

## Redescription of *Seinura demani* (T. Goodey, 1928) J. B. Goodey, 1960 (Nematoda : Seinuridae) and designation of a neotype

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**Summary** – *Seinura demani* is redescribed from a population originating from Humberside, England. A neotype is designated. The species is characterized by a slightly asymmetrical lip region; males are much smaller than females and have often a reduced pharynx.

**Résumé** – *Redescription de Seinura demani* (T. Goodey, 1928) J. B. Goodey, 1960 (Nematoda : Seinuridae) et désignation d'un néotype – *Seinura demani* est redécrit à partir d'une population provenant de Humberside, en Angleterre. Un néotype est désigné. Cette espèce est caractérisée par la région labiale légèrement asymétrique, la taille des mâles nettement plus faible que celle des femelles et un pharynx fréquemment réduit.

**Key-words** : Nematata, *Seinura*, redescription.

In 1928 T. Goodey described a new species, *Aphelenchus demani*, from seven females and one male, found on grass blades from a turf in England. In 1933 he transferred it to the genus *Aphelenchoides* Fischer, 1894; in 1960 J. B. Goodey transferred it to the genus *Seinura* Fuchs, 1931, where it has remained. In his description T. Goodey (1928) made use of notes and measurements sent to him by J. G. de Man from Holland, but he did not see these specimens himself.

Later the species was mentioned and described by Goffart (1930), W. Schneider (1939), Filipjev and Schuurmans Stekhoven (1941), and Meyl (1961). However, all these authors copied the original description; apparently they did not have fresh material. Only Rahm (1938) described new specimens from Hainan, but his description contains data which make it dubious as to whether his specimens belong to *S. demani*.

Goodey's type material does not exist any more. One of us (DJH) found and cultured a population from turf from the county of Humberside, sent by the Agricultural Development and Advisory Service of the Ministry of Agriculture at Leeds, Yorkshire. Since the systematics of the genus *Seinura* contains several uncertainties, we give a redescription of the species and designate a neotype.

### Material and methods

A few specimens of *S. demani* from turf were added to an agar plate culture of *Aphelenchus avenae* on *Botrytis cinerea*. Some five weeks later virtually all the *Aphelenchus* had disappeared, presumably killed by the *Seinura* of which there were several hundred on the plate. Specimens for light microscopy were killed and fixed by add-

ing hot FP 4:1 plus 2% glycerol (plus a trace of picric acid for one batch) to them in a glass cavity block which was then left loosely covered for several weeks at room temperature until the fixative had evaporated leaving the specimens in glycerol in which they were stored and eventually mounted for permanent slides. Specimens for examination with SEM were fixed as above for a few days, then transferred to 1% OsO<sub>4</sub> in phosphate buffer for 1 h, then via graded ethanol solutions to absolute ethanol, critical-point dried using CO<sub>2</sub>, put onto SEM stubs and gold coated. They were examined in an Hitachi S-450 SEM at 20 kV. Some later SEM examinations were made on specimens that had been processed as above in a Jeol JSM 35 C at the TFDL, Wageningen.

### *Seinura demani* (T. Goodey, 1928)

J. B. Goodey, 1960

(Figs 1-3)

### MEASUREMENTS

See Tables 1, 2.

*Neotype female* : L = 0.71 mm; a = 34; b' = 10.9; b = 4.4; c = 6.7; c' = 8.0; V = 71; stylet = 16 µm; distance ant. end to post. margin of pharyngeal bulb = 65 µm; pharyngeal gland overlap = 95 µm; pharynx total length = 160 µm; tail = 106 µm.

### DESCRIPTION

*Adults* : Body slender, almost straight in females, strongly curved ventrad posteriorly in males. Cuticle 1 µm thick, with almost imperceptible transverse striae which are about 1 µm apart. Lateral field narrow, some

**Table 1.** Dimensions of 50 females of *Seinura demani* (all measurements in  $\mu\text{m}$ ).

	Range	Mean	SD	CV %
L	525-748	652	46.3	7.1
a	30.5-37.8	33.5	1.66	5.0
b' *	8.8-11.6	10.7	0.54	5.0
b **	3.6-5.2	4.2	0.25	5.8
Ant. end to post. margin of MB	56-68	61	8.7	14.3
Pharyng. overlap	77-114	93	7.6	8.2
Total pharynx	141-182	153	9.8	6.4
c	6.1-9.0	7.3	0.65	8.9
c'	6.3-10.2	8.2	0.76	9.3
V	68-73	71	0.91	1.3
Tail	69-109	89	9.8	10.9
VA/tail	0.78-1.49	1.15	0.15	13.4
Stylet ***	15-18			

\* Body length divided by distance from ant. end to posterior margin of bulb.

\*\* Body length divided by distance from ant. end to posterior end of gland lobe.

\*\*\* Since it is very difficult to locate the posterior end of the stylet, we have refrained from calculating mean, SD and CV.

3  $\mu\text{m}$  wide, indistinct, with three longitudinal grooves. Head end slightly but distinctly asymmetrical, dorsally higher than ventrally. [This has not been noted earlier, but it is indicated in an unpublished drawing of T. Goodey which is reproduced here]. Head end offset with the six sectors well separated. SEM pictures show that the oral aperture is surrounded by six inner liplets. Amphid apertures shifted slightly dorsad. The four cephalic sensillae are conspicuous, the inner labial sensillae

**Table 2.** Dimensions of 50 males of *Seinura demani* (all measurements in  $\mu\text{m}$ ).

	Range	Mean	SD	CV %
L	361-583	439	41.9	9.6
a	28.4-45.0	34.5	3.5	10.2
b' *	7.5-10.0	8.7	0.45	5.1
b **	3.3-7.4	5.9	0.83	13.9
Ant. end to post. margin of MB	40-59	48.6	4.2	8.6
Pharyng. overlap	13-60	26.6	10.45	39.3
Total pharynx	58-112	76	12.4	16.4
c	5.6-8.6	7.2	0.91	12.6
c'	5.4-9.4	6.9	0.74	10.7
T	19-32	26	2.8	10.7
Tail	43-88	61.5	8.3	13.6
Stylet	13-17			

are just visible, the outer labial ones cannot be distinguished. Head not sclerotized.

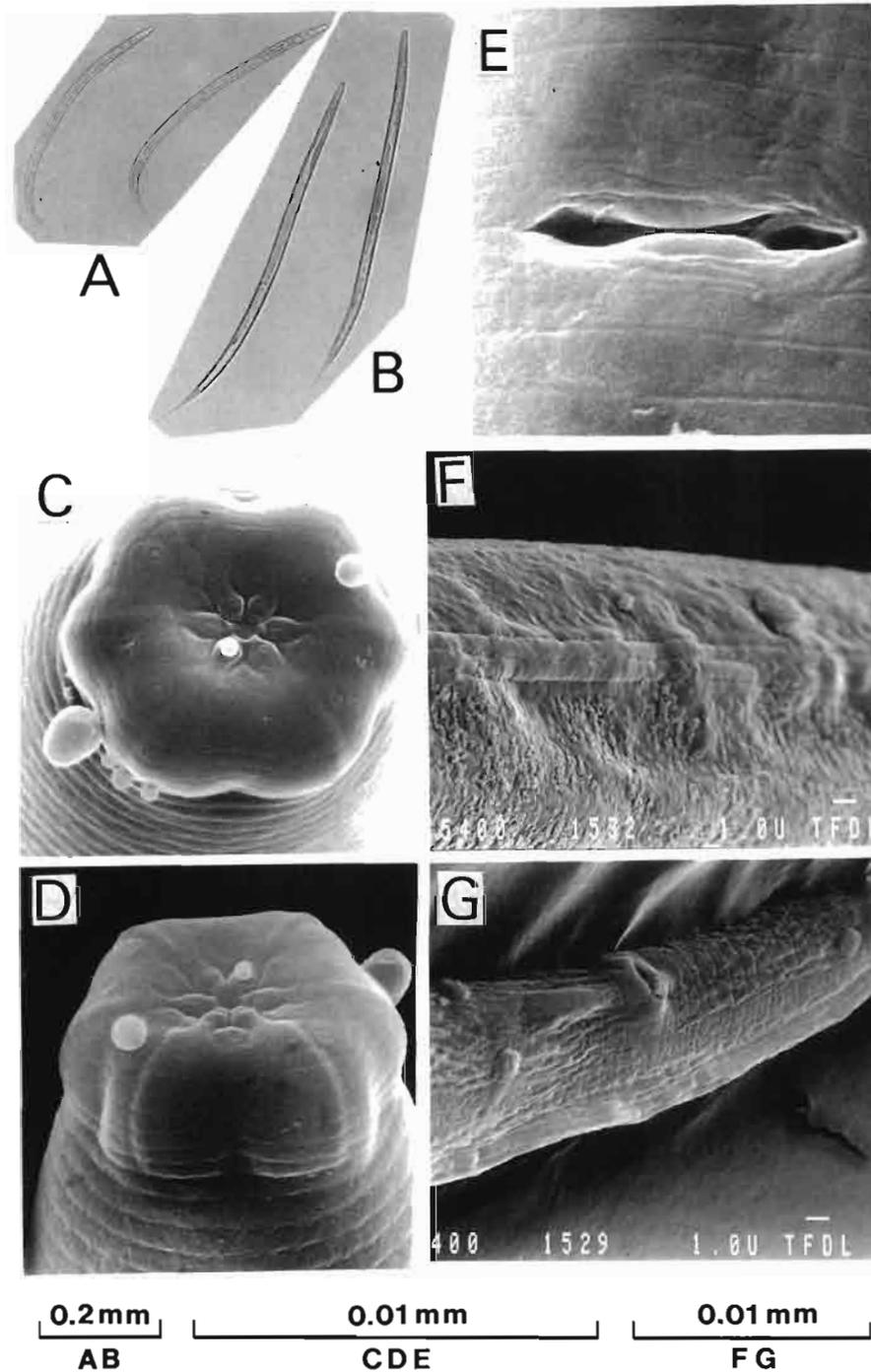
**Females :** Stylet about 15-18  $\mu\text{m}$  long, with small knobs and wide lumen. Median pharyngeal bulb broadly oval. The dorsally overlapping gland lobe extends to 77-114  $\mu\text{m}$  behind the posterior margin of the bulb; total pharynx length is 141-182  $\mu\text{m}$ . The gland lobe often has a distinct, fine, granular zone at the posterior end posterior to the dorsal nucleus. The gland nuclei are often indistinct, but some specimens show three nuclei. Excretory pore usually opposite to, or slightly anterior to the nerve ring, but occasionally slightly posterior to it. Hemizonid 3-4  $\mu\text{m}$  long, just behind the nerve ring and some 15  $\mu\text{m}$  posterior to the excretory pore. Reproductive system mono-prodelphic without a posterior uterine sac, lying on the right side of the intestine. The ovary contains numerous oocytes in multiple rows and often extends into the region of the gland lobe; sperm rounded, about 1  $\mu\text{m}$  in diameter. A true spermatheca appears to be lacking, the sperm may collect at different places in the uterus. Tail 69-109  $\mu\text{m}$  long, gradually narrowing, terminal part filiform. The anus is often very indistinct and difficult to detect; in the scanning microscope we could not see it, but the rectum generally is discernible.

**Males :** Conspicuously smaller than female. Stylet lumen and knobs indistinct. The median bulb and still more the gland lobe are reduced; the latter is often indistinct but of 50 males examined 3 had a distinct, well-developed gland lobe. Testis mostly degenerate but this is probably due to the age of the culture when it was fixed. A few specimens have been seen with an extensive testis; in these the pharynx is almost as well developed as in the females. *Vas deferens* filled with sperm. Spicules typical for genus, with large, rounded head, 13-16  $\mu\text{m}$  long, without gubernaculum. Tail convex-conoid first, then filiform; the two parts are clearly separated by a constriction; the filiform part is straight or curved dorsad. There is a subventral pair of papillae anterior to the cloacal aperture opposite the spicule rostrum, and another subventral pair near the end of the anterior part of the tail.

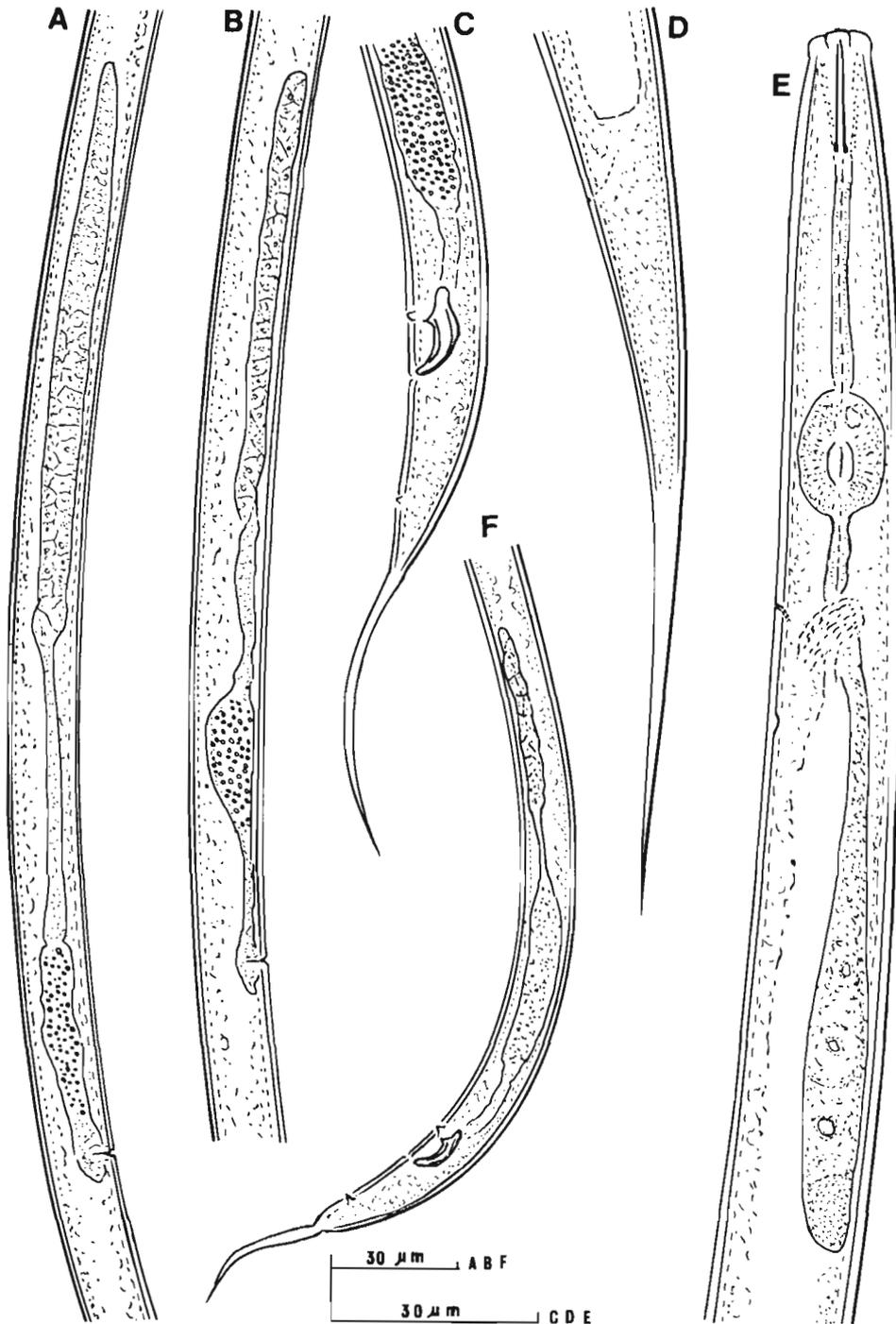
#### TYPE SPECIMENS

**Neotype :** Female on slide 86 A/6/1 in the Nematology Collection of the Rothamsted Experimental Station, Harpenden, England.

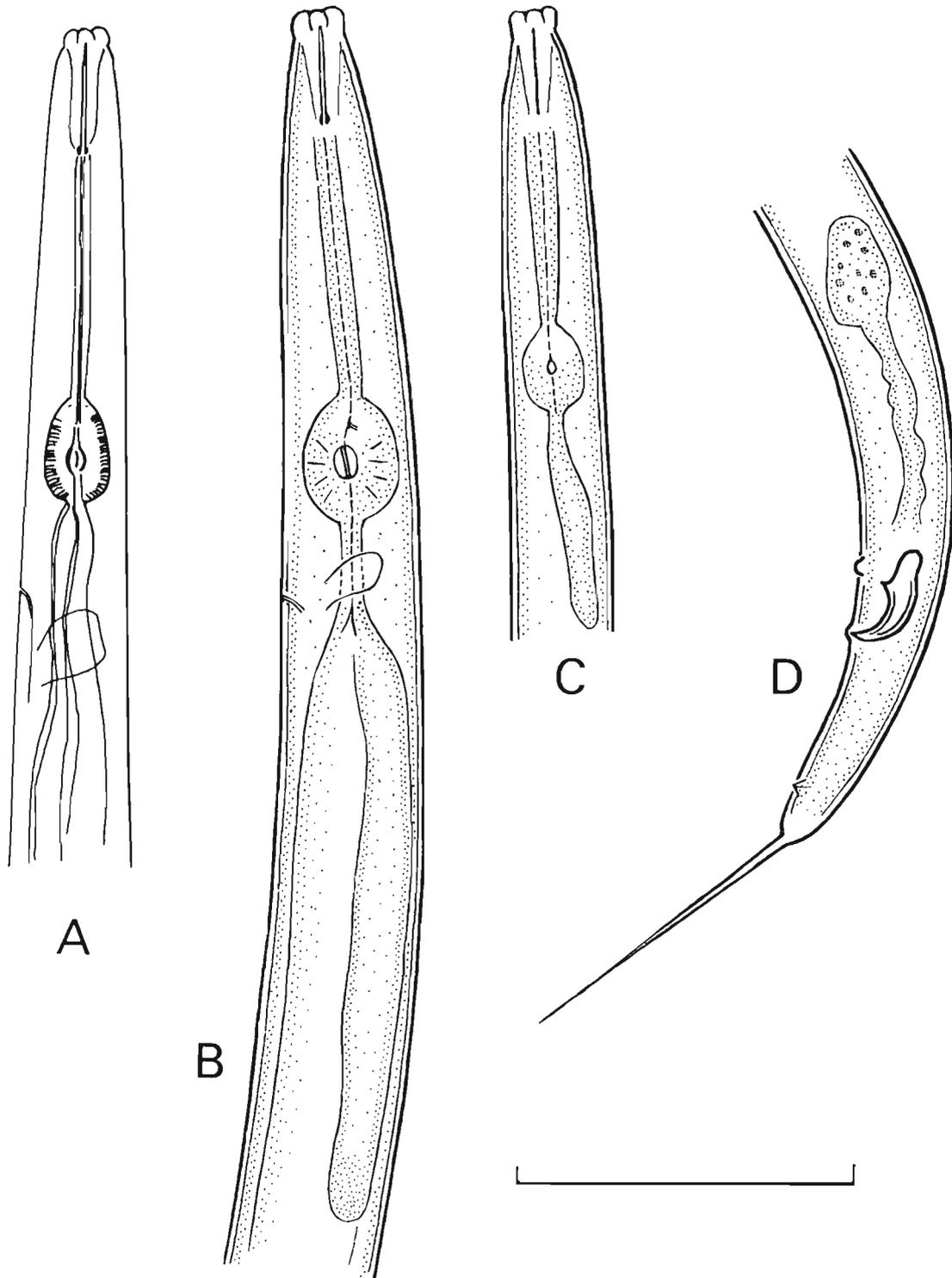
**Paraneotypes :** Deposited at Rothamsted Experimental Station (152 females and 46 males on slides 86 A/6/2-13); Wageningen Agricultural University, Netherlands (60 females, 43 males); one male and two females at each of the following addresses : Instituut voor Dierkunde, Gent, Belgium; Institut für Nematologie und Wirbeltierkunde, Münster, Germany; USDA Nematology Laboratory, Beltsville, USA; University of California, Davis, USA; University of California, Riverside, USA; Randse Afrikaanse Universiteit, Johannesburg,



**Fig. 1.** *Seinura demani*. A : Body attitude of males; B : Same of females – C-G SEM micrographs : C, D : Head end (end-on and oblique); E : Ventral view of vulva; F : Lateral field; G : Male tail showing papillae and lateral field (C, D, E were made with a Hitachi S-450 at Rothamsted, F and G on a Jeol JSM 35 C at the TFDL, Wageningen).



**Fig. 2.** *Seimura demani*. A, B : Reproductive tract of female showing location of sperm; C : Posterior end of male; D : Female tail; E : Female, pharyngeal region; F : Reproductive tract of male with well-developed testis.



**Fig. 3.** *Seinura demani*. A : Male, anterior end of body showing slight asymmetry of the lip region (traced from an unpublished pencil drawing by T. Goodey); B : Female neck region; C : Male neck region; D : Male, posterior end showing straight distal part of tail. (Bar = 50  $\mu$ m).

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#### NEW TYPE LOCALITY

Turf in a field just inside the western border of Humberside between Blackfoss Beck and the road from Elvington to Newton upon Derwent, just north of the road from Elvington to Barmby Moor; National Grid Ref. SE 723476.

Though Goodey's original specimens probably came from somewhere in the St. Albans area, this is not certain and since the type locality was given as "England" without further qualification, we think it justified to select a neotype from the Humberside population, so that Humberside is the new type locality.

#### DIAGNOSIS AND RELATIONSHIPS

*S. demani* differs from most other species in the genus by absence of a posterior uterine sac. It differs from the remaining species as follows :

- *S. diversa* (Paesler, 1957) : this species has a relatively shorter tail ( $c = 8.5-11$  in females,  $13-15$  in males) and consequently the vulva is more posterior ( $75-78$  vs  $68-73$ ).
- *S. oliveirae* (Christie, 1939) : in this species the male tail tapers uniformly and the excretory pore is behind the nerve ring.
- *S. oostenbrinki* Husain & Khan, 1967 : the female tail in this species is abnormal, *Mesodorylaimus*-like; a very short posterior uterine sac is present, one-third to one-half body diameter long. Males were not found with 31 females studied.
- *S. oxura* (Paesler, 1957) : has a more posterior vulva ( $79-80$  vs  $68-73$ ); the tail is short ( $c$  in females =  $13-15$ ) and not filiform.
- *S. paraoxyura* Mavlyanov, 1976 : vulva position and index "c" as in *S. oxura*.
- *S. propora* Siddiqi, Husain & Khan, 1967 : vulva position and index "c" as in the two preceding species.
- *S. winchesi* (Goodey, 1927) : stylet knobs absent; valves in centre of median bulb; the violin shape of the bulb is probably an artefact. *S. winchesi* differs from *S. demani* by its longer stylet ( $24-27 \mu\text{m}$ ) and lack of pre-cloacal male papillae.

*S. demani* resembles most *S. celeris* Hechler & Taylor, 1965 : the tail in this species is slightly shorter, the basal knobs of the stylet are smaller and the median bulb might be slightly more oblong. Also very similar is *S. aurangabadensis* Suryawanshi, 1971, which appears to differ only by longer stylet ( $19-20.5 \mu\text{m}$ ) without basal knobs, and by lower values of a ( $26-30$  vs  $30-38$ ) and b' ( $3.0-3.5$  vs  $3.6-5.2$ ). Suryawanshi (1971) did not give

values for "c" evidently because the anus was undetectable.

The strong size difference between males and females has been reported for some other *Seinura* species too : *S. celeris*; *S. chertkovi* Dmitrenko, 1966; *S. diversa*; *S. elmirraensis* (van der Linde, 1938); *S. filicaudata* (Christie, 1939); *S. longicaudata* (Cobb, 1893); *S. mali* Fuchs, 1931; *S. oliveirae* and *S. winchesi*.

#### GEOGRAPHICAL DISTRIBUTION

Goodey (1928) mentioned the species from Holland and England. Kozłowska (1967) and Domurat (1970) reported it from Poland; the latter author found it in soil of barley fields and calls it a quite common soil inhabiting species in Europe. It has also been reported from Bulgaria (Stoyanov, 1961), Czechoslovakia (Saly, 1971) and Hungary (Andrássy, 1973). Baranovskaya (1981) lists records of *S. demani* from Russia, Azerbaijan, Georgia, Lithuania, Estonia, Moldavia, Kazakhstan and Uzbekistan. Nguyen Chung Tu (1982) recorded it from Vietnam. Wood (1975) studied a population from grassland in the Southern Alps of New Zealand, which was readily reared on bacteria - and fungus - feeding nematodes. The life cycle at  $20^\circ\text{C}$  was 4-5 days.

#### REMARKS

The SEM photos of the head end of *S. demani* correspond with the general scheme given by Hooper and Clark (1980) and are in general not unlike those for *S. tenuicaudata* (de Man, 1895) given by these authors, except that in the latter species a lateral lobe is present on either side of the oral aperture, between this and the lateral liplets; the shape of the latter is also different.

By the fact that the females of *S. demani* and possibly *S. aurangabadensis* have apparently no anal opening, these species appear close to the genus *Ektaphelenchoides* Baujard, 1984. Grewal *et al.* (1992) described *S. paynei* in which the anus in females is "generally obscure" and *S. obscura* where it is "in most specimens indistinct". Studies are desired to establish whether this feature is present in other *Seinura* species as well; if so, *Seinura* and *Ektaphelenchoides* might be placed in the same (sub) family.

#### Acknowledgments

Miss Alison Hoole obtained the SEM micrographs and Mrs. Janet Rowe made the prints for Fig. 1 C, D, E. Mrs. H. van Megen assisted in making the micrographs of Fig. 1 F, G. The Entomology Department of the Agricultural Development and Advisory Service, MAFF, Leeds kindly supplied details of the locality from which the neotype population originated.

#### References

- ANDRÁSSY, I. (1973). 100 neue Nematodenarten in der ungarischen Fauna. *Opusc. zool. Bpest.*, 11 : 7-48.
- BARANOVSKAYA, I. A. (1981). [*Plant and soil nematodes (Aphelenchoididae and Seinuridae)*]. Moscow, Nauka, 234 p.

- DOMURAT, K. (1970). Nematode communities occurring in spring barley crops. *Ekol. polska*, 18 : 681-740.
- FILIPJEV, I. N. & SCHUURMANS STEKHOVEN, J. H. (1941). *A manual of agricultural helminthology*. Leiden, Brill, 878 p.
- GOFFART, H. (1930). *Die Aphelenchen der Kulturpflanzen*. Berlin, Morstatt, 105 p.
- GOODEY, J. B. (1960). The classification of the Aphelenchoidea Fuchs, 1937. *Nematologica*, 5 : 111-126.
- GOODEY, T. (1928). The species of the genus *Aphelenchus*. *J. Helminth.*, 6 : 121-160.
- GOODEY, T. (1933). *Plant parasitic nematodes and the diseases they cause*. London, Methuen, 306 p.
- GREWAL, P. S., SIDDIQI, M. R. & ATKEY, P. T. (1992). *Aphelenchoides richardsoni* sp. nov. and *Seinura paynei* sp. nov. from mushrooms in the British Isles and *S. obscura* sp. nov. from India (Nematoda : Aphelenchina). *Afro-Asian J. Nematol.*, 1 (1991) : 204-211.
- HOOPER, D. J. & CLARK, S. A. (1980). Scanning electron micrographs of the head region of some species of Aphelenchoidea (Aphelenchina : Nematoda). *Nematologica*, 26 : 47-56.
- KOZŁOWSKA, J. (1967). Soil nematode fauna occurring in the Jadwisin fields near Warsaw and the effect of environmental conditions on them. *Ekol. polska*, Seria A 15 : 443-485.
- MEYL, A. H. (1961). *Die freilebenden Erd- und Süßwasserne-matoden (Fadenwürmer)*. *Tierwelt Mitteleuropas* 5a, Leipzig, Quelle & Meyer, 164 p.
- NGUYEN CHUNG TU (1982). [On the order Tylenchida, parasitic nematodes on some crops of Bac Bo Delta area]. *Sinh Vat Hoc*, 4 : 14-22.
- RAHM, G. (1938). Freilebende und saprophytische Nematoden der Insel Hainan (mit besonderer Berücksichtigung der bisher bekannt gewordenen Nematoden Nordchinas und Japans). *Annotines zool. jap.*, 17 : 646-667.
- SALY, A. (1971). Nematodofauna xerofilnych uzemi v oblasti zemplinskej siravy. *Biol. Bratislava*, 26 : 827-834.
- SCHNEIDER, W. (1939). *Würmer oder Vermes. II. Fadenwürmer oder Nematoden. I. Freilebende und pflanzenparasitische Nematoden*. *Tierwelt Deutschlands*, Jena, Gustav Fischer, 36, 260 p.
- STOYANOV, D. (1961). [A contribution to the nematode fauna on some cultivated and wild-growing plants in Bulgaria]. *Plant Prot., Sofia*, 5 : 50-64.
- SURYAWANSHI, M. V. (1971). Studies on Aphelenchoidea (Nematoda) from Marathwada, India, with descriptions of three new species and a discussion on the validity of *Aphelenchus radicolus* (Cobb, 1913) Steiner, 1931. *Nematologica*, 17 : 417-427.
- WOOD, F. H. (1975). Biology of *Seinura demani* (Nematoda : Aphelenchoididae). *Nematologica*, 20 (1974) : 347-353.