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TWO NEW SPECIES OF THE GENUS *APHANOLAIMUS* (NEMATODA, APHANOLAIMIDAE) FROM CAMEROON

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Two New Species of the Genus *Aphanolaimus* (Nematoda, Aphanolaimidae) from Cameroon. Holovachov O. V. — Two new species of *Aphanolaimus* de Man, 1880 are described, and both characterised by smooth cuticular annulation, finely rounded cephalic setae, weakly sclerotized stoma, amphid without central elevation, lateral field crenate with two sublateral rows of dots, renette cell oval; straight vagina; male without neck setae, without precloacal and with four caudal setae. *A. costatus* Holovachov, sp. n. has 358–477 μm long body, 30–39 lateral epidermal glands, anteriormost body pore on 15–30 annule, lateral field starting on 1st–4th annule; male with five tubular supplements, spicules 11–13 μm long with twisted manubrium, rectangular gubernaculum with caudal apophysis. *A. camerunensis* Holovachov, sp. n. has 481–542 μm long body, 10–13 lateral epidermal glands, anteriormost body pore on 28–30 annule, lateral field starting on 3rd–5th annule; male with three tubular supplements, spicules 13–15.5 μm long with ellipsoid manubrium, platelike gubernaculum with caudal apophysis.

Key words: *A. camerunensis*, *A. costatus*, morphology, nematodes, new species.

Два новых вида рода *Aphanolaimus* (Nematoda, Aphanolaimidae) из Камеруна. Головачев А. В. — Описаны 2 новых вида рода *Aphanolaimus* de Man, 1880, характеризующихся следующими признаками: кутикулярная кольчатость гладкая, тонкоокругленные головные щетинки, слабо кутикулированная стома, амфид без центрального утолщения, боковое поле зигзагообразное с двумя sublateralными рядами точек, овальная ренетта; вагина прямая; самец не имеет шейных и преклоакальных щетинок, есть четыре хвостовые щетинки. У *A. costatus* Holovachov, sp. n. длина тела 358–477 μm , 30–39 латеральных гиподермальных желез, первая соматическая пара расположена на 15–30-м кольце, боковое поле начинается на 1–4-м кольце; самец с пятью трубчатými суплементами, спикулы 11–13 μm в длину, с перекрученной головкой, угловатый рулек с хвостовым придатком. У *A. camerunensis* Holovachov, sp. n. длина тела 481–542 μm , 10–13 латеральных гиподермальных желез, первая соматическая пара расположена на 28–30-м кольце, боковое поле начинается на 3–5-м кольце; самец с тремя трубчатými суплементами, спикулы 13–15,5 μm в длину с овальной головкой, пластинкообразный рулек с хвостовым придатком.

Ключевые слова: *A. camerunensis*, *A. costatus*, морфология, нематоды, новый вид.

The genus *Aphanolaimus* de Man, 1880 includes 24 valid species (Raski, Coomans, 1990; De Waele, Coomans, 1993), which occur mainly in freshwaters and moist terrestrial biotopes. Two new species of this genus are described here. They were isolated from two soil samples collected from natural forest in Cameroon by Dr. Dieter Sturhan (Biologische Bundesanstalt für Land- und Forstwirtschaft, Institut für Nematologie und Wirbeltierkunde, Münster, Deutschland), whom we acknowledge for putting this material at our disposal.

Nematodes were extracted from about 500 ml soil each using the centrifugation-flotation method with MgSO_4 . The nematode suspensions were fixed with hot TAF, transferred to glycerine by a slow evaporation method and specimens of the new species were mounted in dehydrated glycerine on permanent slides. The position of the supplements (distance) was measured from cloacal opening to the certain supplement along the median line of the body. On the figures, black setae are located on the side of the body facing the viewer and white setae are located on the opposite side. Epidermal glands and body pores are shown on the side of the body facing the viewer. Supplements were numbered from cloaca anteriorly. Measurements and morphometrics of both species are given table 1.

Table 1. Measurements of *Aphanolaimus costatus* and *A. camerunensis* from Cameroon
Таблица 1. Измерения *Aphanolaimus costatus* и *A. camerunensis* из Камеруна

Measurement, mkm	<i>Aphanolaimus costatus</i> sp. n.			<i>Aphanolaimus camerunensis</i> sp. n.		
	Holotype	6 ♀	6 ♂	Holotype	♀	5 ♂
Body length	442	400±33.6 (358–437)	434±30.2 (389–477)	529	481	526±14.5 (511–542)
Body diameter	12.0	11.9±1.7 (10.0–13.0)	11.3±0.8 (10.0–12.0)	11.0	11.0	9.8±0.9 (9.0–11.0)
Pharyngeal region length	97.0	92.2±8.0 (85.5–105.5)	98.5±8.0 (83.0–107)	118	103	114±7.3 (108–125.5)
Tail length	99.0	81.7±11.0 (69.0–93.0)	95.6±10.5 (78–109)	94.5	91.0	97.6±3.5 (94.5–102)
Anal body diameter	9.0	7.8±1.2 (7.0–9.0)	10.0±0.7 (9.0–11.0)	7.0	8.0	9.0
a	36.2	34.0±2.1 (31.6–36.3)	38.5±1.0 (37.0–39.8)	47.6	43.3	54.1±3.9 (48.5–57.9)
b	4.6	4.3±0.2 (4.1–4.6)	4.4±0.2 (4.2–4.7)	4.5	4.7	4.6±0.3 (4.3–5.0)
c	4.5	4.9±0.3 (4.6–5.3)	4.6±0.3 (4.2–5.0)	5.6	5.3	5.4±0.1 (5.3–5.4)
c'	11.0	10.5±0.4 (10.0–11.2)	9.6±1.0 (7.8–10.6)	14.2	11.7	11.0±0.4 (10.5–11.5)
Labial region diameter	4.5	4.6±0.5 (4.5–5.5)	4.5	4.5	4.5	4.5
Cephalic setae length	8.0	6.1±0.6 (5.5–7.0)	7.0±0.9 (5.5–8.0)	7.0	8.0	7.3±0.6 (7.0–8.0)
Stoma length	5.5	4.8±0.6 (4.5–5.5)	5.2±0.6 (4.5–5.5)	4.5	7.0	7.0
Amphid location	2.0	2.0	2.0	2.0	2.0	2.0
Antermost annule	5.5	5.0±0.6 (4.5–5.5)	5.2±0.6 (4.5–5.5)	5.5	7.0	7.1±0.6 (7.0–8.0)
First body pore (ann)	16	26±5.6 (18–30)	15.8±0.5 (15–16)	30	29	29±0.8 (28–30)
First body pore	23.0	27.0±3.6 (22.0–32.0)	23.8±3.4 (21.0–29.0)	39.0	32.0	33.3±0.9 (32–34.5)
Second body pore (ann)	30	33.5 (28–39)	29.8±1.0 (29–31)	73	70	72.5±2.4 (69–74)
Second body pore	38.0	45.4±9.2 (37.0–60.0)	39.7±2.5 (38.0–43.0)	83.0	80.0	80.3±4.8 (77.0–87.0)
Lateral field start (ann)	1	3.0±1.0 (1.0–4.0)	2.3±0.5 (2–3)	3	3	4.0±0.8 (3–5)
Lateral field start	5.5	7.6±0.5 (7.0–8.0)	7.3±0.6 (7.0–8.0)	9.0	8.0	9.7±1.4 (8.0–11.0)
Cardia length	7.0	6.3±1.3 (5.5–8.0)	7.2±1.4 (5.5–9.0)	11.0	11.0	11.0±1.6 (10.0–13.0)
V or T, %	48.2	49.4±0.6 (48.4–50.1)	44.0 (42.2–45.0)	49.6	49.2	43.4±0.5 (43.1–43.9)
G ₁ , %	13.8	9.7±2.4 (7.0–12.5)	–	10.9	13.9	–
G ₂ , %	15.3	10.5±2.7 (8.6–14.3)	–	9.5	13.4	–
Vagina length	5.5	5.0±0.6 (4.5–5.5)	–	4.5	5.5	–
Vagina/BD	0.5	0.4±0.1 (0.4–0.5)	–	0.4	0.5	–
Rectum length	13.0	11.7±2.7 (10.0–15.5)	–	15.5	17.0	–
Rectum/ABD	1.5	1.6±0.1 (1.5–1.7)	–	2.3	2.1	–

Continue tabl. 1

Measurement, mkm	<i>Aphanolaimus costatus</i> sp. n.			<i>Aphanolaimus camerunensis</i> sp. n.		
	Holotype	6 ♀	6 ♂	Holotype	♀	5 ♂
Spicules length	—	—	12.8±0.9 (11.0–13.0)	—	—	14.2±0.9 (13.0–15.5)
Gubernaculum length	—	—	2.4±0.5 (2.0–3.0)	—	—	3.0
Epidermal glands number:						
pharyngeal region, right side	4	4	4	2	2	2
pharyngeal region, left side	4	4	4	2	2	2
cardia to vulva, right side	5	5.3±0.6 (5–6)	—	2	1	—
cardia to vulva, left side	6	5.7±1.2 (5–7)	—	1	1	—
vulva to anus, right side	5	5.7±1.5 (4–7)	—	1	1	—
vulva to anus, left side	5	5.7±1.5 (4–7)	—	1	1	—
cardia to cloaca, right side	—	—	12	—	—	3.0±0.8 (2–4)
cardia to cloaca, left side	—	—	13 (11–15)	—	—	2.8±0.5 (2–3)
tail, right side	1	2	2	1	1	1.3±0.5 (1–2)
tail, left side	1	2	2	1	1	1
Total	31	34.3±4.5 (30–39)	37 (35–39)	11	10	12.0±1.4 (10–13)

***Aphanolaimus costatus* Holovachov, sp. n. (fig. 1)**

Type material. Holotype ♀ and paratypes 6 ♀ and 6 ♂, Cameroon, settlement Mbode, about 30 km south of Kribi, in northern part of Campo Reserve, virgin rainforest about 3 km east of coastal line, with almost no undervegetation and sandy soil covered by fallen leaves, and second site with sandy soil and mainly ferns as undervegetation, two soil samples, 26.03.1994 (Sturhan). Holotype, four female and five male paratypes deposited in the German Nematode Collection, Biologische Bundesanstalt, Munster, Germany. Two females and one male paratypes in the collection of the author.

Adult. Heat relaxed body almost strongly ventrally arcuate in female and in male. Body tapering anteriorly and posteriorly to vulva, narrowing more quickly on tail. Maximum body diameter at vulva in females, males body more cylindrical. Cuticle annulated with narrow, ridge-like lateral field. Annules smooth. Lateral field crenate and indented with two sublateral rows of dots (two dots per annule), originates at level of labial region base; terminating at middle of tail. Crystalloids absent. Body pores present, arising from oval lateral epidermal gland cells. Anteriormost body annule, which demarcate s labial region, always appearing posterior to amphid, at level with stoma base. Labial sensilla papilliform, four cephalic sensilla setiform. Labial region rounded, continuous with body contour, with four 5.5–8.0 mkm long (equal to 1.2–1.8 of labial region diam.) cephalic setae. Amphid unispiral, with longitudinally oval aperture, without central elevation, located on cephalic capsule. Somatic setae absent in females, present in males. Stoma weakly cuticularized, cylindrical. Posterior portion of stoma enveloped by muscular pharyngeal tissue. Pharynx weakly muscular, cylindrical, lacking radial tubules, bulbs and valves. Pharyngeal glands indistinct. Dorsal gland orifice located somewhat posterior to stoma base. Cardia glandular, free, with posterior part surrounded by intestinal tissue, cylindrical. Nerve ring surrounding pharynx at its posterior third. Hemizonid not seen. Cell body of ventral secretory-excretory gland (renette) oval, 5.5–10 mkm long and contains granular cytoplasm. It is located mid-ventrally opposite to cardia. Posterior part of sclerotized canal making numerous coils and loops and forming a ball-like structure in anterior part of cell. Canal extending forward along ventral side of pharynx with its anterior part opening into anterior part of

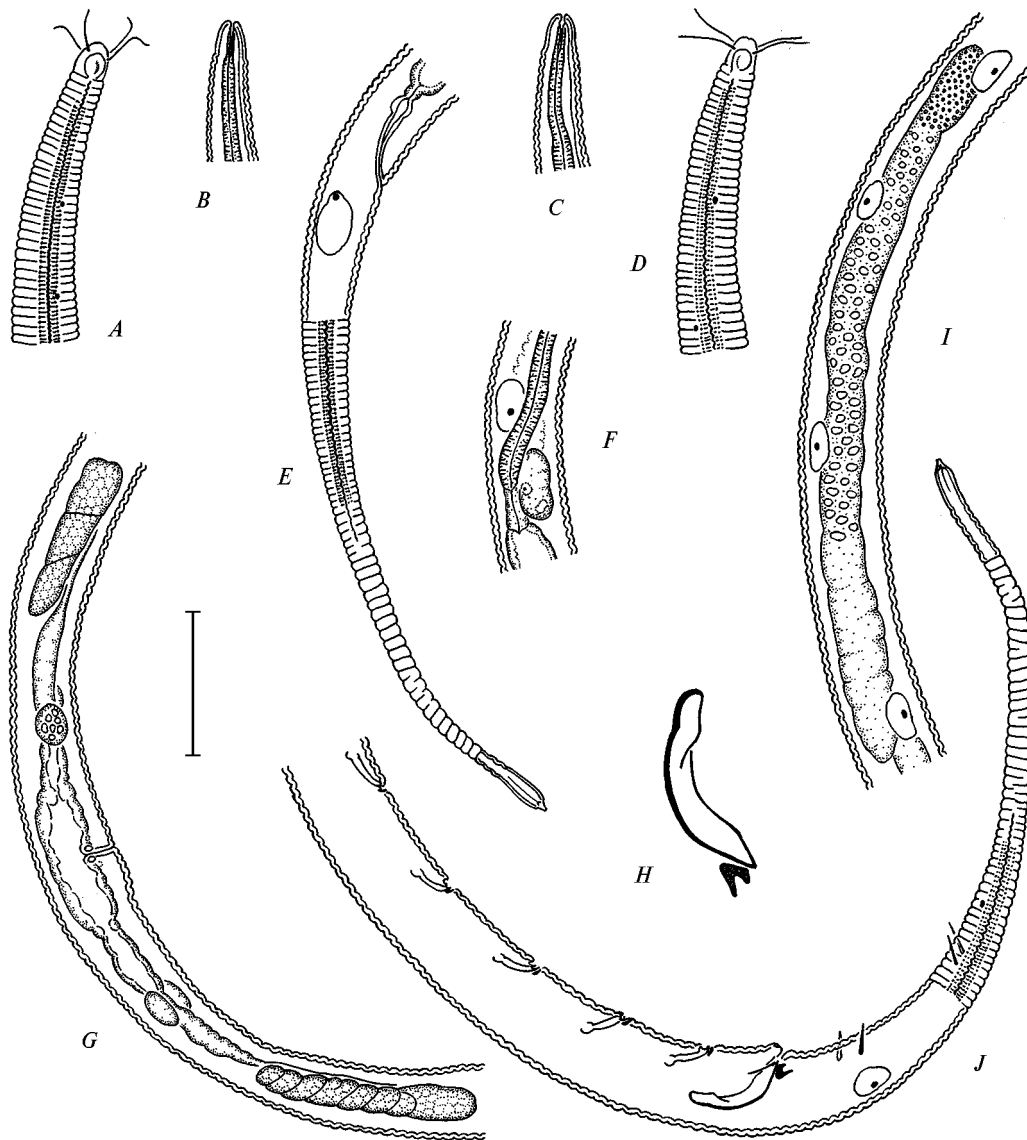


Fig. 1. *Aphanolaimus costatus*: A — female anterior end, surface view; B — female anterior end, median section; C — male anterior end, median section; D — male anterior end, surface view; E — female tail; F — renette cell; G — female reproductive system; H — spicula and gubernaculum; I — male reproductive system; J — male posterior end. Scale bar: A–G, I–J — 20 mkm; H — 10 mkm.

Рис. 1. *Aphanolaimus costatus*: A — головной конец самки, вид с поверхности; B — головной конец самки, сагиттально; C — головной конец самца, сагиттально; D — головной конец самца, вид с поверхности; E — хвост самки; F — ренетта; G — половая система самки; H — спикула и рулек; I — половая система самца; J — задний конец тела самца. Масштабная линейка: A–G, I–J — 20 мкм; H — 10 мкм.

stoma. Tail almost similar in shape in both sexes (shorter and more curved ventrad in male), elongate conoid, gradually narrowing proximally; ventrally curved distally. Tail terminus with smooth cuticle, swollen. Caudal glands present. Spinneret well developed, with protruding tube.

Female. Reproductive system didelphic, amphidelphic, ovary branches reflexed antidromously. Anterior ovary 11–26 mkm long, posterior ovary 10–31 mkm long. Two offset, oval, sac-like spermathecae located on each (right and left) side of each

(anterior and posterior) gonoduct. Spermathecae filled with oval spermatozoa. Vagina straight, 0.4–0.5 vulval body diameter long, encircled by single sphincter muscle. Pars refringens vaginae absent.

Male. Neck setae absent. Male reproductive system monorchic, with outstretched, glandular anterior part and reflexed functional posterior testis lying on right-hand side of intestine. Spicules paired and symmetrical, 1.1–1.3 cloacal body diameters long, arcuate with twisted manubrium and conoid shaft. Gubernaculum rectangular, with caudal apophysis. Male accessory apparatus composed of five midventral tubular supplements, of which second is located on cuticular elevation. Antermost supplement is lying 60–81 mkm from cloaca. Posteriormost supplement is lying 9–11 mkm from cloaca, at level with spicule manubrium. Precloacal setae absent. Tail with four caudal setae: two subventral pairs.

Diagnosis. *A. costatus* sp. n. is characterised by 358–477 mkm long body, smooth cuticle, presence of 30–39 lateral epidermal glands, rounded labial region, finely rounded cephalic setae, weakly sclerotized stoma, amphid without central elevation, anteriormost body pore on 15–30 annule, lateral field starting on 1st–4th annule, crenate and indented with two sublateral rows of dots, renette cell oval; female reproductive system with developed spermathecae, straight vagina; male without neck setae, with five tubular supplements, no precloacal and four caudal setae, spicules 11–13 mkm long with twisted manubrium and conoid shaft, rectangular gubernaculum with caudal apophysis.

***Aphanolaimus camerunensis* Holovachov, sp. n. (fig. 2)**

Type material. Holotype ♀ and paratypes ♀ and 5 ♂, Cameroon, settlement Mbode, about 30 km south of Kribi, in northern part of Campo Reserve, virgin rainforest about 3 km east of coastal line, with almost no undervegetation and sandy soil covered by fallen leaves, and second site with sandy soil and mainly ferns as undervegetation, two soil samples, 26.03.1994 (Sturhan). Holotype and five male paratypes deposited in the German Nematode Collection, Biologische Bundesanstalt, Munster, Germany. One female and one male paratypes in the collection of the author.

Adult. Heat relaxed body slightly ventrally arcuate in anterior half, slightly curved ventrad in posterior part in female or strongly curved ventrad in posterior part in male. Body tapering anteriorly and posteriorly to vulva, narrowing more quickly on tail. Maximum body diameter at vulva in females, males body more cylindrical. Cuticle annulated with narrow, ridge-like lateral field. Annules smooth. Lateral field crenate and indented with two sublateral rows of dots (two dots per annule), originates at level of labial region base; terminating at posterior third of tail. Crystalloids absent. Body pores present, arising from oval lateral epidermal gland cells. Antermost body annule, which demarcate s labial region, always appearing posterior to amphid, at level with stoma base. Labial sensilla papilliform, four cephalic sensilla setiform. Labial region rounded, continuous with body contour, with four 7.0–8.0 mkm long (equal to 1.5–1.8 of labial region diam.) cephalic setae. Amphid unispiral, with longitudinally oval aperture, without central elevation, located on cephalic capsule. Somatic setae absent in females, present in males. Stoma weakly cuticularized, cylindrical. Posterior portion of stoma enveloped by muscular pharyngeal tissue. Pharynx weakly muscular, cylindrical, lacking radial tubules, bulbs and valves. Pharyngeal glands indistinct. Dorsal gland orifice located somewhat posterior to stoma base. Cardia glandular, free, with posterior part surrounded by intestinal tissue, cylindrical. Nerve ring surrounding pharynx at its posterior third. Hemizonid not seen. Cell body of ventral secretory-excretory gland (renette) oval, 7–9 mkm long and contains granular cytoplasm. It is located midventrally opposite to cardia. Posterior part of sclerotized canal making numerous coils and loops and forming a ball-like structure in anterior part of cell. Canal extending forward along ventral side of pharynx with its anterior part opening into anterior part of stoma.

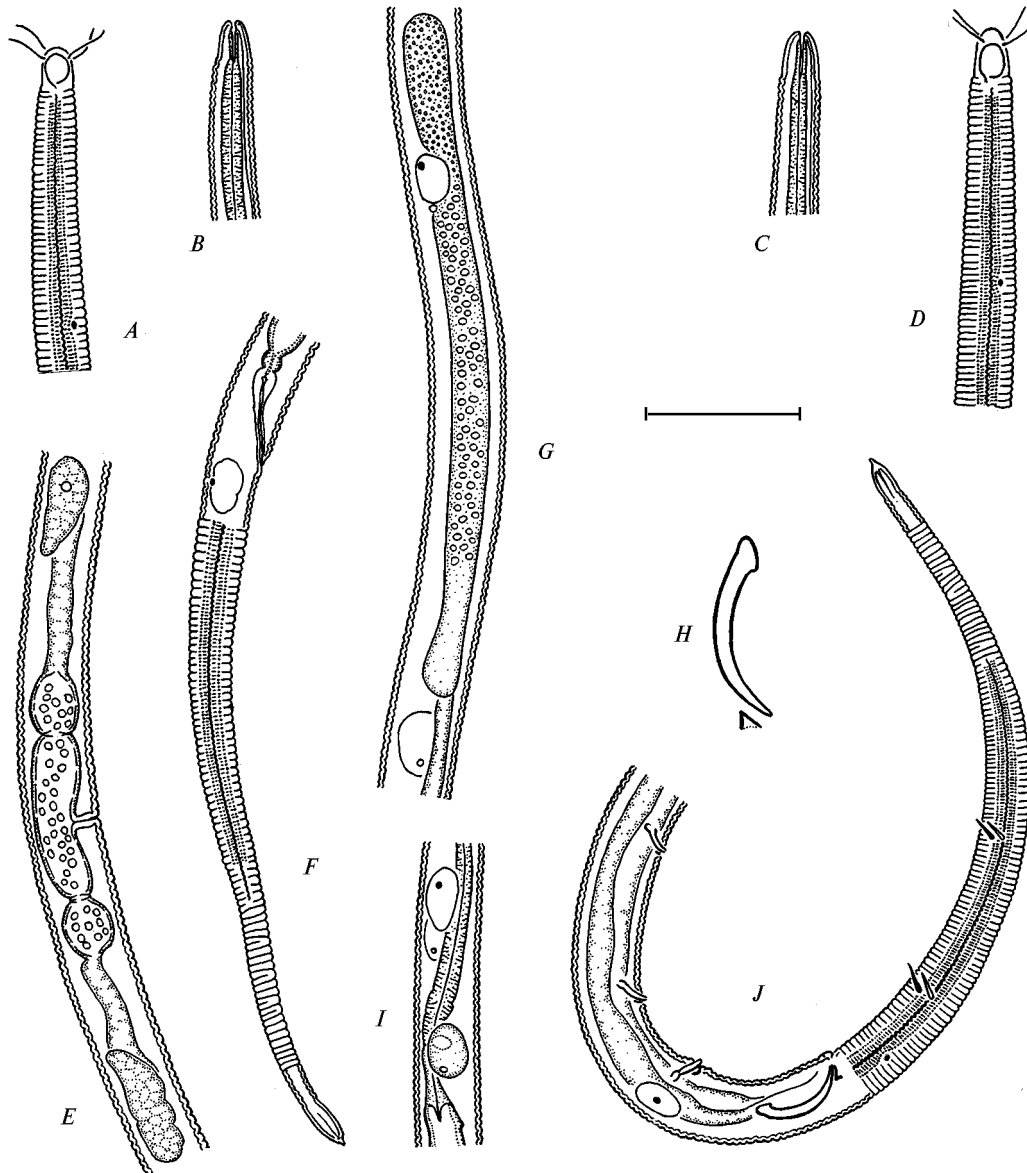


Fig. 2. *Aphanolaimus camerunensis*: A — female anterior end, surface view; B — female anterior end, median section; C — male anterior end, median section; D — male anterior end, surface view; E — female reproductive system; F — female tail; G — male reproductive system; H — spicula and gubernaculum; I — renette cell; J — male posterior end. Scale bar: A–G, I–J — 20 mkm; H — 10 mkm.

Fig. 2. *Aphanolaimus camerunensis*: A — головной конец самки, вид с поверхности; B — головной конец самки, сагиттально; C — головной конец самца, сагиттально; D — головной конец самца, вид с поверхности; E — половая система самки; F — хвост самки; G — половая система самца; H — спикула и рулек; I — ренетта; J — задний конец тела самца. Масштабная линейка: A–G, I–J — 20 мкм; H — 10 мкм.

Tail almost similar in shape in both sexes (shorter and more curved ventrad in male), elongate conoid, gradually narrowing proximally; ventrally curved distally. Tail terminus with smooth cuticle, swollen. Caudal glands present. Spinneret well developed, with protruding tube.

Female. Reproductive system didelphic, amphidelphic, ovary branches reflexed antidromously. Anterior ovary 20–40 mkm long, posterior ovary 20–36 mkm long.

Spermathecae undeveloped, uterus filled with oval spermatozoa. Vagina straight, 0.4–0.5 vulval body diameters long, encircled by single sphincter muscle. Pars refringens vaginae absent.

Male. Neck setae absent. Male reproductive system monorchic, with outstretched, glandular anterior part and reflexed functional posterior testis lying on right-hand side of intestine. Spicules paired and symmetrical, 1.5–1.7 cloacal body diameters long, arcuate with elipsoid manubrium and conoid shaft. Gubernaculum platelike, with caudal apophysis. Male accessory apparatus composed of three tubular supplements, of which first (posteriormost) is located on cuticular elevation. Anteriormost supplement is lying 58–70 mkm from cloaca. Posteriormost tubular supplement is lying 21–25 mkm from cloaca, about one corresponding body diameter anteriorly to spicules. Precloacal setae absent. Tail with four caudal setae: two subventral pairs.

Diagnosis. *A. camerunensis* sp. n. is characterised by 481–542 mkm long body, smooth cuticle, presence of 10–13 lateral epidermal glands, rounded labial region, finely rounded cephalic setae, weakly sclerotized stoma, amphid without central elevation, anteriormost body pore on 28–30 annule, lateral field starting on 3rd–5th annule, crenate and indented with two sublateral rows of dots, renette cell oval; female reproductive system with developed spermathecae, straight vagina; male without neck setae, with three tubular supplements, no precloacal and four caudal setae, spicules 13–15.5 mkm long with with elipsoid manubrium and conoid shaft, platelike gubernaculum with caudal apophysis.

Relationships of the newly described species

Two newly described species, viz. *A. costatus* sp. n. and *A. camerunensis* sp. n. are particularly characterised by the peculiar structure of the lateral field, which is crenate with two sublateral rows of dots (two dots per annule) — the feature so far not found in the genus *Aphanolaimus* and in the whole family Aphanolaimidae (Holovachov et al., 2002). In this respect, these two species differ from every other representative of the genus. In spite of their close morphological similarity and occurrence in the same locality, both species differ from each other in small but distinct morphological and morphometric characters: *A. costatus* sp. n. differs from *A. camerunensis* sp. n. in the body length (358–477 vs 481–542 mkm respectively), a-ratio (31.6–39.8 vs 43.3–57.9), location of the first (15–30 vs 28–30 annules from anterior end) and second body pores (28–39 vs 69–74 annules from anterior end), length (11.0–13.0 vs 13.0–15.5 mkm) and shape (with twisted manubrium vs with elipsoid manubrium) of spicules, shape of gubernaculum (rectangular vs platelike), location of the posteriormost supplement (9.0–11.0 vs 21.0–25.5 mkm from cloaca or at level with spicule manubrium vs about one corresponding body diameter anteriorly to spicules), number of supplements (5 vs 3), number of epidermal glands (30–39 vs 10–13).

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