Veröff. Inst. Meeresforsch. Bremerh. 16: 31 - 44 1976)

From Marine Biological Laboratory Helsingør and
Bermuda Biological Station for Research

Three New Marine Nematodes from Bermuda

Preben Jensen, and Sebastian A. Gerlach

Abstract: From the sandy interdidal of Tucker's Town Cove, Bermuda, the following freeliving marine nematodes are described: *Odontophora bermudensis* n. sp., *Metalinhomoeus torosus* n. sp. and *Trileptium otti* n. sp.

The beach of Tucker's Town Cove, Bermuda has become a favorite site for ecophysiological meiofauna studies, due to the activity of research workers from Bermuda, South Carolina, Austria and Germany. Free-living nematodes from this beach have been the object of adaptation studies by WIESER et al. 1974 and by WIESER 1975. The species treated in these publications have been described by OTT, who kindly let us see his unpublished manuscript on four new species. In September 1975 the senior author made experiments on the beach of Tucker's Town Cove in order to assess the dispersal qualities of meiofauna, and

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Accepted for printing 17. 3. 1976
Address of the authors: cand. scient. Preben Jensen and Professor Dr. Sebastian A. Gerlach, Marine Biological Laboratory, DK-3000 Helsingør, Denmark.
The Danish Research Council financed for the senior author two research weeks on Bermuda and supports the research project „Danish marine nematodes" of the junior author (P. J.). Research on Bermuda was done in cooperation of Professor Dr. Wolfgang Wieser's meiofauna project, sponsored under no. 1852 by „Fonds zur Förderung der wissenschaftlichen Forschung in Österreich". We are grateful for the facilities of the Bermuda Biological Station and for the help by its Director, Dr. Wolfgang Sterrer. Finally we have to thank Mrs. Marion Schrage, Institut für Meeresforschung Bremerhaven, who carefully mounted the Bermuda nematodes on permanent slides.

Contribution no. 660 from Bermuda Biological Station.

to evaluate the attraction outgoing from decaying fish. A rather complete picture of the local fauna had to be worked out, and the following species new to science were found:

Odontophora bermudensis n. sp.

(Fig. 1 a - e)

Material: 2 males, 1 female, 1 juvenile, Bermuda, Tucker's Town Cove, medium calcareous sand at about midlittoral level, oxygenized only in the top centimeter. δ_1 (holotype) slide no. 527-10 g of NSIMB[1)], collected on 19. 9. 1975 24 m from high tide mark; $♀_1$ (paratype) slide no. 527-14 g, collected on 29. 9. 1976 16 m from high tide mark. Other specimens on slides nos. 527-6 c (δ_2) and 527-12 r (juv.$_1$)

Measurements

δ_1	L = 2.79 mm	a = 77	b = 16.6	c = 19.9			
		–	126	168	M	2645	2785 µm
		25	36	36	36	34	
δ_2	L = 2.68 mm	a = 74	b = 16.2	c = 17.8			
		–	135	165	M	2525	2675 µm
		22	32	35	35	36	
$♀_1$	L = 2.44 mm	a = 61	b = 15.2	c = 22.1			
		–	135	160	1350	2325	2435 µm
		22	32	35	40	30	

Male

Cuticle weakly annulated, annulation only visible in the cloacal and tail regions. Cervical setae in the anterior part of the oesophageal region; only two rows, one subdorsal on the right side and one subventral on the left side. The first cervical seta in the subventral row, and the second in the subdorsal row are 5 µm long, all other cervical setae are 9 µm long. No somatic setae between oesophagus and cloaca. Caudal setae in two subdorsal and two subventral rows, 5 µm long.

[1)] Type specimens and other material are deposited in the Nematodensammlung des Instituts für Meeresforschung in Bremerhaven (NSIMB), Am Handelshafen 12, D 285 Bremerhaven, Federal Republic of Germany.

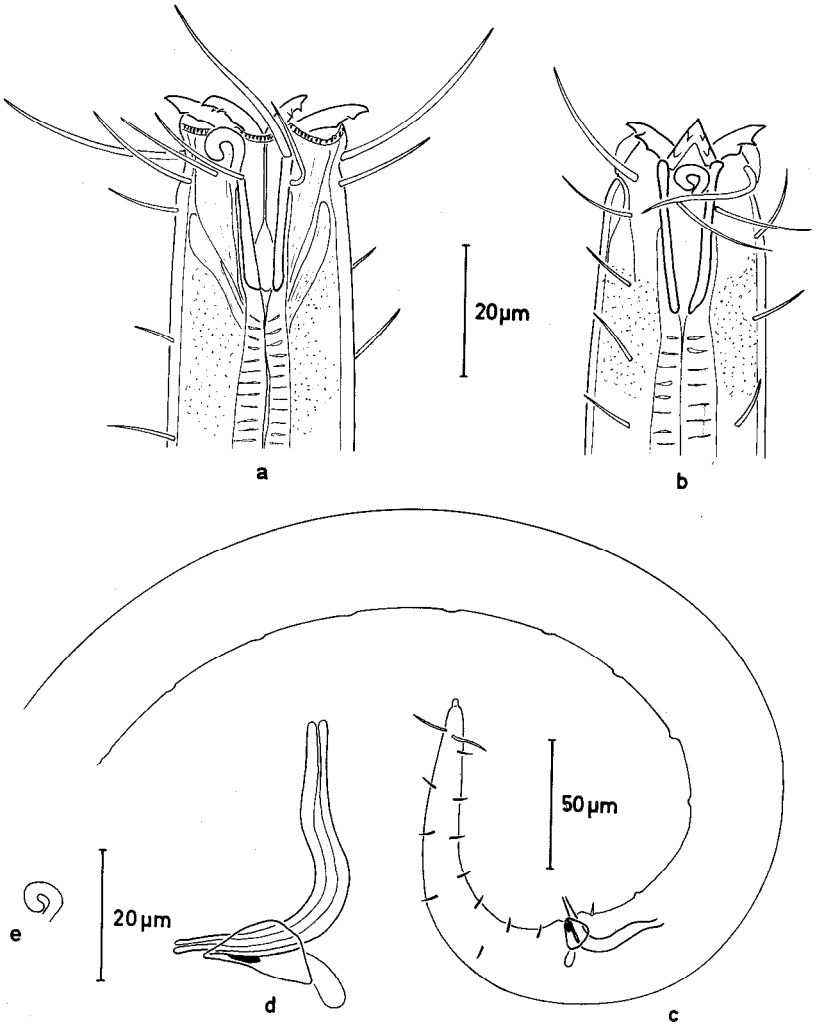

Fig. 1 *Odontophora bermudensis* n. sp.
a head of a male (holotype); b head of a female (paratype); c tail and posterior body region of a male (holotype); d copulatory apparatus (holotype); e amphid of a juvenile ($juv._1$).

Lips striated; no labial sense organs observed. Four 31 μm long cephalic setae followed by one circle of eight 15 μm long subcephalic setae. Amphid short, loop-shaped, situated between cephalic and subcephalic setae. Buccal cavity conical, 22 μm deep, walls strongly sclerotized. In the frontal part there are six about 10 μm long odontia, each provided with two pairs of projections. The oesophagus surrounds the posterior half of the buccal cavity. At the posterior end the oesophagus is slightly enlarged, but without forming a bulb. Nerve ring at about 3/4 of the oesophagus length. Excretory porus at the level of the cephalic setae.

Copulatory apparatus strongly sclerotized, spicules knee-curved, 55 μm long measured round the arc (47 μm from tip to tip). Proximal part of the spicules slightly curved, distal part narrow, the tip dilated. Gubernaculum with a weakly sclerotized apophysis. 9 – 10 small ventral precloacal papillae. On the anterior cloacal lip inserts a single 7 μm long seta. Tail with two 15 μm long subdorsal setae in subterminal position. Spinneret protuded.

Female

Differs from the males in the arrangement of subcephalic and cervical setae: cervical setae 9 μm long, equal in length, in four submedian rows along the anterior half of the oesophagus. Cephalic setae 21 μm long. Four sublateral subcephalic setae, 15 μm long, insert immediately behind the amphids; 3 μm backwards insert four submedian subcephalic setae, 12 μm long. Amphids somewhat more compressed than in the males. Vulva at 56 % of the body length. Tail without subterminal setae, but with four submedian rows of short setae.

The juvenile resembles the female in the arrangement of subcephalic and cervical setae, and in the form of the amphids.

Discussion

BOUCHER (1973) provided an identification key for the species of *Odontophora*, based on the arrangement of the setae in the head region. *Odontophora bermudensis* n. sp. belongs into the group with 4 submedian and 4 sublateral subcephalic setae, distinctly separated from the cervical setae, and without complementary setae. We adopt this key even if we have some hesitation to base the grouping of species predominantly on the setae at the head end. However, what regards the status

of *Odontophora angustilaimus* (FILIPJEV 1918) we cannot follow BOUCHER (1974): according to the original description this species has four complementary setae close to the cephalic setae, and complementary setae are evident, too, in a specimen from North Carolina, depicted by CHITWOOD & CHITWOOD (1950, fig. 60 S). There remain three species in this group (*O. urothrix* GERLACH 1957, *lituifera* WIESER 1959 and *rectangulata* LORENZEN 1972); the new species from Bermuda can be distinguished by small amphids and short subterminal setae on the male tail.

Peculiar are the two pairs of denticulate projections on each of the six odontia (or cheilorhabdian teeth, BOUCHER 1973). Unfortunately these projections are best seen when the buccal cavity is protruded. Descriptions of most *Odontophora*-species are based on specimens with retracted buccal cavities, and it is unknown what their odontia really look like. For a better understanding of variability and speciation in *Odontophora* more characters for distinction would be extremely helpful. During the past 20 years a large number of species has been described which differ only in minor features. There is no other way than to describe any new population which differs as a new species, but there might come a period when enough knowledge is available for a critical review of the species status.

Metalinhomoeus torosus n. sp.

(Fig. 2 a - g, 3 a - e)

Material: 4 males, 1 female, Bermuda, Tucker's Town Cove, medium calcareous sand at about midlittoral level, oxygenized only in the top centimeter. σ_1 (holotype) slide no. 527-8 m of NSIMB, collected on 19. 9. 1975 20 m from high tide mark; φ_1 (paratype) slide no. 527-5 s collected on 19. 9. 1975 16 m from high tide mark. Other specimens on slides nos. 527-5 s (σ_4), 527-8 m (σ_2) and 527-12 k (σ_3).

Measurements

σ_1 L = 2.02 mm a = 78 b = 15.5 c = 13.0

-	?	130	M	1865	2020 µm
15	?	24	26	22	

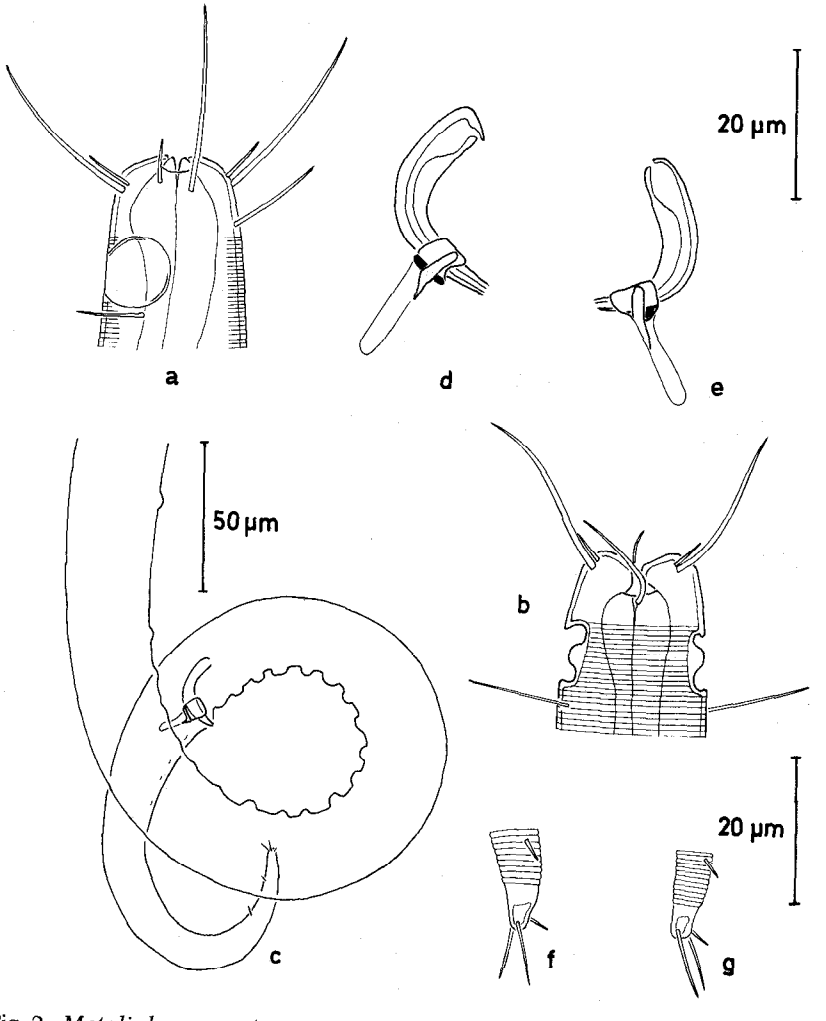

Fig. 2 *Metalinhomoeus torosus* n. sp.
a head of a male (holotype); b head of σ_2; c tail and posterior body region of σ_3; d copulatory apparatus (holotype); e copulatory apparatus of σ_4; f spinneret of σ_3; g spinneret of σ_2.

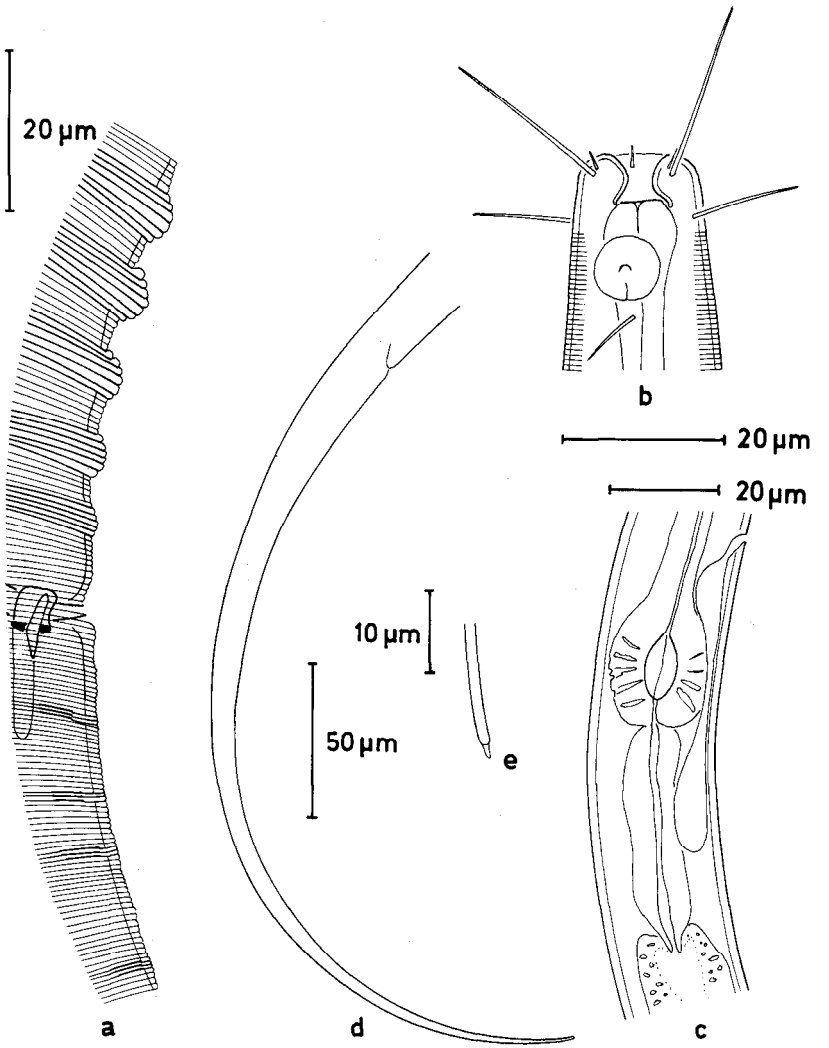

Fig. 3 *Metalinhomoeus torosus* n. sp.
a ventral cuticular structure in the cloacal region of the holotype; b head of a female (paratype); c cardia and ventral gland (paratype); d tail of a female (paratype); e tip of the female tail (paratype).

δ_2	L = 2.92 mm	a = 97		b = 23.2		c = 17.2	
		–	?	125	M	2750	2920 µm
		15	?	24	30	26	
δ_3	L = 1.88 mm	a = 89		b = 24.2		c = 11.6	
		–	?	118	M	1710	1873 µm
		12	?	21	20	20	
δ_4	L = 1.61 mm	a = 62		b = 20.6		c = 19.0	
		–	?	78	M	1520	1605 µm
		12	?	26	26	24	
φ_1	L = 1.95 mm	a = 84		b = 16.2		c = 6.4	
		–	?	120	750	1645	1945 µm
		15	?	22	23	15	

Male

Cuticle weakly annulated backwards from the anterior border of the amphid openings. Only a few somatic setae on the posterior half of the tail. Six thin, 4 – 5 µm long external labial setae and four 24 – 26 µm long cephalic setae, which insert less than 1 µm behind the labial setae. There are four subcephalic setae: two median (dorsal and ventral) 12 µm long setae inserting between the amphids and the cephalic setae, and two 9 µm long lateral setae immediately behind the amphid openings. Amphid openings circular, 9 µm in diameter, the anterior border 10 µm behind the front end.

Buccal cavity weakly sclerotized and without armature. In the holotype (δ_1) the buccal cavity is protruded. Oesophagus slightly dilated in front, and with posterior bulb; cardia elongated. Nerve ring, ventral gland and excretory pore could not be observed.

Gonads diorchic with outstretched testes. Spicules equal, curved, 30 µm long measured round the arc (21 – 24 µm from tip to tip). The proximal half of the spicules is wide, the distal half is tapering. Gubernaculum 5 µm long, with weakly sclerotized 14 – 15 µm long caudal apophysis. In front of the cloaca the cuticle is dilated to structures which surround like hoops the ventral part of the body. The four males had different numbers of hoops: 13 (holotype), 19, 21 and 15; the distance between two hoops is about 10 µm.

The tail is 7 – 8 times as long as the cloacal diameter; only in the samll δ_4 was the tail 3.5 cloacal diameters long. On the anterior part of the tail there are four submedian pairs of convexities, but smaller than the hoops of the pre-cloacal region; the cuticle on the ventral surface is not alterated. These convexities are 14, 25, 33 and 47 µm behind the cloaca. Spinneret with three unequal setae, two subventral setae 9 µm long, one dorsal seta 9 µm long In the holotype only one subventral seta was visible, the other are probably broken. The spinneret has a characteristic concave dorsal wall.

Female

Different by shorter setae: labial setae 1 µm, cephalic setae 22 µm, subcephalic setae 14 and 7 µm long. The ventral gland is situated in the cardia region. The excretory pore with an elongated ampulla is just in front of the oesophageal bulb, 98 µm behind the front end. Reproductive system didelphic-amphidelphic with outstretched ovaries. Vulva at 35 % of the body length. Tail 20 times as long as the anal diameter, gradually tapering. Spinneret protruded. No caudal setae.

Discussion

Metalinhomoeus torosus n. sp. belongs into the group of species characterized by two median and two lateral subcephalic setae, the latter posterior to the amphids (GERLACH, 1963). Setose labial sense organs and an asymmetrical spinneret are features not known in other species of this group. Four small pre-cloacal dilatations of the cuticle, or papillae, have been described in males of *Metalinhomoeus biratus* VITIELLO 1969 and of *M. musaecauda* LORENZEN 1969, but they were not observed on the tail. A sex-dimorphism regarding the length and shape of the tail is already known from the species *insularis* TIMM 1967, *biratus* VITIELLO 1969, *parvasetosus* VITIELLO 1969 and *biformis* JUARIO 1974.

Trileptium otti n. sp.[1)]

(Fig. 4 a - e, 5 a - d)

Material: 8 males, 8 females, 8 juveniles, Bermuda, Tucker's Town Cove, medium calcareous sand at about midlittoral level, oxygenized only in the top centimeter. δ_1 (holotype) and φ_1 (paratype) on slide no. 527-5 e of NSIMB, collected on 19. 9. 1975 16 m from high tide mark. Other specimens on slides nos. 527-2 h (juv.$_1$), 527-11 f (δ_3) and 527-12 n (δ_2; φ_2).

[1)] We dedicate this species to Dr. Jörg Ott, Wien.

Measurements

♂1	L = 5.28 mm	a = 110	b = 6.7	c = 27.0			
		–	200	810	M	5075	5280 µm
		20	38	48	48	38	
♂2	L = 4.43 mm	a = 97	b = 6.5	c = 25.3			
		–	160	680	M	4250	4425 µm
		20	40	46	44	36	
♂3	L = 5.02 mm	a = 109	b = 6.4	c = 26.4			
		–	175	790	M	4830	5020 µm
		22	38	40	46	38	
♀1	L = 5.44 mm	a = 94	b = 6.7	c = 22.7			
		–	220	810	3330	5200	5440 µm
		22	50	58	54	44	
♀2	L = 5.55 mm	a = 99	b = 7.1	c = 22.2			
		–	185	780	3740	5300	5550 µm
		22	40	54	56	44	
juv.1	L = 3.63 mm	a = 86	b = 4.8	c = 16.0			
		–	170	750	–	3400	3625 µm
		20	40	42	42	33	

Male

Cuticle 2 µm thick, non-annulated. Four rows of somatic setae in the cervical region, near the cloaca and on the tail. The anterior seta in each row is 5 µm long, the other setae 12 µm; setae on the tail are 10 µm long.

Head with flap-like lips and with a 20 µm long cephalic capsule, transversally divided 7 µm behind the front end. On the lips a circle of 6 µm long stout setae. Cephalic setae insert in roundish incisions of the posterior margin of the cephalic capsule. There are 10 cephalic setae: in lateromedian position four 44 - 46 µm long setae followed about 2 µm backwards by four 14 µm long setae, and in lateral position 38 µm long setae which insert about 2 µm more anterior than the 44 – 46 µm long setae. There are eight 9 µm long subcephalic setae in submedian and

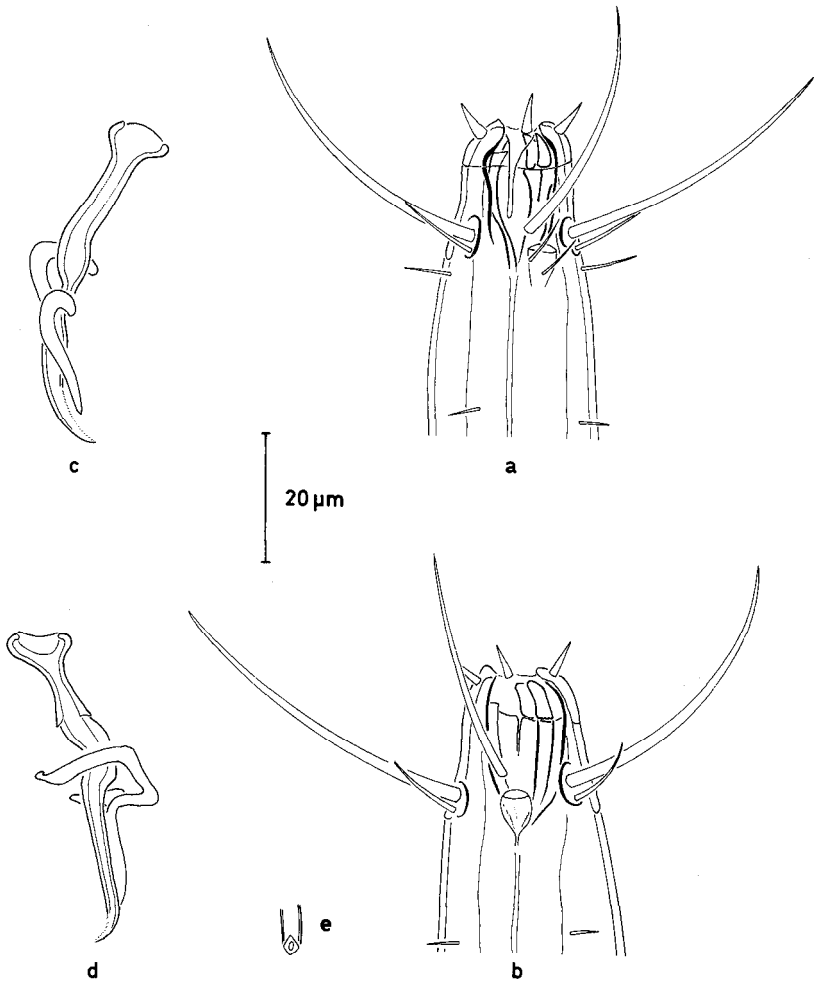

Fig. 4 *Trileptium otti* n. sp.
a head of a male (holotype); b head of a female (paratype); c right spiculum and gubernacular cuticularizations seen from the right side (holotype); d right spiculum and gubernacular cuticularizations seen from the left side (δ_2); e ventral view of the pre-cloacal supplement (δ_2).

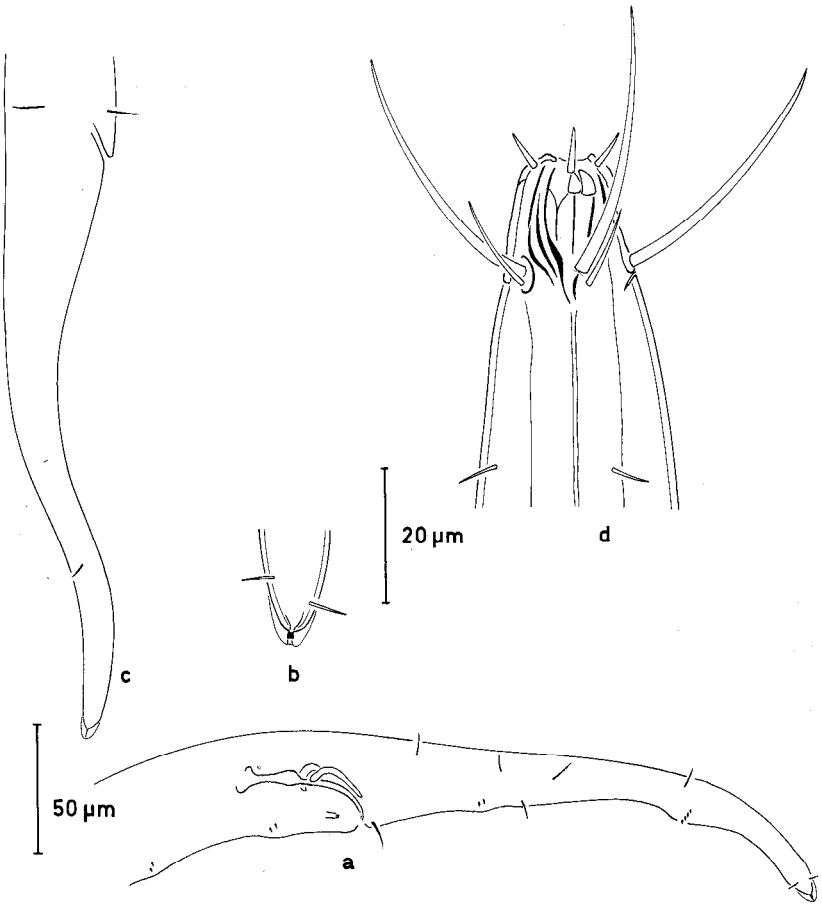

Fig. 5 *Trileptium otti* n. sp.
a tail and cloacal region of δ_3; b spinneret of δ_3; c tail of a female (paratype); d head of a juvenile (juv.$_1$).

sublateral position, about 3 μm behind the cephalic setae. Amphids pocket-like with an oval opening 4 μm wide, situated immediately behind the cephalic capsule.

Buccal cavity with longitudinal ribs, divided into two compartments. On the dorsal wall there is a weakly sclerotized tooth which projects at about the border of the two compartments. On the subventral walls there are two well sclerotized teeth which reach to the front end of the head. The oesophagus surrounds the buccal cavity. Cardia short. Nerve ring at 22 – 26 % of the oesophagus length. Ventral gland and excretory pore not seen.

Gonads diorchic with outstretched testes. Sperms fusiform, about 19 μm long and with a maximum width of 2 μm. Ductus ejaculatorius well developed. Copulatory apparatus complicated. The two equal spicules are 50 – 54 μm long, measured round the arc (50 – 52 μm measured from tip to tip), i. e. about 1.5 cloacal diameters. They are proximally cephalated, have a narrow area in the middle, and the distal part is ventrally curved, with minute serrate dents on the ventral edge. The gubernaculum is complicated, with distal lateral structures parallel to the spicules, proximally dilated so that two cuticularized projections partially surround each spicule.

The 12 μm long pre-cloacal supplement is tubular and situated 29 μm in front of the cloaca. In ventral view it has an oval opening lying in the center of a rhomboid field. 58 μm and 138 μm in front of the cloaca the ventral cuticle is dilated and penetrated by a duct. Close to each dilatation there are two 3 μm long setae. Similar dilatations are on the tail, but no duct has been seen. There is one dilatation 66 μm behind the cloaca, with two 3 μm long setae, and another dilatation 200 μm behind the cloaca, with a transverse row of four setae.

All males observed had the posterior body region somewhat turned round its axis so that the pre-cloacal supplement seemed to have a leftside subventral position; in fact it is ventral. Tail about 5 times as long as the cloacal diameter. Spinneret 3 μm long, protruded and round. The caudal glands lie within the tail.

Female

The cephalic setae are 48 – 50 μm and 12 μm long, the circle of subcephalic setae is lacking. Reproductive system didelphic-amphidelphic

with reflexed ovaries. Eggs up to 250 μm long and 34 μm wide. Spermathecae present. Vulva at 61 - 68 % of the body length.

The juveniles are similar to the females.

Discussion

Trileptium otti n. sp. is distinguished from all species listed in GERLACH & RIEMANN 1973/74 and from *Trileptium parisetum* WARWICK & PLATT 1973 by the peculiar copulatory apparatus and by pre- and postcloacal cuticular dilatations accompanied with setae.

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