

Longidorus dunensis n. sp. and *L. kuiperi* n. sp. from the sand dune coastal region of the Netherlands (Nematoda : Longidoridae)

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SUMMARY

Two new species of the genus *Longidorus* Micoletzky, 1922 are described. *L. dunensis* n. sp., found associated with sea buckthorn (*Hippophae rhamnoides* L.) and probably a factor in its decline, is unisexual, very slender (L = 5.4-7.4 mm), has an expanded lip region and a conoid tail. *L. kuiperi* n. sp. is bisexual, 6.3-8.5 mm long, with very broad lip region, short *vas deferens*, L-shaped spicules and the posterior eight supplements arranged into two subventral rows. It shares all these characters with *L. edmundsi* Hunt & Siddiqi, 1977 but can be differentiated from it by a series of characters. The population described by Lamberti, Roca and Agostinelli (1985) from Italy as *L. edmundsi* is, in fact, *L. kuiperi* n. sp. The species was found in the coastal zones of the Netherlands and France, associated exclusively with marram grass (*Ammophila arenaria* Link.), but the Italian population occurred on pea and olive.

RÉSUMÉ

Longidorus dunensis n. sp. et *L. kuiperi* n. sp. provenant de la région des dunes côtières des Pays-Bas (Nematoda : Longidoridae)

Deux nouvelles espèces appartenant au genre *Longidorus* Micoletzky, 1922 sont décrites. *L. dunensis* n. sp., associé au nerprun (*Hippophae rhamnoides* L.) et causant probablement le déclin de celui-ci, est unisexué, très allongé (L = 5,4-7,4 mm) et présente une région labiale en relief et une queue conoïde. *L. kuiperi* n. sp., bisexué, est long de 6,3-8,5 mm, avec une région labiale très élargie; les mâles montrent un *vas deferens* court, des spicules en forme de L et les huit suppléments postérieurs disposés en deux rangées subventrales. Il partage ces caractères avec *L. edmundsi* Hunt & Siddiqi, 1977 mais peut en être différencié par plusieurs autres caractères. La population venant d'Italie décrite par Lamberti, Roca et Agostinelli (1985) comme *L. edmundsi* appartient en fait à *L. kuiperi* n. sp. Cette espèce a été trouvée dans les zones côtières des Pays-Bas et de France, en association exclusive avec l'oyat (*Ammophila arenaria* Link.), mais la population provenant d'Italie est associée aux pois et à l'olivier.

In the spring of 1981 the late P. Oremus (Institute for Ecological Research, Department of Dune Research "Weevers' Duin", Oostvoorne, Netherlands), when investigating the cause of a decline in sea buckthorn, *Hippophae rhamnoides* L. (see Maas, Oremus & Otten, 1983) sent soil samples from this shrub, which contained per 100 ml of soil, 55 specimens of an undescribed species of *Longidorus*, and low numbers of other plant-parasitic nematode species.

Over several years Dr. K. Kuiper, Plantenziektenkundige Dienst, Wageningen, Netherlands, had collected samples from marram grass (*Ammophila arenaria* Link.) on the Island of Texel. These samples contained another undescribed *Longidorus* species. Both species are described hereunder. The specimens were fixed in F.A. 4 : 1 and mounted in dehydrated glycerin.

Longidorus dunensis n. sp. (Figs 1 and 2)

DIMENSIONS

Females and juveniles : see Table 1.

Holotype (female) : L = 6.60 mm; a = 133; b = 14.3; c = 171; V = $^{\circ}517$; odontostyle = 101 μ m; odontophore = 59 μ m; spear = 160 μ m; GR = 32 μ m; pharynx = 460 μ m; tail = 39 μ m; ABW = 35 μ m; c' = 1.1.

DESCRIPTION

Female : Body very slender, curved widely into C- or J-shape when relaxed. Cuticle 2 μ m thick, increasing to 3 μ m in anterior part of neck and to 7 μ m on base of

Table 1
Dimensions of *L. dunensis* n. sp. with standard deviations

| | ♂-1 | ♂-2 | ♂-3 | ♂-4 | Females |
|-------------------------------|-------------------------------------|---|--|------------------------------------|------------------------------------|
| n | 15 | 14 | 12 | 9 | 25 |
| L | 1.20 mm ± 63 µm (1.12-1.35 mm) | 1.92 mm ± 159 µm (1.73-2.23 mm) | 3.25 mm ± 447 µm (2.70-3.88 mm) | 4.20 mm ± 293 µm (3.78-4.62 mm) | 6.51 mm ± 454 µm (5.39-7.40 mm) |
| a | 61.7 ± 2.85 (58-68) | 68.9 ± 4.94 (55-74) | 87.9 ± 9.14 (75-109) | 107.3 ± 3.11 (103-111) | 137.5 ± 9.17 (120-160) |
| b | 4.9 ± 0.86 (3.6-5.9, n = 11) | 6.5 ± 0.80 (5.4-7.7) | 9.4 ± 1.16 (7.4-11.2) | 11.1 ± 1.12 (9.8-13.3) | 15.2 ± 1.57 (12.5-18.3) |
| c | 27.4 ± 2.10 (25-31) | 39.1 ± 3.09 (34-45) | 64.2 ± 7.49 (52-78) | 85.6 ± 5.39 (80-96) | 157.9 ± 16.53 (136-193) |
| c' | 3.1 ± 0.27 (2.5-3.5) | 2.5 ± 0.13 (2.2-2.7) | 1.9 ± 0.21 (1.6-2.3) | 1.6 ± 0.13 (1.5-1.8) | 1.19 ± 0.10 (1.0-1.4) |
| V | — | — | — | — | 50.9 ± 1.62 (47-54) |
| G ₁ | — | — | — | — | 7.6 ± 0.97 (6-9) |
| G ₂ | — | — | — | — | 8.8 ± 1.69 (7-13) |
| odontostyle | 58.1 µm ± 1.77 (54-60 µm) | 64.0 µm ± 1.66 (62-66 µm) | 77.1 µm ± 3.03 (70-80 µm) | 88.4 µm ± 2.26 (85-92 µm) | 100.2 µm ± 2.83 (95-106 µm) |
| odontophore | — | 39.8 µm ± 1.60 (37-42 µm, n = 12) | 45.8 µm ± 2.79 (41-48 µm, n = 6) | 51.9 µm ± 1.21 (51-54 µm) | 58.1 µm ± 1.87 (54-63 µm) |
| spear | — | 103.8 µm ± 1.90 (101-107 µm, n = 12) | 122.5 µm ± 5.82 (111-127 µm, n = 6) | 140.4 µm ± 1.99 (137-143 µm) | 158.5 µm ± 3.32 (135-165 µm) |
| spare odst. | 64.8 µm ± 1.47 (62-67 µm) | 76.0 µm ± 2.83 (69-79 µm) | 86.8 µm ± 3.35 (81-92 µm) | 100.0 µm ± 4.40 (95-108 µm) | — |
| GR | 18.6 µm ± 0.74 (18-20 µm) | 21.5 µm ± 0.76 (20-23 µm) | 25.1 µm ± 1.04 (23-26 µm) | 27.6 µm ± 1.51 (25-30 µm) | 31.2 µm ± 1.38 (29-33 µm) |
| pharynx | 254 µm ± 39 (205-311 µm, n = 11) | 297 µm ± 39 (243-372 µm) | 347 µm ± 34 (306-427 µm) | 381 µm ± 29 (339-433 µm) | 435 µm ± 38 (353-506 µm) |
| tail length | 44.1 µm ± 2.59 (40-48 µm) | 49.1 µm ± 3.06 (44-54 µm) | 50.8 µm ± 3.96 (44-58 µm) | 49.3 µm ± 1.83 (46-50 µm) | 41.5 µm ± 3.31 (35-48 µm) |
| lip region width | 9 µm | 11.0 µm ± 0.39 (10-12 µm) | 12.6 µm ± 0.70 (12-14 µm) | 13.7 µm ± 0.50 (13-14 µm) | 15.1 µm ± 0.40 (14-16 µm) |
| BWGR ⁽¹⁾ | 12.8 µm ± 0.56 (12-14 µm) | 15.3 µm ± 0.61 (14-16 µm) | 17.5 µm ± 0.71 (16-18 µm) | 19.3 µm ± 1.22 (18-22 µm) | 21.0 µm ± 0.52 (20-22 µm) |
| BWPB ⁽²⁾ | 19.7 µm ± 0.49 (19-20 µm) | 26.9 µm ± 1.86 (24-30 µm) | 33.4 µm ± 1.43 (32-36 µm) | 38.0 µm ± 3.28 (34-44 µm) | 42.6 µm ± 1.96 (40-47 µm) |
| anal body width | 14.1 µm ± 0.59 (13-16 µm) | 20.1 µm ± 1.27 (18-22 µm) | 26.8 µm ± 2.63 (23-31 µm) | 30.4 µm ± 2.26 (27-33 µm) | 34.8 µm ± 1.44 (32-38 µm) |
| thickness of terminal cuticle | 7.3 µm ± 0.88 (6-9 µm) | 9.6 µm ± 0.84 (8-11 µm) | 11.8 µm ± 1.09 (10-13 µm) | 12.7 µm ± 1.00 (11-14 µm) | 14.0 µm ± 1.15 (12-16 µm) |

(1) BWGR = body width at level of guiding ring.

(2) BWPB = body width at level of base of pharynx.

tail. Transverse striae almost imperceptible. Thin outer layer. Lateral chord about 40 % of body width. Lateral pores : on each side about 20 in neck region, 140-160 between pharynx base and vulva; 150-180 between vulva

and anus; two on the tail. Total number per body side 320-370. Dorsal cervical pores none or one; ventral ones 4 to 10. Lip region offset by distinct expansion, its edges rounded, with the usual 6 + 10 sensillae. Amphids

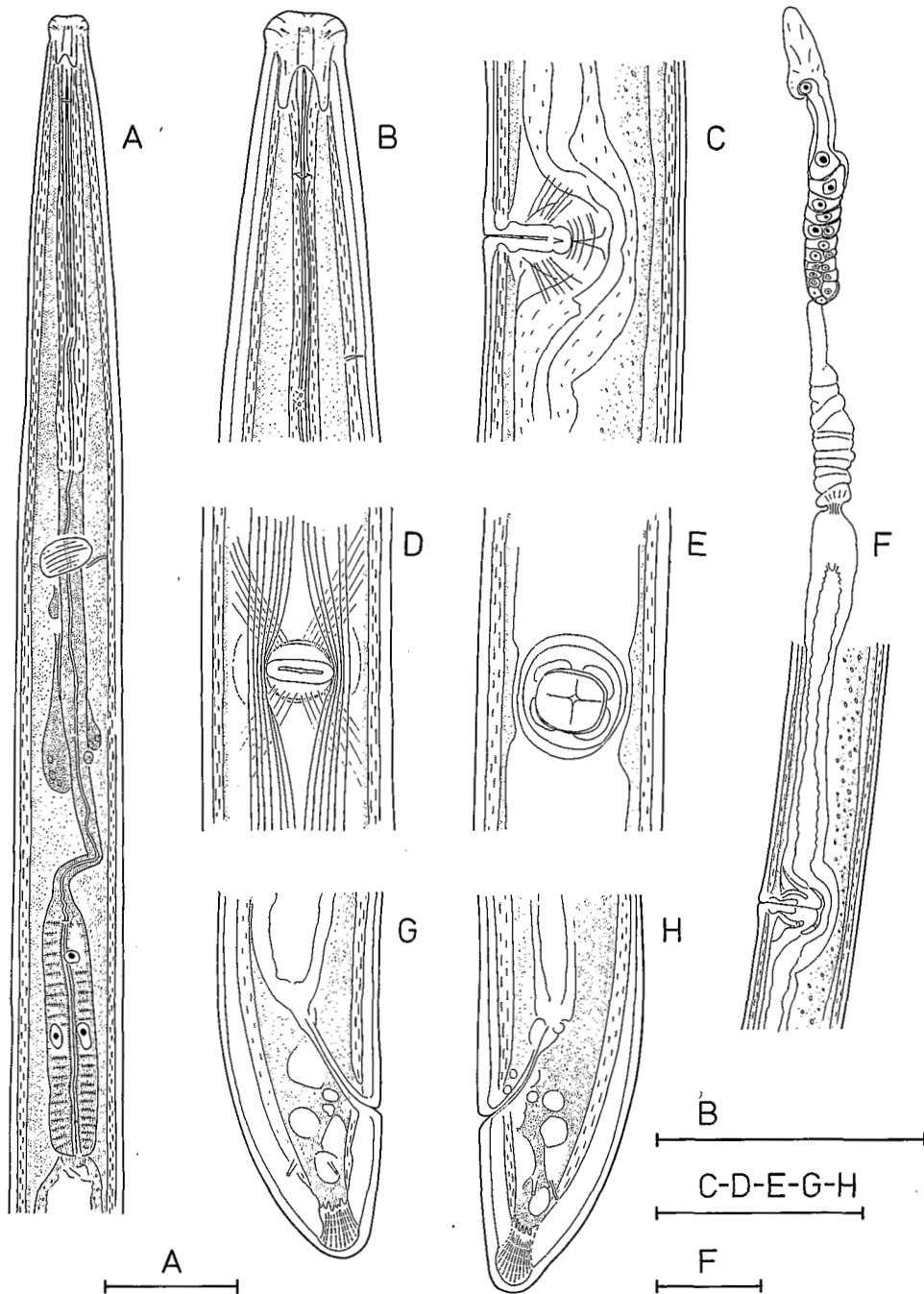


Fig. 1. *Longidorus dunensis* n. sp. Female. A : neck region; B : anterior end, lateral view; C : vulva, lateral view; D : vulva, ventral view; E : optical section through vagina; F : vulva and anterior genital branch; G-H : tails, lateral view. (The scale lines correspond to 50 μ m.)

evenly bilobed, the lobes extending just over halfway to guiding ring. Odontostyle, odontophore and guiding ring typical for genus. Nerve ring single, a short distance behind base of odontophore. The pharyngeal bulb measures $90-121 \times 18-23 \mu\text{m}$; generally it is $5-6 \times$ as long as wide. DO lies at 6-13 %, DN at 20-29 %, SN at 51-60 % and SO at 84-92 % of bulb length. Cardia small.

Vulva a transverse slit $14-17 \mu\text{m}$ long. Vagina almost one-half body width deep. Genital tubes two, opposed, reflexed, of normal structure, without special differentiations. No sperm in the uteri. None of the females bore eggs. Length of prerectum $407 \mu\text{m}$ (291-505). Tail broadly convex-conoid, tip broadly rounded, the ter-

minal cuticle is $12-16 \mu\text{m}$ thick. Two sublateral caudal pores.

Juveniles : In the J-1 the tail is elongate-conoid, often slightly subdigitate. The J-2 has an elongate-conoid tail, in the J-3 and J-4 the tail gradually approaches the shape in the adult female.

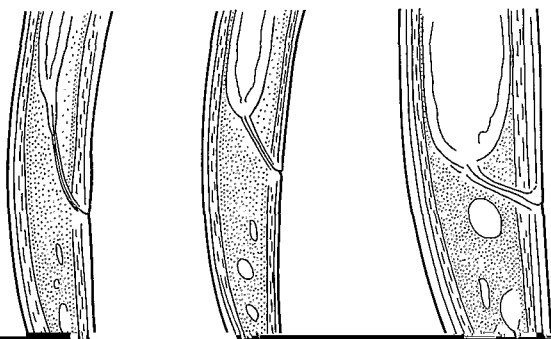
Male : were not found and probably do not exist.

TYPE MATERIAL

Holotype : Female on slide WT 2447 in the nematode collection of the Landbouwhogeschool, Wageningen, Netherlands.

Paratypes : 14 females on slides WT 2448-2456, same collection; one female deposited at each of the following addresses : Rothamsted Experimental Station, Harpenden, England; Instituut voor Dierkunde, Rijksuniversiteit, Gent, Belgium; Istituto di Nematologia agraria, Bari, Italy; Nematologisch Instituut, Münster, Federal Republic of Germany; Muséum national d'Histoire naturelle, Paris, France; Plantenziektenkundige Dienst, Wageningen, Netherlands; USDA, Beltsville, USA, University of California, Davis, USA; University of California, Riverside, USA.

TYPE HABITAT AND LOCALITY



closealongatus Stoyanov, 1964. *L. dunensis* differs from the former by the distinctly bilobed amphid and longer odontostyle, from the latter by the shorter odontostyle and anterior location of DN (see Sturhan & Argo, 1983).

Finally *L. dunensis* should be compared with *L. gubus*

4 μ m in anterior part of neck and 11-12 μ m on base of tail. Transverse striae imperceptible except posteriorly. Thin outer layer. Amphids very short and wide, not bilobed in adults, slightly in juveniles; extending to about 50-60% of the distance between anal opening and

Table 2
Dimensions of *L. kuiperi* n. sp. with standard deviations

| | ♂-1 | ♂-2 | ♂-3 | ♂-4 | Females | Males |
|-------------------------------|-----------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| n | 17 | 18 | 13 | 7 | 20 | 10 |
| L | 1.15 mm ± 65 µm (1.05-1.29 mm) | 1.87 mm ± 169 µm (1.58-2.17 mm) | 3.10 mm ± 135 µm (2.80-3.30 mm) | 4.80 mm ± 387 µm (4.25-5.38 mm) | 7.47 mm ± 552 µm (6.48-8.48 mm) | 6.90 mm ± 575 µm (6.32-8.10 mm) |
| a | 42.0 ± 2.78 (38-48) | 51.8 ± 3.02 (46-56) | 75.7 ± 7.39 (69-92) | 106.7 ± 7.43 (97-119) | 147 ± 11.6 (125-171) | 160 ± 16.0 (132-185) |
| b | 4.0 ± 0.26 (3.6-4.3) | 5.6 ± 0.71 (4.1-7.1) | 8.8 ± 1.17 (7.5-11.3) | 11.7 ± 1.51 (8.8-13.4) | 16.4 ± 1.17 (13.0-18.2) | 16.2 ± 1.31 (14.1-18.5) |
| c | 49.8 ± 4.29 (42-59) | 75.9 ± 6.30 (66-87) | 115.3 ± 8.88 (102-136) | 171.9 ± 10.3 (158-187) | 266 ± 19.9 (231-314) | 243 ± 25.7 (198-286) |
| c' | 0.7 ± 0.07 (0.6-0.8) | 0.8 ± 0.05 (0.7-0.9) | 0.8 ± 0.58 (0.7-0.9) | 0.8 ± 0.08 (0.7-0.9) | 0.76 ± 0.68 (0.6-0.9) | 0.78 ± 0.63 (0.7-0.9) |
| V | — | — | — | — | 52.7 ± 1.45 (50-55) | VD 30.0 ± 4.08 (25-37) |
| G ₁ | — | — | — | — | 8.6 ± 2.15 (6-15, n = 18) | 9.6 ± 2.92 (6-15, n = 9) |
| G ₂ | — | — | — | — | 7.7 ± 1.42 (5-11, n = 19) | 8.0 ± 1.66 (6-11, n = 9) |
| odontostyle | 61.2 µm ± 2.39 (56-65 µm) | 72.9 µm ± 2.85 (68-78 µm) | 86.2 µm ± 2.65 (82-91 µm) | 96.7 µm ± 2.14 (94-100 µm) | 106.6 µm ± 3.05 (101-113 µm) | 104.9 µm ± 5.47 (99-117 µm) |
| odontophore | — | — | — | — | 61.4 µm ± 2.89 (57-67 µm) | 60.0 µm ± 4.64 (52-64 µm) |
| spear | — | — | — | — | 168.0 µm ± 4.33 (158-175 µm) | 163.6 µm ± 7.78 (151-175 µm) |
| spare odst. | 73.4 µm ± 2.09 (70-76 µm) | 85.5 µm ± 1.76 (80-88 µm) | 96.0 µm ± 2.05 (93-100 µm) | 105.7 µm ± 2.98 (100-110 µm) | — | — |
| GR | 17.2 µm ± 1.19 (15-20 µm) | 19.6 µm ± 1.09 (18-22 µm) | 22.3 µm ± 1.25 (20-24 µm) | 24.9 µm ± 1.57 (23-27 µm) | 27.6 µm ± 1.39 (25-31 µm) | 26.2 µm ± 1.40 (24-29 µm) |
| pharynx | 292 µm ± 18 (262-333 µm) | 338 µm ± 21 (308-381 µm) | 356 µm ± 38 (277-407 µm) | 415 µm ± 46 (370-512 µm) | 449 µm ± 25 (403-507 µm) | 426 µm ± 24 (398-476 µm) |
| tail length | 23.1 µm ± 0.99 (22-25 µm) | 24.2 µm ± 1.03 (23-26 µm) | 27.1 µm ± 2.27 (23-31 µm) | 28.1 µm ± 2.27 (26-32 µm) | 28.3 µm ± 2.32 (25-32 µm) | 28.5 µm ± 1.90 (26-32 µm) |
| lip region width | 18.0 µm ± 0.56 (17-19 µm) | 21.9 µm ± 0.64 (21-23 µm) | 23.6 µm ± 0.87 (22-25 µm) | 24.7 µm ± 0.76 (23-25 µm) | 28.6 µm ± 1.27 (27-31 µm) | 27.4 µm ± 1.58 (25-29 µm) |
| BWGR ⁽¹⁾ | 23.4 µm ± 0.50 (23-24 µm) | 26.3 µm ± 0.96 (25-28 µm) | 28.7 µm ± 1.80 (25-31 µm) | 30.7 µm ± 1.80 (27-32 µm) | 32.9 µm ± 1.18 (31-35 µm) | 31.0 µm ± 1.25 (29-33 µm) |
| BWPB ⁽²⁾ | 28.0 µm ± 1.84 (26-31 µm) | 34.9 µm ± 2.35 (32-39 µm) | 39.7 µm ± 2.24 (36-44 µm) | 43.4 µm ± 4.50 (37-50 µm) | 45.2 µm ± 3.25 (41-53 µm) | 42.6 µm ± 2.40 (39-45 µm) |
| anal body width | 27.4 µm ± 1.93 (25-31 µm) | 31.6 µm ± 1.93 (26-35 µm) | 34.4 µm ± 1.41 (32-37 µm) | 36.7 µm ± 1.97 (35-39 µm) | 36.9 µm ± 2.49 (33-42 µm) | 37.9 µm ± 4.09 (33-45 µm) |
| thickness of terminal cuticle | 5.3 µm ± 0.84 (4-7 µm) | 6.9 µm ± 0.73 (6-9 µm) | 8.5 µm ± 0.97 (7-10 µm) | 9.1 µm ± 0.38 (9-10 µm) | 11.9 µm ± 0.99 (10-14 µm) | 9.0 µm ± 0.82 (8-10 µm) |
| spicules | — | — | — | — | — | 64.5 µm ± 2.92 (59-68 µm) |

(1) BWGR = body width at level of guiding ring.

(2) BWPB = body width at level of base of pharynx.

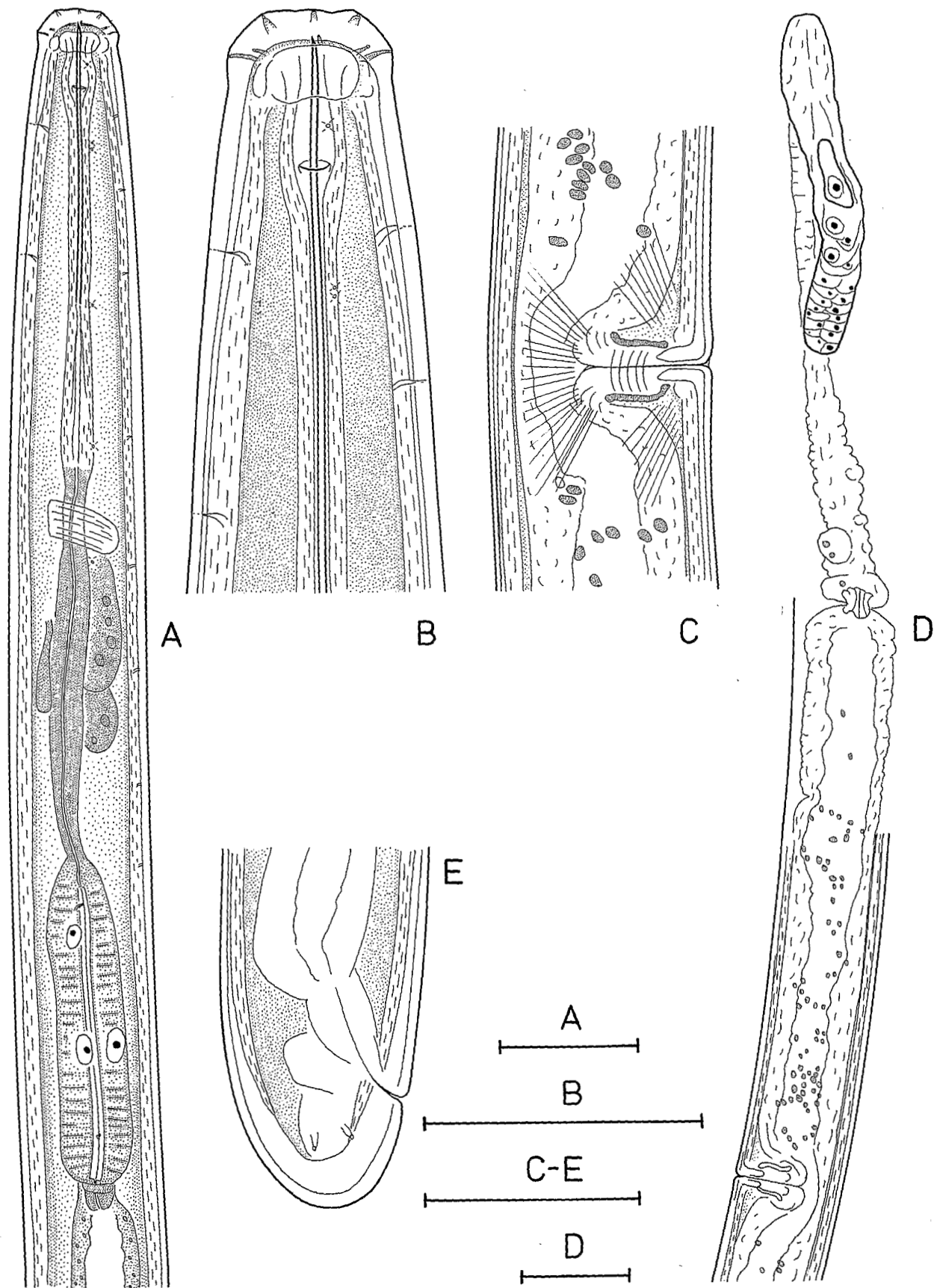
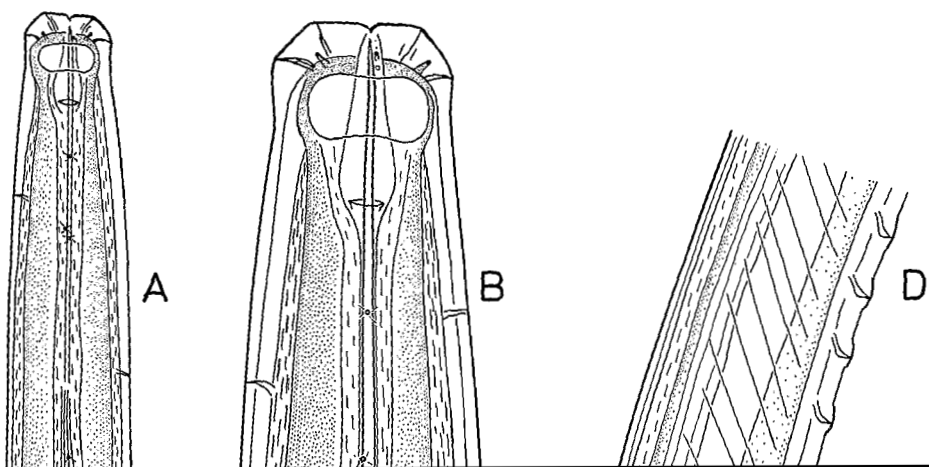


Fig. 3. *Longidorus kuiperi* n. sp. Female. A : neck region; B : anterior end, lateral view; C : vulva, lateral view; D : vulva and anterior genital branch; E : tail. (The scale lines correspond to 50 μ m.)



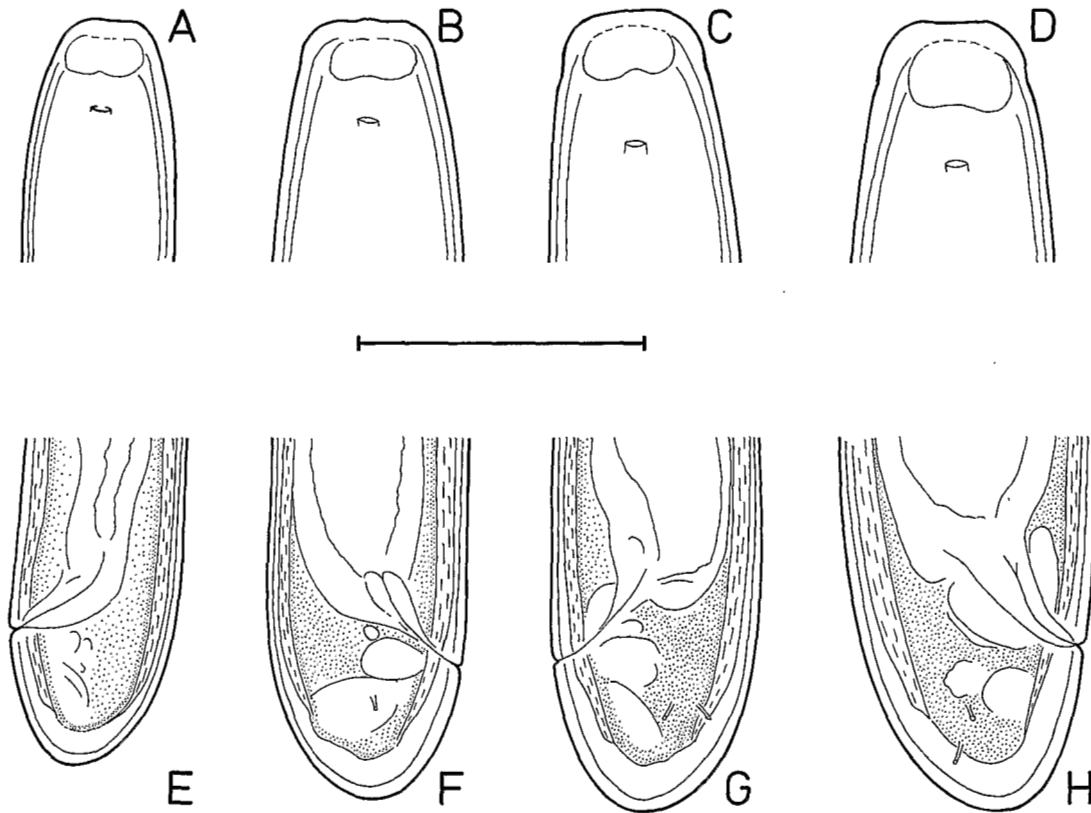


Fig. 5. *Longidorus kuiperi* n. sp. Juveniles. A-D head ends; E-H tails, lateral view. A and E : J-1; B and F : J-2; C and G : J-3; D and H : J-4. (The scale line corresponds to 50 μm .)

Paratypes : ten females and four males on slides WT 2458-2469, same collection; one male and one female at each of the following addresses : Plantenziektenkundige Dienst, Wageningen, Netherlands; University of California, Davis, USA; Nematologisch Instituut, Münster, Federal Republic of Germany; Muséum national d'Histoire naturelle, Paris, France; Instituut voor Dierkunde, Rijksuniversiteit, Gent, Belgium; Istituto di Nematologia agraria, Bari, Italy. One female deposited at : Rothamsted Experimental Station, Harpenden, England; University of California, Riverside, USA; and USDA, Beltsville, USA.

TYPE HABITAT AND LOCALITY

Light dune-sand soil around roots of marram grass (*Ammophila arenaria* Link.), De Muy, Island of Texel, The Netherlands. Found also at Oostvoorne, The Netherlands, and in Wimereux, France; in both localities also associated with marram grass.

DIAGNOSIS AND RELATIONSHIPS

L. kuiperi n. sp. is characterized by the very slender body, curved in adults, straight in juveniles; very broad lip region (25-31 μm); very broad and short amphids; short hemispherical tail; body length 6.2-8.5 mm; vulva position 50-55; odontostyle length 99-117 μm . Males are common; they have VD 25-37; spicules L-shaped; supplements 12-13 ventrosubmedians plus two ventral rows of four each; terminal cuticle bulging.

L. kuiperi shares a great number of conspicuous characters with *L. edmundsi* Hunt & Siddiqi, 1977 from Santa Lucia, West Indies. Indeed, the population of *L. edmundsi* described from Italy by Lamberti *et al.* (1985) is *L. kuiperi* (specimens examined); curiously this population was associated with roots of pea and olive. The common peculiarities are :

— the body tapers only slightly anteriorly, the lip region is conspicuously broad;

- the spicules are L-shaped;
- the amphids are very broad and short;
- the body posture of juveniles is almost or wholly straight;
- VD is very short;
- the posterior supplements are arranged into two longitudinal rows.

L. kuiperi and *L. edmundsi* can be distinguished by the following features :

- adults of *L. kuiperi* often assume a widely curved posture, whereas those of *L. edmundsi* usually lie almost straight;
 - in males of *L. kuiperi* the terminal cuticle is thickened, drop-like; in *L. edmundsi* this thickening is less pronounced or absent;
 - the number of ventromedian supplements is 12-13 in *L. kuiperi*, 7-8 in *L. edmundsi*;
 - the lip region is more distinctly offset in *L. kuiperi* than in *L. edmundsi*;
 - body length of females is 6.5-8.5 mm in *L. kuiperi*, 4.6-6.7 mm in *L. edmundsi*;
 - vulva position : in *L. kuiperi* 48-55 (generally over 50), in *L. edmundsi* 46-51 (generally under 50);
 - a = 125-185 in *L. kuiperi*, 101-138 in *L. edmundsi*;
 - c = 231-314 in *L. kuiperi*, 154-238 in *L. edmundsi*;
 - the distance from head end to guiding ring is 25-31 μm in *L. kuiperi*, 23-25 μm in *L. edmundsi*.
- The species is named in honour of the collector.

ACKNOWLEDGMENT

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imental Station, Harpenden, England, for loaning specimens of *L. attenuatus* and for giving information about *L. apulus*, and Prof. Dr. F. Lamberti, Bari, Italy, for loaning specimens of *L. kuiperi* from Italy.

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