

Nematodes associated with upland rice in South Africa, with a description of *Hemicycliophora oryzae* sp. n. (Nemata : Criconematoidea)

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SUMMARY

Ten plant-parasitic nematode species were found associated with rice in North Natal, South Africa. *Hemicycliophora oryzae* sp. n., *Hemicycliophora typica*, *Hemicriconemoides brachyurus*, *Criconema corbetti*, *Criconemella obtusicaudata*, *Rotylenchus gracilidens*, *Rotylenchus unisexus*, *Brachydorus tenuis*, *Trichodorus* sp. and *Paratrichodorus lobatus* were found in the soil samples; *Pratylenchus zeae* in the roots. The number of plant-parasitic nematodes varied from 2 107 to 3 040 (2 464) nematodes per dm³ of soil and 60 to 660 (345) nematodes per g roots. The plant-parasitic nematodes represented about 1/3 of the total nematode population in the soil. *Hemicycliophora oryzae* sp. n. is described and figured from South Africa. The female is characterized by having a long stylet, a very long, gradually tapering tail with a finely rounded tip, two lip annules, a cuticular sheath which fits closely and a cuticle with 22 to 24 longitudinal rows of regular blocks. Male not found.

RÉSUMÉ

Nématodes associés au riz de plateau en Afrique du Sud, et description de Hemicycliophora oryzae sp. n.

Dix espèces de nématodes phytoparasites ont été trouvées dans les sols rizières du Nord Natal, Afrique du Sud : *Hemicycliophora oryzae* sp. n., *Hemicycliophora typica*, *Hemicriconemoides brachyurus*, *Criconema corbetti*, *Criconemella obtusicaudata*, *Rotylenchus gracilidens*, *Rotylenchus unisexus*, *Brachydorus tenuis*, *Trichodorus* sp. et *Paratrichodorus lobatus*. *Pratylenchus zeae* est présent dans les racines. Le nombre de nématodes phytoparasites varie de 2 107 à 3 040 (2 464) nématodes par dm³ de sol et 60 à 660 (345) nématodes par g de racines. Les nématodes phytoparasites représentent environ un tiers du total du peuplement des nématodes du sol. *Hemicycliophora oryzae* sp. n. est décrit et figuré. La femelle est caractérisée par un long stylet, une très longue queue devenant graduellement plus pointue mais à extrémité arrondie, deux anneaux labiaux, un feuillet cuticulaire externe peu détaché et orné de 22 à 24 rangées longitudinales de blocs réguliers. Le mâle n'a pas été observé.

Rice cultivation in South Africa is limited to some local, traditional cultivation by black small farmers in North Natal and to a small number of project sites, mostly situated in the so-called black states (e. g. Bophuthatswana, Kangwane, Kwazulu). This paper deals with the nematodes associated with upland rice at a project site in the Makatini Flats, North Natal and is the first study of the occurrence of nematodes on rice in South Africa.

The collection site (the rice fields of the rice project of the Industrial Development Corporation) is located in the Ngwavuma District, North Natal, between 27° 00' and 27° 15' S latitude and 32° 45' E longitude at an elevation of 50 m above sea level. The region has a subtropical, subhumid climate with an annual rainfall between 600 and 800 mm, most rainfall occurring between November and March. The mean temperature ranges from 19° (July) to 25° (January).

Soil and root samples were collected from four rice plants, approximately 20 m apart from each other, in a

wet sandy soil, by Dr. J. A. M. van der Mey on 21st February 1985. The soil nematodes were extracted by the decanting and sieving method (Flegg, 1967) using 710 and 45 µm aperture sieves, followed by the sugar centrifugal-flotation method (Jenkins, 1964). The root nematodes were extracted by the sugar centrifugal-flotation method (Coolen & D'Herde, 1972). The extracted nematodes were killed and fixed in hot 4 % formalin. Nematode population levels were determined in a counting dish under a stereoscopic microscope. For species identification plant-parasitic nematodes were transferred to anhydrous glycerin (De Grisse, 1969) and mounted on slides, by means of the paraffin-ring method.

Ten plant-parasitic nematode species were found in the soil samples : *Rotylenchus gracilidens* (Sauer, 1958) Sauer, 1958 and *Paratrichodorus lobatus* (Colbran, 1965) Siddiqi, 1974 occurred in all soil samples; *Hemicriconemoides brachyurus* (Loos, 1949) Chitwood & Birchfield, 1957 in three soil samples; *Hemicycliophora oryzae*

sp. n., *Criconemella obtusicaudata* (Heyns, 1962) Heyns, 1970 and *Rotylenchus unisexus* Sher, 1965 in two soil samples; *Hemicycliophora typica* de Man, 1921, *Criconema corbetti* (De Grisse, 1967) Raski & Luc, 1984, *Brachydorus tenuis* de Guiran & Germani, 1968 and *Trichodorus* sp. in one soil sample. One nematode species, *Pratylenchus zaeae* Graham, 1951, was found in all root samples. The total number of nematodes in the soil samples varied from 6 934 to 8 454 (7 649) nematodes per dm³ of soil, of which about 1/3 were plant-parasitic nematodes : 347 to 1 040 Criconematoidea, 640 to 1 580 Hoplolaimidae and Dolichodoridae, 160 to 1 120 Trichodoridae. The number of *P. zaeae* in the roots varied from 60 to 660 (345) nematodes per g roots.

Only *P. zaeae* has previously been reported from rice in North America (Atkins, Fielding & Hollis, 1957), South America (Monteiro, 1968; Loof, 1974) and Africa (Oteifa, 1962; Merny, 1970; Samsoen & Geraert, 1975; Fortuner, 1975; Babatola, 1984). *H. oryzae* sp. n., *R. gracilidens*, *B. tenuis* and the *Trichodorus* sp. (a new species to be described later) are new species for South Africa.

It is not known if the plant-parasitic nematode species identified can affect growth of rice plants.

***Hemicycliophora oryzae* sp. n.**

(Fig. 1)

MEASUREMENTS

*Females** (n = 16) : L = 1.09 mm ± 0.05 (0.99-1.19); a = 23.4 ± 2 (19.3-25.6); b = 6.3 ± 0.2 (6.0-6.5); c = 5.1 ± 0.6 (4.1-6.1); o = 6.1 ± 1 (4.6-7.7); V = 72 ± 1.8 (69-74); stylet = 114 µm ± 3 (110-121); R = 267-319; RSt = 27-36; ROes = 43-55; Rex = 42-59; RV = 68-90; RVan = 17-27; Ran = 46-71; PV/ABW = 8.9 ± 0.8 (7.5-10.1); T/ABW = 6.1 ± 0.8 (4.7-7.1); VA%T = 50.0 ± 7.6 (39.7-66.5); VL/VB = 7.6 ± 0.7 (6.8-9.5); St%L = 10.5 ± 0.6 (9.5-11.4).

Juveniles (n = 5) : L = 1.03 mm ± 0.1 (0.87-1.13); a = 26.7 ± 3 (25-32); c = 5.8 ± 0.6 (5.3-6.3); stylet = 98 µm ± 8 (83-104); R = 303-342; RSt = 25-37; Ran = 61-69; T/ABW = 6.9 ± 1.3 (5.9-8.5); St%L = 9.5 ± 0.5 (9.0-10.2).

Holotype (female) : L = 1.19 mm; a = 25.3; b = 6.5; c = 5.8; V = 74; stylet = 114 µm; R = 296; RSt = 30; ROes = 48; Rex = 52; RV = 78; RVan = 21; Ran = 57; PV/ABW = 8; T/ABW = 5.4; VA%T = 49.5; VL/VB = 7.3; St%L = 9.6.

* All measurements of females were made across the outer cuticle. The number of annules for the RSt, Rex and ROes values, however, were counted on the inner cuticle because in all specimens the outer cuticle was folded over the lip region thus making it difficult to count the exact annule number.

DESCRIPTION

Female : Body ventrally arcuate. Cuticular sheath closely fitting over whole length of body except on tail. Lateral field not distinct among the cuticular blocks on the first half of the body, but from about middle of body onwards consisting of mostly two rows of blocks with the

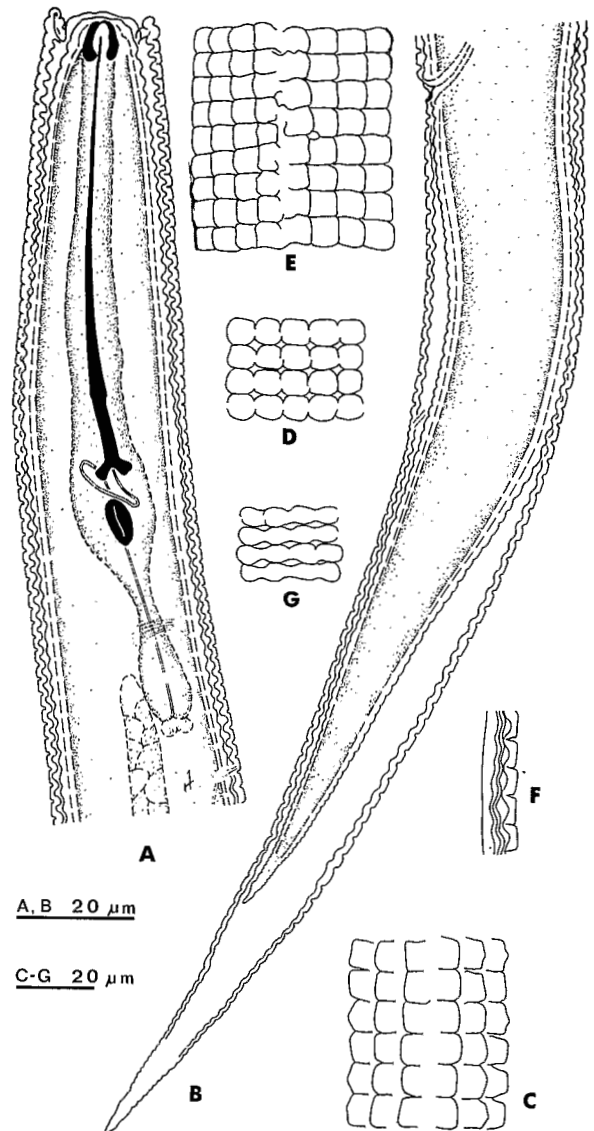


Fig. 1. *Hemicycliophora oryzae* sp. n. A : Female head region (holotype); B : Posterior part (holotype); C : Cuticular ornamentation on tail; D : Cuticular ornamentation just opposite basal part of cesophageal lobe; E : Lateral field and cuticular ornamentation opposite middle of body; F : Outer cuticle outline showing flattened annules; G : Cuticular ornamentation just posterior to lip region.

middle line between the blocks irregular or a break in the striae, continuing as such right on to the tail where the lateral field eventually disappears between the surrounding cuticular blocks. Cuticle outside lateral field with 22 to 24 rows of regular blocks appearing almost like the kernels on a maize cob. Lip region rounded with two annules, $22 \mu\text{m} \pm 1.5$ (20.0-23.5) wide and $11 \mu\text{m} \pm 1$ (10.5-12.5) high. Labial disc does not appear elevated above the first lip annule. Cephalic framework heavily sclerotized. Stylet slender, curved dorsally. Metenchium $92.5 \mu\text{m} \pm 2.5$ (88.5-97.5) long and telenchium $21 \mu\text{m} \pm 2.5$ (18.5-26.5) long. Stylet knobs sloping anteriorly and almost flattened posteriorly with a large cavity; knobs $9 \mu\text{m} \pm 0.5$ (7.5-9.5) wide and $4 \mu\text{m} \pm 0.5$ (3.5-5.0) high. Opening of dorsal oesophageal gland seen in a few specimens, $7 \mu\text{m} \pm 1$ (5-9) from base of stylet knobs. Length of oesophagus $130 \mu\text{m} \pm 5$ (123-138) from anterior end of body to middle of valve of median bulb and $48 \mu\text{m} \pm 7$ (35-59) from this point to posterior margin of oesophageal lobe. Hemizonid not seen in any of the specimens. Excretory pore situated from opposite basal margin of oesophageal lobe to four annules posterior to it, $179 \mu\text{m} \pm 11$ (165-199) from anterior end of body. Width at mid-body $47.5 \mu\text{m} \pm 3.5$ (42-56) and at excretory pore $47 \mu\text{m} \pm 2$ (44.5-49.0). Outer cuticle annules flattened, $4 \mu\text{m} \pm 0.5$ (3.5-5.0) wide at mid-body. Distance between vulva and anus $103 \mu\text{m} \pm 9$ (88-115). Vulval lips not modified and no vulval flap observed. Tail $218 \mu\text{m} \pm 27$ (173-271) long, tapering gradually to a finely rounded tip. In some specimens the tail annulation does not extend right to the tip of the tail. Spermatheca in only a few specimens filled with roundish sperm, round, 4-5 annules long and situated 18-27 annules anterior to vulva.

Male: Not found.

Juvenile: Similar to female. Lip region $17.5 \mu\text{m} \pm 2$ (16-20) wide and $8 \mu\text{m} \pm 1$ (7-9) high. Metenchium $80 \mu\text{m} \pm 6$ (69-84) long and telenchium $17.5 \mu\text{m} \pm 2.5$ (14.5-21.0) long. Excretory pore seen in one specimen only, $158 \mu\text{m}$ from anterior end. Tail $187 \mu\text{m} \pm 24$ (162-212) long.

TYPE HABITAT AND LOCALITY

Wet soil around the roots of *Oryza sativa* L., rice project site of the Industrial Development Corporation, Ngwavuma District, North Natal, South Africa. Collected by J. A. M. van der Mey on 21 Feb. 1985.

DIAGNOSIS AND RELATIONSHIP

The females of *Hemicycliophora oryzae* sp. n. are characterised by having two annules in the lip region, a long stylet, a cuticle with 22 to 24 rows of regular blocks and a very long, gradually tapering tail resulting in a small c-value. No males found.

The females of this new species can be distinguished from the females of *H. typica* de Man, 1921, which also have blocks on the cuticula, by their greater body length (993-1189 μm vs 549-986 μm in *H. typica* from South Africa reported by van den Berg, 1981), greater stylet length (110-121 μm vs 49-77 μm in *H. typica*) and the very long gradually tapering tail (tail shorter and tapering more abruptly in last third in *H. typica*). *H. oryzae* sp. n. also resembles *H. charlestoni* Reay, 1984 and *H. halophila* Yeates, 1967. The females of *H. oryzae* sp. n. can be distinguished from the females of *H. charlestoni* in having two lip annules (vs three lip annules in *H. charlestoni*), outer cuticle closely fitting (vs loosely fitting in *H. charlestoni*) and in having a much longer tail (173-271 μm vs 101-152 μm in *H. charlestoni*) which tapers gradually to a finely rounded tip (tail cylindrical, abruptly narrowing to a rounded terminus in *H. charlestoni*) resulting in a smaller c-value (4.1-6.1 vs 8.2-12.4 in *H. charlestoni*). The females of *H. oryzae* sp. n. can be distinguished from the females of *H. halophila* (compared with the South African specimens reported by van den Berg and Heyns, 1977) in having more body annules (267-319 vs 194-219 in *H. halophila*), much longer tail (173-271 μm vs 68-83 μm in *H. halophila*) which tapers gradually (tail cylindrical, suddenly narrowing to a conoid tip in *H. halophila*) resulting in a much smaller c-value (4.1-6.1 vs 11.9-12.7 in *H. halophila*).

TYPE SPECIMENS

Holotype female (slide 22622), sixteen paratype females and five paratype juveniles (slides 22622-22626) deposited in the National Collection of Nematodes, Plant Protection Research Institute, Pretoria, Republic of South Africa. Two paratype females and two paratype juveniles deposited in the collection of the Laboratoire des Vers, Muséum national d'Histoire naturelle, Paris, France.

Rotylenchus gracilidens (Sauer, 1958) Sauer, 1958 (Fig. 2)

MEASUREMENTS

Females (n = 10): L = 1.09 mm \pm 0.1 (0.98-1.32); a = 28.9 \pm 2.1 (26.7-33.3); b = 6.8 \pm 0.5 (6.1-7.8); b' = 7.9 (7.1-8.9); c = 47.7 \pm 4.8 (39.9-54.1); c' = 0.8 \pm 0.1 (0.7-1.1); o = 13.9 (11.5-18.1); V = 54 \pm 1 (53-56); stylet = 31 $\mu\text{m} \pm$ 1 (29-32).

Males (n = 10): L = 1.02 mm \pm 0.28 (0.95-1.05); a = 30.3 \pm 1.2 (28.3-32.8); b = 6.8 \pm 0.5 (6.0-7.8); b' = 8.0 \pm 0.5 (7.4-8.7); c = 33.0 \pm 1.9 (30.3-36.1); c' = 1.5 \pm 0.1 (1.3-1.7); o = 10.3 \pm 3.2 (7.5-15.6); stylet = 28 $\mu\text{m} \pm$ 1 (27-30); spicules = 38 $\mu\text{m} \pm$ 2 (35-41); gubernaculum = 18 $\mu\text{m} \pm$ 0.5 (17.5-19.0); capitulum = 11 $\mu\text{m} \pm$ 0.5 (10.5-12.0).

DESCRIPTION

Female : Body ventrally curved into an open C. Lip region rounded, $12 \mu\text{m} \pm 1$ (10.5-14.0) wide and $7.5 \mu\text{m} \pm 0.5$ (6.5-9.0) high, set off with four annules. Labial framework very well developed, outer margins reaching posteriorly 1 to 1.5 annules from basal plate. Stylet knobs flattened or very slightly concave anteriorly, $7 \mu\text{m} \pm 0.5$ (6.0-7.5) wide and $3 \mu\text{m} \pm 0.5$ (3.0-3.5) high. Metenchium varying from slightly shorter to slightly longer than telenchium ($m = 49-52\%$). Dorsal oesophageal gland opening $4 \mu\text{m} \pm 0.5$ (3.5-5.5) from base of stylet knobs. Median bulb rounded, $17.5 \mu\text{m} \pm 1$ (16.5-20.0) long and $15 \mu\text{m} \pm 1$ (14.0-16.5) wide. Length of oesophagus $91 \mu\text{m} \pm 4.5$ (84-97) from anterior end to middle of median bulb and $69 \mu\text{m} \pm 4.5$ (61-79) from middle of median bulb to basal margin of oesophageal lobe. Length of oesophageal overlap over intestine $22.5 \mu\text{m} \pm 5.5$ (16-31). Position of excretory pore varying from opposite posterior part of isthmus to opposite posterior part of oesophageal lobe, $135 \mu\text{m} \pm 6$ (125-142) from anterior end of body. Hemizonid 1.5 to 2 annules long, situated opposite excretory pore or 2 annules posterior to it. Hemizonion not seen. Anterior and posterior cephalids seen in two specimens only, situated three and nine or ten annules from base of lip region. Body width at mid-body $38 \mu\text{m} \pm 3.5$ (31.5-44.0) and at excretory pore $34.5 \mu\text{m} \pm 2$ (31-38). Width of annules at mid-body $2.5 \mu\text{m} \pm 0.5$ (2-3). Lateral field $9 \mu\text{m} \pm 0.5$ (8.0-10.5) wide, areolated indistinctly opposite oesophageal area but not on the rest of the body or tail. No irregular longitudinal lines observed on cuticle outside lateral field. Ovaries not clearly seen due to granules in the body cavity; spermatheca seen in three specimens only, round, filled with roundish sperm. Epiptygma double. Intestinal overlap over rectum varies from no overlap to quite a long overlap. Caudalid not seen. Phasmids situated from 12 to 24 annules anterior to anus. Tail rounded, with 10 to 18 annules, $23 \mu\text{m} \pm 4.5$ (19-33) long.

Male : Similar to female. Lip region $12 \mu\text{m} \pm 0.5$ (11.5-12.5) wide and $7.5 \mu\text{m} \pm 0.5$ (6.5-8.0) high. Stylet knobs $5.5 \mu\text{m} \pm 0.5$ (5.0-6.5) wide and $3 \mu\text{m} \pm 0.5$ (2.5-3.5) high. Metenchium varying from slightly shorter to longer than telenchium ($m = 49-57\%$). Dorsal oesophageal gland opening $3 \mu\text{m} \pm 1$ (2.0-4.5) from base of stylet knobs. Median bulb $16 \mu\text{m} \pm 1.5$ (14.5-17.5) long and $13.5 \mu\text{m} \pm 1.5$ (12-15) wide. Anterior part of oesophagus $85 \mu\text{m} \pm 4$ (77-93) from anterior end of body to middle of median bulb and posterior part of oesophagus $65 \mu\text{m} \pm 9$ (54-80) from middle of median bulb to basal margin of oesophageal lobe. Oesophageal overlap over intestine $19 \mu\text{m} \pm 7$ (11.5-28.5). Excretory pore situated from opposite posterior part of isthmus to opposite middle of oesophageal lobe, $122 \mu\text{m} \pm 9$ (108-138) from anterior end of body. Hemizonid seen in a few specimens, two annules long and situated

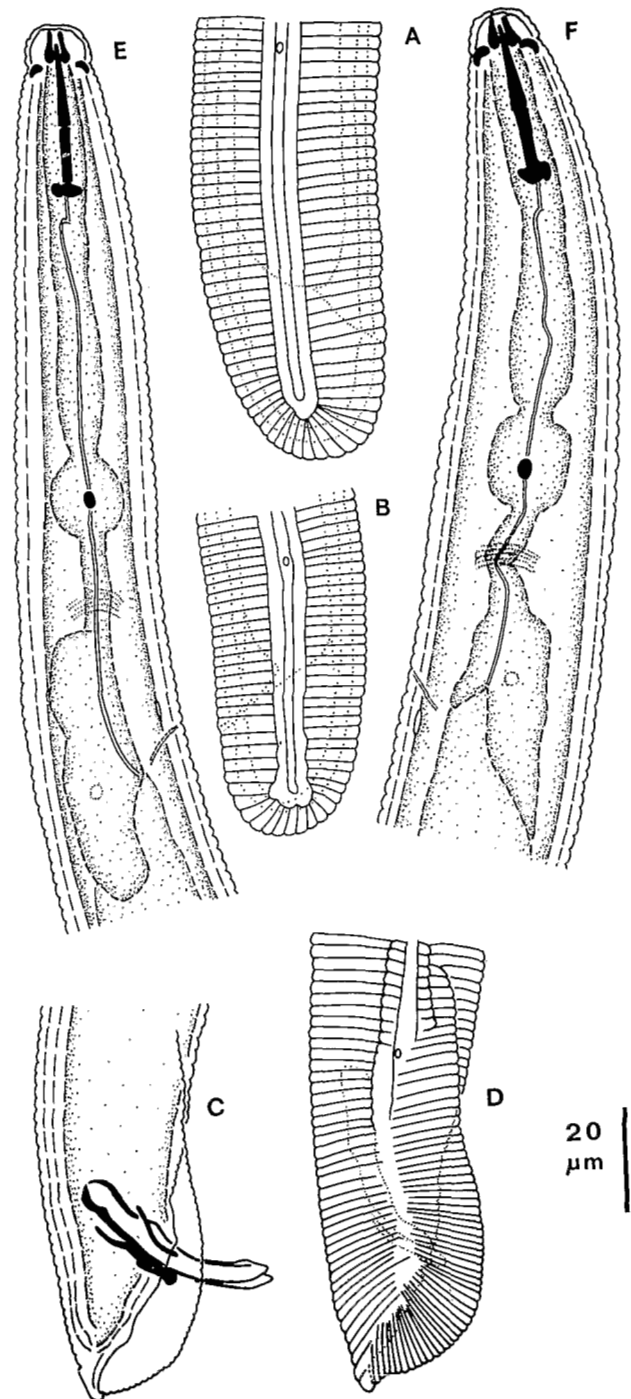


Fig. 2. *Rotylenchus gracilidens*. A, B : Female tail regions showing differences in lateral field and position of phasmids; C : Male tail region (internal view); D : Male tail region (external view); E : Neck region (male); F : Neck region (female).

opposite or slightly posterior to the excretory pore. Hemizonion not seen. Width at mid-body $33.5 \mu\text{m} \pm 1$ (31.5-35.5) and at excretory pore $29 \mu\text{m} \pm 1.5$ (27-31). Width of annules at mid-body $2 \mu\text{m} \pm 0.5$ (2-3). Lateral field $8.5 \mu\text{m} \pm 0.5$ (7.5-9.0) wide, areolated opposite cesophageal area and slightly areolated at posterior ending on bursa. Cuticle outside lateral field with no longitudinal markings. Phasmids situated about one to two cloacal body widths anterior to cloaca. Tail $31 \mu\text{m} \pm 2$ (28-34) long.

DISCUSSION

The specimens from North Natal come very close to *R. goodeyi* Loof & Oostenbrink, 1958, *R. laurentinus* Scognamiglio & Talame, 1972 and *R. usitatus* van den Berg & Heyns, 1974.

When comparing the specimens from North Natal with redescrptions of *R. goodeyi* by Coomans (1962) and Sher (1965) the following differences were noticed : larger body length of females and males (0.95-1.32 mm vs 0.69-1.06 mm in *R. goodeyi*), absence of irregular longitudinal lines on the cuticle outside the lateral field (longitudinal markings opposite the cesophageal region and opposite the anterior part of the intestine in *R. goodeyi*), phasmids in females situated more anteriorly (12-24 annules anterior to anus vs 1-11 annules in *R. goodeyi*), longer tail in females (19-33 μm vs 11-22 μm in *R. goodeyi*), longer spicule, gubernaculum and capitulum length (35-41 μm , 17-19 μm and 10-12 μm vs 25-31 μm , 12-15 μm and 7-8 μm , respectively, in *R. goodeyi*).

The specimens from North Natal can be distinguished from *R. laurentinus* as redescrbed by Vovlas, Cham and Hooper (1980) by the absence of longitudinal striations on the cuticle (vs irregular longitudinal striations which intersect the transverse annulation to give a " tiled " effect in *R. laurentinus*) and by the more anterior position of the phasmids in the females (12-24 annules anterior to anus vs 3-8 annules in *R. laurentinus*).

From *R. usitatus* the specimens from North Natal can be distinguished by the more rounded and longer tail in the females (19-33 μm vs 20-26.5 μm and narrowly rounded in *R. usitatus*), by the greater stylet length in the males (27-29.5 μm vs 20.5-25.0 μm in *R. usitatus*) and by the longer spicule, gubernaculum and capitulum length (35.5-41.0 μm , 17.5-19.0 μm and 10.5-12.0 μm vs 27.0-28.5 μm , 12.5-14.0 μm and 7.5-9.5 μm , respectively, in *R. usitatus*).

The specimens from North Natal most closely fit the original description (Sauer, 1958) and redescription (Sher, 1965) of *R. gracilidens*. Differences are the absence of longitudinal lines on the cuticle outside the lateral field in the North Natal specimens (longitudinal lines present according to Sauer, 1958 and Sher, 1965) and the slightly shorter spicule, gubernaculum and

capitulum length (35.5-41.0 μm , 17.5-19.0 μm and 10.5-12 μm in the North Natal specimens vs 29-34 μm , 12-16 μm and 7-10 μm , respectively). These differences, however, are not regarded as sufficient to erect a new species and the specimens from North Natal are therefore regarded as conspecific with *R. gracilidens*.

Brachydorus tenuis de Guiran & Germani, 1968 (Fig. 3)

MEASUREMENTS

Females (n = 4) : L = 1.09 mm (1.04-1.12); a = 39.7 (38.5-41.4); b = 6.9 (6.3-7.3); c = 10.2 (10-10.3); V = 51.5 % (48.5-53.5); G₁ = 24.6 % (22-29.2); G₂ = 22.1 % (18-26.9); stylet = 22.5 μm (22-24).

Males (n = 3) : L = 0.94 mm (0.88-0.98); a = 35.2 (33.8-36.4); b = 6 (5.7-6.3); c = 37.3 (31.5-40.8); T = 59.1 % (51.2-63.4); stylet = 21.5 μm (21-22); spicules = 27.5 μm (27-28); gubernaculum = 11.5 μm (10.5-12).

DESCRIPTION

Female : Head slightly set off from body, 7.5-8 μm in diameter, 4-4.5 μm high, bearing four to five fine annules.

Cephalic framework strongly sclerotized. Amphidial apertures not evident. Stylet well developed, 22-24 μm , i. e. 3 times the head diameter; cone length about half total stylet length; basal knobs prominent, rounded with slightly flattened anterior surfaces. Dorsal gland orifice about 3 to 4 μm posterior to knobs of spear. CEsophagus typical of the genus : procorpus long and slender, enlarging to muscular metacarpus with large sclerotized valva; isthmus narrow; posterior bulb ovate. Nerve ring encircling basal portion of the isthmus. Excretory pore and canal observed in only two females at 102 and 134 μm from the anterior end of the body, located slightly anterior to the basal bulb. Hemizonid not observed. " Serpentine duct " (de Guiran & Germani, 1968) observed inside the intestine of two females. Gonads amphidelphic, outstretched. Vagina 12-16 μm i. e. 46.2-59.3 % of the corresponding body width, with pronounced sclerotizations; proximal end of oviduct with conspicuous spermatheca; oocytes sometimes in several rows in germinal zone. Tail elongate-conoid, terminus fine. Body annules 2-2.5 μm wide. Lateral field with four longitudinal incisures, 9.5-11.5 μm wide, occupying about 40 % of body width in mid-body region. Phasmid pore-like, situated 7-9 annules or 16-20 μm posterior to anus.

Male : Body similar to females, slightly shorter in total body length. " Serpentine duct " observed inside the intestine of all males. Testis single, outstretched. Spicules

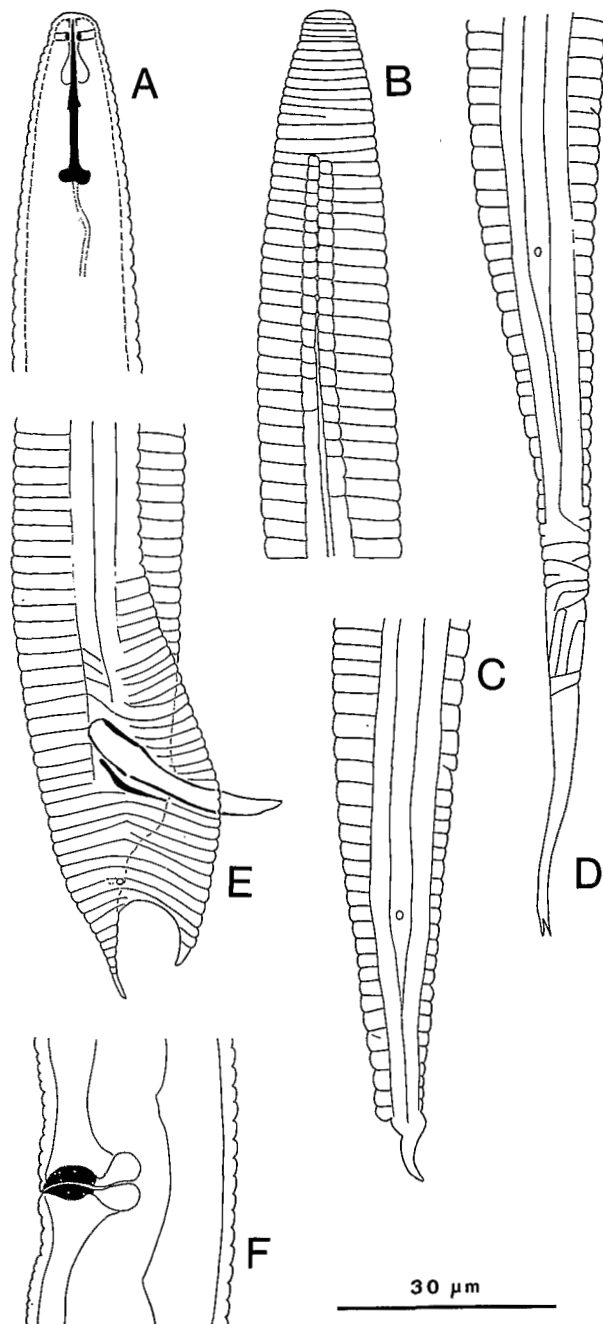


Fig. 3. *Brachydorus tenuis*. A : Head region (male); B : Neck region showing beginning of lateral field (male); C : Tail region, tail tip broken (female); D : Tail region showing ending of lateral field (female); E : Tail region (male); F : Vulva-vagina region.

massive, slightly curved. Tail narrowing abruptly behind cloacal opening, terminus rounded. Bursa trilobed, bearing fine annulations, 1-1.5 μm wide. Phasmids pore-like, situated about half the distance from anus to tail tip.

DISCUSSION

The present specimens agree in most details with the original description except that the head shows four to five fine annules. A smooth head has been considered by Koshy, Raski and Sosamma (1981) one of the morphological characters distinguishing the genera *Brachydorus* and *Dolichodorius*.

B. tenuis has been described from Madagascar and not reported again until the present study. *B. swarupi* Koshy, Raski & Sosamma, 1981, the only other *Brachydorus* species described, occurs only in South India. Apparently, the geographical distribution of the genus *Brachydorus* is rather restricted.

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