One new and some known plant parasitic nematode species from the French Caribbean (Nemata : Tylenchina)

Esther VAN DEN BERG and Patrice CADET

Plant Protection Research Institute, Private Bag X134, Pretoria 0001, Republic of South Africa, and Laboratoire de Nématologie, ORSTOM, B.P. 8006, 97259 Fort de France Cedex, Martinique.

SUMMARY

One new species is described and figured from Martinique: Helicotylenchus minutus sp. n. is characterized by a combination of characters viz. a tail shape which is not commonly found in the genus, the female having a long, irregular ventral tail projection with a finely rounded terminus also with a mucro on the tip; small size of the females and males; a slightly more posteriorly situated vulva than which is normally found; a low broadly rounded lip region, and a long oesophagus resulting in a low \( b \) value in both sexes. Hemicycliophora andrassyi Brzeski, 1974 males are described for the first time; a complete description, figures and SEM photos are also given for the females. Measurements are given for the twelve little known species collected in Martinique and French Guyana while figures and SEM photographs or descriptions are given for some of the species.

RéSUMÉ

Une nouvelle espèce et quelques espèces déjà connues de nénatodes parasites des plantes provenant de la Caraïbe française (Nemata : Tylenchina)

Une nouvelle espèce, provenant de la Martinique, est décrite et illustrée; Helicotylenchus minutus sp. n. est caractérisé par la combinaison suivante de caractères : queue de forme non fréquente dans le genre — la queue de la femelle est pourvue d’une longue projection ventrale irrégulière à extrémité arrondie portant un mucron pointu et la queue du mâle comporte également un appendice à extrémité arrondie avec mucron; faible taille des femelles et des mâles; vulve située plus postérieurement que la normale; région labiale large et basse; oesophage long et, corrélativement, faible valeur du coefficient \( b \) chez les deux sexes. Le mâle d’Hemicycliophora andrassyi Brzeski, 1974 est décrit pour la première fois; une description détaillée, accompagnée de dessins et de photographs au MEB, est également donnée pour les femelles. Des données morphométriques sont rapportées pour douze espèces peu connues recoltées en Martinique et en Guyane, ainsi que, pour certaines espèces, des dessins et des photographies au MEB.

Extensive collections in agricultural areas as well as natural vegetation were done during 1989 in Martinique, French Guyana and Guadeloupe. Specimens of an undescribed Helicotylenchus species were found and are here-in described as new. The males of Hemicycliophora andrassyi Brzeski, 1974 are described for the first time and the females are also described and figured. Measurements are given for twelve little known species collected in Martinique and French Guyana while figures and SEM photographs are given for some of the species. For some, additional descriptions are given to supplement older or inadequate descriptions. The twelve species studied are Aorolaimus luci (Sher, 1964) Fortuner, 1987, Aphasmatylenchus nigritiensis Sher, 1965, Criconemella onoensis (Luc, 1959) Luc & Raski, 1981, C. ornata (Raski, 1958) Luc & Raski, 1981, Criconemona permistum (Raski & Golden, 1966) Raski & Luc, 1985, Gracilacus aonli (Misra & Edward, 1971) Raski, 1976, Hoplolaimus seinhosti Luc, 1958, Neodolichodorus rostrulatus (Siddiqi, 1976) Siddiqi, 1977, Ogma decaliniteum (Chitwood, 1957) Andrassy, 1979, Paratylenchus elachistus Steiner, 1949, P. minutus Linford in Linford, Oliveira & Ishii, 1949 and P. perlatus Raski, 1975.

The nematodes were extracted from the soil according to the method of Seinhorst (1962), killed with the gradual application of heat, preserved in TAF and permanently mounted on aluminium slides according to the slow method of Goodey (1957). Measurements and drawings were made under the light microscope at a magnification of 1360. Nematodes used for scanning electron microscopy were fixed in TAF for ± 2 weeks. Subsequently they were dehydrated in increasing concentrations of alcohol, then transferred to increasing concentrations of amylacetate in pure alcohol and finally

into pure amylacetate. Critical point drying and gold/palladium coating (250 Å) were carried out in the conventional way. Specimens were viewed in a JEOL JSM-35 scanning electron microscope at 15 kV.

**Neodolichodorus rostrulatus** (Siddiqi, 1976) Siddiqi, 1977

A few specimens were collected on the beach at Le Diamant in the south of Martinique. They are very similar to the specimens redescribed from Senegal (Luc, Coomans & Sarr, 1987).

**Measurements**

**Female** (n = 2) : L = 1.650 mm; 1.720 mm; a = --; 33.1; b = 7.4; 7.3; c = 99.5; 97.4; c' = 0.5; 0.5; o = 3.5; 3.7; V = 51; 54; stylet = 93 μm; 89.3 μm; tail = 15.5 μm; 17.6 μm.

**Male** (n = 1) : L = 1.260 mm; b = 6.6; c = 49.1; c' = 1.1; o = 3.8; stylet = 86.3 μm; spicules = 46.7 μm; gubernaculum = 18.7 μm; tail = 25.7 μm.

**Hoplolaimus seinhorsti** Luc, 1958

(Fig. 1)

Several specimens of this species were collected from tomato in Martinique and cowpea in French Guyana. SEM photographs are given to illustrate this species from the French Carribean.

**Measurements**

**Females** (n = 10) : L = 1.190 mm ± 137.8 (1.040-1.420); a = 33.6 ± 4.3 (28.2-37.8); b = 6.4 ± 0.8 (5.5-7.5); b' = 8.1 ± 0.7 (7.3-9.0); c = 55.5 ± 7.7 (47.1-67.9); c' = 0.7 ± 0.1 (0.6-1); o = 11 ± 1 (9.5-13.1); V = 56 ± 1.4 (54-58); stylet = 41.6 μm ± 1.4 (39.4-43.8); dorsal oesophageal gland opening 4.6 ± 0.3 (4-5.2) μm from base of stylet knobs; excretory pore 126 ± 6.3 (115-136) μm from anterior end; oesophageal gland overlap over intestine 36.7 ± 9.8 (26.5-48.9) μm; anterior phasmid = 31 ± 1.4 (29-32)%; posterior phasmid = 78 ± 3.5 (74-82)%; tail 21.9 ± 2.9 (18-28.7) μm long.

**Helicotylenchus minutus** sp. n.

(Fig. 2)

**Measurements**

**Females** (Paratypes, n = 11) : L = 0.400 mm ± 23.7 (0.350-0.430); a = 27.9 ± 3.2 (21.7-34.1); b = 3.3 ± 0.2 (3.2-3.5); c = 23.6 ± 1.6 (20.8-26.4); c' = 1.9 ± 0.1 (1.7-2); o = 49.2 ± 4.1 (43.8-57.3); V = 66 ± 0.7 (65-68); stylet = 20.9 μm ± 1 (19.5-22.4).

**Males** (Paratypes, n = 7) : L = 0.370 mm ± 11 (0.350-0.380); a = 27.2 ± 1.5 (25.3-28.6); b = 3.4 ± 0.2 (3.2-3.8); c = 24.5 ± 2.5 (21.4-27.6); c' = 1.6 ± 0.2 (1.3-1.8); o = 47.8 ± 4 (41-52.7); stylet = 18.8 μm ± 0.6 (18.4-19.9); spicules = 16.9 μm ± 0.7 (15.8-18); gubernaculum = 5.3 μm ± 0.7 (4.4-6.3).

**Holotype** (Female) : L = 0.380 mm; a = 27.8; b = 3.3; c = 22.9; c' = 2; o = 45.6; V = 66; stylet = 21.7 μm.

**Description**

**Females** : Body mostly curved ventrally into C. Lip region low, broadly rounded, not set off with four indistinct annuli, 4.8 ± 0.5 (4-5.5) μm wide and 2.8 ± 0.3 (2.6-3.7) μm high. Labial framework well developed. Stylet moderately developed. Stylet knobs robust flattened to slightly hollow anteriorly, 4.4 ± 0.4 (3.7-5.1) μm wide and 2.2 ± 0.4 (1.8-2.6) μm high. Metenchiun shorter than telenchiun (m = 45-49 %). Dorsal oesophageal gland opening 10.2 ± 0.8 (9.2-11.4) μm from base of stylet knobs. Median bulb ovate, 10.9 ± 0.6 (9.9-11) μm long and 7.6 ± 0.8 (6.6-8.8) μm wide. Oesophagus 57 ± 2.1 (55-60) μm from anterior end to middle of valve of median bulb and 68 ± 5.6 (61-75) μm from middle of valve of median bulb to end of oesophageal glands. Excretory pore located from opposite middle to opposite posterior part of isthmus, 78 ± 5.5 (67-83) μm from anterior end of body. Hemizonid one and a half to two annuli long, situated from opposite to two annuli anterior to excretory pore. Hemizonion one annule long, situated eight annuli posterior to hemizonid. Anterior and posterior cephalids situated four and nine or ten annuli posterior to basal plate respectively. Width at midbody 14.6 ± 1.4 (12.1-16.9) μm and at excretory pore 13.4 ± 1.5 (12.1-16.5) μm. Width of annuli at midbody 1 ± 0.3 (0.7-1.5) μm. Lateral field with four lines 2.8 ± 0.5 (2.2-3.7) μm wide, areolated opposite oesophageal region, not on rest of body nor on tail; ending of lateral field on tail difficult to discern, the inner two lines do not appear to fuse or meet but appear to continue to tail end. Spermaticheca distinct, in most specimens filled with rounded sperm. Epitpygma appears present and double situated deeper into the vagina. Two cuticular flaps are seen on each side of the vulva. No intestinal overlap over rectum. Phasmid situated from opposite to eight annuli anterior to anus. Caudalid not seen. Tail 17.2 ± 1.4 (15.8-20.6) μm long with a long, ventral, irregularly annulated projection, sometimes slightly curved dorsally; terminus finely rounded with a single sharp-pointed mucro on the tip; tail with ten to fifteen ventral annuli.
Fig. 1. *Hoplolaimus seinhorstii* Luc, 1958 Female. A-C: Lateral view of three lip regions; D-F: *En face* view of three lip regions; G: Tail, ventral view; H: Tail, lateral view; I: Posterior phasmid. (*Bars* = 5 μm).

Males: Similar to female except for sexual characters. Dorsal oesophageal gland opening $9 \pm 0.7 \text{(7.7-9.1)} \mu m$ from base of stylet knobs. Phasmid situated from just posterior to just anterior to cloaca. Bursa crenate and narrow, ending just anterior to tail terminus; tail ending peg-like with a finely rounded terminus with a mucro on the tip. Spicules very slightly curved with tips sharply pointed. Gubernaculum very slightly curved, does not appear to protrude; titillae not seen.

**Type specimens**

Holotype (female; slide 24770) and eighteen paratype females and males (slides 24770-24774) deposited in the National Collection of Nematodes, Plant Protection Research Institute, Pretoria, Republic of South Africa. Twelve paratype females and males deposited in the collection of the Laboratoire des Vers, Muséum national d'Histoire naturelle, Paris, France.

**Type locality**

Specimens collected by P. Cadet in May 1989 on the Pelee volcano in Martinique. The specimens were collected at an altitude of 1250 m in the caldera, at the top of the volcano with a rainfall of ca 9 m/year.

**Diagnosis and relationships**

This new species is characterized by a combination of characters which separates it from all other species in the genus, viz. a tail shape which is not commonly found in the genus, the female having a long, irregular ventral tail projection with a finely rounded terminus with a single sharp pointed mucro on the tip and the male tail ending peg-like with a finely rounded terminus also with a mucro on the tip; small size of the females and males; a slightly more posteriorly situated vulva than which is normally found; a low, broadly rounded lip region, and a long oesophagus resulting in a low $b$ value in both sexes.

Although there are a number of species in the genus with pointed ventral projections as well as mucros on their tails, five of them are more closely related to *H. minutus* sp. n. in body length, stylet length, lip form and number of lip annuli etc. This new species is, however, separated from them in a combination of these characters which are presented in Table 1 for the females and Table 2 for the two of the five species in which males have thus far been found.

*Aorolaimus luci* (Sher, 1964) Fortuner, 1987

(Fig. 3 A-G)

This species was originally described from pineapple from Martinique. Now a few specimens were collected from pineapple in French Guyana. Their measurements and description are given below.

Table 1
Comparison of females of *Helicotylenchus minutus* sp. n. with closely related species

| Characters                      | *Helicotylenchus minutus* sp. n. | *Helicotylenchus apiculus* Roman, 1965 | *Helicotylenchus cenus* Knobloch & Nguyen Vu 
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>11</td>
<td>?</td>
<td>?</td>
<td>10</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td><strong>L (mm)</strong></td>
<td>0.404 (0.352-0.432)</td>
<td>0.5-0.6</td>
<td>0.59-0.65</td>
<td>0.6 (0.52-0.65)</td>
<td>0.56 (0.52-0.61)</td>
<td>0.54 (0.40-0.95)</td>
</tr>
<tr>
<td><strong>a</strong></td>
<td>3.3 (3.2-3.5)</td>
<td>4.2-5.7</td>
<td>4.8-6.0</td>
<td>4.2 (3.7-4.6)</td>
<td>4.6 (4.4-4.8)</td>
<td>5.5 (5-6)</td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>23.6 (20.8-26.4)</td>
<td>30-41</td>
<td>36-45</td>
<td>29 (23-33)</td>
<td>23 (21-26)</td>
<td>20 (26-33)</td>
</tr>
<tr>
<td><strong>c'</strong></td>
<td>1.9 (1.7-2)</td>
<td>[1.6]</td>
<td>[1.0-1.3]</td>
<td>1.3</td>
<td>&gt; 2</td>
<td>1.2-1.7*</td>
</tr>
<tr>
<td><strong>V</strong></td>
<td>66 (65-68)</td>
<td>61-66</td>
<td>61-65</td>
<td>56-61</td>
<td>59-66</td>
<td>60 (58-63)</td>
</tr>
<tr>
<td><strong>Stylet (μm)</strong></td>
<td>20.9 (19.5-22.4)</td>
<td>24</td>
<td>23-25</td>
<td>23 (22-24)</td>
<td>20-21</td>
<td>22</td>
</tr>
<tr>
<td><strong>Tail</strong></td>
<td>Long, irregularly annulated ventral projection with finely rounded terminus with single sharp-pointed micro on tip</td>
<td><strong>Spicules (μm)</strong></td>
<td><strong>Gubernaculum (μm)</strong></td>
<td><strong>Capitulum (μm)</strong></td>
<td><strong>Spicules (μm)</strong></td>
<td><strong>Gubernaculum (μm)</strong></td>
</tr>
<tr>
<td><strong>Phasmid</strong></td>
<td>0-8 annuli anterior to anus</td>
<td>5 annuli anterior to anus</td>
<td>4-annuli posterior to anus</td>
<td>2 annuli posterior to 6 annuli anterior to anus</td>
<td>5 annuli posterior to 2 annuli anterior to anus</td>
<td>4-3 annuli anterior to anus</td>
</tr>
<tr>
<td><strong>Lip annuli</strong></td>
<td>4, indistinct</td>
<td>5-7</td>
<td>4-5, indistinct</td>
<td>4, distinct</td>
<td>4, distinct</td>
<td>4, distinct</td>
</tr>
</tbody>
</table>

[ ] Calculated from the figures of the authors.

* From Ali and Geraert (1975).

Table 2
Comparison of males of *Helicotylenchus minutus* sp. n. with closely related species

<table>
<thead>
<tr>
<th>Characters</th>
<th><em>Helicotylenchus minutus</em> sp. n.</th>
<th><em>Helicotylenchus apiculus</em> Roman, 1965</th>
<th><em>Helicotylenchus macronatus</em> Siddiqi, 1963</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td><strong>L (mm)</strong></td>
<td>0.365 (0.352-0.378)</td>
<td>0.6</td>
<td>0.48 (0.44-0.52)</td>
</tr>
<tr>
<td><strong>a</strong></td>
<td>27.2 (25.3-28.6)</td>
<td>31-36</td>
<td>28.7 (26-32)</td>
</tr>
<tr>
<td><strong>b</strong></td>
<td>3.4 (3.2-3.8)</td>
<td>4.5-5.5</td>
<td>5.2 (5-5.5)</td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>24.5 (21.4-27.6)</td>
<td>23-29</td>
<td>28.4 (26-32)</td>
</tr>
<tr>
<td><strong>Spicules (μm)</strong></td>
<td>16.9 (15.8-18)</td>
<td>22-23</td>
<td>19 (18-21)</td>
</tr>
<tr>
<td><strong>Gubernaculum (μm)</strong></td>
<td>5.3 (4.4-6.3)</td>
<td>6</td>
<td>6 (5-7)</td>
</tr>
<tr>
<td><strong>Stylet (μm)</strong></td>
<td>18.8 (18.4-19.9)</td>
<td>22</td>
<td>19.5 (19-21)</td>
</tr>
</tbody>
</table>

**Measurements**

**Females** (n = 4) : L = 0.830 mm ± 92.1 (0.700-0.870); a = 27.6 ± 2.5 (24-29.8); b = 6.4 ± 0.5 (6.1-7.1); b' = 7.6 ± 0.7 (7.1-8.6); c = 69.1 ± 9.3 (59.3-81.5); c' = 0.7 ± 0.1 (0.5-0.8); o = 21.6 ± 2 (19.7-24.3); V = 56 ± 0.9 (55-57); OV₁ = 24 ± 5.8 (19-32); OV₂ = 20 ± 3.6 (17-22); stylet = 27.6 μm ± 1.3 (26.1-28.7).

**Males** (n = 3) : L = 0.730 mm ± 44.6 (0.700-0.780); a = 28.2 ± 2.7 (25.9-31.2); b = 5.5 ± 0.3 (5.1-5.7); b' = 6.9 (n = 1); c = 56.6 ± 6.1 (51-63.1); c' = 0.7 ± 0.1 (0.6-0.8); stylet = 27.4 μm ± 1.9 (25.7-29.4); spicules = 29.2 μm ± 0.8 (28.3-29.8); gubernaculum = 13.9 μm ± 1.3 (12.5-15.1); capitulum = 8.5 μm ± 0.9 (7.4-9.2).

**DESCRIPTION**

_Female_: Body form ranging from a complete circle to a tight 6. Lip region slightly set off, rounded, slightly flattened anteriorly with no or indistinct annulation, 7.2 ± 0.7 (6.6-8.1) μm wide and 5 ± 0.9 (4.6-2.3) μm high. Labial framework very well developed stretching posteriorly from basal plate for about one annule. Stylet robust with cupped basal knobs, the latter 5.9 ± 0.3 (5.5-6.2) μm wide and 2.9 ± 0.5 (2.2-3.9) μm high. Metenchium shorter than telenchium (m = 43.9-46.2 %). Dorsal oesophageal gland opening 6.1 ± 0.5 (3.5-6.6) μm from base of stylet knobs. Median bulb ovate, 13.5 ± 0.5 (13.2-14) μm long and 10.4 ± 0.6 (9.9-11) μm wide. Oesophagus 74 ± 8.5 (64-84) μm from anterior end to middle of valve of median bulb and 58 ± 7.9 (53-66) μm from middle of valve of median bulb to end of oesophageal glands. Oesophageal overlap over intestine 21.1 ± 3.9 (16.2-25.7) μm long. Position of excretory pore varying from opposite posterior part of isthmus to opposite posterior part of oesophageal lobe, 103 ± 11.1 (87-112) μm from anterior end of body. Hemizonid two annuli long, situated from opposite to one annule posterior to excretory pore. Hemizonid about one annule long, situated from six to ten annuli posterior to hemizonid. Anterior and posterior cephalids one quarter to one half annule long situated from three or four and nine to eleven annuli posterior to basal plate respectively. Width at midbody 30.4 ± 4.7 (25-36.4) μm and at excretory pore 23.5 ± 1.6 (21.3-24.6) μm. Width of annuli at midbody 1.5 ± 0.2 (1.5-1.8) μm. Lateral field with four lines, 5.9 ± 1.1 (4.8-7) μm wide; areolated only slightly anteriorly but not on rest of body nor around phasmids; outer two lines disappearing behind posterior phasmid, in one specimen continuing up to anal level; inner lines continue to middle of tail where they either coalesce or disappear. Anterior and posterior phasmids 3.5 ± 0.9 (2.2-4.4) μm long and 2.5 ± 0.5 (1.8-2.9) μm wide, situated at 82 ± 2.8 (78-84) % and 88 ± 1.4 (86-89) % respectively from anterior end; distance between anterior and posterior phasmid 51 ± 12.5 (43-70) μm. Epitygma conspicuous, double and protruding outward. Spermatica elong with filled with roundish sperm. Caudalid not seen. Tail rounded or conoid with eight to twelve annuli, 12.1 ± 0.9 (11-13.2) μm long; annuli on tail not much larger than on rest of body.

_Males_: Similar to female except for reproductive system. Lip region 8 ± 0.5 (7.7-8.5) μm wide and 5 ± 0.2 (4.8-5.1) μm high. Width at midbody 25.8 ± 0.9 (25-26.8) μm and at excretory pore 20.8 ± 1.2 (19.8-22) μm. Distance between anterior and posterior phasmid 29 ± 10.9 (18.7-40.4) μm. Tail short, 13 ± 1.7 (11-14) μm long, with bursa broadly rounded posteriorly, projecting well beyond tail terminus; coarser, more pointed crenations along posterior margin.

**DISCUSSION**

These specimens correspond well with the original description of the species by Sher (1964) from Martinique. This species is however very close to _A. nigeriensis_ Sher, 1964 but is separated mainly on having more female tail annules and annules not distinctly coarser on terminus.

_Aphasmatylenchus nigeriensis_ Sher, 1965

(Figs 3H-K & 4)

Several specimens of the species were collected in a tropical forest near Mana, French Guyana by P. Cadet during April 1989. These specimens correspond well with the original description of the species by Sher (1965) except for a few minor differences. This is the first record of this species outside West Africa.

**MEASUREMENTS**

_Females_ (n = 13) : L = 1.010 mm ± 167.8 (0.680-1.270); a = 23.6 ± 1.7 (20.7-25.6); b = 6.4 ± 0.8 (5-7.9); b' = 8.9 ± 1.1 (7-11.1); c = 25.6 ± 3.6 (21.2-34.9); c' = 1.1 ± 0.2 (0.8-1.6); o = 27.9 ± 3.1 (23.3-35.3); V = 56 ± 2.1 (53-60); _OV_ = 21 ± 4.2 (16-29); _OV_1 = 21 ± 4.6 (16-32); stylet = 30.8 μm ± 2.5 (27.2-35.7).

_Males_ (n = 3) : L = 0.790 mm ± 115.2 (0.660-0.890); a = 30.8 ± 2.6 (28.1-33.2); b = 5.8 ± 0.4 (5.4-6.2); b' = 7.1 ± 1.1 (6.3-7.8); c = 17.8 ± 0.4 (17.3-18); c' = 2.7 ± 0.2 (2.5-2.9); stylet = 24.5 μm ± 1.1 (23.5-25.7); spicules = 31.3 μm ± 2.6 (28.7-33.8); gubernaculum = 12.5 μm.

**DESCRIPTION**

_Females_: Body form ranging from open C to complete circle. Lip region rounded, slightly set off with eight annuli; lip region 10.5 ± 1.1 (8.1-12.1) μm wide and 7.1 ± 0.9 (5.5-8.8) μm high. Labial framework well developed, outer margins reaching posteriorly one annule from basal plate. Stylet knobs mostly flattened or sloping very slightly backward, 4.9 ± 0.4 (4.5-5.5) μm wide and 2.6 ± 0.3 (1.8-2.9) μm high. Metenchium varying from slightly shorter than to slightly longer than telenchium (m = 47-52 %). Dorsal oesophageal gland opening 8.6 ± 1 (6.3-9.9) μm from base of stylet knobs. Median bulb rounded, 16.2 ± 1.3 (14-18.4) μm long and 11.7 ± 0.8 (10.3-12.9) μm wide. Oesophagus 82 ± 7.5 (68-97) μm from anterior end of body to middle of valve of median bulb and 74 ± 6.1 (63-82) μm from middle of median bulb to base of oesophageus. Oesophageal overlap over intestine 44.1 ± 5.4 (34.5-52.5) μm long. Excretory pore situated opposite anterior part of oesoph-
Fig. 3. *Aorolaimus luci* (Sher, 1964) Fortuner, 1987 Female. A: Oesophageal region; C, F: Tail; G: Posterior phasmid; Male. B: Tail region, internal view; D: Oesophageal region; E: Tail region, external view. *Aphasmatylenchus nigeriensis* Sher, 1965 Female. H: Lateral field opposite vulva; I-K: Tail variations. (Bar = 20 μm).
Fig. 4. Aphasmatylenchus nigeriensis Sher, 1965 Female. A: En face view of labial area; D: Tail; E: Vulva; F: Lateral field; J: Spermatheca; Male. B: En face view of labial area; C: Lip region, lateral view; G: Lateral field; H: Ventral view of tail; I: Cloacal opening. (Bar = 5 μm in A, B, C, F, G, I, J; 10 μm in D, E, H).
Nematodes from the French Caribbean

Phageal lobe, 125 ± 13.8 (96-151) μm from anterior end. Hemizonid two annuli long situated from opposite to two annuli posterior to excretory pore. Hemizonid one annule long situated from nine to twelve annuli posterior to hemizonid. Anterior and posterior cephalids not seen. Width at midbody 42 ± 6.9 (31-52) μm and at excretory pore 32 ± 4.2 (25-40) μm. Width of annuli at midbody 1.8 ± 0.2 (1.5-2.2) μm. Lateral field with four lines, 7.8 ± 0.9 (5.9-8.8) μm wide, outer bands well areolated over whole body, inner band occasionally slightly areolated. Spermatheca small, rounded, filled with very fine sperm. Epipytgma not clearly seen, could be double and folded into the vagina. Long intestinal overlap over rectum, almost filling tail region. Phasmid not seen. Tail narrowly to broadly rounded with twenty to 36 annuli, 39.9 ± 8.5 (27.9-57) μm long.

Males: Similar to female except for sexual characters. Stylet and oesophagus less developed than female. Tail 44.4 ± 7.4 (36.8-51.5) μm long.

Criconema permistum (Raski & Golden, 1966) Raski & Luc, 1985

(Fig. 5A, B)

Four females of this species were collected on the slopes of the Pelee volcano, Martinique, by P. Cadet in May, 1989. The specimens were collected on the Atlantic side of the volcano in forest growth.

Measurements

Females (n = 4): L = 0.410 mm ± 24.3 (0.380-0.440); a = 12.2 ± 1 (11.3-13.3); b = 3.4 ± 0.2 (3.2-3.5); c = 11.4 ± 1.3 (10.1-13); o = 8.8 ± 0.9 (7.8-9.5); V = 84; stylet = 90.4 μm ± 1.1 (89.3-91.5); VL/VB = 1.9 ± 0.2 (1.8-2.1); St/L = 22.2 ± 1.3 (20.8-23.8); R = 79-84; RSt = 19-20; ROes = 25-27; RV = 14-15; RVan = 4-5; Ran = 8-9.

Description

Female: Body slightly arcuate ventrally. Lip region with two annuli and six rounded lips elevated above first lip annule; first lip annule 13.6 ± 0.8 (12.5-14.3) μm wide, directed slightly anteriorly; second lip annule 13.9 ± 1.4 (12.5-15.4) μm wide, directed backward; both lip annuli narrower than succeeding first two body annuli which are 18 ± 1.1 (16.9-19.1) μm and 21.2 ± 1.5 (19.8-22.8) μm wide respectively. All body annuli rounded and retrorse with smooth posterior margins. Annuli 5.2 ± 0.3 (4.8-5.5) μm wide at midbody. Width at midbody 33.3 ± 0.4 (33.1-33.8) μm. Stylet long and slender with slightly cupped basal knobs; knobs 10 ± 0.3 (9.6-10.3) μm wide and 4 ± 0.9 (3.7-4.4) μm high. Metenchium 77 ± 2.3 (75-79) μm long and telenchium

13.7 ± 0.7 (12.9-14.3) μm long. Dorsal oesophageal gland opening 7.5 ± 0.6 (7.1-7.8) μm from base of stylet knobs. Oesophagus 93 ± 1.6 (92-94) μm from anterior end to middle of valve of median bulb and 20 ± 2.1 (18.7-21.7) μm from middle of valve of median bulb to base of oesophagus. Excretory pore seen in one specimen only, situated just posterior to oesophageal lobe, 115 μm from anterior end of body. Hemizonid not seen. Spermatheca round to oblong, two to five annuli long, filled with small roundish sperm, situated eleven or twelve annuli anterior to anus. Dorsal vulval lip formed into a prominent flap which covers the ventral lip. Tail 35.9 ± 3.8 (32.3-40.8) μm long, tapering to a finely rounded terminus with last two or three annuli almost attenuated.

Males and juveniles: Not found.

DISCUSSION

These specimens correspond very well with the description of the species by Raski and Golden (1966) except for having a longer tail resulting in a smaller c value, 11.4 (10.1-13) vs 16.5 (13-22).

The specimens are also very close to C. calvum (Raski & Golden, 1966) Raski and Luc, 1985, but differ in the shape of the lip region (having six raised, rounded lips vs a flat head), having a shorter stylet, 90.4 (89.3-91.5) μm vs 92-106 μm and first lip annule not wider than second. These differences were also seen when the present specimens were compared with one paratype female from Nova Teutonia, Brazil, the type locality.

Ogma decalineatum (Chitwood, 1957)
Andrásy, 1979

(Fig. 6A-C)

Specimens of this species were collected from a humid forest on the “Trace des Jésuites” near Fond-St-Denis, Martinique. SEM photographs are given to illustrate this species from the French Caribbean.

MEASUREMENTS

Females (n = 13): L = 0.380 mm ± 29.7 (0.320-0.420); a = 10.5 ± 1.6 (8.7-12.5); b = 3.3 ± 0.2 (3-3.6); c = 13.1 ± 1.8 (11.1-14.7); o = 7.3 ± 1.3 (5.6-9); V = 86 ± 0.9 (85-89); stylet = 83.1 ± 5.1 (73.5-90.4) μm; R = 78-87; RStudent = 18-21; ROes = 23-29; Rex = 27-31; RV = 12-15; RVann = 3-6; Ran = 7-10; VL/VB = 1.7 ± 0.2 (1.5-2); StO/L = 21.9 ± 1.3 (20-24.3); dorsal oesophageal gland opening 5.9 ± 0.7 (5.1-6.6) μm from base of stylet knobs; excretory pore 130 ± 7.2 (121-139) μm from anterior end; tail length = 29.5 ± 4.4 (21.3-35.3) μm; first lip annule 13.6 ± 0.8 (11.8-14.7) μm wide; second lip annule 13.9 ± 1 (11.8-15.4) μm wide; first body annule 18.2 ± 1.4 (15.8-21.3) μm wide.

Fig. 6. Ogma decalineatum (Chitwood, 1957) Andrásy, 1979 Female. A: En face view of labial area; B: Lip region, lateral view; C: Posterior region. (Bar = 5 μm in A, B; 10 μm in C).
**Criconemella onoensis** (Luc, 1959)
Luc & Raski, 1981

(Figs 7A-C, 8A-E)

Numerous specimens of this species were collected from tomato, sugarcane and anthurium in Martinique and rice in French Guyana. SEM photographs are given to illustrate the species.

**Measurements**

*Females* (n = 30): L = 0.410 mm ± 65.8 (0.320-0.530); a = 10.8 ± 1 (8.3-12.6); b = 4.6 ± 0.6 (3.8-5.5); c = 16.9 ± 3.9 (11.9-24.5); V = 92 ± 1 (91-94); OV = 50 ± 6.7 (38-68); stylet = 45.9 µm ± 2.4 (41.2-49.7); R = 110-129; RSt = 14-20; ROe = 26-35; Rex = 29-36; Rhem = 29-35; RV = 8-11; Ran = 5-9; RVan = 0-3; VL/VB = 1.1 ± 0.1 (0.9-1.4); St/L = 11.5 ± 1.6 (9.3-15.7); dorsal oesophageal gland opening 6.3 ± 0.5 (5.9-7) µm from the base of the stylet knobs; excretory pore 93 ± 10.6 (71-112) µm from anterior end; tail length = 25.8 µm ± 9 (11.8-40.4).

*Criconemella ornata* (Raski, 1958)
Luc & Raski, 1981

(Fig. 7D-I)

Specimens of this species were collected from tomato in Martinique and pineapple in French Guyana.

**Measurements**

*Females* (n = 11): L = 0.400 mm ± 37 (0.350-0.460); a = 10.7 ± 1.3 (8.9-13.5); b = 4.2 ± 0.2 (3.8-4.5); c = 20.2 ± 2.5 (16.4-23.6); V = 92 ± 0.5 (92-94); OV = 45 ± 3.9 (37-51); stylet = 55.7 µm ± 3.2 (51.5-60.3); R = 83-97; RSt = 14-18; ROe = 22-28; Rex = 24-31; Rhem = 23-29; RV = 6-8; RVan = 4-6; Ran = 0-2; VL/VB = 1 ± 0.09 (0.8-1.1); St/L = 14.1 ± 1.5 (12.6-15.4); dorsal oesophageal gland opening = 5.9 ± 0.7 (5.2-6.6) µm from base of stylet knobs; excretory pore = 105 ± 14.3 (87-128) µm from anterior end; tail length = 19.7 µm ± 2.2 (16.5-23.2).

**Hemicycliophora andrassyi** Brzeski, 1974

(Figs 9A-F, 10A-K)

Specimens of this species were collected by P. Cadet in May 1989 on the Pelee volcano in Martinique. The specimens were collected at an altitude of 650 m from a forest area on the Atlantic side of the volcano with a rainfall of 4000 mm/year.
Fig. 8. Criconemella onoensis (Luc, 1959) Luc & Raski, 1981 Female. A: En face view of labial area; B: Excretory pore; C: Annuli near midbody; D, E: Posterior regions of two females. (Bars = 5 μm in A, B, C; 10 μm in D, E).

gradually again to rounded terminus; annuli indistinct on last quarter of tail. Spermatheca round to oblong, four to seven annuli long, filled with small, rounded sperm, situated 27 to 60 annuli anterior to vulva. Vulval lips slightly elongated. Vulval sheath present, two annuli long.

Males: Body straight to arcuate ventrally. Lip region rounded; not annulated, 9.9 ± 0.8 (8.8-11.8) μm wide and 6.8 ± 0.7 (5.9-7.4) μm high. SEM photographs show a squarish en face view with all lip annuli and sectors fused; amphid openings two narrow slits; whole lip region wrinkled. Stylet absent. Oesophagus degenerate. Lateral field a single line across entire length of body disappearing behind bursa. Cuticula very finely wrinkled over whole body. Hemizonid one to two annuli long situated from one and a half to four annuli anterior to excretory pore. Excretory pore situated 118 ± 6.1 (108-129) μm from anterior end of body. Width at midbody 24.8 ± 1.6 (21.3-26.5) μm and at excretory pore 22.7 ± 1.2 (20.9-24.3) μm. Width of annuli at midbody 2.9 ± 0.4 (2.2-3.3) μm. Tail 167 ± 13.8 (146-186) μm long, tapering gradually to a finely rounded or pointed terminus, occasionally with a mucro on tip; annulation distinct and uniform on entire tail. Bursa well developed, about four times as long as the width of the body just anterior to cloaca. Penial tube 9.4 ± 1.4 (7.4-10.7) μm long, posterior lip slightly elongated.
Fig. 9. *Hemicycliophora andrassyi* Brzezki, 1974 Female. A: Oesophageal region; D: Posterior region; F: Lateral field. Male. B: Oesophageal region; C: Posterior region; E: Lateral field. (*Bar* = 20 μm).
Fig. 10. *Hemicycliophora andrészyi* Brzeski, 1974 Female. A: En face view of labial area; B: Lip region, lateral view; C: Vulva, lateral view; D: Lateral field; E: Tail ending; Male. F: En face view of labial area; G: Tail terminus; H: Lip region, lateral view; I: Cloacal area with bursa and penial tube; J: Lateral field; K: Penial tube opening with spicule tips. (*Bars* = 5 μm in A, B, D, F, H, J, K; 10 μm in C, E, G, I).
**Discussion**

The population described above is being regarded as belonging to the species *H. andrassyi* Brzeski, 1974, as all measurements and morphological data are similar to those reported in the original description and illustration, namely the shape of the labial disc, shape of the vulval lips and of the post-vulval part. Unfortunately, others not. It is also known that the number of lateral lines may be considerably variable in the same species. However, the type series, consisting of only two females, cannot be of reference concerning such a variation. However, in a second population from Martinique, presently being studied by E. Costa Manso (pers. comm.), some females show a second lateral line on some body annules. Moreover, the type population of *H. andrassyi* was recorded from a tropical forest in Paraguay, a biotope very similar to the Martinique ones.

*Paratylanchus elachistus* Steiner, 1949

A few badly preserved specimens resembling this species were collected from sugarcane in Martinique, however correspond well with the redescription given by Raski (1975).

**Measurements**

*Females* (n = 2) : L = 0.300 mm; 0.250 mm; a = 22.8; b = 4.7; 4.2; c = 14.1; 15.4; c’ = 2.5; 2.1; o = 11.6; 11.8; V = 81 %; OV1 = 29 %; —; stylet = 22.4 μm; 22.1 μm; excretory pore from anterior end = 61 μm; 54 μm; tail = 21.3 μm; 16.2 μm.

*Paratylanchus minutus* Linford in Linford, Oliveira & Ishii, 1949

(Fig. 5C-G)

Specimens from this species were collected in Martinique from *Anthurium* sp. and *Heliconia cartasia*. They fit the redescription given by Raski (1975).

**Measurements**

*Females* (n = 10) : L = 0.230 mm ± 14.9 (0.196-0.244); a = 19.9 ± 1.8 (17.2-22.6); b = 3.6 ± 0.2 (3.3-4); c = 16.1 ± 1.8 (13.7-19.6); c’ = 2.3 ± 0.2 (2.1-2.8); o = 18.8 ± 2.3 (14.8-22.2); V = 82 ± 0.6 (81-83); OV1 = 26 ± 4.5 (22-35); stylet = 18 μm ± 1 (16.6-19.9) excretory pore = 55 ± 3.2 (50-60) μm from anterior end; dorsal oesophageal gland opening 3.4 ± 0.3 (2.9-3.7) μm from base of stylet knobs; lateral field 2 ± 0.4 (1.5-2.6) μm wide; tail 14.4 ± 1.6 (12.1-17.6) μm long.

*Males* (n = 3) : L = 0.215 mm ± 6 (0.209-0.221); a = 23.9 (n = 1); b = 4.8 (n = 1); c = 15.9 ± 0.3 (15.7-16.3); c’ = 1.8; spicules = 15.5 ± 0.6 (15.1-16.2) μm; gubernaculum = 4.9 ± 0.2 (4.8-5.1) μm; excretory pore 48.7 ± 0.4 (48.5-49.2) μm from anterior end; tail 13.4 ± 0.6 (12.9-14) μm long.

*Paratylanchus perlatus* Raski, 1975

Specimens of this species were collected in a tropical forest near Mana, French Guyana during April 1989. They fit the original description by Raski (1975) as well as the well illustrated description of Huang and Raski (1987). In both these cases the specimens were collected in Brazil.

**Measurements**

*Females* (n = 10) : L = 0.220 mm ± 17.5 (0.190-0.240); a = 16.2 ± 2 (13.7-20.5); b = 3.5 ± 0.2 (3.3-3.8); c = 18.3 ± 1.3 (16.5-20.9); c’ = 1.5 ± 0.3 (1.1-1.9); o = 16.6 ± 3.9 (11.8-23.5); V = 83 ± 1.3 (81-85); OV1 = 44 ± 5.3 (38-53); stylet = 20.2 ± 1.4 (18.4-22.1) μm.

*Females* : Lip region 4.4 ± 0.5 (4-5.1) μm wide and 1.9 ± 0.2 (1.8-2.2) μm high. Metenchiurn 13.2 ± 0.5 (12.5-13.6) μm long and telenchium 7.5 ± 1 (6.2-8.5) μm long. Stylet knobs 3.1 ± 0.3 (2.9-3.7) μm wide and 1.1 ± 0.3 (0.7-1.5) μm high, flattened or slightly hollow anteriorly. Opening of dorsal oesophageal gland 3.4 ± 0.8 (2.6-5.1) μm from base of stylet knobs. Oesophagus 35 ± 1.6 (33-37) μm from anterior end to middle of valve of median bulb and 26 ± 2 (21-29) μm from middle of valve of median bulb to base of oesophagus. Excretory pore located from opposite posterior part of isthmus to opposite middle of oesophageal lobe, 53.4 ± 3.8 (47-58.4) μm from anterior end of body. Median bulb valve 4.7 ± 0.9 (3.7-5.9) μm long and 2.3 ± 0.4 (1.8-2.9) μm wide. Hemizonid two annuli long, situated directly posterior to excretory pore. Width at midbody 13.5 ± 0.9 (11-14) μm and 11.5 ± 0.7 (10.3-12.5) μm at excretory pore. Width of annuli at midbody 0.7 μm. Lateral field four faint lines 2.2 ± 0.3 (1.8-2.6) μm wide. Tail 11.9 ± 1.1 (10.3-14) μm long with seventeen to twenty annuli, tapering to a finely rounded tip, mostly with a slight digit.
Gracilacus aonli (Misra & Edward, 1971)
Raski, 1976

Some specimens resembling this species were collected on the beach at Le Diamant in the south of Martinique.

MEASUREMENTS

**Females** (n = 9): L = 0.313 mm ± 32 (0.281-0.383); a = 24.2 ± 2.6 (20.3-29.2); b = 2.7 ± 0.3 (2.3-3.2); c = 11.6 ± 1.9 (9.8-14.9); c' = 4.1 ± 0.5 (3.2-4.7); o = 12.8 ± 1.6 (10.3-14.5); V = 75 ± 0.7 (74-76); Ov = 23 ± 2.5 (19-25); stylet = 64.6 µm ± 3.5 (59.2-69.8) opening of dorsal oesophageal gland 8.7 ± 1.1 opening of dorsal oesophageal gland 8.7 ± 1.1 (7.4-11) µm from stylet knobs; median bulb valve 77.3 ± 1.1 (77.0-77.6) µm wide or 3.2 (2.5-3.7) µm lateral field 2.1 (1.8-2.6) µm wide; tail 27.4 ± 4.4 (20.2-33.8) µm long; post vulval region 77.3 ± 9 (68-96.3) µm long; spemathec 23.3 ± 3.7 (18.7-27.2) µm long and 7.4 ± 0.6 (7-8.1) µm wide or 3.2 ± 0.7 (2.4-3.9) times longer than wide.

**Males** (n = 5): L = 0.318 mm ± 24.7 (0.282-0.343); a = 27.4 ± 2.5 (23.3-29.2); b = 4.6 ± 0.2 (4.4-4.8); c = 12.6 ± 1.8 (10.8-15.6); c' = 2.8 ± 0.6 (2.3-3.7); excretory pore = 79 ± 7.7 (71-87) µm from front end; lateral field 2.1 ± 0.7 (1.5-3.3) µm wide; tail 25.4 ± 3.7 (21.7-31.6) µm long; spicules = 18.4 ± 0.3 (18-18.7) µm; gubernaculum = 3.2 ± 0.2 (2.9-3.3) µm.

DISCUSSION

These specimens correspond well with the type specimens from India (Misra & Edward, 1971) as well as those described from Western Samoa (Orton Williams, 1985), however, a few slight morphometric differences were noticed viz. females slightly larger (0.281-0.383 mm vs 0.250-0.310 mm), female and male tails slightly longer (20.2-33.8 µm vs 18-25 µm and 21.7-31.6 µm vs 20-25 µm respectively), male spicules slightly longer (18-18.7 µm vs 16-18 µm) while the gubernaculum is slightly shorter (2.9-3.3 vs 3.4-4 µm), male excretory pore situated further backward (70.9-87.1 µm vs 62-73 µm) and female stylet situated further from the opening of the dorsal oesophageal gland (7.4-11 µm vs 5-6 µm).

The authors would like to thank Mrs. S. C. van den Berg for technical assistance, and Mrs. N. H. Buckley and Mr. H. van Tonder for the scanning electron microscope photographs. Dr. M. Luc of the Muséum national d'Histoire naturelle, Paris, France and Dr. E. M. Noffsinger, University of California, Davis, California are thanked for the loan of paratype specimens.

ACKNOWLEDGEMENTS

The authors would like to thank Mrs. S. C. van den Berg for technical assistance, and Mrs. N. H. Buckley and Mr. H. van Tonder for the scanning electron microscope photographs. Dr. M. Luc of the Muséum national d'Histoire naturelle, Paris, France and Dr. E. M. Noffsinger, University of California, Davis, California are thanked for the loan of paratype specimens.

REFERENCES


