy soil in India, and subsequently discovered by Andrásy (1987) from forest litter in North Korea. The present specimens fit well to both descriptions.

SOME COMMENTS ON THE GENUS OPISTHODORYLAIMUS

1) *Opisthodorylaimus major* Gagarin, 2004. – Gagarin described this species from reservoirs on the Kuril Islands, Russia. He compared it with *O. paracavalcantii* Carbonell & Coomans, 1986, and enumerated the following distinguishing features: body larger, stylet, prerectum and tail longer, vulva more anterior and supplements more numerous.

However, the taxonomic position of this species of Gagarin can not be stated with confidence, namely whether it is close to *Opisthodorylaimus*, or it belongs to another genus, or, what is more, to another family. On the one hand, it resembles the *Opisthodorylaimus* species in its general body shape, the non-offset head, the short stylet, and in the longitudinal

vulva. On the other hand, however, it shows some morphological features that are strange for *Opisthodorylaimus*, such as *a*) the great length of body (2.4–3.0 mm vs. 0.7–2.4 mm), *b*) the female genital system is amphidelphic and symmetrical, with normally developed anterior ovary (vs. anterior ovary lacking, or if present, rudimentary), *c*) the male prerectum is very long, beginning far anterior to the row of supplements (vs. short, starting within the range of supplements or quite close to it), *d*) the ventromedial supplements are too numerous (18 vs. 5–11) and contiguous (vs. spaced to far spaced). Unfortunately, the original description does not contain information on the oesophageal gland nuclei, although their arrangement would be important to know (see next paragraph). Finally, it is worth noting that Gagarin found his species in freshwater habitats, whereas all the (valid) members of the genus *Opisthodorylaimus* are definitely soil inhabitants, never observed in freshwater biotopes.

Considering the above discrepancies, I suggest *Opisthodorylaimus major* Gagarin, 2004 to be considered, at least for the moment, a *species incertae sedis*.

2) *Dorylaimidae* or *Thornenematidae*? – As regards the taxonomic position of *Opisthodorylaimus* – whether it belongs to the family Dorylaimidae or Thornenematidae – the opinions are different. Baqri and Jairajpuri (1982), Carbonell and Coomans (1986), Andrásy (1987), Baqri (1991), and Jairajpuri and Ahmad (1992) placed the genus in Thornenematidae or Thornenematinae, respectively. Coomans and Carbonell (1988) as well as Loof (1999) regarded it as a member of the subfamily Mesodorylaiminae within Dorylaimidae. Coomans and Carbonell supposed that *Opisthodorylaimus paracavalcantii* forms a link between *Mesodorylaimus* and the other species of *Opisthodorylaimus*.

Whereas, I am of the opinion that *Opisthodorylaimus* should be separated from the members of Dorylaimidae and assigned to the Thorne-

nematidae. I have two main arguments. 1) Within the so rich family Dorylaimidae all the species (of 23 nominal genera) are amphidelphic with equally developed female gonads, and there is no tendency among them towards reducing the anterior ovary. In the genera of Thornematidae the female genital system is rarely didelphic or pseudo-didelphic, in the majority of species it is mono-opisthodelphic, with or without a reduced anterior uterine branch. 2) On the basis of several observations (Baqri and Jairajpuri, 1967; Loof and Coomans, 1970; Mehdi Ali & Prabha, 1974; Baqri and Jana, 1980; Sauer, 1981; Ahmad and Jairajpuri, 1982; Carbonell and Coomans, 1986, 1987; Andrássy, 1987; Coomans and Carbonell, 1988; Baqri, 1991; Fadaei-Tehrani and Coomans, 2005; present paper) it can be stated that all the thornematid species have a special and very constant pattern of the oesophageal gland nuclei which clearly differs from that of the members of Dorylaimidae. While in the latter family the PS nuclei are predominantly located far back, fairly close to the posterior margin of the cylindrus (in general at 70–80 % of glandularium), the species assigned to Thornematidae all show a much more anterior location of PS nuclei; these are situated at not farther than 2/3 of glandularium length. Just this is the situation in each representative of *Opisthodorylaimus*: the PS nuclei are located at a longer distance from the posterior margin of the oesophagus, namely at 52 to 64 % of the glandularium (= distance between the D nucleus and posterior end of cylindrus). Concretely, they are situated as follows: in *O. baqrii* at 61 %, in *O. caudatus* at 58–60 %, in *O. cavalcantii* at 52–56 %, in *O. chamoliensis* at 58–59 %, in *O. filicaudatus* at 55–60 %, in *O. maqsoodi* at 52–56 %, in *O. mitis* at 56–59 %, in *O. papuanus* at 60–64 %, in *O. paracavalcantii* at 56 % and in *O. sylphoides* at 54–55 %.

Within the family Thornematidae Siddiqi, 1969 fifteen nominal genera may be listed, twelve of them being probably valid. Among them, *Opisthodorylaimus* is characterized by the

absence of labial sclerotization or lack of sublabial collare (sclerotized thickenings of cuticle behind the head).

3) *Distribution pattern*. – Although the genus *Opisthodorylaimus* belongs to the less frequent genera of dorylaimid nematodes, its representatives are distributed all over the world. Their dispersion is however not uniform. While Europe is represented by a single species, in Asia five and in Africa six species occur. Accordingly, the distribution of species on the continents is as follows.

Europe: *sylphoides*.

Asia: *caudatus*, *cavalcantii*, *chamoliensis*, *maqsoodi*, *sylphoides*.

Africa: *baqrii*, *cavalcantii*, *filicaudatus*, *maqsoodi*, *paracavalcantii*, *sylphoides*.

North America: *cavalcantii*.

South America: *cavalcantii*, *consobrinus*, *mitis*.

Australasia: *cavalcantii*, *papuanus*.

As may be seen, *baqrii*, *caudatus*, *chamoliensis*, *filicaudatus*, *maqsoodi*, *mitis*, *papuanus* and *paracavalcantii* each are distributed on one continent. Whereas, *sylphoides* occurs on three, *cavalcantii* even on all continents with exception of Europe.

To the best of our knowledge, the ten species have been recorded from the following countries.

O. baqrii: Cameroon (Carbonell & Coomans, 1986).

O. caudatus: India (Ahmad & Jairajpuri, 1986).

O. cavalcantii: Georgia (Eliava *et al.*, 1975), Azerbaijan (Eliava *et al.*, 1975), India (Siddiqi, 1965; Baqri & Khera, 1977; Ahmad & Jairajpuri, 1982; Baqri, 1991; Baniyamuddin & Ahmad, 2006), Malaysia (Sauer, 1981), Indonesia (Sauer, 1981), Vietnam (present paper), South Korea (Choi, 1999), Japan (Khan & Ara-

ki, 2002), Cameroon (Carbonell & Coomans, 1986), Nigeria (Loof & Coomans, 1970), Ivory Coast (Carbonell & Coomans, 1986), Kenya (Carbonell & Coomans, 1986), Zaire (Carbonell & Coomans, 1986), South Africa (Carbonell & Coomans, 1986), United States: South Carolina (Carbonell & Coomans, 1986); Venezuela (Loof, 1964; Loof & Coomans, 1970), Brazil (Lordello, 1955; Monteiro, 1970; Carbonell & Coomans, 1986), Australia (Sauer, 1981).

O. chamoliensis: India (Ahmad & Jairajpuri, 1982).

O. filicaudatus: Ivory Coast (Carbonell & Coomans, 1986).

O. maqsoodi: India (Ahmad & Jairajpuri, 1982), North Korea (Andrássy, 1987), Seychelles (present paper).

O. mitis: Guadeloupe, Ecuador (present paper).

O. papuanus: Papua New Guinea (present paper).

O. paracavalcantii: Uganda (Carbonell & Coomans, 1986).

O. sylphoides: Netherlands (Bongers, 1988; De Goede & Bongers, 1998; Loof, 1999), Germany (Loof, 1999), Hungary (Andrássy, 1991), Romania (Popovici, 1990, 1998), Spain (Abo-lafia & Peña-Santiago, 1996; Liébanas *et al.*, 2002; Peña-Santiago *et al.*, 2003), France (Carbonell & Coomans, 1986), Italy (Carbonell & Coomans, 1986; Manfredi *et al.*, 1995), Georgia (Eliava *et al.*, 1975), Iraq (Carbonell & Coomans, 1986), Iran (Fadaei-Tehrani & Coomans, 2005), Mauritius (Williams, 1959, 1964).

Opisthodorylaimus cavalcantii is the most widespread species of the genus, it has been observed in 18 countries so far. *Opisthodorylaimus sylphoides* was recorded from 11, *O. maqsoodi* from 3 and *O. mitis* from 2 countries; all the other species have been found in one country each.

KEY TO SPECIES OF OPISTHODORYLAIMUS

Then ten valid species of *Opisthodorylaimus* can immediately be divided into two equal groups with five species each: species with transverse vulva (*baqrii*, *cavalcantii*, *maqsoodi*, *mitis* and *paracavalcantii*) and those with longitudinal vulva (*caudatus*, *chamoliensis*, *flicaudatus*, *papuanus* and *sylphoides*). The members of the first group can be subdivided: species with well-sclerotized vulva (*baqrii*, *maqsoodi* and *mitis*) and those with unsclerotized vulva (*cavalcantii* and *paracavalcantii*). Besides, the other morphological features (presence or absence of an anterior rudimentary gonad or uterine sac, length of tail, body size, etc.) also well characterize the species, so that their identification does not make difficulties.

- 1 Vulva transverse 2
 - Vulva longitudinal 6
- 2 Vulval lips distinctly sclerotized 3
 - Vulval lips not sclerotized 5
- 3 Anterior uterine sac present, 2–3 body widths long; tail shorter, 6–8 anal body diameters. L = 1.2–1.4 mm; a = 38–47; b = 4.0–5.3; c = 8–11; c' = 6–8; V = 42–44 % *baqrii* Carbonell & Coomans
 - Anterior uterine sac practically absent; tail longer, 10–16 anal body diameters 4
- 4 Stylet 15–17 µm; tail 14–16 anal body widths long. L = 1.2–1.3; a = 34–36; b = 4.3–4.5; c = 4.2–4.6; c' = 14–16; V = 39–41 % *mitis* sp. n.
 - Stylet 19–21 µm; tail 9–12 anal body widths long. L = 1.3–1.5 mm; a = 28–35; b = 4.0–4.5; c = 4–7; c' = 9–11; V = 40–42 % *maqsoodi* Ahmad & Jaiarjpurii

- 5 Female genital organ pseudodidelphic with reduced anterior ovary; body longer. L = 1.3–1.4; a = 34–39; b = 4.1–4.6; c = 16–23; c' = 2.5–3.0; V = 48–52 %
 *paracavalcantii* Carbonell & Coomans
 – Female genital organ mono-prodelphic, an anterior reduced ovary only exceptionally present; body mostly shorter. L = 0.9–1.4 mm; a = 24–38; b = 3.5–4.8; c = 10–12; c' = 2.0–5.2; V = 40–47 % *cavalcantii* (Lordello)
- 6 Large and slender species, 1.7–2.4 mm; anterior uterine sac present, short but distinct. L = 1.7–2.4 mm; a = 42–64; b = 5.4–6.3; c = 3.5–6.0; c' = 14–25; V = 35–38 %
 *sylphoides* (Williams)
 – Smaller and less slender species, 0.7–1.6 mm; anterior uterine sac completely or practically absent 7
- 7 Tail filiform, 20–30 times the anal body width long; body shorter than 1 mm. L = 0.7–0.8 mm; a = 30–37; b = 4.1–5.1; c = 2.3–2.6; c' = 20–30; V = 33–38 %
 *filicaudatus* Carbonell & Coomans
 – Tail shorter, 4–12 times the anal body width long; body longer, 1.2–1.6 mm 8
- 8 Tail short, 4–5 anal body diameters, dorsally bent. L = 1.5–1.6 mm; a = 31–44; b = 4.0–4.6; c = 11–15; c' = 4–5; V = 44–48 %
 *caudatus* Ahmad & Jairajpuri
 – Tail longer, 8–12 anal body diameters, straight 9
- 9 Cuticle finely but distinctly annulated; tail 250 µm long. L = 1.2 mm; a = 30–34; b = 4.3–4.6; c = 5; c' = 11–12; V = 36–40 %
 *chamoliensis* Ahmad & Jairajpuri
 – Cuticle smooth; tail 180–220 µm long. L = 1.3–1.5 mm; a = 28–36; b = 4.1–4.6; c = 5.6–8.1; c' = 7.5–9.2; V = 40–46 %
 *papuanus* sp. n.

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