

Draconematidae (Nematoda, Desmodoroidea) from the Coast of Kenya, East Africa

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Abstract

Six species of the family Draconematidae from the intertidal zone of the beaches of Gazi and Malindi, Kenya, are described or provided with additional information. *Dracognomus annae* sp. n. is characterized by its round rostrum, and by the shape of the male spicules; *Dracognomus dermatoglyphus* sp. n. is characterized by its indented rostrum, the fingerprint-like pattern of the annules at the mid-body region, and males by their spicules with hook-shaped capitulum; *Dracograllus gilbertae* sp. n. is characterized by its large fovea amphidialis, its slender posterior adhesion tubes, and a ventral post-cloacal swelling at the base of the tail. Only one female and one juvenile was found of a *Dracograllus* spec. Additional characteristics are described for *Dracograllus demani* ALLEN & NOFFSINGER, 1978 and *Dracograllus eira* (INGLIS, 1968) ALLEN & NOFFSINGER, 1978. For most of the species, Scanning Electron Microscopic pictures are shown.

Key words : Marine Nematodes, Draconematidae, systematics.

Résumé

Six espèces, dont trois nouvelles, de la famille Draconematidae ont été trouvées dans les sables de Gazi et Malindi, Kenya. *Dracognomus annae* sp. n., *Dracognomus dermatoglyphus* sp. n. et la femelle et un juvénile d'un *Dracograllus* spec. sont décrites. Des données complémentaires sont fournies pour *Dracograllus demani* ALLEN & NOFFSINGER, 1978 et *Dracograllus eira* (INGLIS, 1968) ALLEN & NOFFSINGER, 1978. La plupart des espèces est aussi illustrée par des photos S.E.M.

Mots-clefs : Nématodes marins, Draconematidae, systématique.

Introduction

Draconematidae are nematodes with adaptations (such as cephalic and posterior adhesion tubes) for locomotion and life in coarse sandy habitats and on algae. Contrary to most nematodes, Draconematidae 'walk' around on their ventral side in a hirudinean way. They are often found together with species of the family Epsilonematidae.

This paper presents descriptions of four new species (one is known only from a female and juvenile and therefore not named) and additional information of two known species, found in samples taken in Kenyan coastal biotopes. The work is part of an ongoing

research project in cooperation with the Kenyan-Belgian project (organised by the Free University of Brussels, Belgium and by the Kenya Marine Fisheries and Research Institute, Mombasa, Kenya).

Material and Methods

Benthic samples were taken using a core of 3.5 cm diameter which is pushed into the sediment down to 20 cm depth. Samples were fixed with a hot (70°C) 4 % formalin-seawater solution. Nematodes were transferred to pure glycerine by the method of SEINHORST(1959). Drawings were made with the aid of a camera lucida on a LEITZ DIALUX 20EB microscope.

Scanning Electron Microscopic pictures were taken from formalin fixed animals, transferred in OsO₄, dehydrated, dried and coated with 20-25 nm of gold (type of SEM : JEOL JSM 840).

Type specimens are deposited in the collection of the Zoology Institute (RUG); other specimens in the collection of the Marine Biology Section (MBRUG) of the University of Gent, Belgium.

Abbreviations

a : body length divided by maximum body diameter; abd : body diameter at level of anus or cloacal opening; b : body length divided by pharyngeal length; c : body length divided by tail length; CAT : cephalic adhesion tubes; cs : length of cephalic setae; gub : length of gubernaculum; hw : maximum headwidth; L : body length; ICAT : length of cephalic adhesion tubes; ltp : length of seta pedicel on tail; mbd : maximum body diameter of posterior body region; (mbd) : minimum body diameter; mbd ph : body diameter at level of pharyngeal bulb; N : number of body rings; No SIAT : number of sublateral adhesion tubes; No SIAT_L : number of sublateral adhesion tubes on the left of the body; No SIAT_R : number of sublateral adhesion tubes on the right side of the body : No SvAT : number of subven-

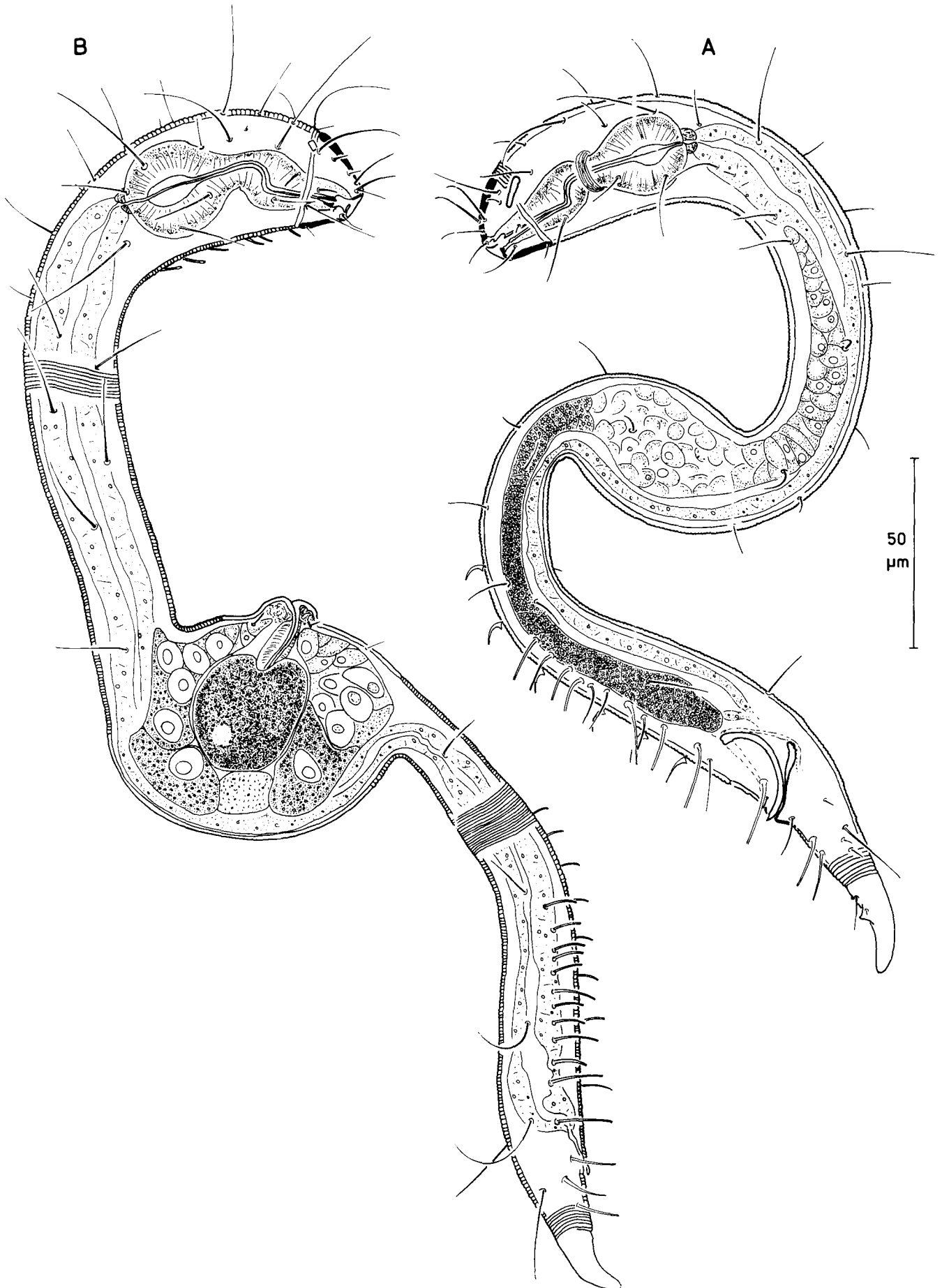


Fig. 1. – *Dracognomus annae* sp. n. – A. Habitus of holotype male. – B. Habitus of allotype female.

tral adhesion tubes; No SvAT_L : number of subventral adhesion tubes on the left side of the body; No SvAT_R : number of subventral adhesion tubes on the right side of the body; No VAT : number of ventral adhesion tubes; PAT : posterior adhesion tubes; ph : length of pharynx; spic : length of spicule, measured along the arc; SIAT : sublateral adhesion tubes; SIAT 1..1 : length of first, .. last pair of sublateral adhesion tubes; SvAT : subventral adhesion tubes; SvAT 1..1 : length of first, .. last pair of subventral adhesion tubes; t : tail length; tmr : length of non-annulated tail end; V : position of the vulva as a percentage of the total body length from anterior; VAT : ventral adhesion tubes; VAT 1..1 : length of the first, .. last ventral adhesion tube.

Descriptions

Family DRACONEMATIDAE FILIPIJEV, 1918
Genus *Dracognomus* ALLEN & NOFFSINGER, 1978

***Dracognomus annae* sp. n.**
(Fig.1, Plate 1, Table 1)

TYPE SPECIMENS

Holotype male, allotypic paratype female, slide n° 3590 (RUG). Other paratypes (2 ♂♂, 2 ♀♀, J₄), slides n° 3590-3591 (RUG). Two other paratypes (♂₂ and Juv.) used for S.E.M.

TYPE LOCALITY

Kenya, Gazi (50 km south of Mombasa): collected on 01-08-1989 by D. Verschelde. Sandbank near a *Sonneratia* bush, in the mouth of the Gazi Creeck river.

ETYMOLOGY

This species has been named in honour of Anneke HERMAN.

DESCRIPTION

Males

Body S-shaped (Fig. 1A; Plate 1A), with bubble-like swelling in the mid-body region; cuticle finely annulated in a parallel order. Long somatic setae in pharyngeal region arranged in five longitudinal rows; posterior to bubble-shaped mid-body, they are arranged in two lateral rows. At the level of the spicules, there is one single dorsal somatic seta; tail with one long and two or three very short subdorsal somatic setae; subventrally on non-annulated tail end, there is one pair of long and one pair of tiny somatic setae.

MEASUREMENTS

Table 1

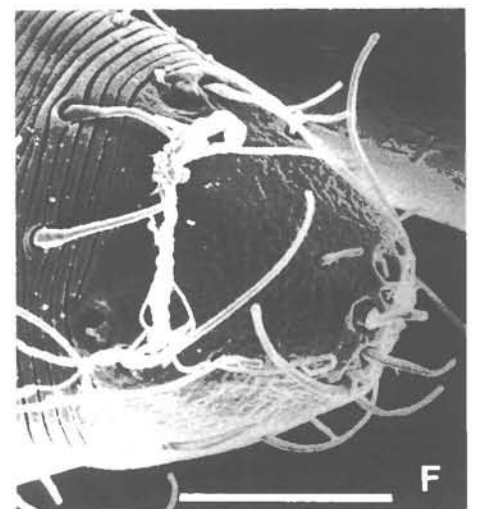
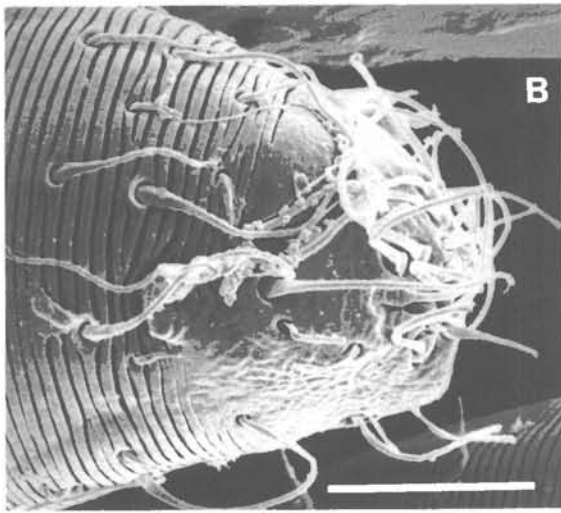
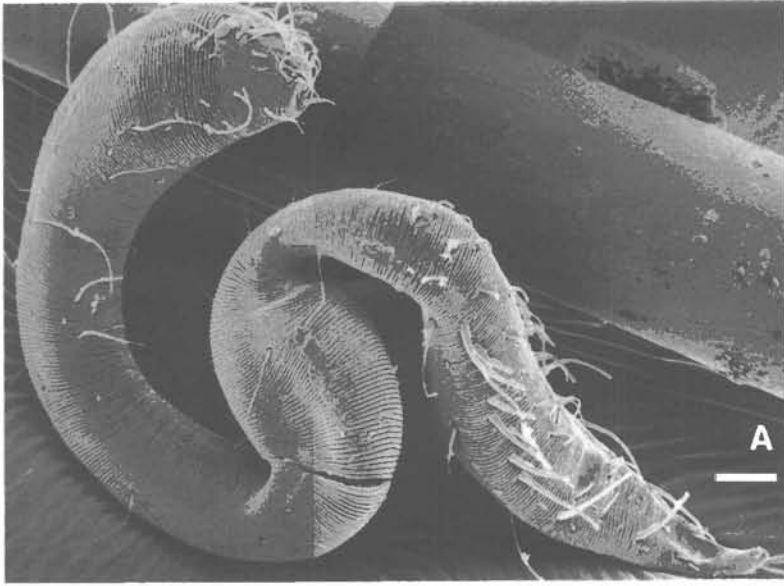
Measurements and ratios of *Dracognomus annae* sp. n.

HOL	PAR ♂♂ ♂	ALL n = 2	PAR ♀	♀♀ n = 2	J ₄ n = 1
L	433	397 - 422	441	402 - 445	381
ICAT	16	13 - 11	14	15 - 12	11
cs	7	6 - 7	7	5 - 6	7
hw	23	23 - 23	25	25 - 24	22
ph	60	58 - 58	65	60 - 63	54
mbd ph	31	33 - 30	36	34 - 33	35
mbd	36	34 - 33	60	60 - 65	38
(mbd)	15	13 - 13	15	16 - 14	15
t	56	45 - 46	36	36 - 34	38
tmr	27	23 - 22	20	20 - 18	19
abd	22	20 - 19	16	17 - 18	17
SIAT 1	14	12 - 11	11	14 - 8	11
SIAT 1	13	14 - 13	12	15 - 12	13
SvAT 1	11	7 - 6	4	6 - 5	5
SvAT 1	9	10 - 9	5	10 - 9	7
spic	34	31 - 34			
gub	22	22 - 22			
V			54	52 - 52	
a	12	11.7-12.8	7.4	6.7 - 8.1	10
b	7.2	6.8 - 7.3	6.8	6.7 - 7.1	7.1
c	7.7	8.8 - 9.2	12.3	11.2- 13.1	10
No SIAT _L	10	9 - 9	15	14 - 14	6
No SIAT _R	9	9 - 9	15	14 - 14	6
No SvAT _L	6	7 - 7	8	8 - 8	4
No SvAT _R	6	7 - 7	8	7 - 8	4

Measurements in μm.

PAT in four longitudinal rows (a pair of sublateral rows, and a pair of subventral rows) : Holotype male with nine SIAT on the right hand side (SIAT_R) and ten SIAT on the left hand side of the body (SIAT_L); para-type males with nine pairs of SIAT, of which eight pairs are situated anterior to the cloaca and one pair posterior to it (holotypic male with two pairs of postcloacal SIAT). SIAT not modified (Plate 1C,E; see remark). One pair of somatic seta in front of the first pair of SIAT, four more pairs between SIAT; these somatic setae have the same size as the SIAT. Two pairs of anal setae. Six SvAT_L, alternating with seven SvAT_R; SvAT are broad-based, spured, modified tubes (Fig. 1A; Plate 1C).

Smooth, rounded head capsule (Fig. 1A, Plate 1B,D) with four cephalic and ten to twelve subcephalic setae. Modified CAT situated half way between rostrum edge and middle of the head capsule. Long, straight amphids (length = 12 μm) shifted almost completely behind the rostrum, extending as far as the sixth body annule (Fig. 1A); pore-like apertura amphidialis (Plate 1B). Buccal



cavity with distinct dorsal tooth and minute subventral teeth; short, broad dumbbell-shaped pharynx with swollen corpus and strong, muscular posterior bulb; nerve ring situated in front of endbulb; cardia (3 µm long).

Reproductive system monorchic. Arched spicules clearly sclerotized and hollow; club-shaped capitulum; spicule tips often slightly protruding in fixed specimens (Fig. 1A; Plate 1C). Gubernaculum oriented almost perpendicular to the ventral body wall, with widened proximal end.

Non-annulated tail end with one pair of conspicuous subventral thorns and a single inconspicuous thorn in front of them (Fig. 1A; Plate 1A,C).

Females

General body shape as in male but mid-body swelling more pronounced (Fig. 1B); in this area some *Vorticella*-like specimens (Ciliata) can be attached to the body cuticle.

Fourteen to fifteen pairs of SIAT (not modified) of which twelve to thirteen pairs are situated preanally and two pairs postanally; they are often broken off in fixed specimens. Seven to eight pairs of short modified SvAT with tiny spur (nearly as the SIAT). Ten tube-like setae subventrally in the pharyngeal region. Two pairs of paravulval setae: one pair located anterior, and one pair posterior to vulva.

Rostrum similar to males; four cephalic and twelve subcephalic setae; position of modified CAT somewhat more anterior than in males. Small amphids (length = 3 µm) almost entirely located within the first three body annules. Buccal cavity with large dorsal tooth and tiny subventral teeth. Short dumbbell-shaped pharynx with broad midbulb and muscular endbulb. Small cardia.

Reproductive system entirely located within the bubble-like swelling of the mid-body region, at the right and ventrally to the intestine; didelphic, amphidelphic with ventrally reflected ovaries. Vulva wide, sometimes rising above the surrounding body annules (Fig. 1B). Cuticular vagina vera and muscular vagina uterina. Uterus with large egg.

Tail shorter than that of males; no ventral thorns present (sexual dimorphism); caudal glands extending as far as anus. Non-annulated tail end can carry a large number of slender micro organisms.

Juveniles

First, second and third juvenile stage not found.

Fourth juvenile stage.

Similar to adult for most characteristics. The single juvenile found, is a young female.

Six pairs of SIAT, four pairs of SvAT; no somatic setae arranged between the SIAT.

Smooth, rounded rostrum; four cephalic and eight subcephalic setae; one row of CAT on the anterior rostrum edge. Amphid somewhat smaller than that of female; small apertura (Plate 1F) in which a spiral origin is clear.

Diagnosis

Dracognomus annae sp. n. is characterized by the shape of its smooth, rounded rostrum, by ten to fourteen subcephalic setae, by the position of CAT on the rostrum. Males are characterized by the long amphid (and its shape), shape of spicules, by the almost perpendicular position of gubernaculum, by the shape of SvAT and by the presence of three (single ventral one, followed by a ventroventral pair) thorns on non-annulated tail end.

Differential diagnosis

Dracognomus annae sp. n. resembles *Dracognomus marioni* ALLEN & NOFFSINGER, 1978 but differs from it by shape of rostrum (respectively by: rounded compared to a more straight silhouette), length of the amphid; males differ in shape of the spicules (spicules of males of *D. annae* sp. n. are more arcuate and have a club-shaped capitulum; those of *D. marioni* have no capitulum), shape of gubernaculum (that of *D. annae* sp. n. is broader), and in number of cuticular thorns on the non-annulated tail end [respectively by: three (one single followed by a pair) compared to four (two pairs)]. *Dracognomus annae* sp. n. differs from *Dracognomus dermatoglyphus* sp. n. (see further) in shape of the rostrum (strongly cuticularized and indented in the latter), in the orientation of the fovea amphidialis longitudinal compared to almost transverse (Fig. 1A, 2A), in the pattern of body annules; males differ in shape of capitulum (hook-like in *D. dermatoglyphus* sp. n.), shape of gubernaculum (more bent in *D. dermatoglyphus* sp. n.), and in number of thorns on the non-annulated tail end (three pairs in *D. dermatoglyphus* sp. n.). The subventral tube-like setae (adhesion tubes) in the pharyngeal region of females are slim in *D. marioni*, built somewhat heavier in *D. annae* sp. n., and the heaviest in *D. dermatoglyphus* sp. n.

PLATE 1.

Dracognomus annae sp. n.

A. Habitus of paratype male (♂₂). – B. Rostrum of ♂₂. – C. Posterior adhesion tubes of ♂₂. – D. Dorsal view on rostrum of ♂₂. – E. SIAT and SvAT of ♂₂. – F. Rostrum of Juv. (Scale bars equal 10 µm)

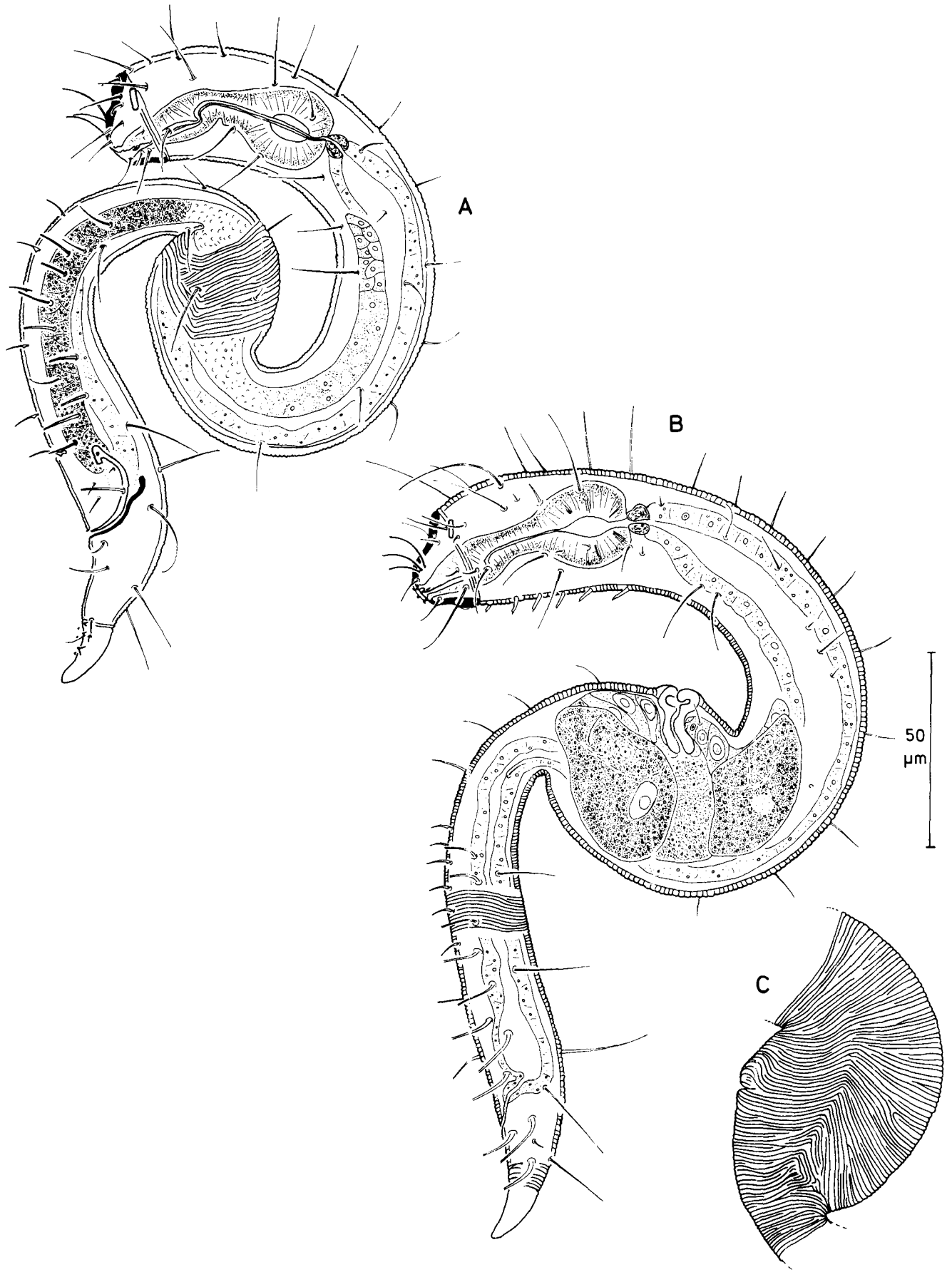


Fig. 2. – *Dracognomus dermatoglyphus* sp. n. – A. Habitus of holotype male. – B. Habitus of allotype female. – C. Body annules in the region of the body mid (♀).

***Dracognomus dermatoglyphus* sp. n.**
(Fig. 2, Table 2).

TYPE SPECIMENS

Holotype male, allotype female, and other paratypes (2 ♀ ♀): slide n° 3591 (RUG).

TYPE LOCALITY

Kenya, Gazi: 01-08-1989. Sandbank near a *Sonneratia* bush in the mouth of the Gazi Creek (low tide).

ETYMOLOGY

The species name refers to the fingerprint-like pattern of the body annules of the bubble bell-shaped mid-body (Greek: derma = skin, glyphein = to carve).

MEASUREMENTS

Table 2

Measurements and ratios of Dracognomus dermatoglyphus sp. n.

	HOL ♂	ALL ♀	PAR ♀ ♀ n = 2
L	383	370	381 - 375
ICAT	14	13	14 - 12
cs	9	9	8 - 7
hw	25	26	26 - 26
ph	57	58	56 - 57
mbd ph	27	32	31 - 31
mbd	34	52	46 - 46
(mbd)	14	16	15 - 16
t	46	36	34 - 33
tmr	19	18	19 - 17
abd	20	15	15 - 15
SIAT 1	11	12	14 - 13
SIAT 1	14	16	13 - 11
SvAT 1	7	6	6 - 7
SvAT 1	10	7	6 - 10
spic	43		
gub	22		
V		51	55 - 51
a	11.3	7.1	8.3 - 8.2
b	6.7	6.4	6.8 - 6.6
c	8.3	10.3	11.2 - 11.4
No SIAT _L	9	11	11 - 11
No SIAT _R	9	13	11 - 11
No SvAT	6	7	7 - 7

Measurements in µm.

DESCRIPTION

Males

Body S-shaped with bubble-shaped mid-body (Fig 2A). Numerous, slender body annules; parallelly ordered anterior to and posterior to bubble-shaped body middle; at level of the mid-body region, annules irregular, showing a fingerprint-like pattern.

Somatic setae in the pharyngeal region arranged in six rows; posterior to the body middle there is a lateral row on each side; at level of the spicules, there is a dorsal, single somatic seta.

Nine pairs of slender SIAT located in almost longitudinal rows at alternating levels (Fig. 2A); last pair of SIAT situated postcloacally; SIAT alternate sometimes with equally sized somatic setae. Six pairs of slender SvAT (not modified), situated in alternating rows. Subventrally there are two pairs of precloacal setae and one pair of postcloacal setae. A pair of long somatic setae is located subdorsally on tail; a pair of short setae sublaterally on the second last tail annule; subventrally on non-annulated tail end there are three pairs of small thorns, at level of the second pair there is a pair of tiny somatic setae.

Short, asymmetrical rostrum, thickly cuticularized, dorsally indented (ventrally only slightly indented, less than in females); four cephalic and fourteen (i.e. seven pairs) subcephalic setae; a group of twelve very thin CAT (apparently not modified since distal tips are swollen) is located on the first half of the rostrum. Large (6 µm), bar-shaped amphids situated within and almost transverse (parallel to the first two body annules).

Buccal cavity with small dorsal tooth; short dumbbell-shaped pharynx with broad corpus and muscular posterior bulb. Large cardia (5-6 µm).

Single testis extending almost as far as the pharyngeal region; spermatozooids not apparent; long, smoothly arched spicules with hook- to hammer-shaped capitulum; distal half of gubernaculum parallel to spicules, proximal half bent conspicuously.

Non-annulated tail end with three pairs of small, subventral thorns.

Females

Body shape, pattern of body annules and arrangement of somatic setae as in male (Fig. 2B). Eleven pairs of SIAT (not modified), of which nine preanally and two postanally (allotype female with eleven SIAT_L and thirteen SIAT_R). No somatic setae arranged between the SIAT. Seven pairs of (not modified) SvAT, at alternating levels. Ventrally in the pharyngeal region, posterior to the rostrum, there are ten to twelve (five to six pairs) short, firm tube-like setae (adhesion tubes).

Rostrum similar or somewhat slimmer than in males, both dorsally and ventrally indented. Four cephalic and fourteen subcephalic setae; six conspicuous labial sen-

sillae; a group of ten to twelve very thin CAT (but with swollen distal tips) located anterior on the rostrum; bar-shaped amphid situated almost parallel with and within the first two body-annules. Buccal cavity with large dorsal tooth and tiny ventral tooth; pharynx with slender corpus and muscular endbulb; cardia well marked. Vulva slightly protruding; enclosing, as two lips, a small chamber behind it. Vagina vera strongly sclerotised, vagina uterina not clear. Reproductive system didelphic, amphidelphic with ventrally bent ovaries; two large oocytes present. Antepudendum (i.e. anterior genital branch) extends anterior to the bubble-shaped mid-body region, postpudendum (i.e. posterior genital branch) located completely within the bubble-like mid-body region.

Tail shorter than in males. Non-annulated tail end without subventral thorns (sexual dimorphism).

Juveniles

Not found.

Diagnosis

Dracognomus dermatoglyphus sp. n. is characterized by the indentation of the rostrum; by the orientation (almost parallel to the body annules) of the amphids (unique for the genus until now); by the fingerprint-like pattern of body annules located in the bubble-like swelling of the mid-body region. Distinctive for males is the distally bent gubernaculum, spicules with hook-shaped capitulum, and the three pairs of subventral thorns on the non-annulated tail end. Distinctive for females is the long, thickly cuticularized vagina vera, and the firm subventral tube-like setae in the pharyngeal region (they are built more firmly than in any of the other *Dracognomus* species).

Differential diagnosis

Based on the characters stated under the diagnosis, *Dracognomus dermatoglyphus* sp. n. cannot be confused with any other of the five *Dracognomus* species.

REMARK

ALLEN & NOFFSINGER (1978) introduced the term 'modified adhesion tubes' for adhesion tubes present in species of *Dracognomus* ALLEN & NOFFSINGER, 1978. These adhesion tubes are smaller in diameter than normal adhesion tubes, they are hollow and have an open distal tip (no internal tongue-like structure observed); the open distal tip can be slightly expanded (funnel-shaped). Both types of adhesion tubes (modified as well as normal) can be present in *Dracognomus* species.

Genus *Dracograllus* ALLEN & NOFFSINGER, 1978

Dracograllus gilbertae sp. n. (Fig. 3, Plate 2, Table 3)

TYPE SPECIMENS

Holotype male, allotypic paratype and other paratypes (three juveniles), slide n° 3592 (RUG). Other paratypes (1 ♀, J3) used for S.E.M.

TYPE LOCALITY

Kenya, Gazi : 01-08-1989.
Beach near a *Sonneratia* bush, Gazi Creek.

ETYMOLOGY

Named in honour of Gilberta BACCARNE.

DESCRIPTION

Male

Body S-shaped (Fig. 3A). Large number of slim (1 µm) body annules with broad interannual space (2-2.5 µm); body annules ornamented with a slit. There is a ventral postcloacal swelling present (Fig. 3A, arrow).

Somatic setae arranged in eight longitudinal rows of alternating long and very short setae in pharyngeal region; in six rows along the rest of the body. Ten pairs of SIAT, all situated preanally; they are long, slender and have no swollen distal tip (as in most other *Dracograllus* species), they look more like the modified SIAT of *Dracognomus* species. Between first and second pair of SIAT there is a pair of somatic setae of the same length; further (from second to tenth pair of SIAT) SIAT alternate with tiny somatic setae; behind the last pair of SIAT there is a pair of long somatic setae. Nine pairs of long, slender SvAT with distal beak-shaped tip. One pair of pre-anal setae, one pair of para-anal setae and one pair of postanal setae; in front of the pre-anal setae, there is a pair of somewhat longer, subventral somatic setae. Tail with one pair of long and two pairs of short somatic setae are situated subdorsally and three pairs of short somatic setae subventrally.

Rostrum (Fig. 3B) with six labial sensillae, four cephalic and many (28) subcephalic setae. Large, ventrally whorled, open loop-shaped amphidial fovea. Eight CAT, two pairs located subdorsally and two sublaterally. Pharynx dumbbell-shaped; nerve ring in front of endbulb. Cardia small (3 µm).

Single testis extending to anterior part of widened mid-body region; sperm cells oval (L = 10 µm). Slender, slightly bent spicules with offset capitulum; short but conspicuous gubernaculum, parallel with spicules.

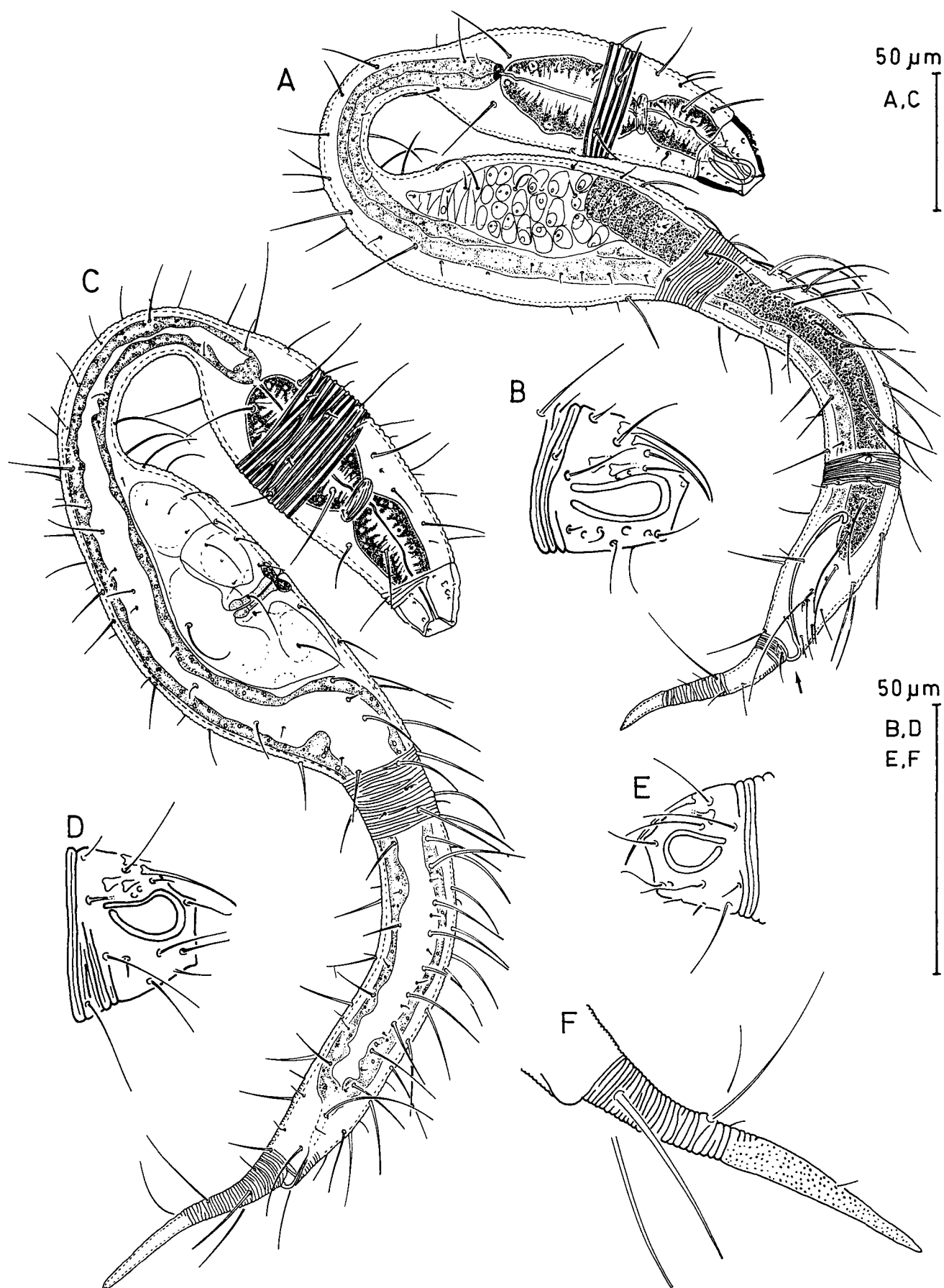
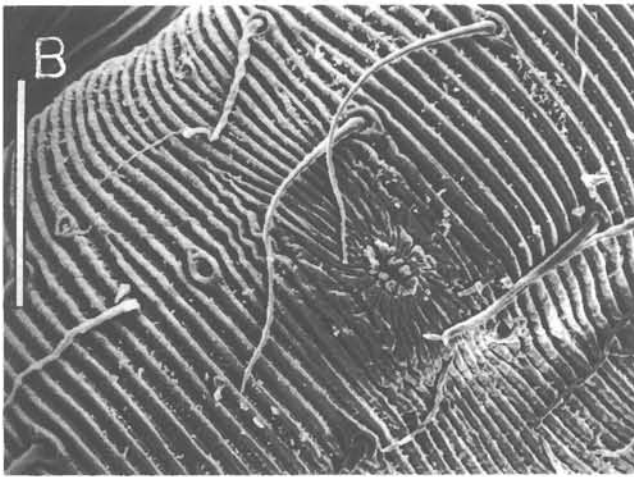
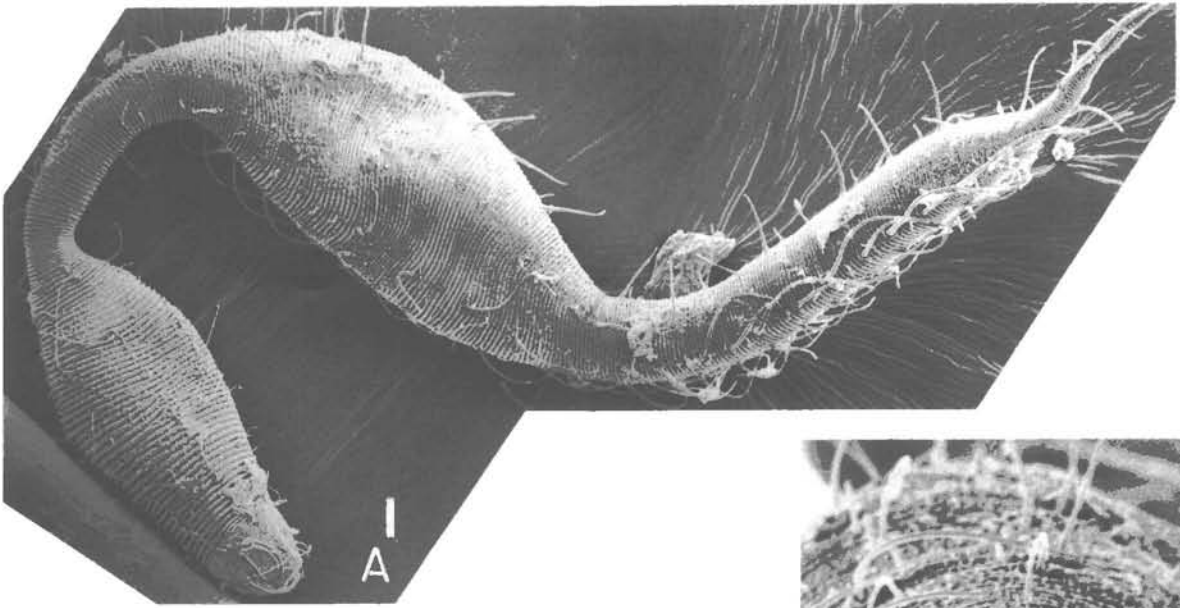


Fig. 3. - *Dracograllus gilbertae* sp. n. - A. Habitus of holotype male ($\delta 1$). - B. Rostrum of $\delta 1$. - C. Habitus of allotype female ($\varphi 1$). - D. Rostrum of $\varphi 1$. - E. Rostrum of paratype J4. - F. Tail of J4.



MEASUREMENTS

Table 3
Measurements of and ratios *Dracograllus gilbertae*
sp. n.

	HOL ♂	ALL ♀	J ₄
L	581	639	521
ICAT	22	22	18
cs	7	9	10
hw	27	27	23
ph	98	105	92
mbd ph	44	49	38
mbd	56	65	42
(mbd)	15	18	17
t	74	84	82
tmr	20	42	40
abd	17	17	17
spic	59		
gub	14		
V		47	
a	10.4	9.8	12.4
b	5.9	6.1	5.7
c	7.9	7.6	6.4
No SIAT	10	13	7
No SvAT	9	10	4
No CAT	8	8	4
SIAT 1	45	42	30
SIAT 2	42	35	24
SIAT 3	32	43	32
SIAT 4	49	31	32
SIAT 5	33	42	38
SIAT 6		29	28
SIAT 7	33	43	33
SIAT 8	50	32	42
SIAT 9	34	38	34
SIAT 10	55	33	
SIAT 11		53	
SvAT 1	40	36	28
SvAT 2	34	34	29
SvAT 3	31	30	27
SvAT 4	28	28	25
SvAT 5	26	25	
SvAT 6	27	31	
SvAT 7	31	35	
SvAT 8	32	33	
SvAT 9	34	35	
SvAT 10		27	

Measurements in μm .

Tail slender with short non-annulated tail end (sexual dimorphism); cuticle of non-annulated tail end punctated. Caudal glands extending dorsally as far as the gubernaculum.

Female

Body-shape (Fig. 3C; Plate 2A), body annules and setae pattern similar to male. Thirteen pairs of SIAT of which twelve located anterior to anal region and one pair postanally. SIAT alternate with short somatic setae. Ten pairs of SvAT, sometimes alternating with short somatic setae. No para-anal setae.

Rostrum cuticle showing an intricate ornamentation (Plate 2C); six labial sensillae, four cephalic and 32 subcephalic setae; eight CAT (Plate 2C); large, closed loop-shaped fovea amphidialis. Buccal cavity, pharynx, and cardia similar to males. Broad anus.

Vulva small (Plate 2B); vagina vera strongly cuticularized. Reproductive system didelphic, amphidelphic with reflected ovaries.

Ventral postanal swelling present. Tail with one pair of long, subdorsal somatic setae and three pairs of short somatic setae. Non-annulated tail end punctated, and longer than in male.

Juveniles

First and second-stage juveniles not observed.

Fourth juvenile stage (Fig. 3E,F)

Body shape similar to adults. PAT in four longitudinal rows: seven pairs of SIAT, of which the last is located postanally, and four pairs of SvAT which are located at alternating levels. Short somatic setae alternate with the SIAT.

Rostrum (Fig. 3E) with four cephalic and eighteen subcephalic setae; four CAT; amphid as in female.

Ventral postanal swelling present (Fig. 3F). Slender tail with one pair of subdorsal, long somatic setae and two pairs of short somatic setae. Non-annulated tail end 50% of total tail length.

Third juvenile stage (Plate 2D,E)

L = 330 μm . Five pairs of PAT located sublaterally and preanally.

Rostrum with four cephalic, fourteen subcephalic setae and three CAT; rounded, closed loop-shaped fovea amphidialis (Plate 2D). Non-annulated tail end punctated (Plate 3B); t = 58 μm , tmr = 30 μm .

PLATE 2.

Dracograllus gilbertae sp. n.

A. Habitus of paratype female (\varnothing_2). – B. Vulva of \varnothing_2 . – C. Rostrum of \varnothing_2 , frontal view. – D. Rostrum of J₃. – E. Habitus of J₃. (Scale bars of B, C, D, E equal 10 μm ; scale bar of A equals 1 μm).

Diagnosis

Dracograllus gilbertae sp. n. is characterized by large amphidial fovea, by long and slender PAT, a slender tail with ventral postcloacal (anal) swelling. Distinctive for males are the long spicules and cuticularized gubernaculum.

Differential diagnosis

Dracograllus gilbertae sp. n. resembles *Dracograllus papuensis* DECRAEMER, 1988 and *Dracograllus spinosus* DECRAEMER, 1988.

Dracograllus gilbertae sp. n. differs from *D. papuensis* by body length (respective by : $L_{\delta} = 581 \mu\text{m}$, $L_{\varphi} = 639 \mu\text{m}$ as compared to $L_{\delta} = 310 \mu\text{m}$, $L_{\varphi} = 410 \mu\text{m}$ in *D. papuensis*), its more slender rostro-pharyngeal region, shape of the fovea amphidialis (closed loop-shaped in $\varphi\varphi$ of *D. gilbertae* sp. n., open loop-shaped in $\varphi\varphi$ of *D. papuensis*), shape of the adhesion tubes (long and slender in *D. gilbertae* sp. n., short and strong in *D. papuensis*), length of spicules (respectively by : $59 \mu\text{m}$ as compared to $29 \mu\text{m}$), the ventral post-cloacal swelling at tail basis and by the shape of tail (*D. gilbertae* sp. n. : $\text{tmr}/t = 27\%$ in δ and 50% in φ as compared to *D. papuensis* : $\text{tmr}/t = 76\%$ in φ).

Dracograllus gilbertae sp. n. differs from *D. spinosus* in body length (*D. spinosus* $L = 340 \mu\text{m}$), shape of amphidial fovea, length of PAT and shape of the tail (*D. spinosus* : $\text{tmr}/t = 59\%$ in δ).

Note the aberrant presence of four rows of PAT (2 SIAT and 2 SvAT) in the fourth-stage juvenile, instead of three rows (2 SIAT and 1 VAT) as generally is observed in species of Draconematidae (ALLEN & NOFFSINGER, 1978).

***Dracograllus demani* ALLEN & NOFFSINGER, 1978**
(Fig. 4E,F; Plate 3; Table 4)

SPECIMENS

Three males, one female, slide n° 10277 (MBRUG).

LOCALITY

Kenya, Malindi (70 km north of Mombasa): 04-08-1989. Watamu Reserve, coarse coral sand.

ADDITIONAL INFORMATION

Males

Type specimens are described from Marseille, France (ALLEN & NOFFSINGER, 1978). The species was also

MEASUREMENTS

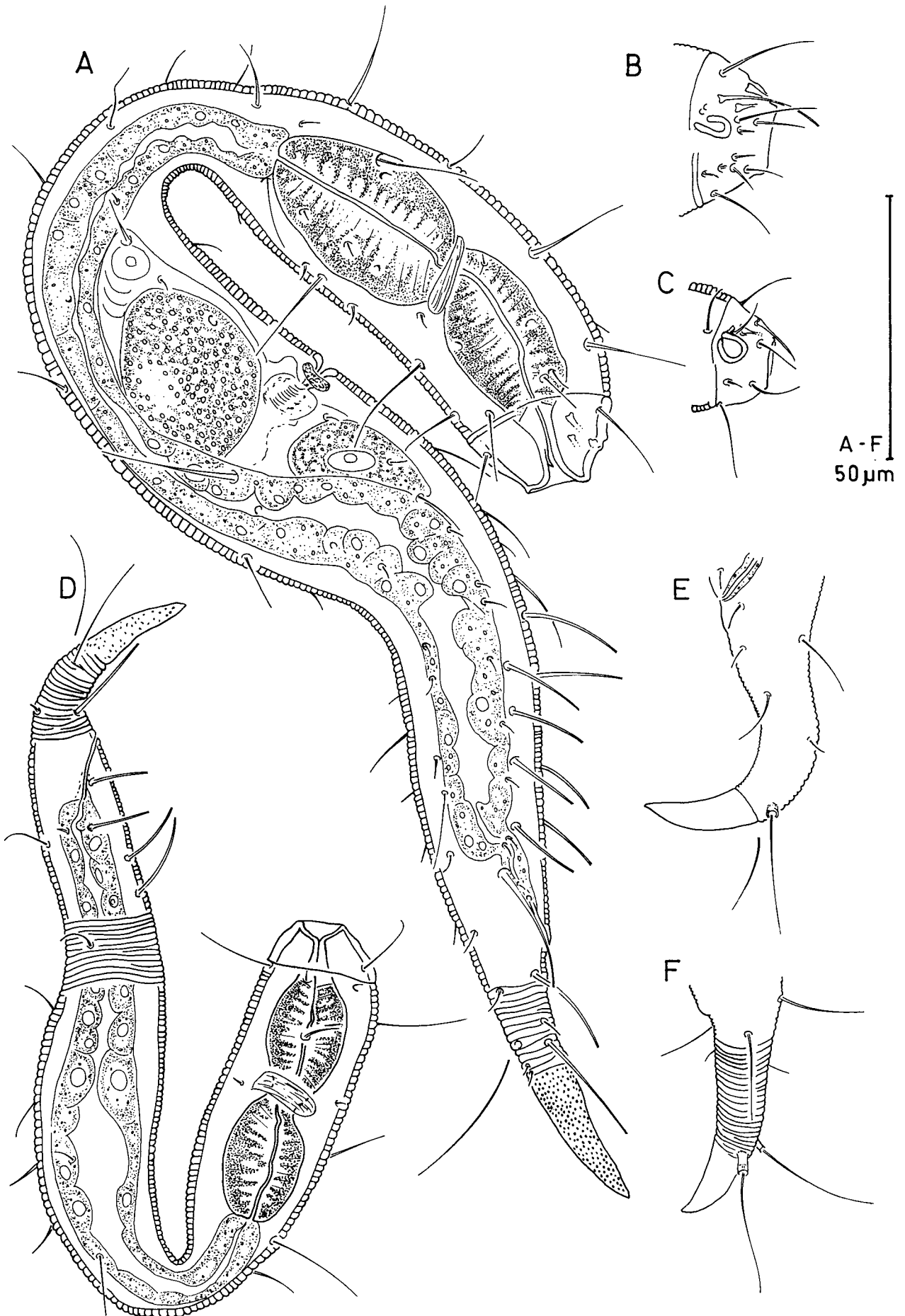
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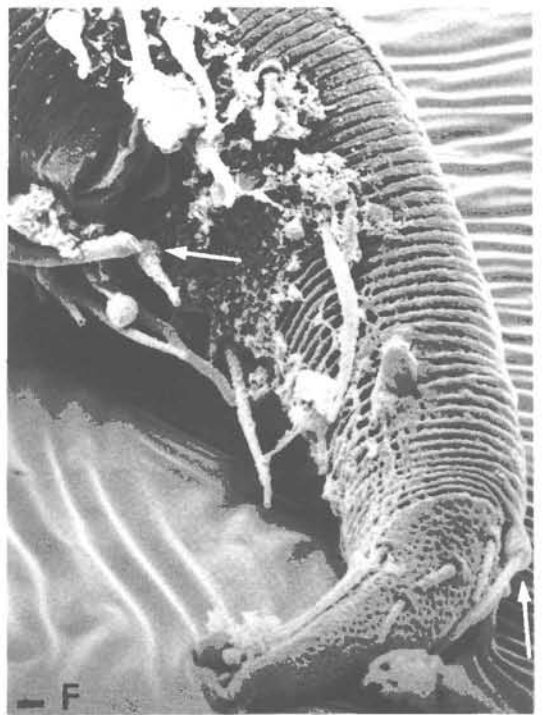
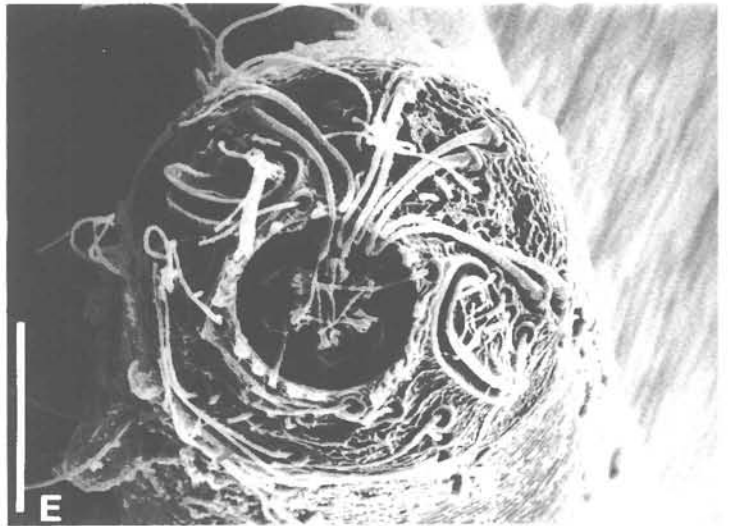
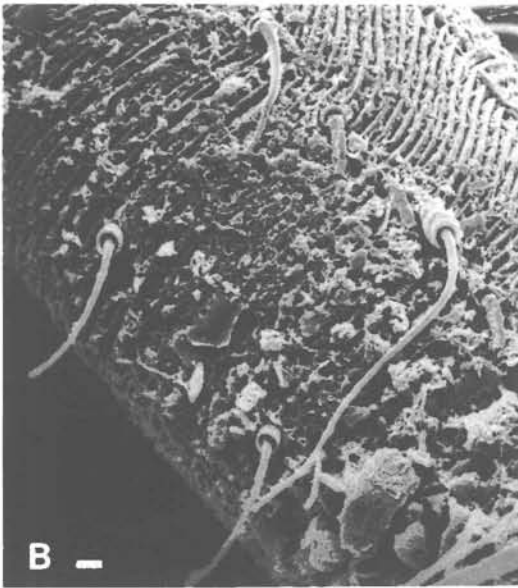
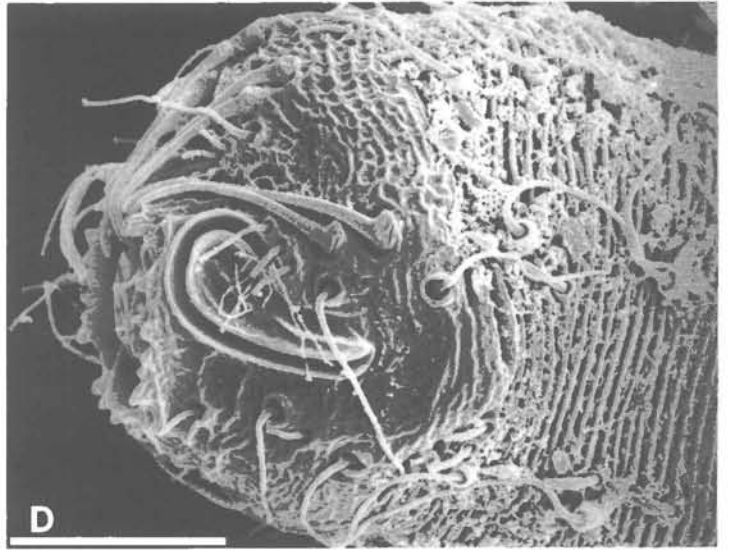
Measurements and ratios of Dracograllus demani
ALLEN & NOFFSINGER, 1978

	$\delta\delta$ n = 2	φ n = 1
L	430 - 455	448
ICAT	12 - 14	11
cs	5 - 8	7
hw	28 - 29	31
ph	76 - 76	89
mbd ph	36 - 42	41
mbd	29 - 34	44
(mbd)	18 - 18	21
t	63 - 54	52
tmr	19 - 20	20
abd	18 - 17	16
ltp	2 - 2	7
spic	56 - 58	
gub	18 - 17	
V		47
a	14.8 - 13.4	10.2
b	5.7 - 6	5
c	6.8 - 8.4	8.6
No SIAT _L	6 - 6	8
No SIAT _R	7 - 6	7
No SvAT _L	10 - 10	10
No SvAT _R	11 - 11	11
No CAT	8 - 8	8
SIAT 1	21 - 19	21
SIAT 2	22 - 17	21
SIAT 3	22 - 20	20
SIAT 4	16 - 20	20
SIAT 5	20 - 21	25
SIAT 6	20	
SvAT 1	17 - 17	16
SvAT 2	18 - 18	14
SvAT 3	17 - 17	13
SvAT 4	17 - 15	13
SvAT 5	14 - 15	13
SvAT 6	15 - 15	13
SvAT 7	14 - 16	15
SvAT 8	14 - 15	14
SvAT 9	15 - 15	14
SvAT 10	16 - 15	14

Measurements in μm

Fig. 4. - *Dracograllus spec.* - A. Habitus of female (φ_1). - B. Rostrum of φ_1 . - C. Rostrum of Juv. - D. Habitus of Juv. \triangleright
Dracograllus demani ALLEN & NOFFSINGER, 1978. - E. Tail of male. - F. Tail of female.





found in polychaete tubes of sand and mucus, in the sand and silt of calcareous algae, on green algae and in coarse coral sands of the intertidal zone (Laing Island, Papua New Guinea; DECRAEMER, 1988).

The morphometric data of the Kenyan specimens (i.e. $L = 430\text{--}455\ \mu\text{m}$; Plate 3A) fits in between that of the type specimens ($L = 500\text{--}800\ \mu\text{m}$) and the Papua New Guinean specimens ($L = 350\ \mu\text{m}$), a variability previously noted by DECRAEMER.

Six to seven pairs of SIAT alternating with somatic setae of the same size. SvAT short (ten SvAT_L , eleven SvAT_R).

Kenyan specimens have a long tail ($t = 54\text{--}63\ \mu\text{m}$ compared to $40\ \mu\text{m}$ in type specimens; Plate 3F), with short non-annulated tail end ($\text{tmr} = 20\ \mu\text{m}$ compared to $30\ \mu\text{m}$ in type specimens). Subdorsally on tail, Kenyan specimens carry a pair of long, pedicelled (somatic) setae (Fig. 4E; Plate 3C,F); in type specimens and specimens from Papua New Guinea, these setae don't show a pedicel; moreover, in the latter, the setae are located on the non-annulated tail end.

Rostrum (Plate 3D,E) with over 24 subcephalic setae; a ventral subcephalic seta is shifted anteriorly to the level of the cephalic setae (Plate 3E). Amphid open loop-shaped. Pharynx ($76\ \mu\text{m}$) long compared to that of the specimens from Papua New Guinea ($60\ \mu\text{m}$).

Spicules $56\text{--}68\ \mu\text{m}$, long compared to $48\ \mu\text{m}$ in type specimens and $37\ \mu\text{m}$ in specimens from Papua New Guinea; gubernaculum $17\text{--}18\ \mu\text{m}$ compared to 14 and $13\ \mu\text{m}$ respectively.

Female

Six SIAT, clearly shorter ($21\ \mu\text{m}$) than in type specimens and specimens of Papua New Guinea ($28\ \mu\text{m}$). Pedicel of pedicelled setae, anterior to SIAT, measures $4\text{--}7\ \mu\text{m}$ (Plate 3B, male). Ten SIAT_L , eleven SIAT_R , which are shorter than those of the specimens from New Guinea. Located between the last SIAT, there are short somatic setae.

Subdorsally on the last annules of the tail (Fig. 4F) there is a pair of pedicelled setae (length of pedicel = $7\ \mu\text{m}$); three (maybe four) pairs of somatic setae are located on the non-annulated tail end (not drawn of Fig. 4F).

Rostrum similar to males. Amphideal fovea closed loop-shaped (beginning and end of the loop touch each other). Anterior rostrum edge with protruding tooth-like spines. Pharynx with strong muscular corpus and posterior bulb.

Remark

Keeping in mind the large differences in measurements of pharynx, SIAT, SvAT, spicules and gubernaculum between the specimens of the three separate localities and also the difference in subcephalic setae and especially the presence of pedicel setae on the tail, we have to regard *Dracograllus demani* as a species with large intraspecific variations.

Dracograllus eira

(INGLIS, 1968) ALLEN & NOFFSINGER, 1978

(Plate 4; Table 5)

SPECIMENS

Eight males, four females, six juveniles, slide n° 10277 (MBRUG).

LOCALITY

Kenya, Malindi : 04-08-1988. Watamu Reserve, coarse coral sand.

ADDITIONAL INFORMATION

Males

The species was originally described from St.-Vincent Bay, New Caledonia (Inglis, 1968) and redescribed from the type locality by ALLEN & NOFFSINGER, 1978 and was also found in samples from Laing Island, Papua New Guinea (samples of coarse coral sands and polychaete tubes; DECRAEMER, 1988).

The specimens from Kenya (Plate 4A, habitus ♀) largely agree with former descriptions, their measurements more closely resemble those of the Papua New Guinean specimens (DECRAEMER, 1988).

Adhesion tubes are shorter than those of type specimens and specimens from Papua New Guinea; somatic seta of the same length alternate with every two SIAT. Distal tips of SIAT and SvAT are funnel-shaped (Plate 4C).

Rostrum with four cephalic and a large number of subcephalic setae (up to 40); subventrally on the first half of the rostrum there are two pairs of small spines ('cephalic sublateral acanthiform setae'; ALLEN & NOFFSINGER, 1978), these are present both in males and females (Plate 4B, female). Rostrum surface shows an intricate ornamentation, body annules on the other hand are smooth (Plate 4B).

PLATE 3.

Dracograllus demani ALLEN & NOFFSINGER, 1978.

Male. – A. Habitus. – B. Pedicelled somatic setae. – C. Pedicel seta on tail. – D. Rostrum, lateral view. – E. Rostrum, frontal view. – F. Tail.

(Scale bars of A, D, E equal $10\ \mu\text{m}$; scale bar of B, C, F equal $1\ \mu\text{m}$).

MEASUREMENTS

Table 5
Measurements and ratios of *Dracograllus eira* (INGLIS, 1968) ALLEN & NOFFSINGER, 1978

	♂ ♂ n = 4	♀ ♀ n = 2	J ₄ n = 1
L	574 - 658 (615)	578 - 626	420*
ICAT	11 - 16 (14)	16 - 14	13
cs	10 - 12 (12)	10 - 10	7
hw	33 - 39 (36)	37 - 38	36
ph	115 - 117 (116)	126 - 122	
mbd ph	47 - 53 (49)	52 - 54	50
mbd	58 - 66 (62)	76 - 81	55
(mbd)	16 - 18 (17)	19 - 20	18
t	63 - 71 (
68)	58 - 63	64	
tmr	31 - 36 (34)	43 - 44	26
abd	25 - 27 (26)	22 - 23	23
spic	61 - 73 (69)		
gub	17 - 20 (18)		
V		49 - 53	
a	9.3 - 10.3 (9.9)	7.6 - 7.7	8.8
b	5 - 5.6 (5.3)	4.5 - 5.1	
c	8.9 - 9.3 (9.1)	10 - 9.9	7.5
No SIAT	14 - 15 (15)	16 - 14	8
No SvAT	10 - 10 - 13 - 12	10 - 11	
No CAT	8 - 8	8 - 8	4
No VAT			7

Measurements in μm ; mean value between brackets.
(* length of another J₄ = 482 μm)

	♂ n = 1	♀ n = 1
SIAT 1→1	13;13;14;16; 15;16;15;18; 17;21;18;21; 25;21;18	15;16;16;17; 19;17;20;19; 24;18;21;20; 22;20;20;23
SvAT 1→1	12;12;12;12; 12;12;12;13; 15;14	13;13;12;12; 12;12;14;16; 16;17

Measurements in μm .

Testis extends as far as the posterior end of the narrow region in front of swollen body middle.

The tail carries two pairs of SIAT of which the last pair is located on the non-annulated tail end; the latter also carries six pairs of somatic setae and one pair of small subventral thorns; it is ornamented with small perforations which show superficially and run right through the cuticula; non-annulated tail end of male is shorter than that of female. Spinneret clear in tail tip.

Females

Somatic setae alternate with every SIAT, these somatic setae either have same length as SIAT or are very short. On S.E.M picture (Plate 4B) the small, loop-shaped amphid shows only a suture (Fovea amphidealis interior) and opens by a pore (apertura amphidealis); corpus gelatum bulges out.

Non-annulated tail end 70 % of total tail length (compared to 50 % in males); it carries the last or last two SIAT and five to seven pairs of somatic setae.

Juveniles

First stage juvenile not found.

Fourth juvenile stage (Plate 4G)

L = 318 μm (two other J₄ measured 482 μm and 420 μm). PAT in three longitudinal rows: seven or eight pairs of SIAT, six or seven VAT; short somatic setae alternate with the SIAT.

Rostrum with four CAT; acanthiform setae tiny; amphid similar to adults.

Non-annulated tail end 41 % of total tail length, compared to 54-63 % in Papua New Guinean specimens.

Third juvenile stage (Plate 4F)

L = 247 μm . PAT in two longitudinal rows of six tubes. Rostrum with three CAT, of which the dorsal one is located on the front edge of the rostrum; four cephalic setae, ventrally a subcephalic seta shifted to the front edge of the rostrum; two pairs of tiny cephalic acanthiform setae.

Second juvenile stage (Plate 4D,E)

L = 195 μm . PAT in two longitudinal rows of six tubes. Rostrum with two CAT and few subcephalic setae. Two pairs of acanthiform setae.

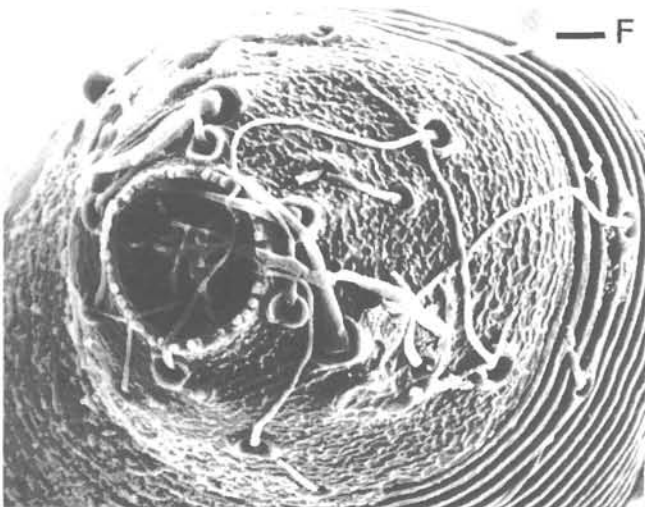
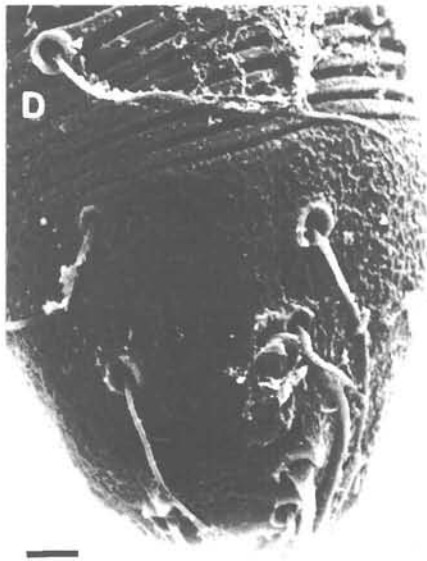
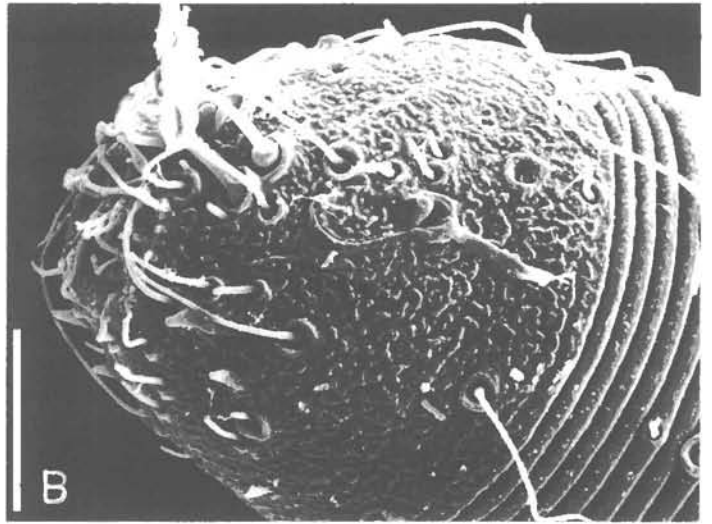
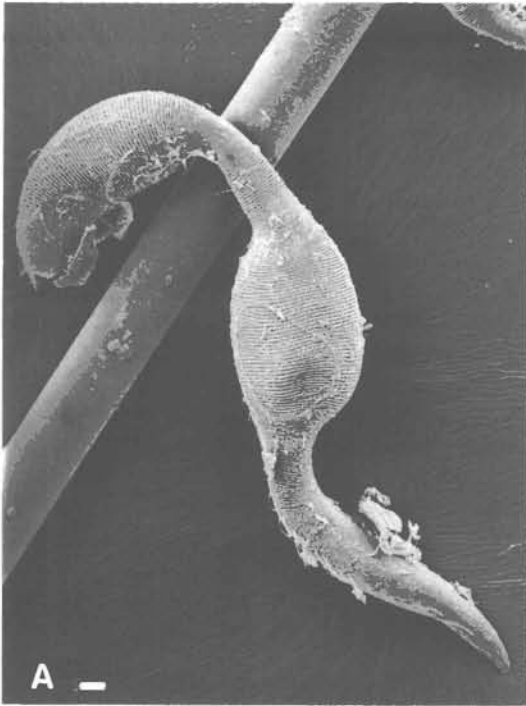
Remarks

DECRAEMER (1988) describes a 'second juvenile stage' with a single CAT and three pairs of PAT. Compared to what is described above, it could be that DECRAEMER found a first juvenile stage instead of a second; how-

PLATE 4.

Dracograllus eira (INGLIS, 1968) ALLEN & NOFFSINGER, 1978.

A. Habitus of female (φ_1). - B. Rostrum of φ_1 , lateral view. - C. Adhesion tubes of φ_1 . - D. Rostrum of J₂. - E. Habitus of J₂. - F. Rostrum of J₃. - G. Rostrum of J₄. (Scale bars of A, B, E, G equal 10 μm ; scale bars of C, D, F equal 1 μm).



ever, this would be in contradiction with what has been described for Draconematidae in general (ALLEN & NOFFSINGER, 1978), namely that first stage juveniles lack adhesion tubes and also that second stage juveniles only have one CAT.

In the same article, DECRAEMER gives a key to the species of the genus *Dracograllus*. In this key one species: *Dracograllus filipjevi* ALLEN & NOFFSINGER, 1978, has been overlooked.

Dracograllus spec.
(Fig. 4A-D, Table 6)

SPECIMENS

One female, one juvenile, slide n° 3593 (RUG).

LOCALITY

Kenya, Gazi : 10-08-1989 Sample taken at the foot of a *Ceriops* tree in mixed mangrove bush.

MEASUREMENTS

Table 6
Measurements and ratios of Dracograllus spec.

	♀	J		♀	J
L	385	231	No SIAT	7	3
ICAT	22	13	No SvAT _R	4	2
cs	13	10	No SvAT _L	3	2
hw	30	21	No CAT	6	4
ph	86	60	SIAT 1	15	22
mbd ph	34	27	SIAT 2	15	15
mbd	42	23	SIAT 3	15	19
(mbd)	17	11	SIAT 4	14	
t	52	18	SIAT 5	18	
tmr	25	20	SIAT 6	19	
abd	16	12	SIAT 1	23	
V	56		SvAT 1	19	18
a	9.2	10	SvAT 2	17	13
b	4.5	3.8	SvAT 3	14	
c	7.4	12.8	SvAT 1	14	

Measurements in µm.

DESCRIPTION

Female small, robust body (Fig. 4A), with gradually enlarged mid-body region. Large number of slender body annules, no ornamentation. Somatic setae in eight longitudinal rows; alternating long (23-25 µm) and short somatic setae in pharyngeal region. PAT slender, no swollen distal tips. Seven pairs of SIAT, alternating with very short somatic setae; last two pairs of SIAT

located postanally; last pair of short somatic setae posteriorly shifted to third annule in front of the last SIAT. Subdorsally, at level of last SIAT, there is one pair of long, somatic setae (on fifth annule in front of non-annulated tail end) followed by two pairs of short somatic setae. Between SIAT 1 and 2 there is no short somatic seta, it is sublaterally shifted, above the first SIAT. Four SvAT_R, alternating with three SvAT_L, all located preanally.

Short, broad rostrum (Fig. 4B) with four cephalic and 22 subcephalic setae; six CAT; amphidial fovea open loop-shaped, ventrally whorled. Buccal cavity with ventral tooth. Pharynx dumbbell-shaped, nerve ring in front of endbulb. Cardia inconspicuous.

Vagina short with distinct sphincter muscle. Reproductive system didelphic; different parts hard to distinguish.

Juvenile

Due to lack of comparative material (only one juvenile found) it was not possible to determine the precise juvenile stage (maybe J4).

Body annules (Fig. 4D) as in female. Fewer somatic setae than in female. Three pairs of SIAT of which one pair is located postanally. Two pairs of SvAT, located anterior to SIAT 1. One pair of long somatic setae subdorsally on fourth last body annule.

Rostrum (Fig. 4C) with four cephalic and eight subcephalic setae; four CAT; rounded, closed loop-shaped fovea amphidialis (as a unispiral amphid). Buccal cavity with no (or maybe very small) ventral tooth.

Discussion

This female and juvenile are specimens of a new species, but has not yet been given a name as such, because a male is lacking and male characteristics are too important to species descriptions of marine nematodes. It differs from all other *Dracograllus* species by the following: apart from *Dracograllus minutus* DECRAEMER, 1988, it is the smallest draconematid species, with only six CAT, known until now. *Dracograllus spec.* differs from *D. minutus* by its general body shape (*D. minutus* has a more slender body with set-off, enlarged mid-body region); its short, broad rostrum; its small, open loop-shaped amphid (*D. minutus* has a large closed, loop-shaped amphid); by its longer pharynx; by its shorter tail and non-annulated tail end (respectively: t = 52 µm, tmr = 25 µm as compared to t = 69.5 µm, tmr = 32.5 µm; for description of females of *D. minutus* see GOURBAULT & DECRAEMER, 1992).

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