

Four large-sized species of the family Aporcelaimidae (Nematoda, Dorylaimida) with proposal of a new genus, *Epacrolaimus* gen. n.

By

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Abstract. Four uncommonly large species of the family Aporcelaimidae are presented. Two of them belong to the genus *Aporcelaimus*: *A. americanus* Thorne & Swanger, 1936 and *A. caesar* sp. n., two to a newly suggested genus, *Epacrolaimus* gen. n.: *E. declinatoaculeatus* (Kreis, 1924) and *E. imperator* sp. n. The new genus resembles *Aporcelaimus* in several respects, but it clearly differs from that in structure of the labial region, shape of the spear and arrangement of the oesophageal gland nuclei.

The representatives of the family Aporcelaimidae Heyns, 1965 are predominantly large nematodes, in general between 2 and 4 mm, but also some extremely long species may occur among them. In the present paper, such large-sized (7 to 10 mm) aporcelaimoid nematodes are discussed. Of the four species described below, two are members of the old genus *Aporcelaimus* Thorne & Swanger, 1936: *A. americanus* Thorne & Swanger, 1936 and *A. caesar* sp. n. The other two species however represent another group showing several *Aporcelaimus*-like characters on the one hand, but also a number of differing morphological structures on the other hand. For these latter species, *declinatoaculeatus* (Kreis, 1924) and *imperator* sp. n., a new genus, *Epacrolaimus* gen. n., is proposed.

Three of the species were collected in Hungary, one came from Alaska.

Aporcelaimus americanus Thorne & Swanger, 1936

(Figs. 1 A-E, 2 A-C and 5)

Present specimens

Females (n = 3): L = 7.00-7.27 mm; a = 50-53; b = 5.5-6.8; c = 104-125; V = 50-54 %; a' = 241-245; c' = 0.8-0.9.

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Males (n = 2): L = 7.70-7.74 mm; a = 50-51; b = 5.8-6.0; c = 116-118; a' = 257-266; c' = 0.7-0.8.

Measurements after Thorne and Swanger, 1936

Females: L = 5.0-7.0 mm; a = 45; b = 5.2; c = 100; V = 49 %; c' = 0.7.

Males: L = 5.0-7.0 mm; a = 41; b = 4.7; c = 100; c' = 0.8.

Very large nematodes, between 7 and 8 mm. Figure slender, 136-150 μm wide on mid-body region. Cuticle thick, 7-9 μm on most part of body, 12-13 μm on the preanal region; possessing two dorsal and two ventral canals on the neck. Head offset by a deep constriction, 29-30 μm wide. Lips practically not separated from one another, papillae small, not elevated. Body at posterior end of oesophagus as wide as 4.2-5.0 labial widths. Amphids as usual in the genus with slightly arcuate anterior contour and fine medial ribs, nearly half the corresponding body width.

Odontostyle 28-29 μm , 2.3-2.9 % of oesophagus length, about equal to labial width, a little thinner than cuticle at same level. Aperture 2/3 of spear length or more; ventral wall more than twice as long as dorsal wall, both thin, slightly sclerotized. Oesophagus 1010-1320 μm long, massive, strongly muscular, gradually expanding from well before its middle. Cardial gland (disc) dorsal. Intestine thick-walled with dense contents. Prerectum 2.8-3.3 anal body widths long, rectum nearly equal to anal diameter. Distance between posterior end of oesophagus and vulva 1.9-2.6 times as long as the oesophagus.

Oesophageal glands uni-nucleate, well visible. Dorsal nucleus lying slightly behind the oesophagus middle, in 8.4 to 9.6 % of total length of body, far behind its orifice. Glandularium 480-620 μm long, 45-49 % of oesophagus. Nucleus AS₁ in one-third, AS₂ in mid-region of glandularium. The distance between the two AS nuclei is fairly constant, 144-150 μm .

Oesophageal gland nuclei in Aporcelaimus americanus

D = 51-55 %	AS ₁ = 26-30 %
	AS ₂ = 48-52 %
	PS ₁ = 70-71 %
K = 57-60 %	PS ₂ = 72-73 %

Vulva transverse with well sclerotized heart-shaped inner lips measuring 22-23 μm in width. Vagina more or less spheroid, 70-72 μm long, occupying about 1/2 body diameter. Amphidelphic. Both gonads together amount to 30-32 % of body length; each is 15-16 % or 8-9 body widths long. Anterior gonad on the right, posterior gonad on the left side of intestine. A gravid female contained two uterine eggs measuring 155-158 \times 80-85 μm and being as long

as or a little longer than corresponding body diameter. Uterus differentiated to form a spermatheca-like chamber on each end.

Distance vulva-anus as long as 50–57 tail lengths. Female tail 58–65 μm , only 0.7– 0.8 % of body length, conoid-rounded with blunt tip and two pairs of subdorsal papillae.

Male prerectum beginning at level of the anteriormost supplement(s). The entire genital tract (from anterior tip of T_1 to cloaca) amounts to 60 % of body length. Each testis 6–7 body diameters long. Spermatozoa irregular or more or less rounded, 6–7 μm . Spicula large, 200–210 μm in curved medial axis; postcorpus swollen, longer than precorpus. Comites¹ 46–49 μm long, obliquely tipped distally. Ventromedial supplements 15 or 16, small, separated by fine blisters between them. One or two of the posterior supplements being within the range of the spicula. Male tail similar to that of female, 65–71 μm , provided with 5 pairs of small papillae.

Locality. Budakeszi in Hungary, forest soil, collected in May, 1972 (3 females and 2 males).

Remarks. *Aporcelaimus americanus* is fairly similar to *A. eurydoris* (Ditlevsen, 1911) Thorne & Swanger, 1936, from which it differs in the much thicker cuticle, the comparatively gracile spear being thinner than the cuticle at same level (vs. spear thicker than cuticle), the longer spicula (200–210 μm vs. 150–170 μm), and in the arrangement of the supplements of which the posterior one or two level with the proximal ends of the spicula (vs. all supplements lying in front of the spicula).

This species was described by Thorne and Swanger (1936) from the United States, and subsequently mentioned (but morphologically not detailed) by some other authors. The Hungarian specimens agree well with the original description in having a large body, a spear being as long as head diameter and thinner than cuticle on neck, conspicuously swollen spicula, supplements possessing small refractive elements (blisters) between them and ending at level of the proximal tips of the spicula. The present animals were identical with the American ones, except for being somewhat longer and having 15–16 supplements (instead of 12–15). These are however no real differences, only may be due to variability.

One of the most important characters of *A. americanus* is the position of the last supplements: they always are within the range of the spicula.

Thorne and Swanger mentioned another „main” character: the cuticle being three-layered on neck. However, this is not a true distinguishing mark since every species of *Aporcelaimus* I have studied hitherto shows the same cuticular pattern: three layers namely, being the external layer (exocuticula) conspicuously duplex.

¹ A technical term for the „lateral guiding pieces”; see Andrásy, 1998, P. 177.

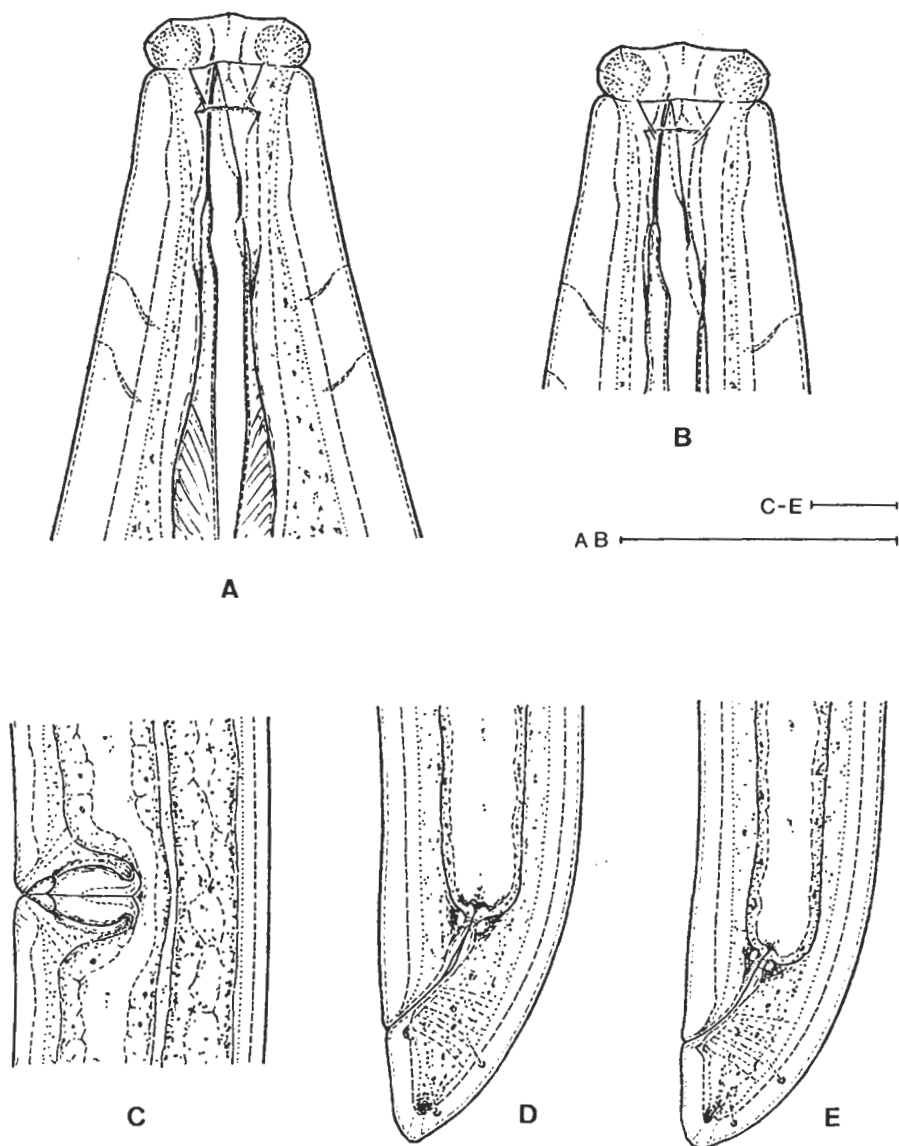


Fig. 1. *Aporcelaimus americanus* Thorne & Swanger, 1936. A-B: anterior regions; C: vulval area; D-E: female posterior regions. (Scale bars 50 μ m each)

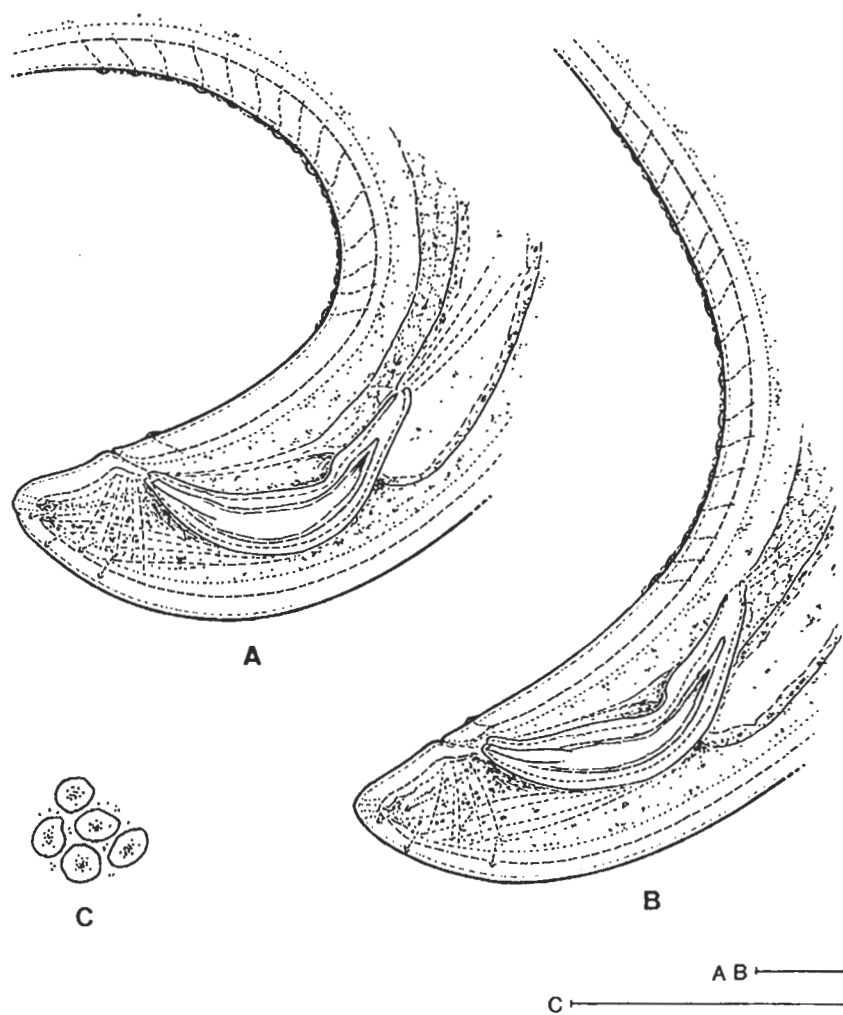


Fig. 2. *Aporcelaimus americanus* Thorne & Swanger, 1936. A-B: male posterior body regions; C: spermatozoa. (Scale bars 50 μ m each)

Distribution. *Aporcelaimus americanus* is a comparatively rare species. As far as I know, it has been recorded from Holland (Loof & Coomans, 1970), Poland (Winiszewska-Slipinska, 1987; Wasilewska, 1997), France (Loof & Coomans, 1970), Hungary (present data), and the United States (Thorne & Swanger, 1936; Loof & Coomans, 1970).

Aporcelaimus caesar sp. n.

(Figs. 3 A-E, 4 A-C and 6)

Holotype male: L = 8.52 mm; a = 57; b = 6.4; c = 138; a' = 240; c' = 0.8, PO: 24.

Paratype females (n = 2): L = 10.05-10.50 mm; a = 58-60; b = 6.8-7.0; c = 128-132; V = 46-52 %; a' = 287-300; c' = 0.8.

Paratype males (n = 2): L = 7.50-8.64 mm; a = 45-50; b = 5.4-6.2; c = 94-116; a' = 214-243; c' = 0.7-0.8.

Body unusually large, in females as long as or longer than 10 mm, in males up to 8.6 mm; as far as known, this is the largest-sized species in the family Aporcelaimidae. Figure slender, body 160-190 μ m wide at the middle. Cuticle thick, 10-12 μ m on most part of body, 15-17 μ m on the preanal region and 17-18 μ m on neck; finely striated radially and marked by fine criss-cross fibers. Labial region in comparison with body length fairly narrow, 35-36 μ m wide, sharply separated from neck. Lips hardly set off from one another, almost fused. Amphids aporcelaimoid, somewhat less than half the corresponding lip region width.

Odontostyle 35-37 μ m, about equal to labial width, 2.3-2.7 % of oesophagus length, distinctly narrower than cuticle at same height. Aperture occupying 3/4 spear length, with straight or (more at males) slightly concave contour. Oesophagus 1380-1520 μ m long, strongly muscular in entire length, gradually enlarging posterior to its first third. Cylindrus very strong. Cardial gland dorsally wider than ventrally. Intestine unusually thin-walled, with dark and compact contents. Prerectum 1.7-3.0 times, rectum 1.3 times anal body width. Distance between posterior end of oesophagus and vulva 2.2-2.5 times longer than oesophagus.

Oesophageal gland nuclei large, well visible; at lower magnification they appear to be more conspicuous. Dorsal nucleus hardly greater than other nuclei, located well behind the oesophagus middle, in 8-10 % of total length of body. Orifice far before the dorsal nucleus. Glandularium 538-667 μ m long, 41-44 % of oesophagus length. AS₁ nucleus before one-third, AS₂ at middle of glandularium. PS nuclei smaller than the anterior subventral nuclei.

Oesophageal gland nuclei in Aporcelaimus caesar

D = 56-59 %	AS ₁ = 28-31 %
	AS ₂ = 47-52 %
	PS ₁ = 72-75 %
K = 58-62 %	PS ₂ = 73-76 %

Vulva transverse, with strongly sclerotized heart-shaped inner lips and very finely striated outer lips. Vagina 98-120 μm , as long as 1/2 to 2/3 body width. Amphidelphic species. Gonads 38-40 % of body length; O₁ 18-19 % or 9-10 body widths, on the left side, O₂ 17-19 % or 8-10 body widths, on the right side of intestine. Ovaries reflexed to the half-length, uterus long, packed with sperm. One female possessed five eggs; these are 235-290 \times 114-140 μm , 1.2-1.6 times longer than one body diameter.

Distance vulva-anus equal to 63-68 tail lengths. Female tail 77-82 μm , bluntly conoid-rounded with two pairs of papillae.

Male gonad (from anterior tip of T₁ to cloaca) measuring 66-70 % of body length. Each testis 13-19 % of body, T₁ located on the right, T₂ on the left side. Spermatozoa ovoid, 8-10 μm . Spicula 210-230 μm in the curved medial line, fairly slender with elongate collum, swollen venter, conspicuous sinus and almost straight pes². Antecorpus hardly shorter than postcorpus. Comites 55-63 μm long. Supplements 23, 24 or 27 in number, contiguous or nearly so, the posterior ones lying a little anterior to the spicular tips. Prerectum beginning in range of the first supplements. Male tail 67-78 μm , similar to female tail, with 6 pairs of sublateral/subdorsal papillae.

Holotype. Male on the slide Nr. 7373/H. Paratypes: 2 females, 2 males and 1 juvenile. All type specimens are in the collection of the author.

Type locality. Buda Mountains, soil samples from oak forests, collected in December, 1970, December, 1971 and March, 1972, respectively.

Remarks. *Aporcelaimus caesar* sp. n. is distinctive because of its extremely large body, the very thick cuticle, posterior position of the dorsal oesophageal nucleus, heart-shaped vulval lips, very large and distally not swollen spicula, and the great number of contiguous supplements.

This is the biggest species within the genus. Among the members of *Aporcelaimus* only two species are known that possess so numerous (23 to 30) supplements: *A. paraspiralis* Thorne & Swanger, 1936 and *A. fortis* Gagarin, 1992. *Aporcelaimus caesar* sp. n. differs from *paraspiralis* in having a longer body (7.5-10.5 mm vs. 5.8-6.1 mm) and a longer precloacal space (vs. posterior four supplements lying within the range of spicula). It differs from *fortis* in having a much narrower spear (vs. spear distinctly thicker than cuticle) and more slender spicula (vs. spicula strongly swollen).

² Technical terms of spicular nomenclature see in Andr ssy, 1999, Page 18.

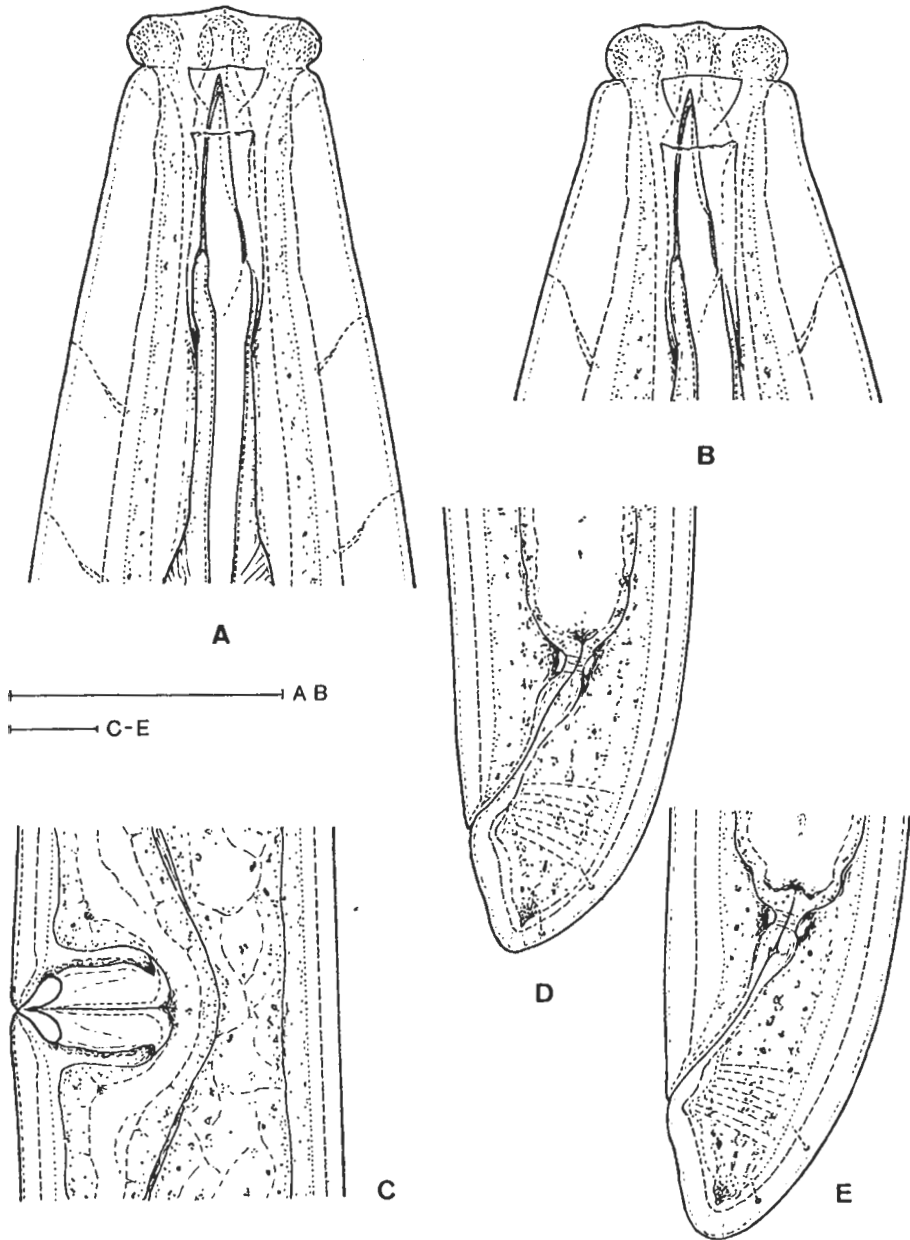


Fig. 3. *Aporcelaimus caesar* sp. n. A-B: anterior ends; C: vulval region; D-E: forms of female tails. (Scale bars 50 μ m each)

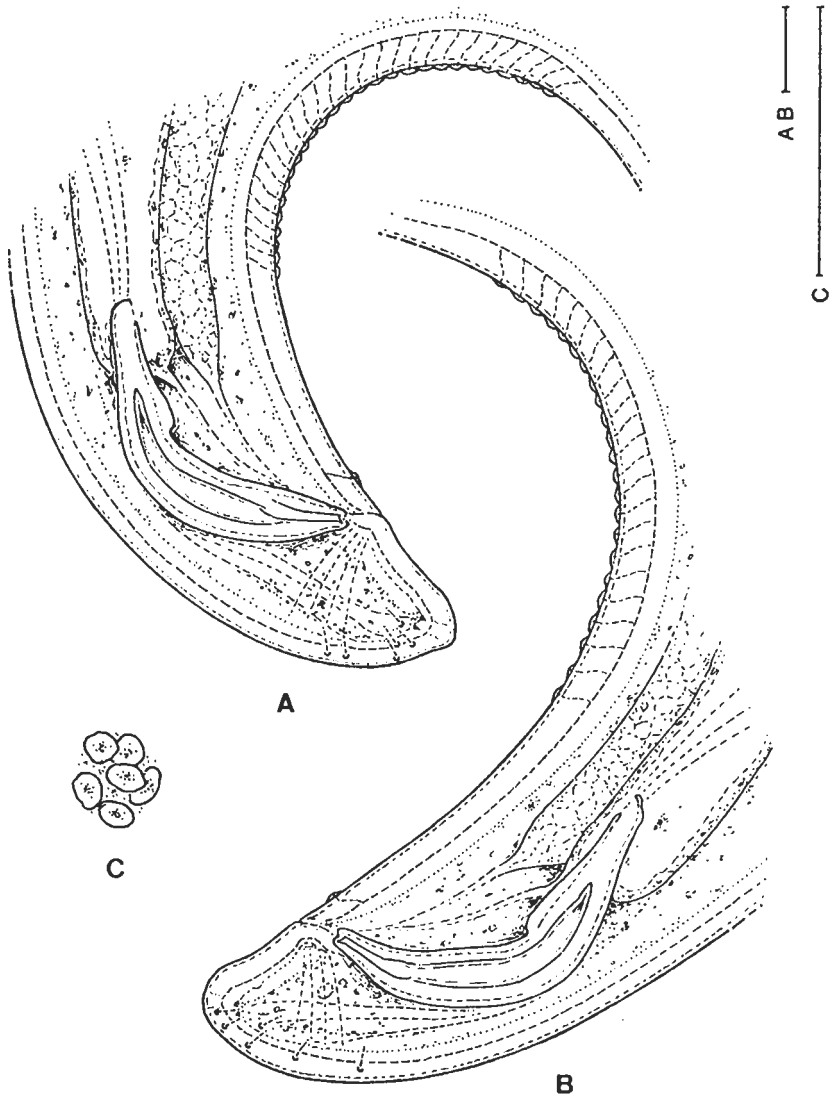


Fig. 4. *Aporcelaimus caesar* sp. n. A-B: male posterior body regions; C: spermatozoa. (Scale bars 50 μ m each)

Etymology. The species name „caesar” (Latin) means „emperor”. In its body size this species bears „rule” over the other members of the genus, even over those of the whole family.

Epacrolaimus gen. n.

Aporcelaimidae. Very large animals with body length of 7–9 mm. Cuticle thick, marked with fine criss-cross lines. Labial region offset by a deep constriction. Lips very distinctly separated from one another, each provided with a protruding inner liplet. Odontostyle slightly or heavily arched inward on the dorsal contour, with thin blade and large aperture. Oesophagus in its entire length muscular, gradually widening from far before the middle. Oesophageal glands often with duplex nuclei; anterior subventral nuclei lying close to each other, but far from dorsal nucleus. Reproductive system amphidelphic. Vulva transverse with wrinkled cuticle. Male supplements 11 to 16, mostly separate. Tail form in each sex similar, shorter than anal body diameter, dorsally convex-conoid with bluntly rounded or slightly subdigitate terminus.

Type species: *Dorylaimus declinatoaculeatus* Kreis, 1924 = *Epacrolaimus declinatoaculeatus* (Kreis, 1924) comb. n.

The new genus includes two species:

E. declinatoaculeatus (Kreis, 1924) comb. n.

Dorylaimus declinatoaculeatus Kreis, 1924

Aporcelaimus declinatoaculeatus (Kreis, 1924) Thorne & Swanger, 1936

Dorylaimus (Aporcelaimus) declinatoaculeatus Kreis, 1924 (Altherr, 1950)

Drepanodorus declinatoaculeatus (Kreis, 1924) Brzeski, 1964

Aporcelaimus vorax Thorne & Swanger, 1936 syn. n.

Drepanodorus vorax (Thorne & Swanger, 1936) Brzeski, 1964 syn. n.

E. imperator sp. n.

Remarks. Whereas *Epacrolaimus* gen. n. is closely related to *Aporcelaimus* Thorne & Swanger, 1936, it differs from that in several morphological and anatomical characters. Thus, it differs in having cephalic lips strongly separated from one another (lips hardly differentiated or practically fused in *A.*), conspicuous inner liplets (no such liplets in *A.*), thin-bladed spear (spear thick-bladed in *A.*), strongly wrinkled cuticle on the outer vulval lips (vulval cuticle not wrinkled, at most finely striated in *A.*), and other arrangement of the oesophageal gland nuclei. As for the latter, the first anterior subventral oesophageal nucleus (AS_1) lies much closer to its partner (AS_2) than to the dorsal nucleus (*D*), the value of *K* is therefore high, about 70 to 80 % (AS_1 nucleus more or less midway between *D* and AS_2 , the value of *K* lower, generally 45 to 60 % in *A.*), in addition, the nucleus AS_2 is located well behind

the middle of the glandularium (before or exceptionally a little behind the middle of glandularium in *A.*), and the glandularium is longer than half-length of the oesophagus (shorter in *A.*)

Etymology. The genus name is composed of two Greek words: *επακρυσ* = sharpened, *λαμνος* = throat, but here: spear. *Epacrolaimus* is a latinized form meaning „a sharpened spear“. At the same time, *Epacrolaimus* is an anagram of *Aporcelaimus*.

Epacrolaimus declinatoaculeatus (Kreis, 1924) comb. n.

(Figs. 7, 9 A-F and 10 A-F)

Present specimens

From Budakeszi: Females (n = 3): L = 7.15–8.25 mm; a = 48–58; b = 4.9–5.7; c = 103–110; V = 48–54 %; a' = 248–294; c' = 0.7–0.8. - Male: L = 9.30 mm; a = 70; b = 6.1; c = 130; a' = 320; c' = 0.8.

From Keszthely: Female: L = 7.62 mm; a = 62; b = 6.0; c = 116; V = 52 %; a' = 272; c' = 0.8.

From Baradla: Female: L = 8.10 mm; a = 58; b = 5.6; c = 115; V = 53 %; a' = 288; c' = 0.8.

Measurements after other authors

Kreis, 1924 (*declinatoaculeatus*): Female: L = 6.91 mm; a = 47; b = 5.5; c = 102; V = 45 %.

Thorne & Swanger, 1936 (*vorax*): Females: L = 7.0–9.0 mm; a = 50; b = 6.3; c = 125; V = 54 %; c' = 0.8.

Thorne, 1939 (*vorax*): Male: L = 7.2 mm; a = 59; b = 6.8; c = 111; PO: 11.

Body very large, 7–9 mm; in contrast with most dorylaimids the male specimen was the longest, 13 to 30 % times longer than the females. Body figure slender, especially at male; body width 124–128 μm in the mid-region. Cuticle thick, 7–9 μm on most part of body, 16–20 μm on the preanal region; more strongly thickened on neck where possessing three ventral and three dorsal canals. Cuticle on tail marked by fine radial striation and criss-cross lines. Labial region 28–29 μm wide, offset by a profound constriction. Lips distinctly separated from one another, spheroid, possessing small protruding inner liplets. Body at posterior end of oesophagus 3.7–4.2 times the labial width. Amphid stirrup-shaped with arcuate anterior margin and fine medial rib, its aperture occupying half the corresponding body width.

Odontostyle 22–25 μm , 1.5–1.8 % of oesophagus length, shorter than labial width and a little thinner than cuticle at the same level. Aperture measuring 2/3 (occasionally to almost 3/4) of spear length, and very characteristic from

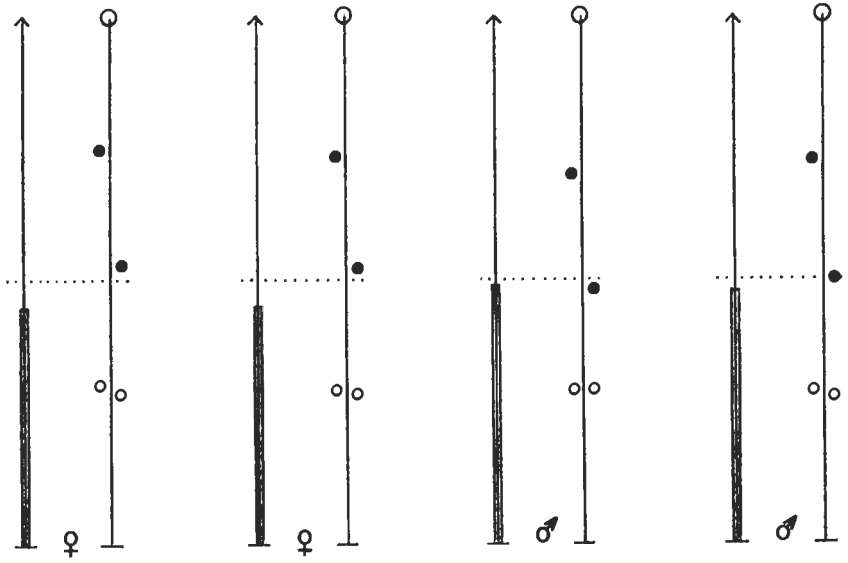


Fig. 5. Map of oesophageal gland nuclei in *Aporcelaimus americanus* Thorne & Swanger, 1936

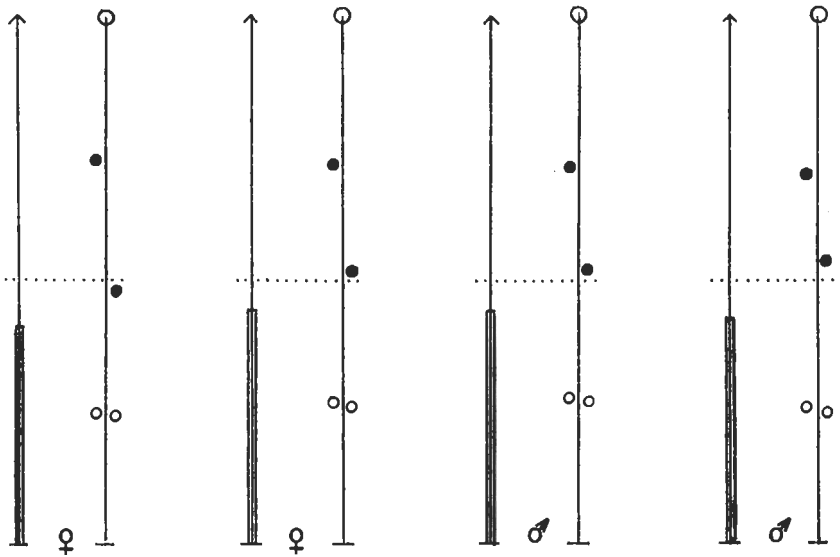


Fig. 6. Map of oesophageal gland nuclei in *Aporcelaimus caesar* sp. n.

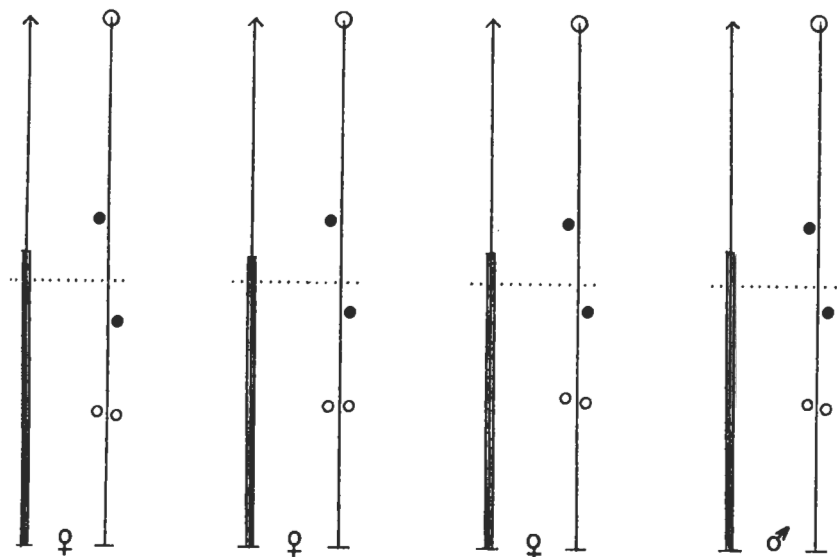


Fig. 7. Map of oesophageal gland nuclei in *Epacrolaimus declinatoaculeatus* (Kreis, 1924) comb. n.

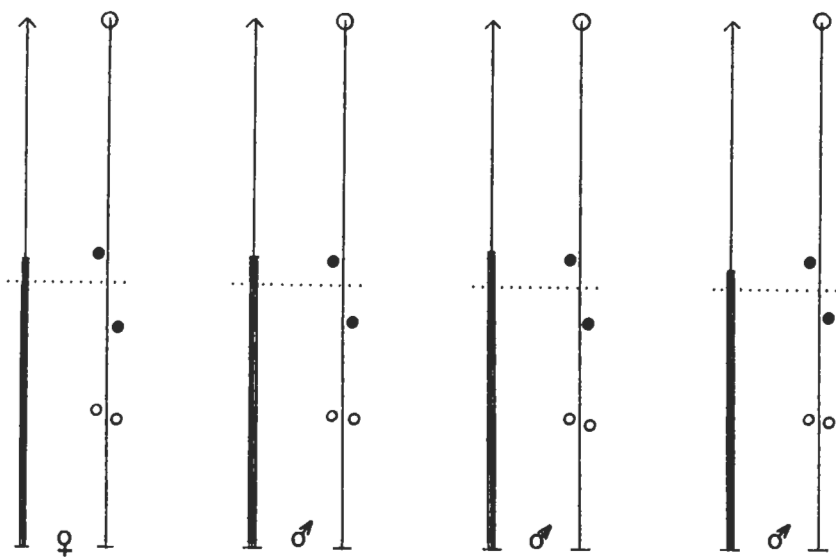


Fig. 8. Map of oesophageal gland nuclei in *Epacrolaimus imperator* sp. n.

lateral view: its border is strongly incurved giving the spear an angular appearance. The „blade“ of spear (the part from distal tip of spear to proximal end of aperture) is much narrower than the „haft“. Guiding sheath wide but thin mostly with plicate anterior margin. Oesophagus 1300–1495 μm long, 16–20 % of body length, strongly muscular in its entire length, somewhat narrowing where encircled by the nerve ring, then gradually widening from before its middle; the actual beginning of the cylindrus cannot be determined. Cardia consisting of an anterior discoid and a posterior conoid element. Prerectum 2.8–3.5 anal body widths long, rectum a little longer than one anal diameter. Distance between posterior end of oesophagus and vulva longer (1.5–2.1 times) than oesophagus.

Gland nuclei in oesophagus large, well discernible; occasionally some of the glands are binucleate, i.e. within the halo (court) a larger and a smaller nucleus can be observed (especially in the D and AS₂ glands). Glandularium 760 to 852 μm long, 55–57 % of oesophagus. Dorsal nucleus mostly oval, always located before the middle of oesophagus, in 9–10 % of the entire length of body. Orifice far before the nucleus D. Nucleus AS₁ at 2/3 of the distance between D and AS₂ or more posterior in position. AS₂ lying behind the middle of glandularium; the distance of AS₂ from AS₁ was very constant in the six specimens examined: 128 to 130 μm . PS nuclei nearly levelling with each other, and lying at a distance of 210–230 μm from posterior margin of cylindrus.

As may be seen on the small tables below, the arrangement of the oesophageal gland nuclei of the present specimens agrees very well with the gland map given by Loof and Coomans (1970) for *A. declinatoaculeatus*. This is a good example again to demonstrate the constant location of the oesophageal gland nuclei within one species. This anatomical character ought to be followed with more attention in the future.

Oesophageal gland nuclei in Epacrolaimus declinatoaculeatus

Present specimens

D = 43–45 %	AS ₁ = 37–39 %
	AS ₂ = 54–57 %
	PS ₁ = 71–74 %
K = 66–72 %	PS ₂ = 72–75 %

After Loof & Coomans (1970)

D = 44–46 %	AS ₁ = 37–38 %
	AS ₂ = 55–57 %
	PS ₁ = 71–72 %
K = 64–70 %	PS ₂ = 72–73 %

Vulva a large transverse slit, with strongly sclerotized, 35–37 μm wide inner lips and heavily wrinkled outer lips. Vagina very strong, 73–105 μm , 2/3 to almost 3/4 body diameter. Amphidelphic species. Gonads comparatively short, O₁ 6–11 % or 3–7 body widths, O₂ 6–10 % or 3–5 body widths; all together amount 12–21 % of body length. Both gonads lying seemingly on the same side, either on the right or on the left side of body. Uteri in fertilized

females packed with sperm. Ovaries reflexed 1/3 to 1/2 the distance back to vulva. Mature eggs were not present in the uteri.

Vulva–anus distance 48–54 times as long as tail. Female tail 63–75 μm , only 0.8–0.9 % of body length, shorter than anal diameter, bluntly conoid, rounded on tip or with a minute peg.

Posterior end of male slightly arcuate ventrally. Spermatozoa roughly globular, 10–13 μm . Spicula 215 μm along the curved medial line, massive with narrow collum, swollen venter, strongly widening pes and spacious inner lumen. Comites 50 μm , obliquely tipped. Ventromedial supplements 12, separate, the posterior ones lying well before the spicula; the distance between the anteriormost supplement and cloaca amounts to 260 μm . Male tail 75 μm long, with four pairs of small papillae.

Material studied: Budakeszi, Julianna-major close to Budapest, Hungary, forest soil, December, 1970, 1 female; the same, January, 1971, 1 female; the same, March, 1972, 1 male. Keszthely, Hungary, cultivated soil, May, 1967, 1 female, 1 juvenile. Baradla cave, Hungary, interstitial habitat, March, 1967, 1 female.

Remarks. *Epacrolaimus declinatoaculeatus* is very easily recognizable by the characteristically curved spear aperture combined with the large size of body. The odontostyle structure gives it a special appearance, and distinguishes it from all other representatives of the family Aporcelaimidae. Kreis (1924) described the species from Switzerland as *Dorylaimus declinatoaculeatus*. His description was though rather laconic, still unambiguous because of the good illustration of the spear. When suggesting the genus *Aporcelaimus*, Thorne and Swanger (1936) transferred *declinatoaculeatus* to their genus. At the same time, they described another very similar species from the United States, *Aporcelaimus vorax* Thorne & Swanger, 1936. This large-sized (7–9 mm) nematode shows quite the same peculiar spear shape, and the figures of the head and tail are quite similar also. Later, Thorne (1937, 1939) reported on a male specimen, too. According to the American authors, the species *vorax* differs from *declinatoaculeatus* in two rather insignificant characters: the vulva lies more back (54 % vs. 45 %), and the uterine egg is somewhat longer than one body diameter (vs. a little shorter).

Rather few additional data can be found in the literature. Altherr (1950) described a juvenile *Dorylaimus* (*Aporcelaimus*) *declinatoaculeatus* from Switzerland. Under the name *Aporcelaimus vorax*, Heyns (1965, 1971) gave some good drawings (but no description) of South African specimens, then Coomans and Van der Heiden (1971) described the feeding apparatus of Belgian exemplars.

The present animals agree well with those of older descriptions. Considering the literature data of *declinatoaculeatus* and *vorax*, and comparing them with one another as well as with the present individuals, the

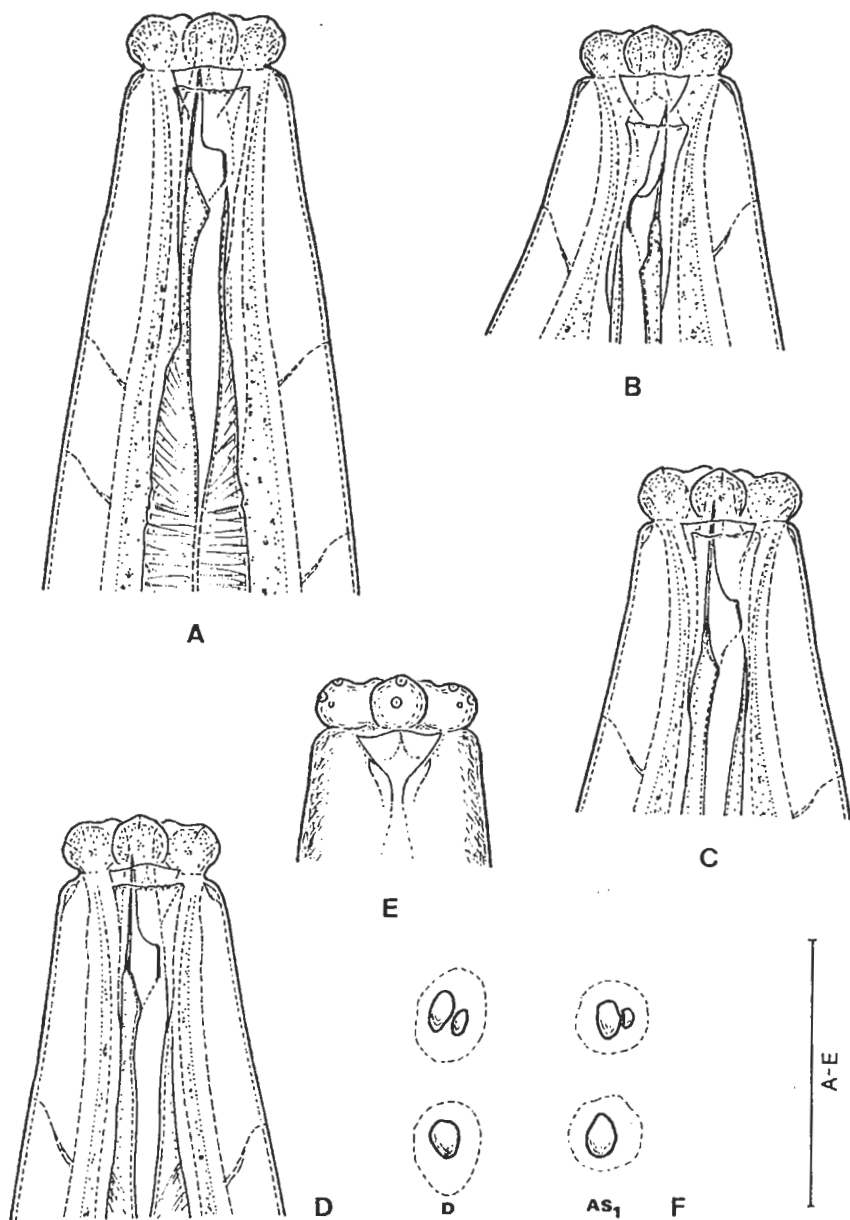


Fig. 9. *Epacrolaimus declinatoaculeatus* (Kreis, 1924) comb. n. A-D: variations of anterior regions; E: anterior end in surface view; F: binucleate and uninucleate forms of oesophageal gland nuclei D and AS₁. (Scale bars 50 μm each)

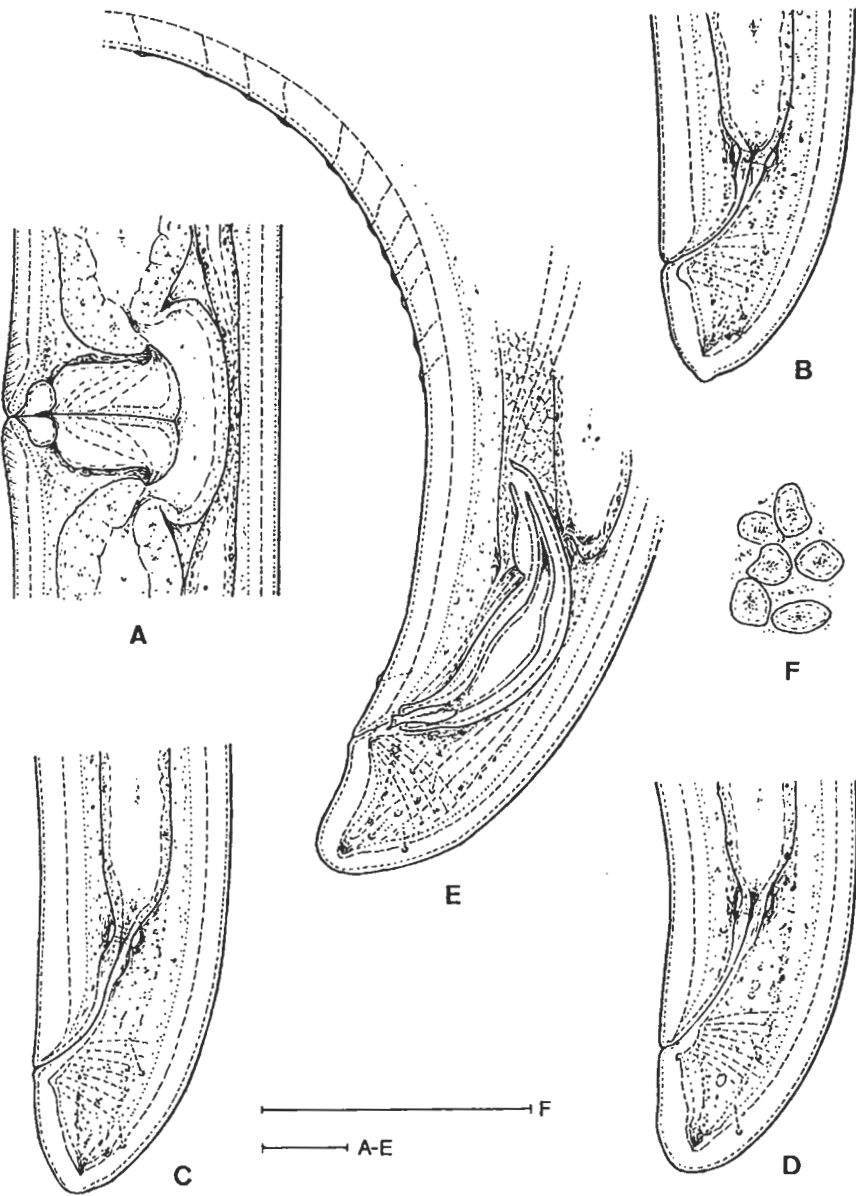


Fig. 10. *Epacrolaimus declinatoaculeatus* (Kreis, 1924) comb. n. A: vulval region; B-D: variations of female caudal regions; E: male posterior body; F: spermatozoa. (Scale bars 50 μ m each)

conspecificity of these taxa can hardly be queried. On the one hand, the differences between the two species as mentioned by Thorne and Swanger are negligible³; on the other hand, the Hungarian animals show an intermediate position of the vulva between the two data. In addition, the number of copulatory supplements is practically the same in both known males: Thorne's (11) and the Hungarian's (12). As for the length of spear, Heyns (1965) illustrated it as being about 22 μm , Coomans and Van der Heiden (1971) as being 26 μm ; these data coincide with the spear length of my specimens (22–25 μm). On account of the morphological and morphometrical congruence, I consider *A. vorax* a junior synonym of *A. declinatoaculeatus*.

Whether there exists another but much smaller *declinatoaculeatus*-like species, it is strongly questionable. Altherr's *Dorylaimus (Aporcelaimus) declinatoaculeatus* (1950) was a 2.6 mm long juvenile with discernible genital primordium, $V = 58\%$ (?). Mateo and Campoy (1983) rather insufficiently described under the name *Aporcelaimus vorax* another small form from Spain. The 1.9 mm long females (?) showed the peculiar shape of spear; the position of the vulva was however quite unusual: 66% (?). The „female“ illustrated on Fig. 2a was surely a young animal since a conspicuous replacement spear was drawn in the oesophageal tissues. Finally, Brzeski (1964) described under the name *Drepanodorus declinatoaculeatus* a comparatively small-sized (3.5 mm) nematode from Poland, but the spear of his species did not show the typical shape, the lips were not separated from one another, etc.

Distribution: *Epacrolaimus declinatoaculeatus* seemingly prefers terrestrial habitats in temperate regions, but occurs also in limnic or semi-limnic biotopes. It has been recorded from three continents. Europe: Switzerland (Kreis, 1924; Altherr, 1950), Holland (Heyns, 1965; Loof & Coomans, 1970), Belgium (Coomans & Van der Heiden, 1971), Germany (Loof & Coomans, 1970; Altherr, 1974), Poland (Wasilewska, 1997), Hungary (Andrássy, 1973, 1990, and present data); Africa: South Africa (Heyns, 1965, 1971); North America: United States: New York, Utah (Thorne & Swanger, 1936, Thorne, 1939), California (Heyns, 1965). As large-sized dorylaims in general, *A. declinatoaculeatus* occurs in small individual numbers. Especially males appear to be rare.

Epacrolaimus imperator sp. n.

(Figs. 8, 11 A–D, 12 A–D and 13)

Holotype male: $L = 7.82$ mm; $a = 52$; $b = 5.5$; $c = 99$; $a' = 252$; $c' = 0.7$, PO: 13.

Paratype female: $L = 8.18$ mm; $a = 48$; $b = 5.2$; $c = 93$; $V = 49\%$; $a' = 264$; $c' = 1.0$.

³ Loof (1999, P. 99) also emphasized that these species seemingly differ only in the position of vulva from each other.

Paratype males (n = 5): L = 7.13-8.26; a = 48-55; b = 4.5-5.6; c = 90-105; a' = 238-266, c' = 0.7-1.0.

Very big animals, 7-8 mm or longer. Body slender, 156-160 μm at middle, markedly tapering to the anterior end. Cuticle thick, 10-14 μm throughout most of the body and 18-19 μm on the precloacal region; marked by fine criss-cross lines, and showing three S-shaped canals on both ventral and dorsal side of the neck region. Labial region as compared to the robust size of body fairly small, 30-31 μm wide, sharply offset by a deep constriction. Body at posterior end of oesophagus 4-5 times as wide as head. Lips well separated from one another, more or less spherical, provided with small protruding inner liplets. Labial papillae small, in the usual arrangement (6 + 10). Amphids nearly as wide as half a corresponding body width, slightly arched on anterior margin and provided with medial support.

Odontostyle fairly gracile, conspicuously thinner than cuticle at the same level, 29-31 μm long, about equal to labial diameter, 1.8-2.1 % of oesophagus length; thin-walled, dorsal wall nearly half as long as ventral wall. Aperture occupying 2/3 of spear length or so. Anterior margin of guiding sheaths close to the spear tip. Oesophagus 1420 to 1584 μm long, in its entire length muscular, gradually enlarging from far anterior to its middle; the effective beginning of the cylindrus is not to determine. Slightly narrowed and widened parts generally alternate on the cylindrus. Cylindrus wider than anterior end of intestine. Cardia short with a dorsolateral globular gland (disc). Intestinal walls thick, mostly wrinkled, intestinal contents compact, dark in colour with numerous transverse or oblique articulations. Definite food elements cannot be recognized. Prerectum three anal widths, rectum more than one anal diameter long. Distance between posterior end of oesophagus and vulva 1.6 times as long as oesophagus.

Oesophageal gland nuclei in Epacrolaimus imperator

D = 43-48 %	AS ₁ = 44-46 %
	AS ₂ = 54-58 %
	PS ₁ = 74-76 %
K = 78-82 %	PS ₂ = 76-77 %

Oesophageal gland nuclei large, well visible. Dorsal nucleus (D) anterior to oesophagus middle, in 8.0 to 9.8 % of the entire length of body, lying rather far from its orifice. Nucleus AS₁ as large as or even larger than AS₂. The two AS nuclei lie close to each other, AS₁ in about 80 % of the distance D-AS₂. Both of them are always situated in the posterior half of the distance between D and PS nuclei. PS nuclei almost at same level, at a distance of 365-390 μm from posterior margin of cylindrus. Very remarkable in the glandular picture is that all the oesophageal glands may show two nuclei each. These duplex nuclei were in the AS glands in 90 per cent, in the other glands in 60-70 per

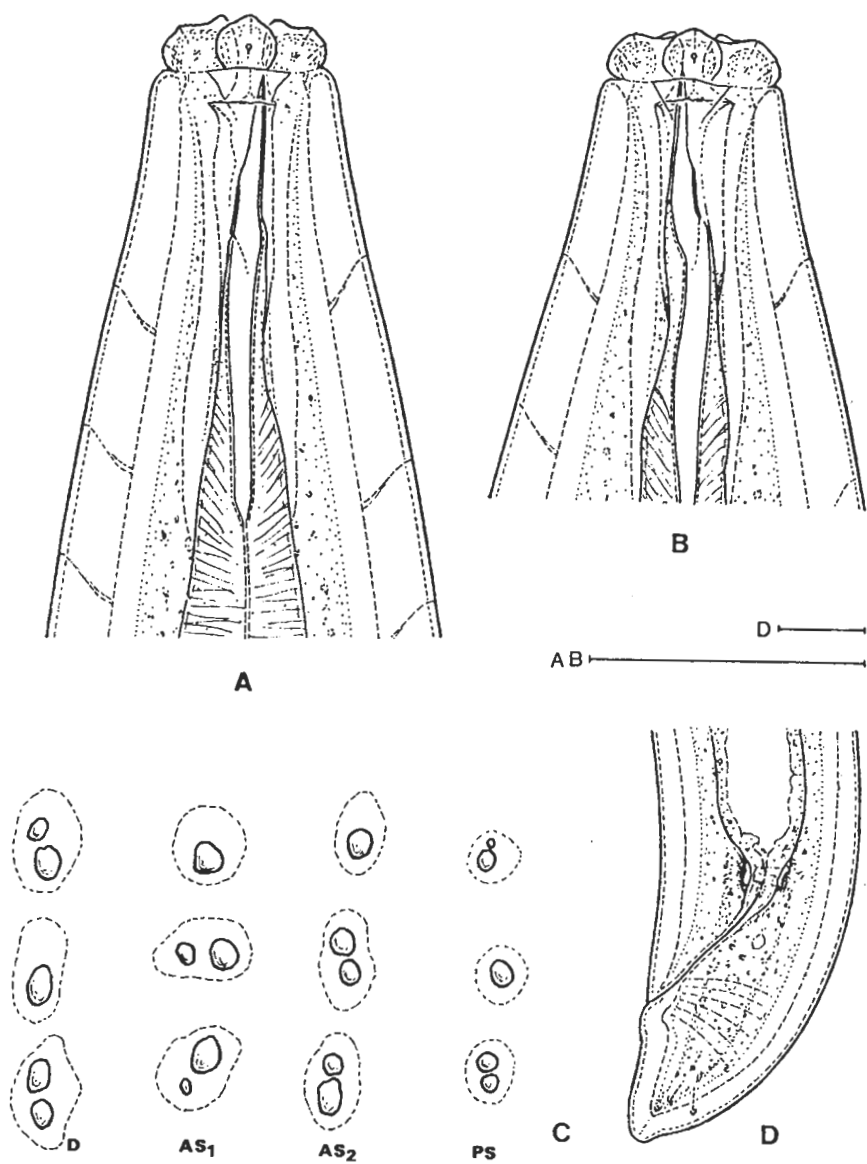


Fig. 11. *Epacrolaimus imperator* sp. n. A-B: anterior regions; C: variations of uni- and binucleate types of the oesophageal gland nuclei D, AS₁, AS₂ and PS; D: female posterior end. (Scale bars 50 μ m each)

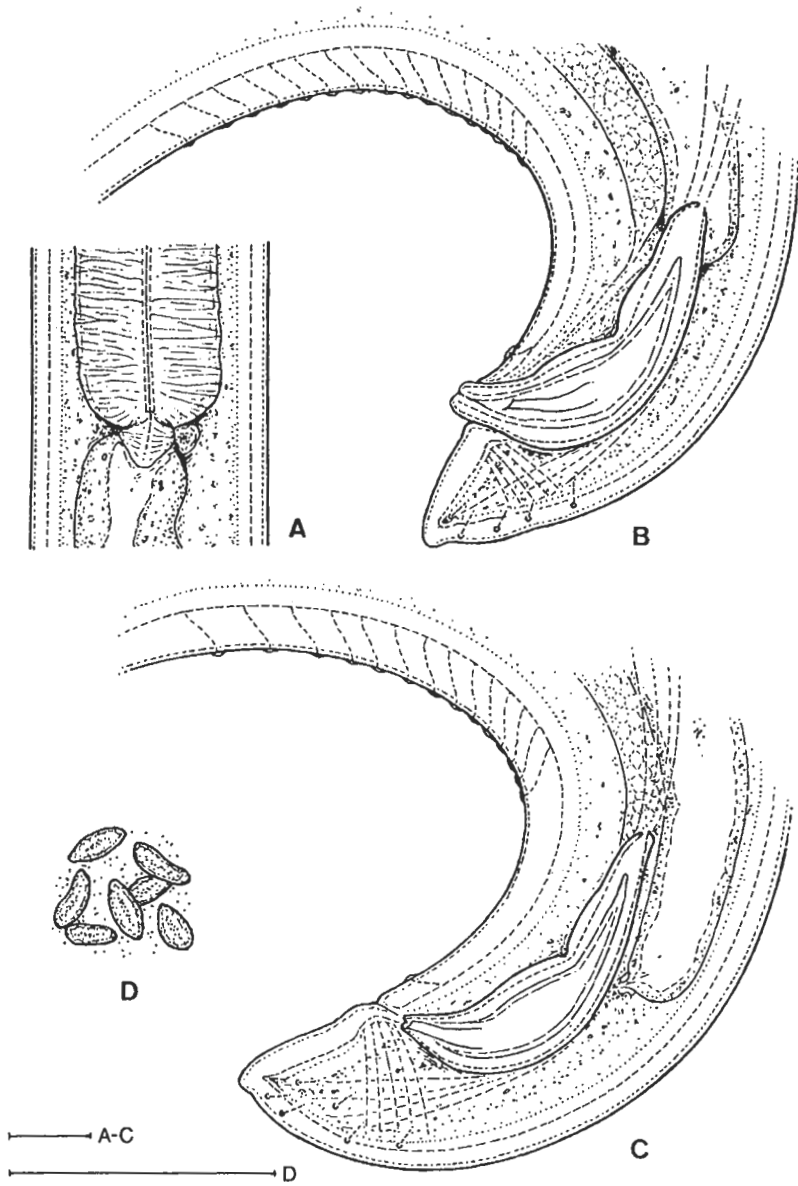


Fig. 12. *Epacrolaimus imperator* sp. n. A: cardial region; B-C: posterior ends of two males; D: spermatozoa. (Scale bars 50 μ m each)

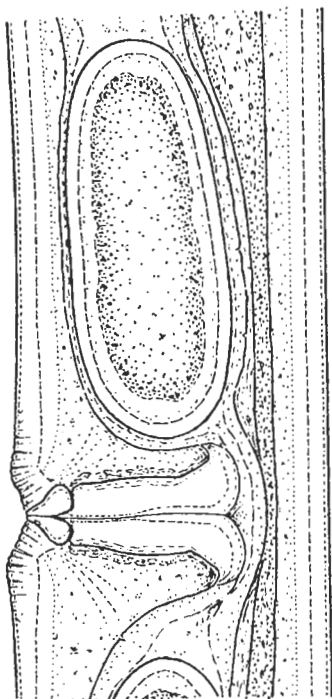


Fig. 13. *Epacrolaimus imperator* sp. n. Vulval region with egg. (Scale bar 100 μm)

cent present. There were animals in which all the nuclei were double, but none showing simple nuclei purely. Glandularium 762–900 μm long, 52–57 % of oesophagus.

Vulva transverse, sunk in body contour with well-cuticularized inner lips and conspicuously wrinkled outer lips. Vagina large, 122 μm , $2/3$ of corresponding body width, wider than the sclerotized vulval lips. Genital system amphidelphic. Both gonads together measuring 36 % of body length; each 9 body widths long. Gonads alternating in position, anterior branch on the right side of body, posterior branch on the left side. Uterus large, gravid females with up to four eggs of 220–236 \times 95–120 μm ; these latter are longer than one body width and provided with unusually thick shells. Oviducts slender, transversely striated.

Distance vulva–anus 46 times tail length. Female tail 84 μm , about 1 % of entire body length, convex-conoid, slightly subdigitate on tip.

Posterior body of male strongly curved ventrally. Prerectum beginning within the range of the anterior-most supplement(s). Testes long, T_1 7–8 body widths or 16 % of body length, + T_2 6.5–7.5 body widths or 13–14 % of body length. As for the position of testes, they lie on alternate sides of intestine: T_1 either on the right (4 males) or on the left side (2 males), T_2 on the left (4 males) or on the right side (2 males). Spermatozoa rather small, 13–15 μm , more or less spindle-shaped. Supplements 11 to 16 in number (11, 12, 13, 14, 14, 16), small, the anterior ones separate, the posterior ones contiguous. Posterior-most supplement at a short distance before the spicula. Spicula 202–210 μm along their curved medial axis, strongly developed with wide inner lumen; postcorpus longer and much wider than antecorpus, collum narrowly rounded at tip, venter and sinus well expressed, pes strongly swollen. Comites 45–52 μm . Male tail 70–86 μm long, about 1 % of body length, similar in shape to that of female, convex-conoid, slightly subdigitate with 5 or 6 pairs of small sublateral or subdorsal papillae.

Holotype. Male on the slide No. 13625/Al. Paratypes: 1 female and 5 males. All type specimens are preserved in the collection of the author.

Type locality. Chena Ridge along the Chena River near Fairbanks, Alaska, taiga soil with grass; collected in October 1998 by T. R. Christiansen (Copenhagen).

Remarks. The new species can be characterized by its very large and slender body, thick cuticle, relatively small head, slender spear with slightly arcuate dorsal contour, closely to each other arranged, but far from D lying AS nuclei, frequent occurrence of duplicated gland nuclei, vulva sunk in body contour, thick-walled eggs, posteriorly swollen spicula, mostly contiguous supplements, as well as by short and slightly subdigitate tails in both sexes.

Epacrolaimus imperator sp. n. shows the same generic characters as *E. declinatoaculeatus* (Kreis, 1924): very large body size, well separate lips, protruding inner liplets, narrow-bladed spear, close to each other lying anterior subventral oesophageal nuclei, conspicuously wrinkled cuticle at vulva. However, it can easily be distinguished from *E. declinatoaculeatus*: the dorsal contour of spear is never so strongly arched and therefore the spear has a thicker blade. In addition, the new species has a longer spear (29–31 μm vs. 22–25 μm), a thinner vagina, thick-walled eggs, oblong spermatozoa and an other arrangement of supplements. Furthermore, the nucleus AS₁ lies more closer to AS₂, the K-value is therefore higher (78–82 vs. 66–72).

Etymology. The species name „*imperator*“ (Latin) means „a ruler“ or „a monarch“, and refers to the very imposing appearance of these nematodes.

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