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Free-living marine nematodes from the Southern Bight of the North Sea. I. Notes on species of the genera *Gonionchus* Cobb, 1920, *Neochromadora* Micoletzky, 1924 and *Sabatieria* Rouville, 1903

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Abstract

The intraspecific variation of some nematode species from the Southern Bight of the North Sea is discussed.

A redescription (or amplification) is provided for following species: *Gonionchus longicaudatus* (Ward, 1972), *Neochromadora angelica* Riemann, 1976, *N. munita* Lorenzen, 1971, *N. paratecta* Blome, 1974, *Sabatieria celtica* Southern, 1914, *S. longispinosa* Lorenzen, 1972, *S. punctata* (Kreis, 1924).

Following taxonomic changes are proposed: *Gonionchus villosus* sensu Vincx, 1981 nec Cobb, 1920 is synonymized with *G. cumbraensis* Benwell, 1981; *Neochromadora paramunita* Boucher, 1976 is synonymized with *N. munita* Lorenzen, 1972; *Sabatieria strigosa* Lorenzen, 1972 is synonymized with *S. celtica* Southern, 1914; *Sabatieria mortenseni* (Ditlevsen, 1921), *S. breviseta* (Stekhoven, 1935) and *S. vulgaris* sensu Gerlach (1965) and sensu Riemann (1966) (nec de Man, 1907) are synonymized with *S. punctata* (Kreis, 1924).

Two new species are described: *Gonionchus heipi* sp.n., a species mainly characterized by its aberrant cuticular ornamentation and *Neochromadora nicolae* sp.n. a species characterized by a weak cuticular ornamentation, cephalic setae less than 50% of corresponding body diameter (c.b.d.), prominent dorsal stomatal bulb, prominent ventral gland and males with eight minute preanal supplements.

Introduction

Biological species are in practice defined as a cluster of phenetically similar individuals; the inference that a phenetic cluster is a biological species can be viewed as a prediction that stands or falls with increased data (Hull, 1968, 1971).

Marine nematode species are often characterized and defined by diagnostic features which are valid for the few specimens on which the species diagnosis is based. The examination of large nematode populations from the Southern Bight of the North Sea shows that the diagnostic characters proposed for some species are not constant at all. This large intraspecific variation will be illustrated by a few species of the genera *Gonionchus, Neochromadora* and *Sabatieria*. The variation is especially large in *G. villosus, N. munita, S. celtica* and *S. punctata*. For the sake of completeness, all the encountered species of these genera, found in the study area, are described.

Nematologists should be stimulated to examine an increased number of data from a larger number of specimens; nowadays, the tendency exists that each nematologist creates his own species (at least for some genera) in his area of investigation.

Material and methods

From 1972 onward, a bulk of samples was collected in the Southern Part of the North Sea revealing a lot of nematodes to examine.

Description of the area and general characteristics of the nematode assemblages are given in Herman *et al.* (1985).

Methods and abbreviations are as mentioned previously (Vincx *et al.*, 1982).

Results

Gonionchus heipi *sp.n. (Figs. 1–3 A–C)*

Material

Type specimens. Holotype male σ'_1 (slide no. 731) and paratype female φ_1 (slide no. 732) in the Nematode Collection of the Instituut voor Dierkunde, Gent, Belgium. Other paratypes (5 males, 5 females and 10 juveniles) in the same collection.

Type locality. Station M25 (52°26′30″N–03°09′15″E) in the Southern Bight of the North Sea. Collected 27 June 1972. Fine-medium sand with median particle diameter of the sand fraction= 260 μm; silt-clay fraction <1%; no gravel. Depth= 31 m.

Other localities. Twenty-three in total are shown on Fig. 1.

Etymology

The species is dedicated to Dr. C. Heip, head of the Marine Biology Section in the Institute of Zoology, Gent.

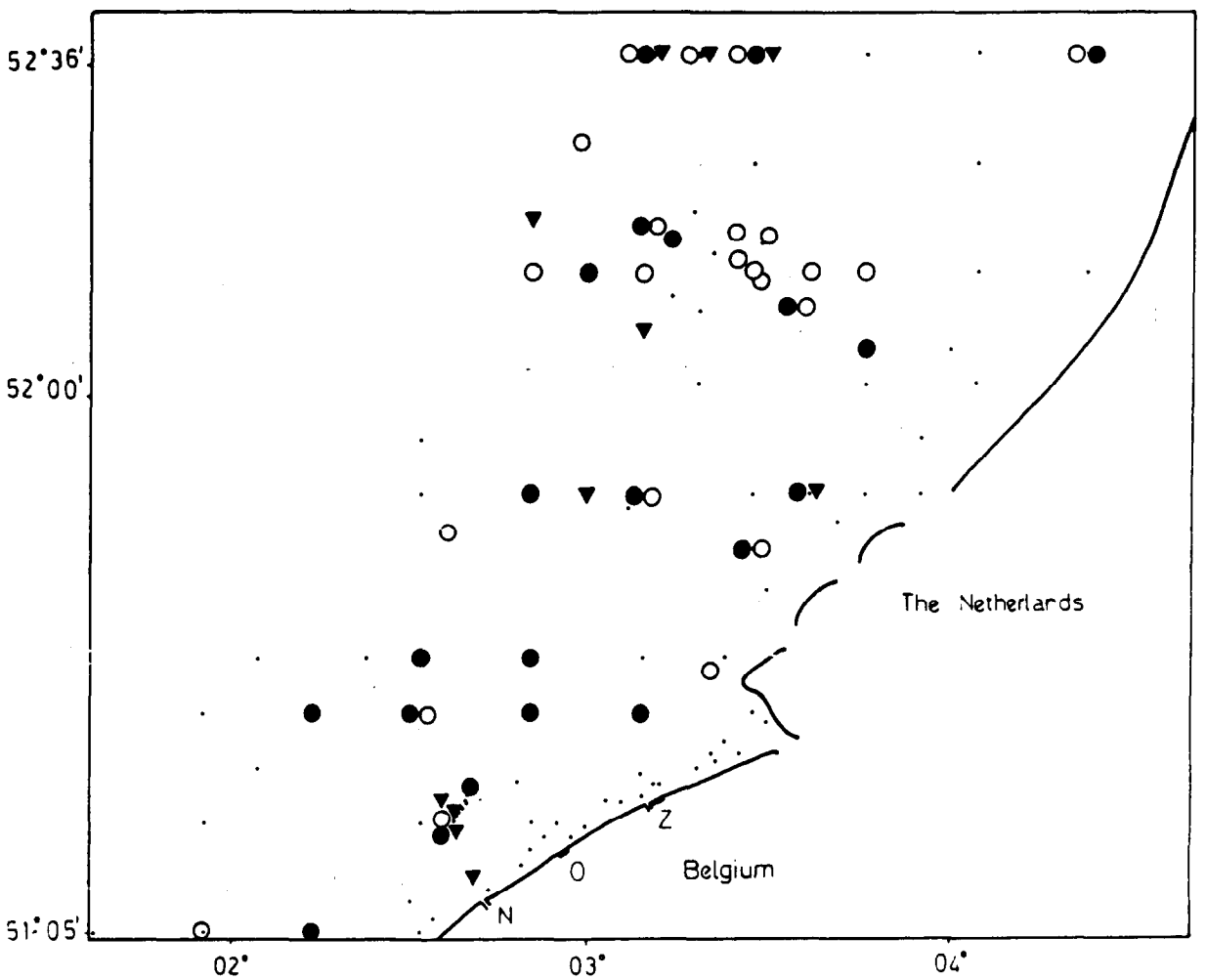

Fig. 1. Distribution of *Gonionchus longicaudatus* (▾), *G. villosus* (●) and *G. heipi* (○) in the Southern Bight of the North Sea.

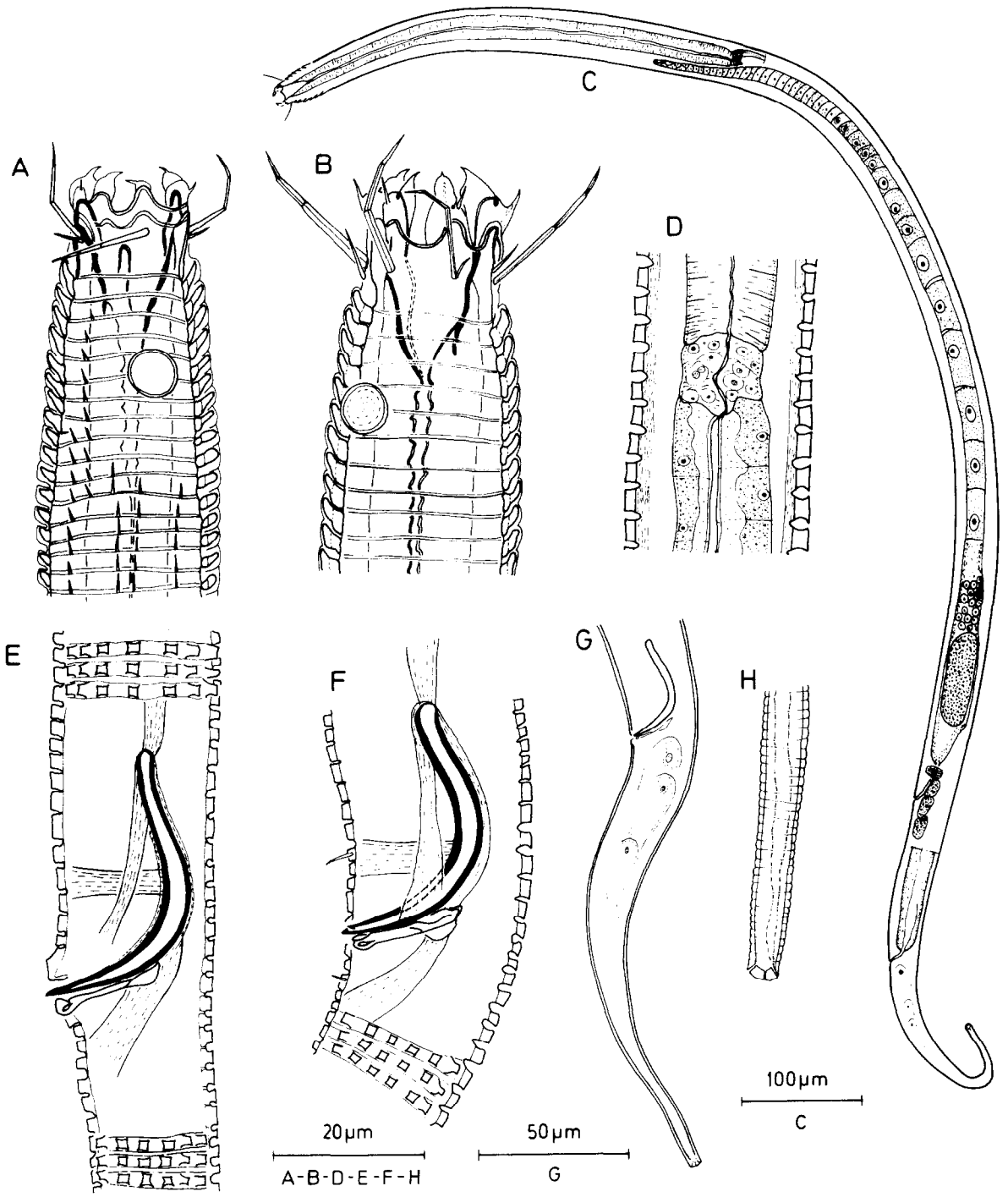

Fig. 2. Gonionchus heipi sp.n. A. Head end σ_1; B. Head end φ_1; C. Total view φ_1; D. Cardial region σ_1; E. Copulatory apparatus σ_1; F. Copulatory apparatus σ_2; G. Tail σ_2; H. Tail tip σ_2.

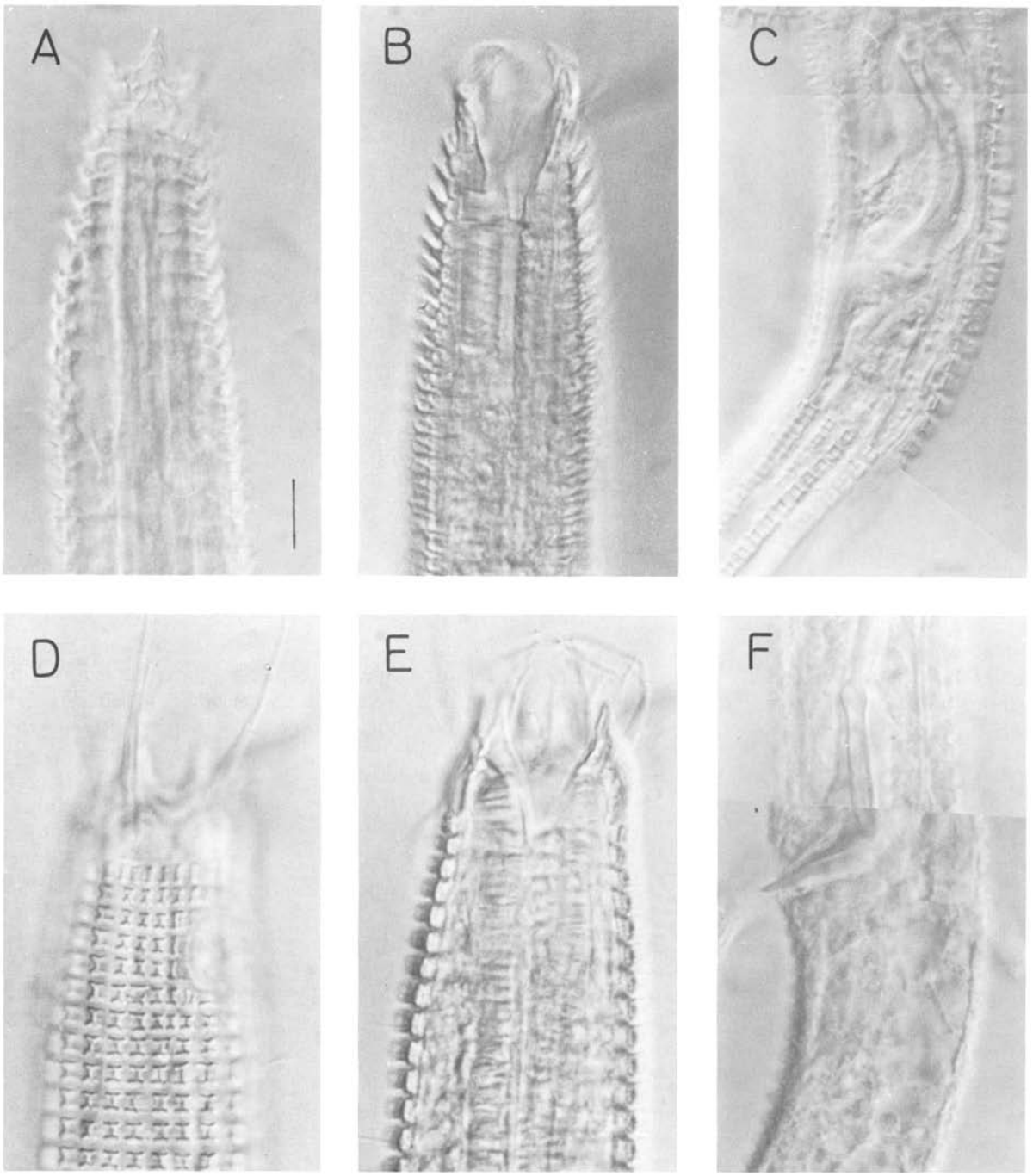

Fig. 3. Gonionchus heipi sp.n.: A. Head end σ_1; B. Buccal cavity σ_1; C. Spicule and cuticular pattern σ_1. *Gonionchus longicaudatus*: D. Head end σ_1; E. Buccal cavity σ_1; F. Spicule σ_1. (Scale bar is 10 μm).

Measurements

Holotype (♂$_1$): $\frac{- \quad 85 \quad 290 \quad M \quad 1227}{17 \quad 23 \quad 24 \quad 25 \quad 23}$ 1390

a = 55.6 b = 4.8 c = 8.5 c′ = 7.0 spic = 47 μm

Paratype (♀$_1$): $\frac{- \quad 131 \quad 437 \quad 1193 \quad 1342}{24 \quad 31 \quad 33 \quad 39 \quad 31}$ 1570

a = 40.3 b = 3.6 c = 6.9 c′ = 7.4 V = 76.0%

Other paratypes:

	Males (n = 5)			Females (n = 5)		
L	: 1260	– 1490	μm	1370	– 1590	μm
a	: 43.5	– 55.6		40.2	– 45.6	
b	: 3.8	– 4.8		3.6	– 3.9	
c	: 7.9	– 8.8		6.9	– 7.3	
c′	: 6.7	– 7.0		7.3	– 8.7	
spic:	41	– 48	μm	V:74	– 76%	

Description

Males. Body elongated and cylindrical; tail tapering with cylindrical end part. Cuticle prominently annulated; annules about 3 μm broad. The cervical annules have anterior sections which cover the posterior border of the preceding annule. Longitudinal ornamentation starts at irregular levels in the cervical region; about 12 ridges of longitudinal bars pass into about 20 rows which consist of rectangular projections. The cylindrical part of the tail is annulated but lacks the longitudinal ornamentations.

The six lips are very high and weakly cuticularized. Each lip consists of a basal part which is separated from an apical part by a rather well pronounced boundary. The apical part ends in a flap-like protrusion.

Six internal labial sensillae (3 μm) project from the outer anterior wall of the basal part of the lips. Latter separated from the head region by an outer, folded ring which borders the head capsule anteriorly. This ring has six blunt protrusions and is continuous with an internal cephalic capsule, which is itself continuous with the wall of the buccal cavity. A second folded ornamentation in the cuticle of the head capsule is present between the anterior folded ring and the external labial and cephalic setae.

The six external labial setae (22 μm) are three-segmented; the four cephalic setae (7 μm) are at the same level of the former and are not segmented. Subcephalic setae absent. Somatic setae scarce and very short (5 μm).

Amphideal fovea circular (diameter 7 μm or 30% of the c.b.d.), situated between the fifth and sixth body ring in examined males.

Buccal cavity large and conical with strongly cuticularized walls; two ventrosublateral tooth-like protrusions are obvious but weakly sclerotized in ♂$_1$. In the other males, the tooth-like structures are not obvious, perhaps due to fixation conditions.

Pharynx cylindrical and muscular throughout its length; the lumen is well cuticularized. Cardia is 10 μm long. The wall of the intestine is composed of large cells which show a certain polarity: the outer part, which contains the nucleus, is heavily granulated in comparison with the translucent inner part.

Nerve ring at 30% of the pharyngeal length.

Ventral gland and pore not observed.

Other internal structures are not well preserved in the specimens examined.

Males diorchic; anterior testis on the left side of the intestine; posterior testis on the right side of the intestine. Spicules equal, regularly curved with bifid distal end (not always obvious) (cfr. Fig. 2F). The spicular retractor extends from the proximal end of the spicule to the lateral body wall; the protractor consists of two parts: a dorsal part extending from the dorsal side of the capitulum to the dorsal part of the gubernaculum and a ventral part between the ventral side of the capitulum and the lateral part of the gubernaculum. A rotator muscle extends from halfway the shaft of the spicule (dorsal side?) to the subventral body wall. Gubernaculum paired with a common median part; each lateral part is 16 μm long, weakly sclerotized and with a small dorso-caudal apophysis; the distal part shows a thickening with an internal opening. The protractor of the gubernaculum extends from the caudal part of the apophysis to the subventral body wall. Retractor of the gubernaculum not obvious.

There are probably five pairs of ejaculatory gland cells, situated at both sides of the vas deferens.

Tail conical in its first part, then cylindrical. Three caudal glands have separate outlets. No terminal setae.

Females. External morphology similar to the males.

Amphideal fovea with coiled corpus gelatum (not seen in the males because of fixation?) and situated between fourth and fifth body annule.

Reproductive system monodelphic with outstretched anterior ovary situated at the left side of the intestine. Top of the ovary extends to the level of the pharynx. One egg is found in uterus of ♀$_1$, preceeded by a group of sperm cells. Three prominent post-vaginal gland cells.

Diagnosis

Gonionchus heipi sp.n. is characterized by the anterior protrusions of the cervical body annules; longitudinal ornamentation (as rod-like structures) starting at irregular levels in the cervical region and continueing as rectangular protrusions which extend as longitudinal crests throughout the body (except for the cylindrical part of the tail); lack of subcephalic setae; equal spicules.

Discussion

Gonionchus heipi sp.n. is distinguished from all known *Gonionchus*-species by its typical cuticular ornamentation in the cervical region.

Gonionchus longicaudatus *(Ward, 1972) (Figs. 1, 3D–F)*

syn. Xyala longicaudata *Ward, 1972 in Lorenzen, 1977* Xyala smo *Warwick & Platt, 1973 in Warwick & Platt, 1973*

Material

Seven males, one female and ten juveniles.

Locality

Southern Bight of the North Sea; sublittoral fine-medium sandy bottoms (10–35 m depth) with less than 1.5% silt. Twelve localities (Fig. 1). Collected between 1972–1984.

Measurements

σ_1: $\frac{-\ 125\ \ 358\ \ M\ \ 1402}{21\ \ 27\ \ 29\ \ 31\ \ \ 27}$ 1600 (slide no 10101)

a = 51.6 b = 4.5 c = 8.1 c′ = 7.3 spic = 39 μm

♀$_1$: $\frac{-\ 135\ \ 406\ \ 1167\ \ 1377}{24\ \ 31\ \ 35\ \ \ 44\ \ \ 26}$ 1670 (slide no 10102)

a = 38.0 b = 4.1 c = 5.7 c′ = 11.3 V = 69.9%

Others:

Males (n = 6)

L	: 1600	– 1765	μm
a	: 45.7	– 55.2	
b	: 4.0	– 4.7	
c	: 6.8	– 8.7	
c′	: 7.3	– 7.8	
spic	: 30	– 39	μm

Description

Gonionchus longicaudatus was fully described by Ward (1972) and by Warwick & Platt (1973). Only additional information will be noted here.

Anterior folded border of the cephalic capsule continuous with the sclerotized wall of the buccal cavity. Tooth-like protrusions of the ventrosublateral walls of the stoma obvious in apical view.

Amphideal fovea circular, with coiled corpus gelatum.

Males diorchic with anterior testis on the left and posterior testis on the right of the intestine. Spicules equal; capitulum weakly developed and distal bifid tip. Gubernaculum (17 μm) paired with dorso-caudal apophysis. Musculature not obvious.

Tail conical with cylindrical end part; three caudal glands with separated outlets.

Female similar to the males. Genital apparatus weakly developed in the only specimen found.

Discussion

Benwell (1981) proposed to transfer the species in discussion to the *Xyala* genus, because of the cuticle with longitudinal ornamentations. I do not agree with this transfer because *Gonionchus* and *Xyala* do have a different head structure. In *Gonionchus*, the internal labial sensillae are protrusions of the thin, hyaline lips and the real base of these sensillae is not found. In *Xyala*, the internal labial sensillae are situated at the base of the lips and the base of the seta is obvious.

The buccal cavity of *Gonionchus* is conical and surrounded by pharyngeal tissue; ventrosublateral tooth-like projections are present. The buccal cavity of *Xyala* consists of a large cylindrical part (not surrounded by the pharynx) and a much shorter conical tail.

Gonionchus cumbraensis *Benwell, 1981*

syn.n. Gonionchus villosus *sensu Vincx, 1981, nec Cobb, 1920.*

Material

Five males, ten females and 18 juveniles.

Locality

Southern Bight of the North Sea; sublittoral fine-medium sand (10–35 m depth) with less than 2% silt. Twenty localities (Fig. 1). Collected between 1972–1984.

Description

The description of *Gonionchus villosus* sensu Vincx, 1981 in Vincx (1981) is in complete agreement with the description of *Gonionchus cumbraensis* Benwell, 1981. Reexamination of the type material of *G. cumbraensis* as well as *G. villosus* sensu Vincx, 1981 showed that males as well as females have one pair of 'subcephalic' setae additional to the lateral external labial setae. The length of the additional setae is equal to the length of the four cephalic setae. The presence of these additional setae was obvious in en face views but not always clear in the lateral view of the head.

Discussion

Up to now, the genus *Gonionchus* contained eight species which can be divided into two groups: a group of five species which have no longitudinal cuticular ornamentation, i.e. *G. cumbraensis* Benwell, 1981, *G. inaequalis* Warwick & Platt, 1973, *G. intermedius* Jensen, 1986, *G. paravillosus* Blome, 1982 and *G. villosus* Cobb, 1920 and a group of three species which have longitudinal ornamentations: *G. heipi* sp.n., *G. longicaudatus* (Ward, 1972) and *G. sensibilis* Lorenzen, 1977. The similarity of three species of the first group (excluding *G. inaequalis* which has unequal spicules) is striking. *G. cumbraensis* differs from *G. villosus* by the bifid spicules and by the possession of gubernacular apophyses.

G. paravillosus differs from *G. villosus* by the shape of the spicules ('proximal part of the spicule is not dorsally orientated as in *G. villosus*'); the length of the external labial setae to the cephalic setae (75% vs. 50%) and a shorter body length (± 1400 μm vs. 1900 μm).

G. villosus was redescribed by Vincx (1981) from specimens of the Southern Bight of the North Sea. Resemblances of the spicules cannot be fully assessed, as Cobb did not illustrate this structure.

However, the presence of an obvious gubernacular apophysis in *G. cumbraensis* indicates that difference with the original description of *G. villosus*. Therefore, I decide to synonymize *G. villosus* sensu Vincx, 1981 with *G. cumbraensis* Benwell, 1981.

Examination of the holotype of *G. paravillosus* shows the slender spicule and the complete absence of an apophysis in this species which clearly indicates the difference with *G. cumbraensis*.

The differential diagnoses of *G. cumbraensis* and *G. paravillosus* emphasize on the shape of the copulatory apparatus and the relative length of the anterior setae. The distal bifid tip of the spicules is also a generic character, not a specific one.

Neochromadora angelica *Riemann, 1976 (Figs. 4–6)*

Material

Three males, one female and three juveniles

Locality

Southern Bight of the North Sea; sublittoral medium-coarse sand with less then 2% silt. Five localities (Fig. 4). Collected between 1972–1984.

Measurements

σ'_1: $\frac{- \; 129 \; 235 \; M \; 1847}{25 \; 37 \; 39 \; 58 \; 44}$ 2070 (slide no. 10103)

a = 35.7 b = 8.8 c = 9.3 c′ = 5.1 spic = 45 μm

φ_1: $\frac{- \; 131 \; 225 \; 1004 \; 1822}{27 \; - \; - \; 65 \; 41}$ 2010 (slide no. 10104)

a = 30.9 b = 8.9 c = 10.7 c′ = 4.6 V = 50.0% (flattened at pharyngeal level)

Others:

Males (n = 2)

L	:	2100	– 2530	μm
a	:	35.6	– 38.3	
b	:	8.6	– 9.0	
c	:	8.9	– 9.3	
c′	:	5.0	– 6.2	
spic:		44	– 47	μm
p.s.:		6		

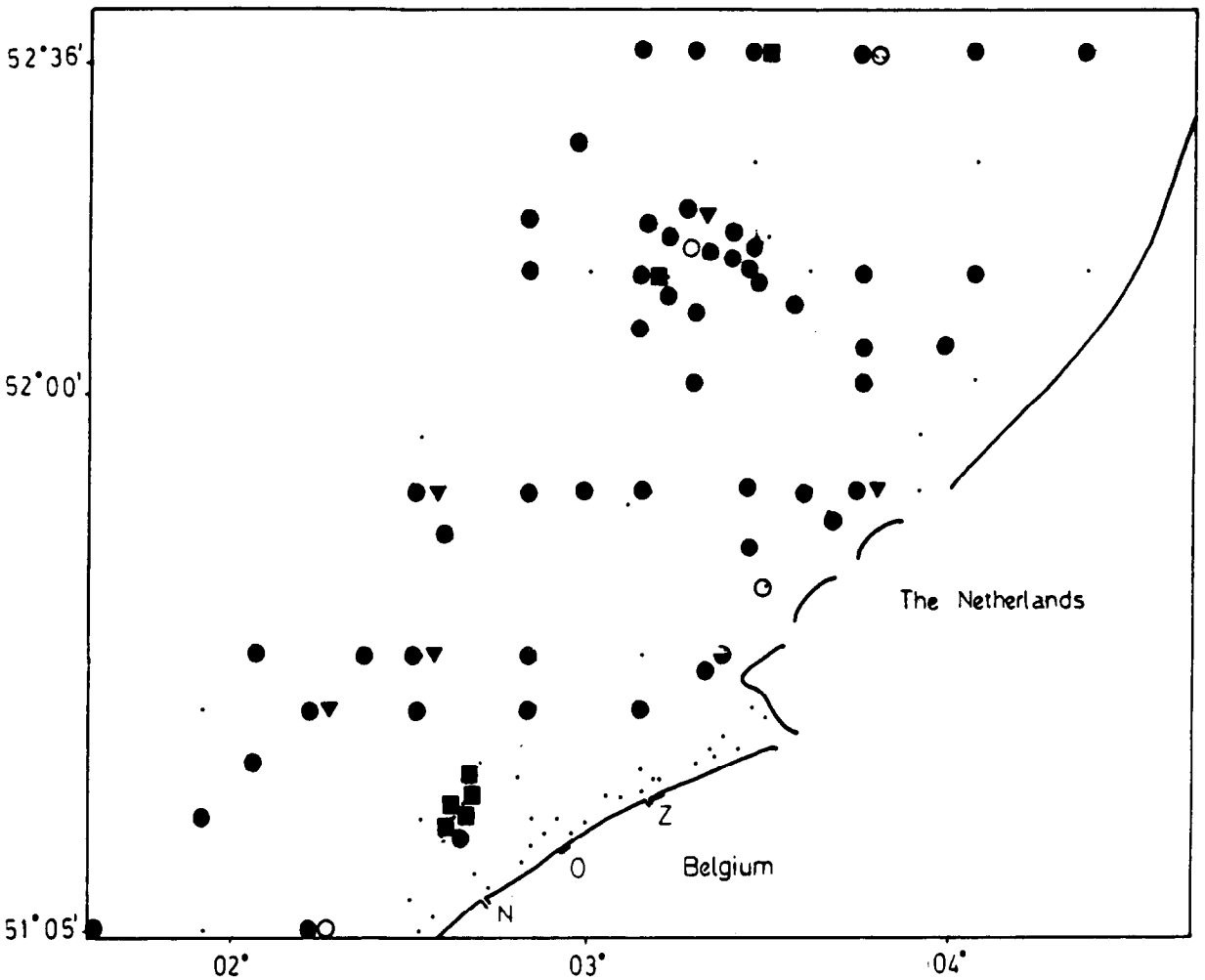

Fig. 4. Distribution of *Neochromadora angelica* (▼), *N. munita* (●), *N. paratecta* (■) and *N. nicolae* sp.n. (○) in the Southern Bight of the North Sea.

Description

Neochromadora angelica is very accurately described by Riemann (1976) from coarse sublittoral bottoms in the Helgoland Bight. Only additional information will be noted here.

The cuticular ornamentation starts at the level of the cephalic setae (these are 13 μm long); i.e. anterior from the amphideal fovea. The ornamentation consists there of very small dots which are irregularly placed. The broader body annules (cfr. description of *N. munita*) show a well pronounced lateral differentiation. At about 50% of the pharyngeal length, a broad lateral ala extends till the tail end.

The buccal cavity has one big dorsal tooth, two small ventrosublateral teeth and a ventral field of prominent denticles in its anterior part.

The six minute preanal supplements are connected with glandular structures.

Reproductive system monorchic with testis situated at the left of the intestine.

Spicules are open at their proximal end and pointed at the distal tip. The gubernaculum (23 μm) is weakly sclerotized.

Females resemble males.

Discussion

N. angelica is sympatric with *N. munita* but the

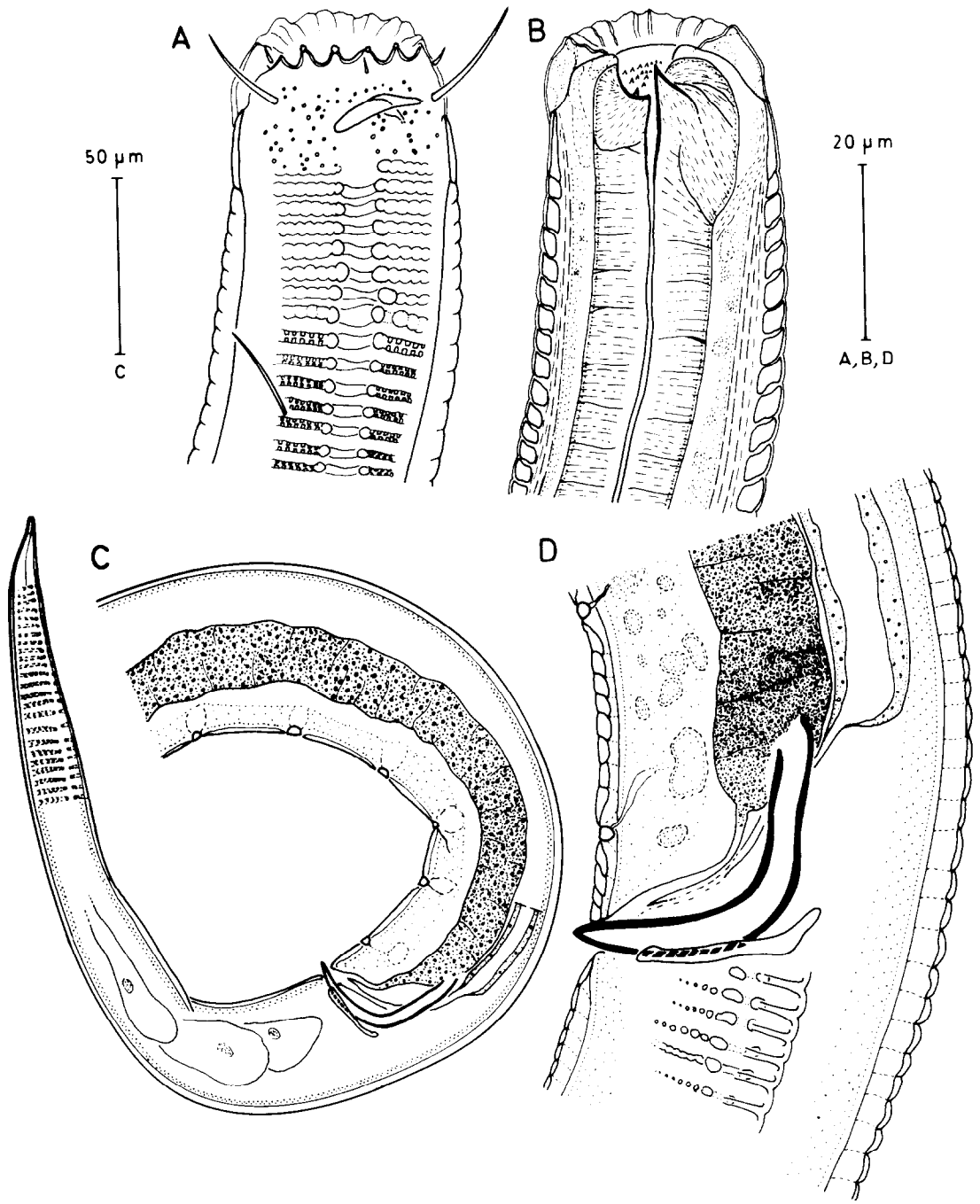

Fig. 5. Neochromadora angelica (σ_1): A. Head end; B. Buccal cavity; C. Tail and preanal supplements; D. Copulatory apparatus.

first species is especially abundant in coarse bottoms.

Neochromadora munita *Lorenzen, 1972 (Figs. 4, 7, 8)*

syn.n. Neochromadora paramunita *Boucher, 1976*

Material

20 males, 10 females and 10 juveniles.

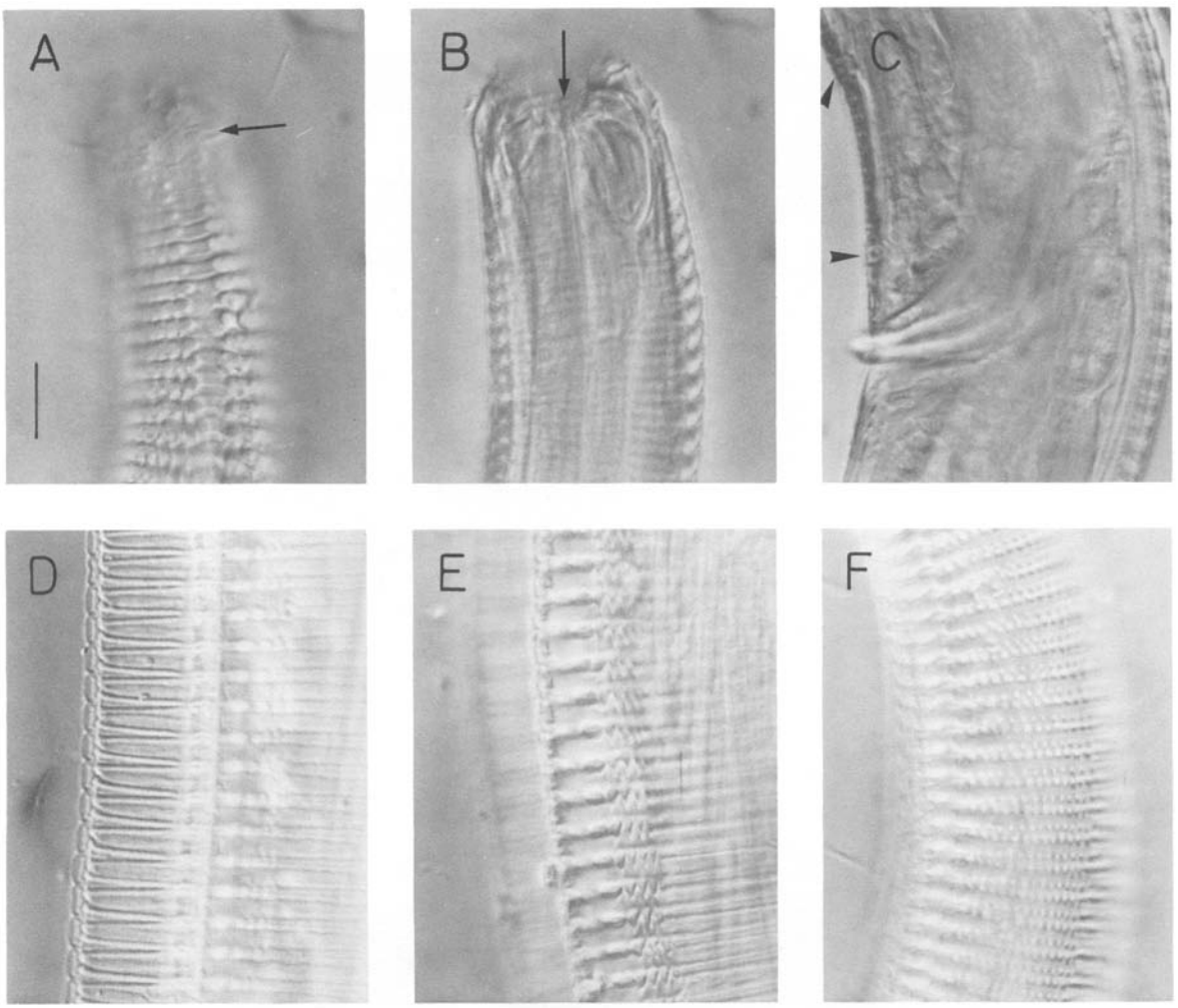

Fig. 6. Neochromadora angelica (σ'_1): A. Head end, arrow indicates amphideal fovea; B. Buccal cavity, arrow indicates dorsal tooth; C. Cloacal region, arrowheads indicate preanal supplements 5–6; D. Lateral ala at the cardial level; E. Body surface (cuticular pattern) at the cardial level; F. Base of the cuticular pattern at the cardial level. (Scale bar is 10 μm).

Locality

Southern Bight of the North Sea; sublittoral fine-medium sand with less than 3% silt. 54 localities (Fig. 4). Collected between 1972 and 1984.

Measurements

σ'_1: $\frac{- \; 102 \; 177 \; M \; 1336}{19 \; 36 \; 36 \; 38 \; 36}$ 1510 (slide no. 10105)

a = 39.7 b = 8.5 c = 8.7 c′ = 4.8 spic = 50 μm 9 p.s.

σ'_2: $\frac{- \; 108 \; 183 \; M \; 1524}{21 \; 33 \; 34 \; 40 \; 43}$ 1690 (slide no. 10106)

a = 39.4 b = 9.2 c = 10.2 c′ = 3.9 spic = 42 μm 12 p.s.

φ_1: $\frac{- \; 77 \; 133 \; 653 \; 1239}{15 \; 27 \; 24 \; 39 \; 22}$ 1395 (slide no. 10107)

a = 35.8 b = 10.5 c = 8.9 c′ = 7.1 V = 46.8%

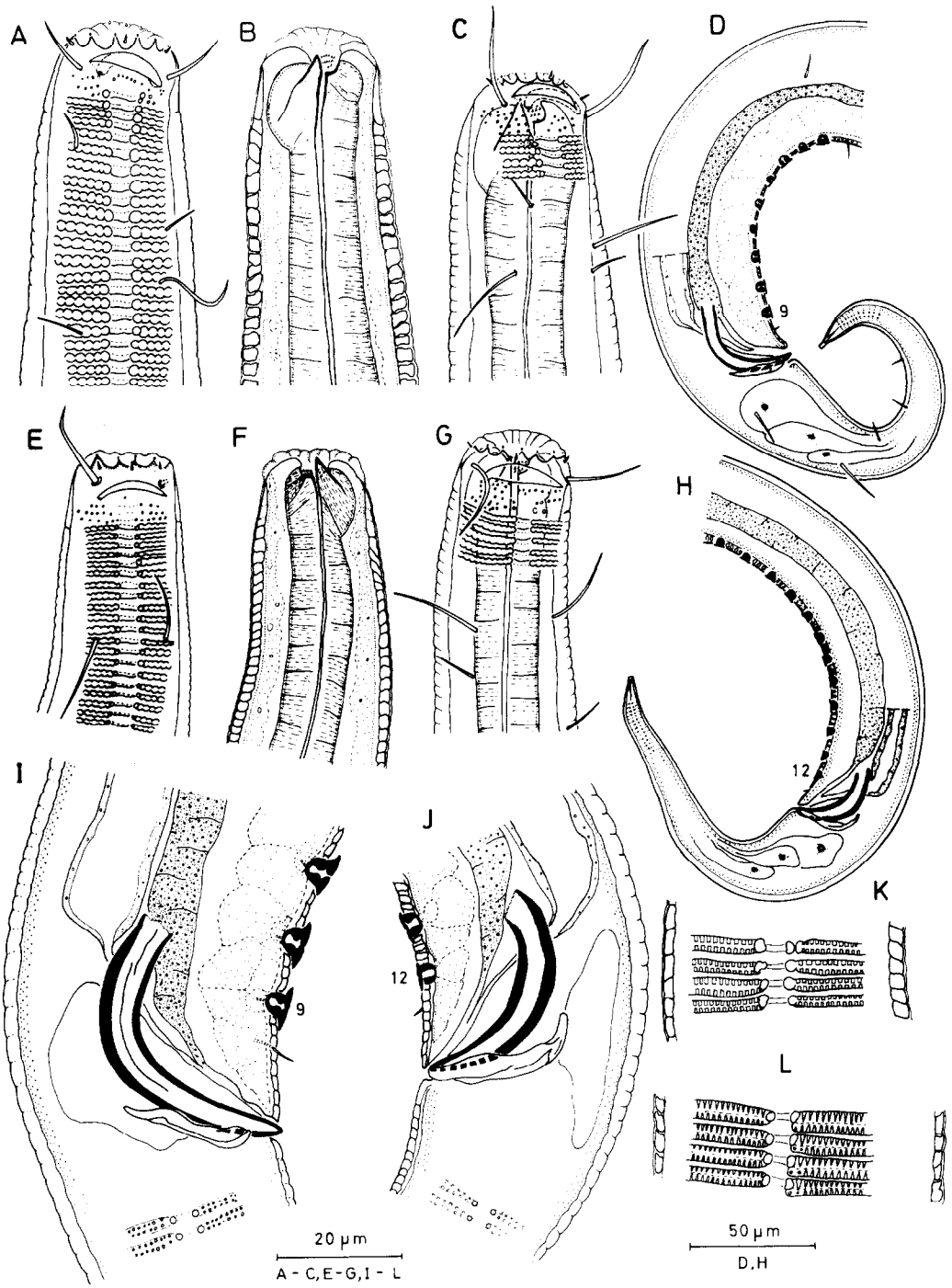

Fig. 7. Neochromadora munita: A. Head end ♂$_1$; B. Buccal cavity ♂$_1$; C. Head end ♀$_1$; D. Tail region ♂$_1$; E. Head end ♂$_2$; F. Buccal cavity ♂$_2$; G. Head end ♀$_2$; H. Tail region ♂$_2$; I. Copulatory apparatus ♂$_1$; J. Copulatory apparatus ♂$_2$; K. Cuticular pattern at the cardial region ♂$_1$; L. Cuticular pattern at the mid-body region ♂$_1$.

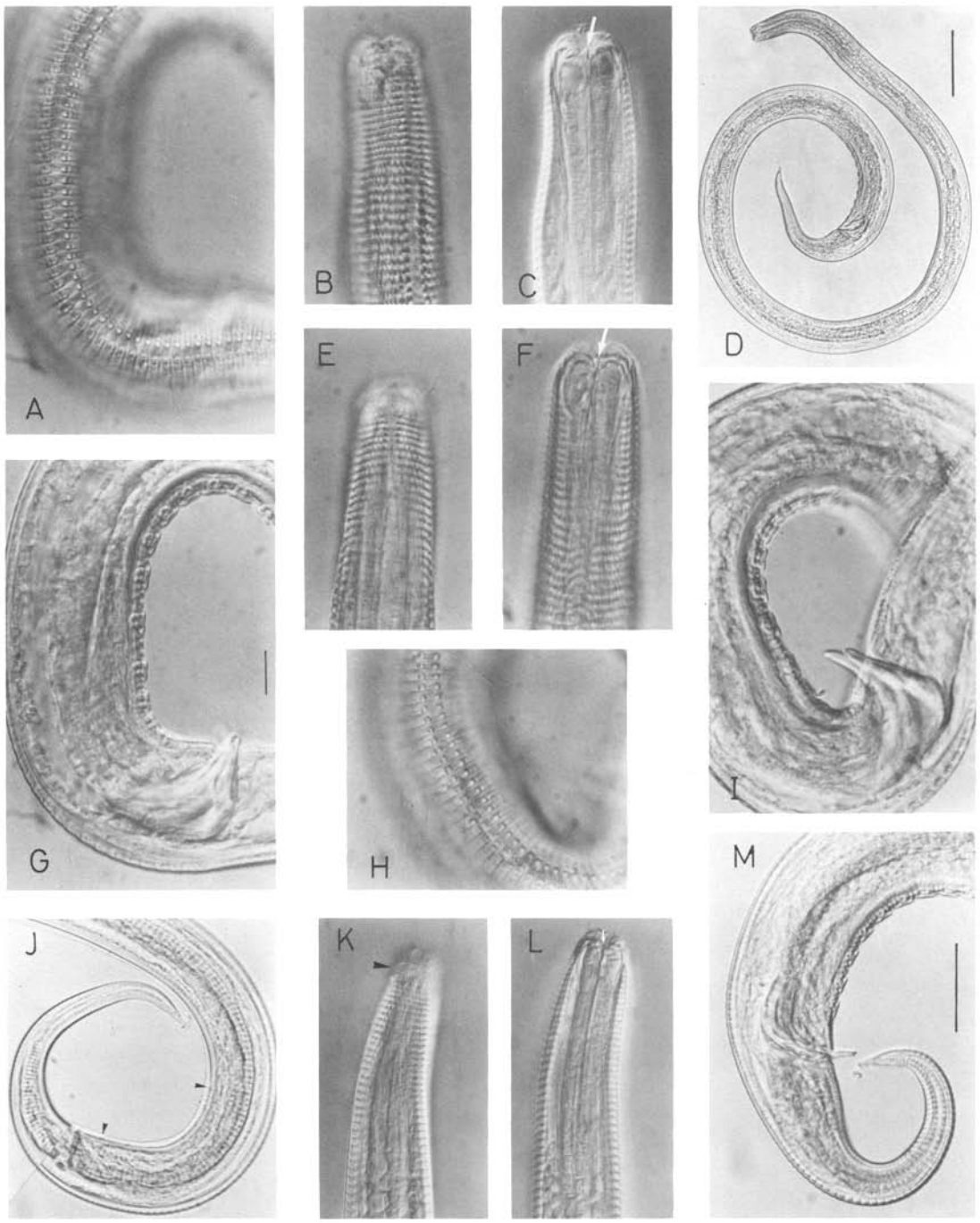

Fig. 8. Neochromadora munita: A. Cuticular pattern at the cloacal region (σ_2); B. Head end σ_1; C. Buccal cavity σ_1, arrow indicates dorsal tooth; D. Total view σ_2; E. Head end σ_2; F. Buccal cavity σ_2, arrow indicates dorsal tooth; G. Preanal supplements and spicular apparatus σ_2; H. Cuticular pattern at the cloacal level σ_1; I. Preanal supplements and spicular apparatus σ_1; M. Tail region σ_1. *Neochromadora peoicilosomoides*: J. Tail region σ_1; K. Head end σ_1, arrowhead indicates amphideal fovea; L. Buccal cavity σ_1, arrow indicates dorsal tooth. (Scale bar is 10 μm for A, B, C, G, E, F, H, I, K, L; scale bar is 100 μm for D; scale bar is 50 μm for J, M).

Others:

	Males (n = 10)	Males (n = 10)
L	: 1220 – 1800	1300 – 1750
a	: 34.2 – 46.0	30.1 – 45.0
b	: 8.4 – 9.7	7.9 – 9.3
c	: 8.4 – 9.7	8.6 – 9.4
c′	: 3.9 – 4.8	4.1 – 4.9
ps	: 9	12
spic:	45 – 50 μm	42 – 48 μm

Females (n = 10)
1050 – 1795
27.6 – 39.4
6.1 – 9.9
6.0 – 9.5
7.1 – 7.3

V: 45 – 50%

Description

Males. Body cylindrical with rounded head end and conical tail.

Cuticle thick (4 μm in the cervical region, 3 μm in the region of the pharyngeal bulb and 4 μm in the anal region). Cuticular ornamentation starts behind the level of the cephalic setae. Over about 5 μm, a field of irregularly placed small dots passes into a more pronounced ornamentation. Lateral differentiation starts at about 10 μm from the fore end and consists of transverse bars which connect the lateral margins of the ornamentate annulations; the annulations are heterogeneous, i.e. they differ throughout the body length.

The somatic setae are arranged in four longitudinal rows.

The internal labial sensillae are papilliform; the external labial sensillae are 1–2 μm long and are placed at the base of the lips. The cephalic setae are situated at the level of the amphid and are 10 μm long in $♂_1$ (55% of c.b.d.) and 13 μm long in $♂_2$ (65% of c.b.d.). The length of the cephalic setae varies from 55–90% of the c.b.d. in males with 9 p.s. and between 60–80% in males with 12 p.s.

The buccal cavity is cup-shaped with one large, triangular dorsal tooth and a ventral field of small denticles. The dorsal stomatal bulb and the terminal bulb of the pharynx are well developed.

The amphideal aperture is crescent-like and the fovea is situated more inward and has rounded edges; a sensilla is situated at this dorsal side. Aperture 56% of c.b.d. in $♂_1$ and 62% in $♂_2$.

Ventral gland situated at the beginning of the intestine, pore not found.

Nerve ring at 60–80% of the pharyngeal length.

Reproductive system monorchic with testis situated at the left of intestine. Spicular apparatus heavily cuticularized in both males; spicules 45–50 μm in males with nine preanal supplements and 42–48 μm long in males with 12 preanal supplements; spicules regularly curved with thick outer lamellae. The gubernaculum is paired, 21 μm ($♂_1$) and 27 μm ($♂_2$) and forms a kind of gutter for the spicules. Some males have nine p.s., others have 12 p.s., but a few have an intermediate number. A ventral preanal seta is present between the last preanal supplement and the cloaca. Musculature not obvious.

Tail with thin ventral setae. Three caudal glands prominent; spinneret well developed.

Females. Except for the genital system, all females have morphological features similar to the males; however, two types (corresponding to males with 9 or 12 supplements) could not be detected, even between populations which consist only of males of one type.

Discussion

Neochromadora paramunita Boucher, 1976 is synonymized with *N. munita* Lorenzen, 1972 because the two morphotypes of males (main difference is the number of preanal supplements) are found in the same population.

In some localities, only males with 9 and in other localities males with 12 preanal supplements are found; but in a number of sampling sites, they are found at the same abundances together; females and juveniles cannot be subdivided in two types. From the 100 males examined, only two specimens have 10 or 11 preanal supplements; about 28 of the males have 9 p.s.; 70 have 12 p.s. Lorenzen (1972) found 48 ♂♂ with 9 p.s. and one ♂ with 10 p.s.

Boucher (1976) noted following characters from *N. munita*: longer cephalic setae (100% instead of 65% of the cephalic diameter); shorter spicules (30–32 μm instead of 43 μm cord length) and the presence of 12 instead of 9–10 p.s.

In the North Sea specimens with 9 p.s., the length of the cephalic setae varies from 55–90% of the

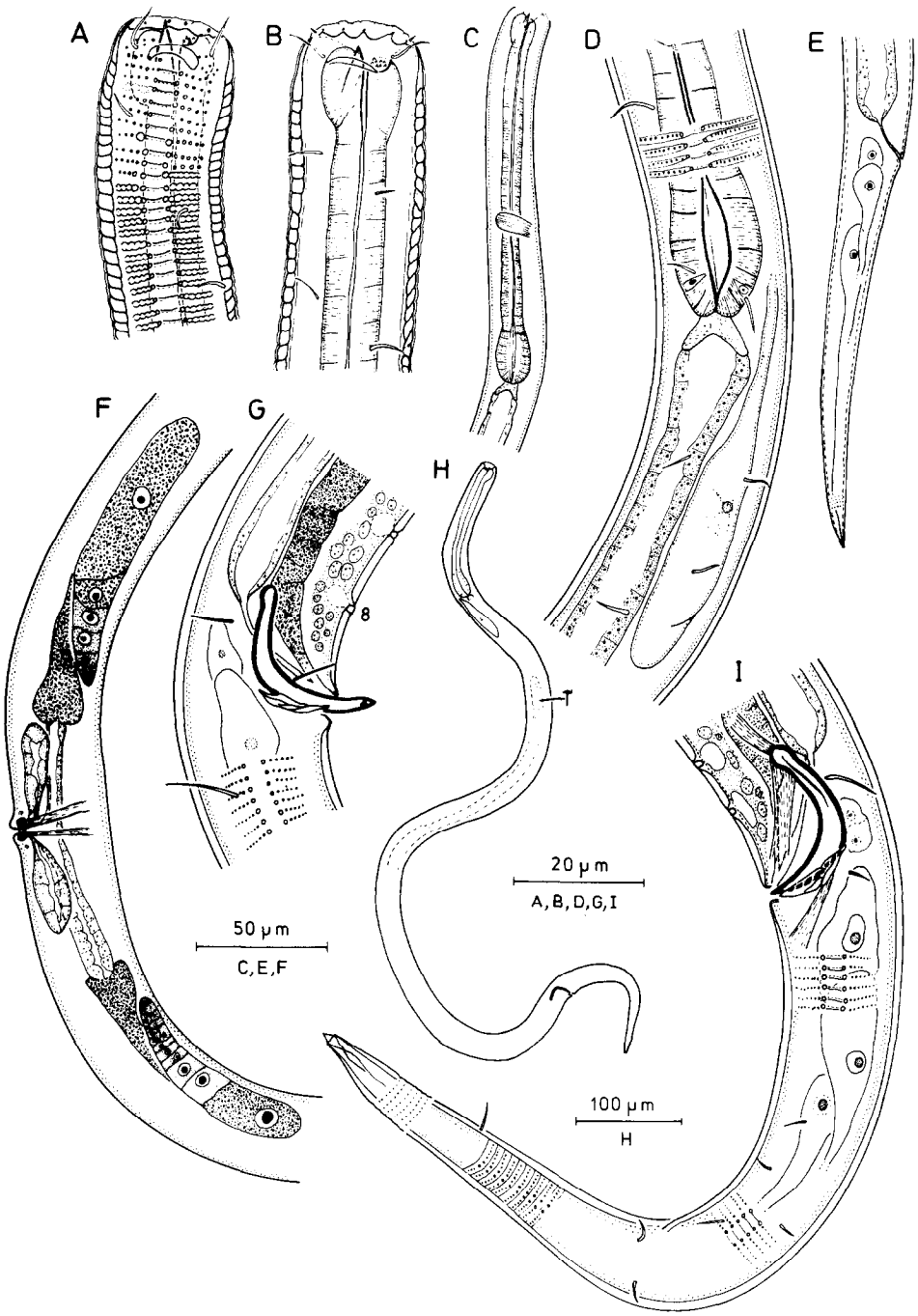

Fig. 9. Neochromadora nicolae sp.n. A. Head end ♂$_1$; B. Buccal cavity ♀$_1$; C. Pharyngeal region ♂$_1$; D. Cardial region ♂$_1$; E. Tail ♀$_1$; F. Genital apparatus ♀$_1$; G. Copulatory apparatus ♂$_2$; H. Total view (T = testis) ♂$_1$; I. Tail region ♂$_1$.

c.b.d. and in the specimens with 12 p.s. the length varies between 60–80% of the c.b.d.

Both types are also found by Blome (1982) in a 'medium wave-beaten beach' on the Isle of Sylt. Blome mentioned that the length and the a-index of *N. paramunita* are higher than for specimens of the type locality (L = 1315 µm; a = 45.3). However, these measurements (and others found in the litera-

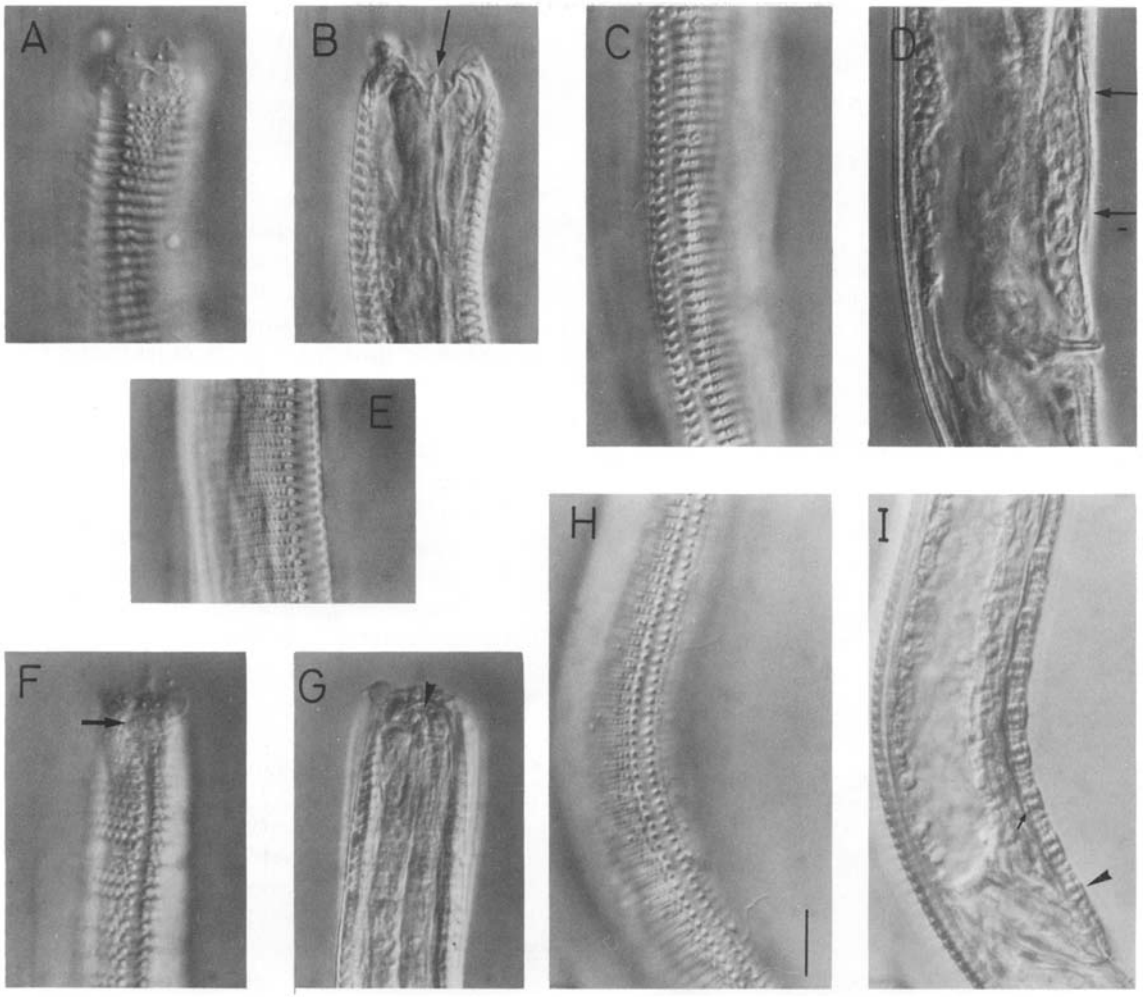

Fig. 10. Neochromadora nicolae sp.n. A–E; A. Head end σ_1; B. Buccal cavity σ_1, arrow indicates dorsal tooth; C. Cuticular pattern at the cloacal level σ_1; D. Arrows indicate preanal supplements σ_1; E. Cuticular pattern at the cardial level σ_1. (Scale bar is 10 μm). *Neochromadora paratecta*: F–I; F. Head end σ_1, arrow indicates amphideal fovea; G. Buccal cavity σ_1, arrowhead indicates dorsal tooth; H. Cuticular pattern at the precloacal level σ_1; I. Preanal supplements σ_1.

ture) are within the range of measurements found in the North Sea specimens.

After examination of the type material of *Neochromadora paramunita* I consider both types as one species, i.e. *Neochromadora munita* Lorenzen, 1972. This species has a rather large intraspecific variability concerning the length of the cephalic setae (between 55–100% of the c.b.d.), the body length (between 990–1 800 μm) and the number of preanal supplements (from 9 to 12).

Neochromadora munita is distinguished from the other *Neochromadora* species by the presence of 9–12 well developed p.s.; these supplements are not accompanied by a supplementary cuticular piece as in *N. paratecta* Blome, 1974.

Neochromadora nicolae *sp.n. (Figs. 4, 9, 10E)*

Material

Type specimens. Holotype male σ_1 (slide no. 733) and paratype female φ_1 (slide no. 734) in the Nematode Collection of the Instituut voor Dierkunde, Gent, Belgium. Paratypes (3 males, 2 females, 2 juveniles) in the same collection.

Type locality. Station M1432 (51°41'01''N–03°30'28''E) in the Southern Bight of the North Sea. Collected 29 Feb. 1972. Fine-medium sand; less than 1% silt, no gravel. Depth 15 m.

Other localities. Four in total are shown in Fig. 4.

Etymology

This species is dedicated to Drs Nicole Smol, fellow marine nematologist in the Institute of Zoology, Gent.

Measurements

Holotype (σ_1): $\frac{-\ 81\ \ 148\ \ M\ \ 825}{17\ \ 24\ \ \ 24\ \ 24\ \ \ 24}$ 980

a = 40.8 b = 6.6 c = 6.3 c' = 6.5 spic = 32 μm p.s. = 8

Paratype (φ_1): $\frac{-\ 83\ \ 150\ \ 499\ \ 874}{21\ \ 30\ \ \ 30\ \ \ 34\ \ \ 22}$ 1030

a = 30.3 b = 6.9 c = 6.6 c' = 7.1 V = 48.4%

Other paratypes:

	Males (n = 3)	Females (n = 2)
L	950 – 1200	1030 – 1270
a	33.0 – 40.8	30.2 – 37.4
b	6.6 – 7.3	6.8 – 8.6
c	6.3 – 7.2	6.8 – 7.9
c'	5.9 – 6.9	7.0 – 7.3
spic	31 – 39 μm	V: 48.2 – 48.6%

Description

Males. Body cylindrical with rounded head end and elongated, cylindro-conical tail.

Cuticle annulated; each annule contains a row of points which pass into a zigzag outer board of the annules at the mid-pharyngeal level. From the level of the pharyngeal bulb on, the annules are ornamentated with one row of small dots. The lateral differentiation consists of two rows of larger dots, which are connected by transverse bars (not obvious on the tail end); lateral differentiation not present around the amphideal fovea and on the tail tip (extreme last part of the tail is not annulated). Small punctations are present anterior to the amphideal fovea.

The six internal labial sensilla were not found; the six external labial sensilla are papilliform and are located at the base of the lips. The four cephalic setae are 8 μm long (30–40% of c.b.d.) and anterior to the amphideal fovea.

The amphideal fovea is ventrally curved and sausage-like; the canalis is placed on the dorsolateral side.

Somatic setae are very thin and situated in four sublateral rows throughout the body.

The buccal cavity contains one big dorsal tooth, two smaller ventrosublateral teeth and a ventral field of denticles. The stomatal bulb of the pharynx is extremely prominent at its dorsal side; the end bulb is enlarged and elongated but not very prominent.

The cardia is 4 μm long at its centre and 6 μm at the outer margin.

The intestine has flattened cells and a rather broad lumen. The rectum is 20 μm long.

The ventral gland is quite prominent and situated at the level of the anterior part of the intestine. Pore not found (probably in the lip region).

Nerve ring situated at 55% of the pharyngeal length.

Reproductive system monorchic with outstretched testis situated at the left side of the intestine.

Spicules regularly curved, 31–39 μm along the arc; capitulum well developed; distal tip of the spicules with two accessory cusps. Gubernaculum 13 μm long, with more sclerotized posterior border. Spicular protractor extends from the ventral part of the capitulum to the ventral body wall (level of cloaca); spicular retractor extending from apical part of capitulum to the lateral body wall. Gubernacular protractor extends from dorsal posterior part of gubernaculum to the ventral body wall of the anterior part of the tail. Eight minute preanal supplements are placed at regular intervals anterior to the cloaca (they can be easily overlooked). Each supplement is connected with a small flattened cell.

Tail with three prominent caudal glands. The triangular spinneret is 2 μm long.

Females. Similar to the males except for the narrower amphideal fovea. Didelphic with ovaries reflexed to the dorsal side of the genital tract. Anterior tract on the left of the intestine, posterior tract on the right of the intestine. The oviduct is well developed and has prominent granules in its

wall cells. The uteri are empty in examined females. Two seminal receptacles are directly connected with the vagina; they have a thick wall, but are not filled with sperm cells in the observed females. The vagina is short, supported by small cuticular rods; vaginal glands are not prominent.

Diagnosis

Neochromadora nicolae sp.n. is characterized by its rather weak cuticular ornamentation, cephalic setae less than 50% of c.b.d., well developed teeth in the buccal cavity with a promiment stomatal bulb of the pharynx, a well developed ventral gland; males have eight minute p.s. and spicules with accessory cusps. Females resemble *N. munita* although the cephalic setae are shorter and the cuticular ornamentation is less pronounced.

Neochromadora paratecta *Blome, 1974 (Figs. 4, 10F–I, 11)*

Material

Three males, one female and ten juveniles.

Locality

Southern Bight of the North Sea; sublittoral fine-medium sand (10–35 m) with less than 1% silt. Seven localities (Fig. 4). Collected between 1972–1984.

Measurements

σ'_1: $\frac{-\ 76\ \ 152\ \ M\ \ 1504}{12\ \ 22\ \ \ 24\ \ 24\ \ \ 22}$ 1630 (slide no. 10108)

a = 67.9 b = 10.8 c = 12.9 c′ = 5.7 spic = 41 μm p.s. = 8

φ_1: $\frac{-\ 67\ \ 131\ \ 561\ \ 1060}{15\ \ 25\ \ \ 27\ \ \ 29\ \ \ 22}$ 1220 (slide no. 10109)

a = 42.1 b = 9.3 c = 7.6 c′ = 7.3 V = 46.0%

Others:

Males (n = 2)

L	: 1070	– 1550	
a	: 34.5	– 57.1	
b	: 7.2	– 9.7	
c	: 8.4	– 13.4	
c′	: 5.8	– 6.2	
spic:	38	– 43	μm
p.s.:	8		

Description

Neochromadora paratecta is well described and illustrated by Blome (1974, 1982). Additional observations are: No cervical setae. Cuticle heavily annulated with the lateral differentiation from head till tail end. The first two or three body annules are ornamentated with small punctations with a lateral differentiation which consists of larger points. The same pattern is found on the tail (Fig. 11F). A large cervical sublateral pore on the dorsal side of the lateral field is present in all specimens. The ornamentation in the pharyngeal region consists of a zigzag outer margin of each annule and each annule contains one row of large dots (cfr. Fig. 11A, C). From the cardial to the anal region, the ornamentation is shown in Fig. 11E.

The buccal cavity has one big dorsal tooth at the inner side of a prominent anterior dorsal stomatal bulb; the ventral region of the mouth cavity has two ventrosublateral small teeth and a ventral field of small denticles.

Ventral gland very small and situated at the anterior level of the intestine. Pore not found (probably in the lip region).

The spicules are regularly curved, 38–43 μm long (about 1.8 c.b.d.), opened proximally and distally pointed. The gubernaculum is 21 μm long. The eight preanal supplements are typical for the genus, i.e. the cup-shaped part consists of two rod-like structures which are covered by an outer oval (in surface view) plate. But an accessory dorsal cuticularized piece accompanies each preanal supplement. A glandular cell opens through a small pore in the outer plate of the supplement.

Discussion

N. paratecta from the Southern Bight of the North Sea resembles the type specimens described by Blome (1974) from the German coast near the Isle of Sylt.

Neochromadora poecilosoma *(de Man, 1893)*

Material

One male.

Locality

Station 11860 (Fig. 4) in the Southern Bight of the North Sea; fine sand with more than 50% silt. Collected 9 May 1984.

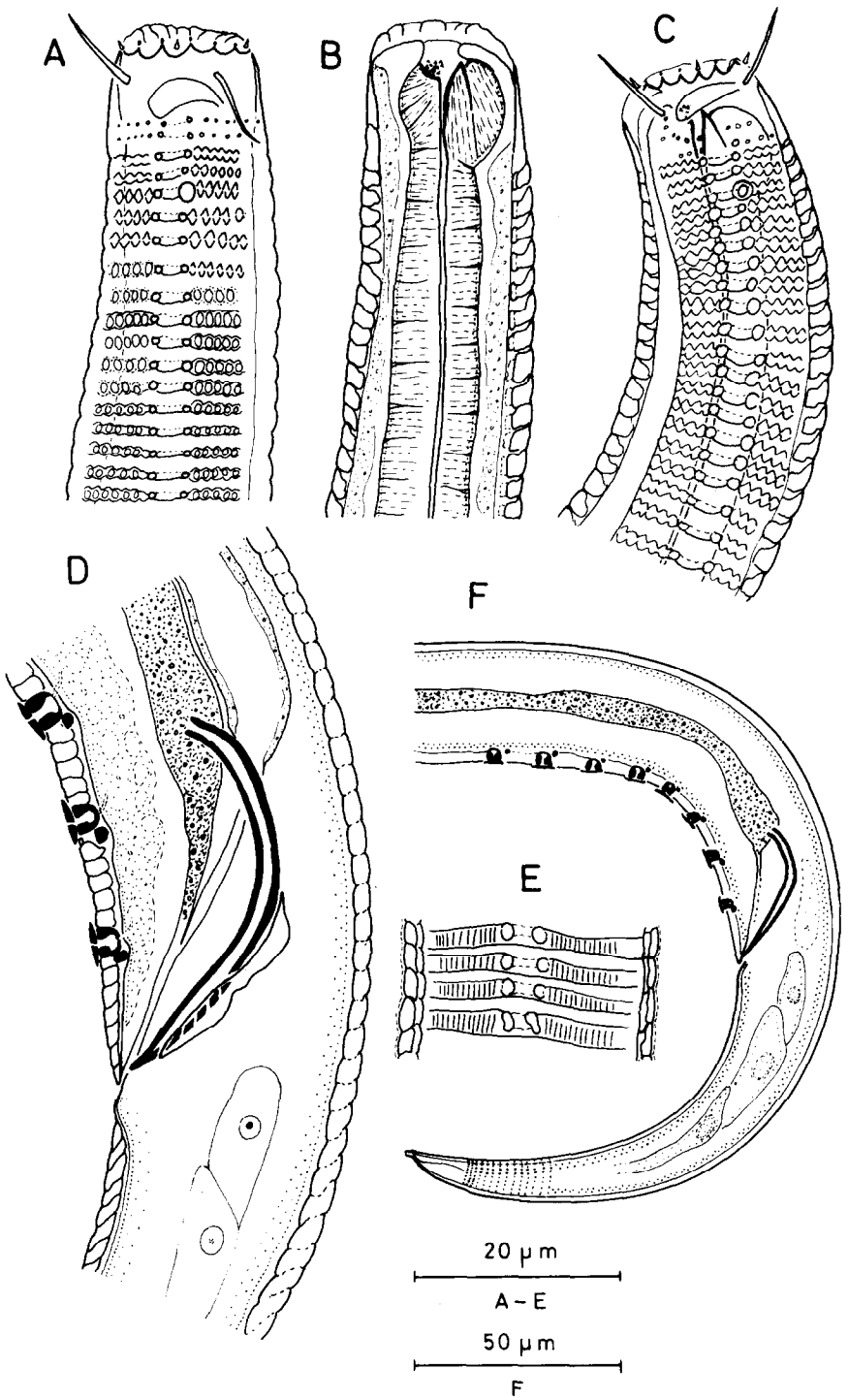

Fig. 11. Neochromadora paratecta: A. Head end σ_1; B. Buccal cavity σ_1; C. Head end φ_1; D. Copulatory apparatus σ_1; E. Cuticular pattern at the cardial level σ_1; F. Tail region σ_1.

Neochromadora poeicilosomoides *(Filipjev, 1918) (Fig. 8J, K, L)*

Material
One male.

Locality
Station MO3 (Fig. 4) in the Southern Bight of the North Sea. Medium sand with less than 1% silt, no gravel. Collected 4 July 1972.

Description
The specimen is not well preserved but resembles the specimens from the Channel described by Boucher (1976).

Sabatieria celtica *Southern, 1914 (Figs. 12–14)*

syn.n. S. strigosa *Lorenzen, 1972.*

Material
10 males, 10 females and 10 juveniles.

Locality
Southern Bight of the North Sea; common; abundance of the species more than 10% in sites with median grain size of the sand fraction between 150–250 μm and with 1–20% silt. 56 localities (Fig. 12). Collected between 1972 and 1985.

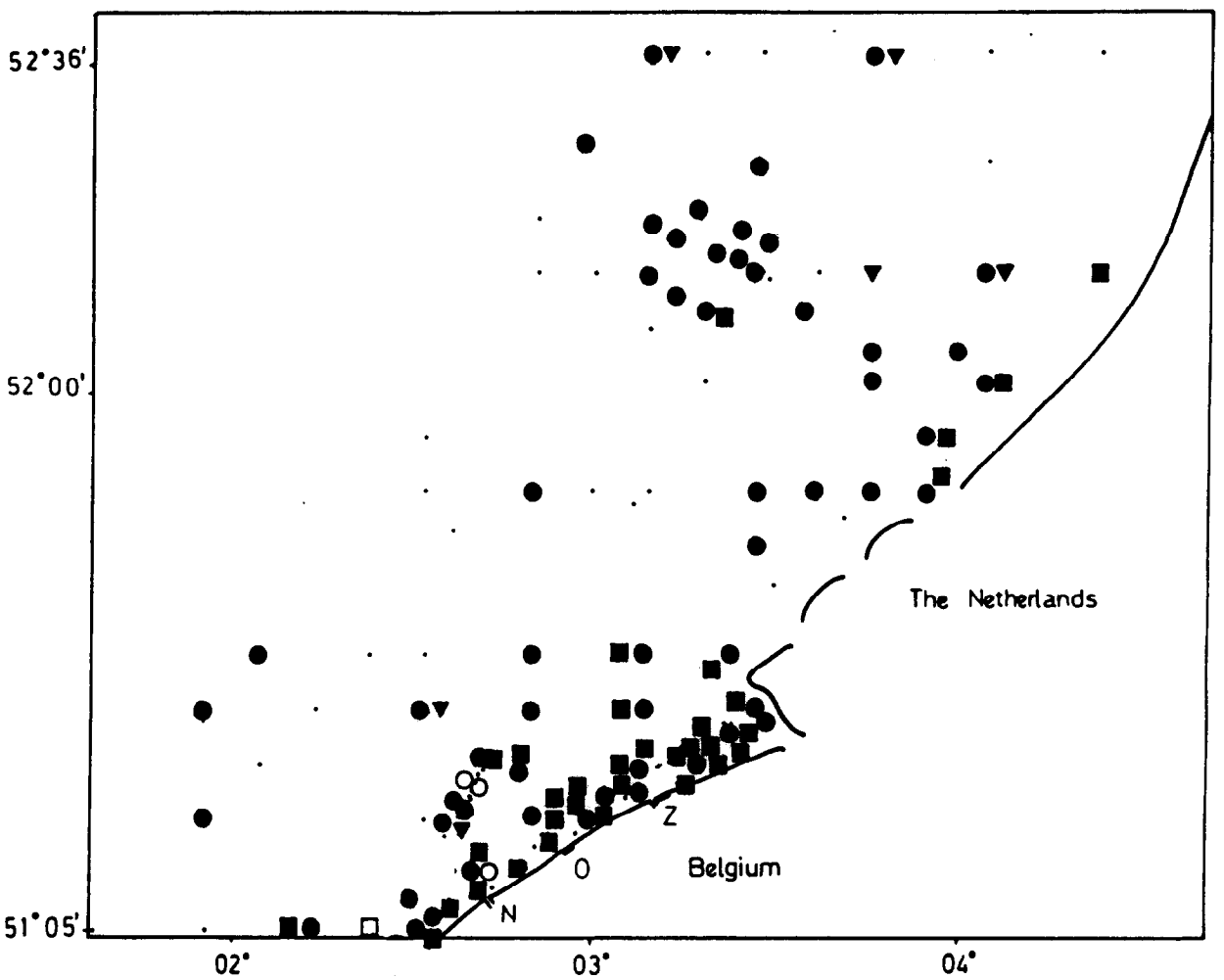

Fig. 12. Distribution of *Sabatieria celtica* (●), *S. longispinosa* (▼), *S. punctata* (■), *Sabatieria* sp. 1 (○), *Sabatieria* sp. 2 (□).

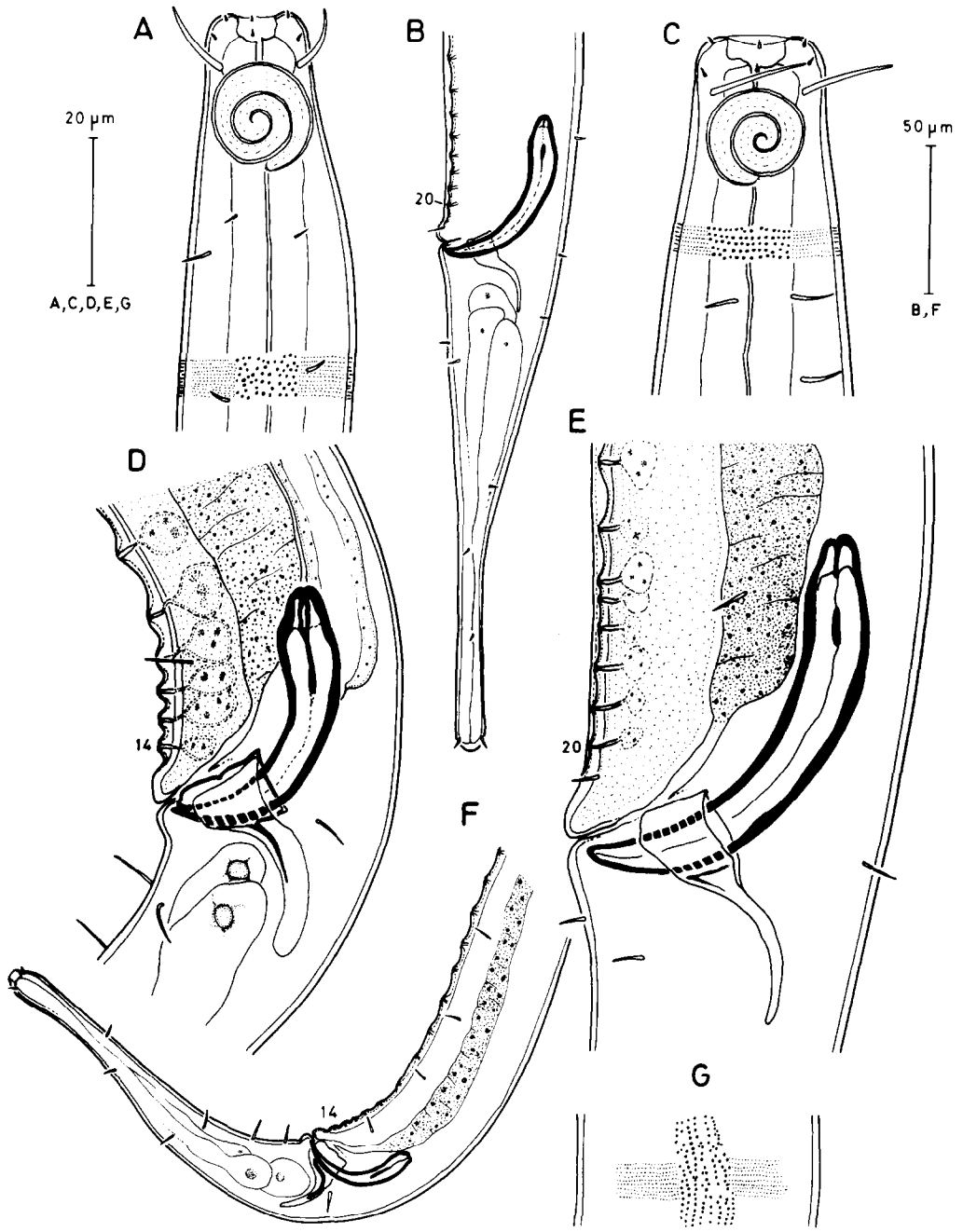

Fig. 13. Sabatieria celtica: A. Head end σ_1; B. Tail region σ_2; C. Head end σ_2; D. Copulatory apparatus σ_1; E. Copulatory apparatus σ_2; F. Tail region σ_1; G. Cuticular pattern at the cardial level σ_2.

Measurements

σ_1: $\frac{-135\ 157\ 315\ M\ 2010}{17\ \ 35\ \ 35\ \ 39\ 46\ \ \ 39}$ 2150 (slide no. 10110)

a = 46.7 b = 6.8 c = 15.4 c′ = 3.6 spic = 40 µm
14 p.s.

σ_2: $\frac{-160\ 174\ 424\ M\ 2338}{19\ \ 39\ \ 41\ \ 52\ 44\ \ \ 44}$ 2510 (slide no. 10111)

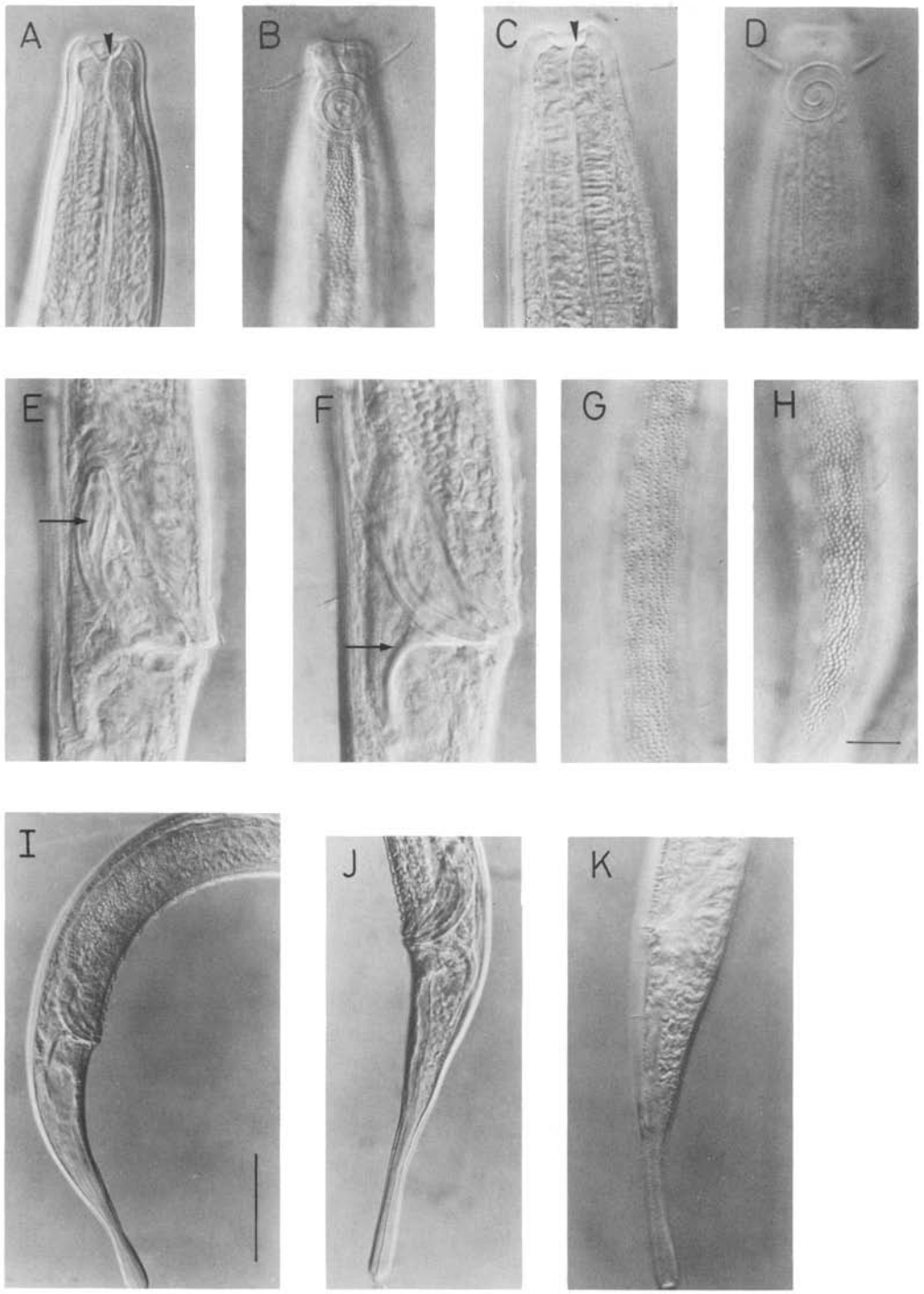

Fig. 14. Sabatieria celtica: A. Buccal cavity σ_1, arrowhead indicates small dorsal tooth; B. Head end σ_1; C. Buccal cavity σ_2, arrowhead indicates small dorsal tooth; D. Head end σ_2; E. Spicule σ_2; F. Spicular apparatus σ_2; G. Cuticular pattern at the cardial level σ_1; H. Cuticular pattern at the mid-body region σ_2; I. Tail region σ_1; J. Tail region σ_2; K. Tail region σ_2. (A–H: scale bar is 10 μm; I–K: scale bar is 50 μm).

a = 48.3 b = 5.9 c = 14.6 c′ = 3.9 spic = 63 μm 20 p.s.

♀1: $\frac{-100\,106\,264\,131\,82\,491}{19\ 35\ 36\ 39\ 51\ 40}$ 2690 (slide no. 10112)

a = 52.7 b = 10.2 c = 13.5 c′ = 5.0 V = 49%

Others:

	Males (n = 10)	Females (n = 10)
L	: 2100 – 2890 μm	2200 – 2980 μm
a	: 46.3 – 68.9	45.7 – 57.0
b	: 8.9 – 11.5	10.0 – 12.2
c	: 14.0 – 17.5	14.7 – 16.3
c′	: 3.6 – 4.5	4.4 – 5.3
spic:	30 – 65 μm	V: 47 – 50%
p.s.:	12 – 21	

Description

S. celtica has already several times been described in an accurate way (Lorenzen, 1972; Boucher, 1976; Platt, 1984). These authors also discuss the large variability in morphometric data (i.e. body length; length of cephalic setae; diameter of the amphideal fovea; spicule length; number of preanal supplements). A closely related species is *S. strigosa* Lorenzen, 1972 of which only males were described because this species was in all characters (i.e. length of the cephalic setae, size of the amphideal fovea, habitus (a-index) and shape of the tail), except for the length of the spicules and number of preanal supplements, nearly identical with *S. celtica.*

Differences according to Lorenzen (1972):

	S. celtica	*S. strigosa*
L	1800 – 3150 μm	1660 – 2120 μm
spic. length	38 – 61 μm	28 – 31 μm
number p.s.	15 – 22	9 – 12

The extremely high variability of the spicule length in *S. celtica* is correlated with the body length; i.e. longer animals have longer spicules.

In different samples of the Southern Bight of the North Sea a *Sabatieria* species close to *S. strigosa* with 14 p.s. (rarely 12 and 13 p.s.) occurs and the length of the spicules ranges between 40 – 43 μm. It occurs together with *Sabatieria* species which resemble more *S. celtica* because of the presence of 18 – 21 p.s.

However, the specimens with 14 preanal supplements have characters which fall within the range of the *S. celtica* except that some specimens (not all) show a lateral differentiation in the cuticle in which the coarser dots in the lateral field are arranged in nearly longitudinal rows from the end of the pharyngeal region on.

Therefore we consider *S. strigosa* synonymous with *S. celtica.*

Sabatieria longispinosa *Lorenzen, 1972*

Material

Three males, one female, ten juveniles.

Locality

Southern Bight of the North Sea. Fine-medium sand with less than 2% silt. Six localities (Fig. 12). Collected between 1972 and 1984.

Measurements

♂1: $\frac{-\ 135\ 165\ 237\ M\ 3518}{13\ \ 24\ \ 26\ \ 30\ 35\ \ \ 26}$ 3700 (slide no. 10113)

a = 105.7 b = 15.6 c = 20.3 c′ = 7.0 spic = 44 μm p.s. = 7.

Other males and female are too much curved to be measured in an accurate way.

Description

Riemann (1966), Lorenzen (1972) and Platt (1984) gave accurate descriptions of *Sabatieria longispinosa.* Additional morphological features are: the North Sea specimens are longer, have elongated spiral amphideal foveas (3 3/4 turns) which are ventrally wound; ± 90% of the c.b.d.; the cuticle is punctuated; dots are arranged in transverse rows; sublateral modified punctuations are present in the pharyngeal region and the anterior part of the intestine; these punctuations consist of transverse slits which connect two cuticular points of the same row. The amphideal fovea is bordered posteriorly by such modifications.

The three North Sea males have seven preanal supplements; the three supplements close to the cloaca are smaller and associated by a long ventral seta.

Sabatieria punctata *(Kreis, 1924) (Figs. 12, 16, 17, 18)*

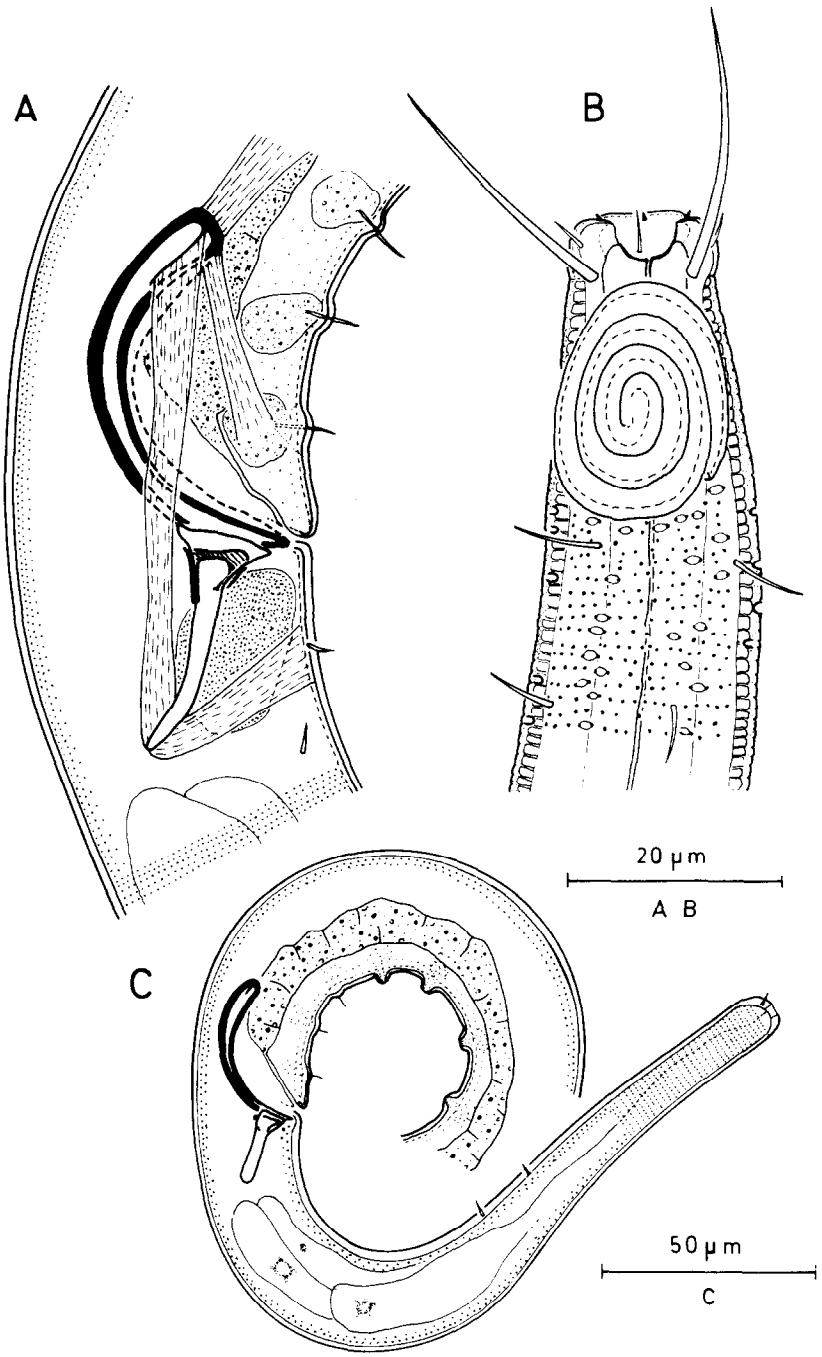

Fig. 15. Sabatieria longispinosa (σ_1): A. Spicular apparatus; B. Head region; C. Tail region.

syn.n. S. mortenseni *(Ditlevsen, 1921)*
S. breviseta *(Schuurmans Stekhoven, 1935)*
S. vulgaris *sensu Gerlach (1965) and sensu Riemann (1966) nec (de Man, 1907)*

Material
211 males, 100 females and 100 juveniles.

Locality
Southern Bight of the North Sea. Sublittoral fine

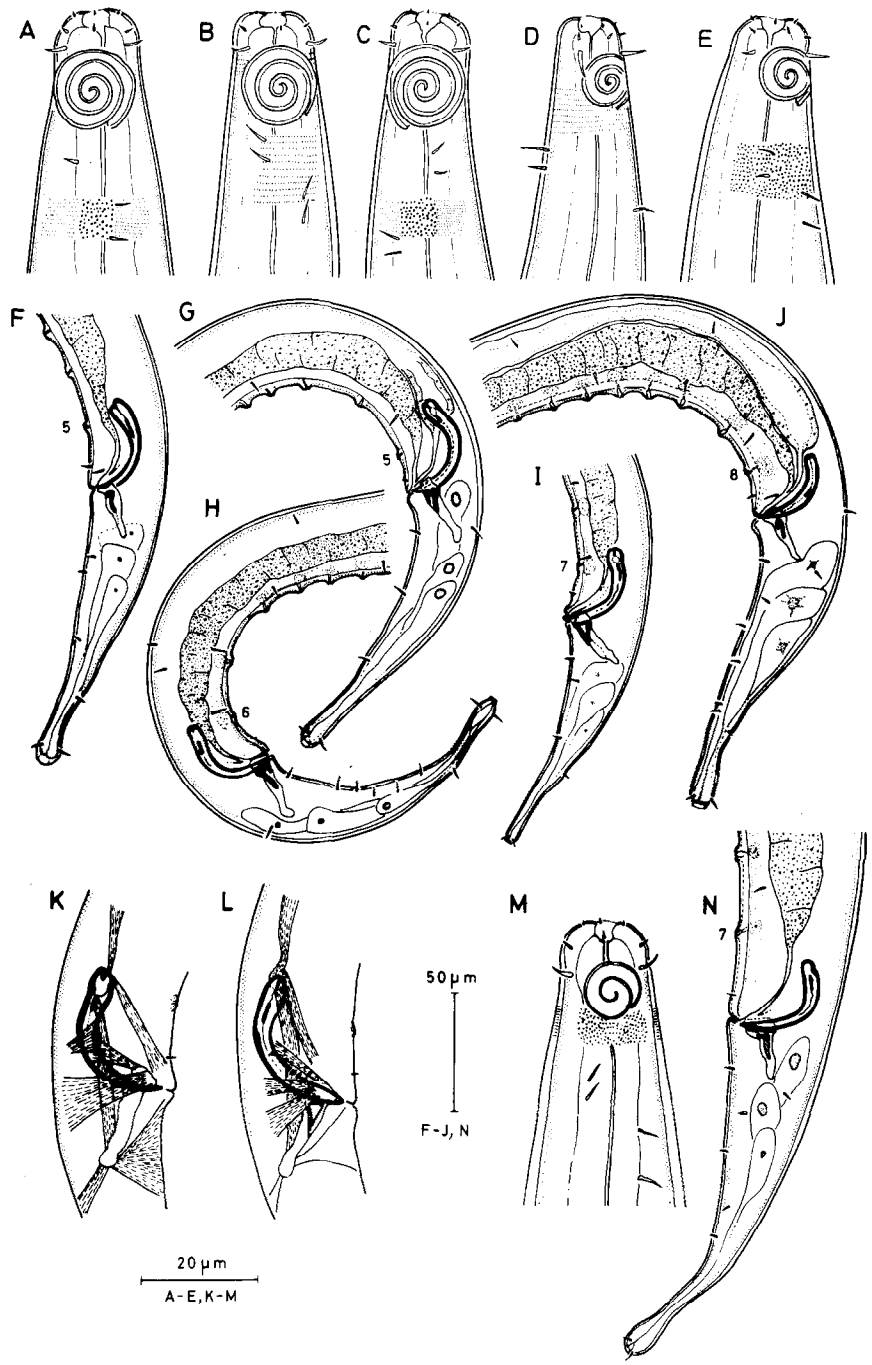

Fig. 16. Sabatieria punctata: A. Head end σ_1; B. Head end σ_2; C. Head end σ_3; D. Head end σ_4; E. σ_5; F. Tail region σ_1; G. Tail region σ_2; H. Tail region σ_3; I. Tail region σ_4; J. Tail region σ_5; K. Spicular apparatus σ_6; L. Spicular apparatus σ_2. *Sabatieria pulchra* (from type locality; provided by P. Jensen); M. Head end; N. Tail region.

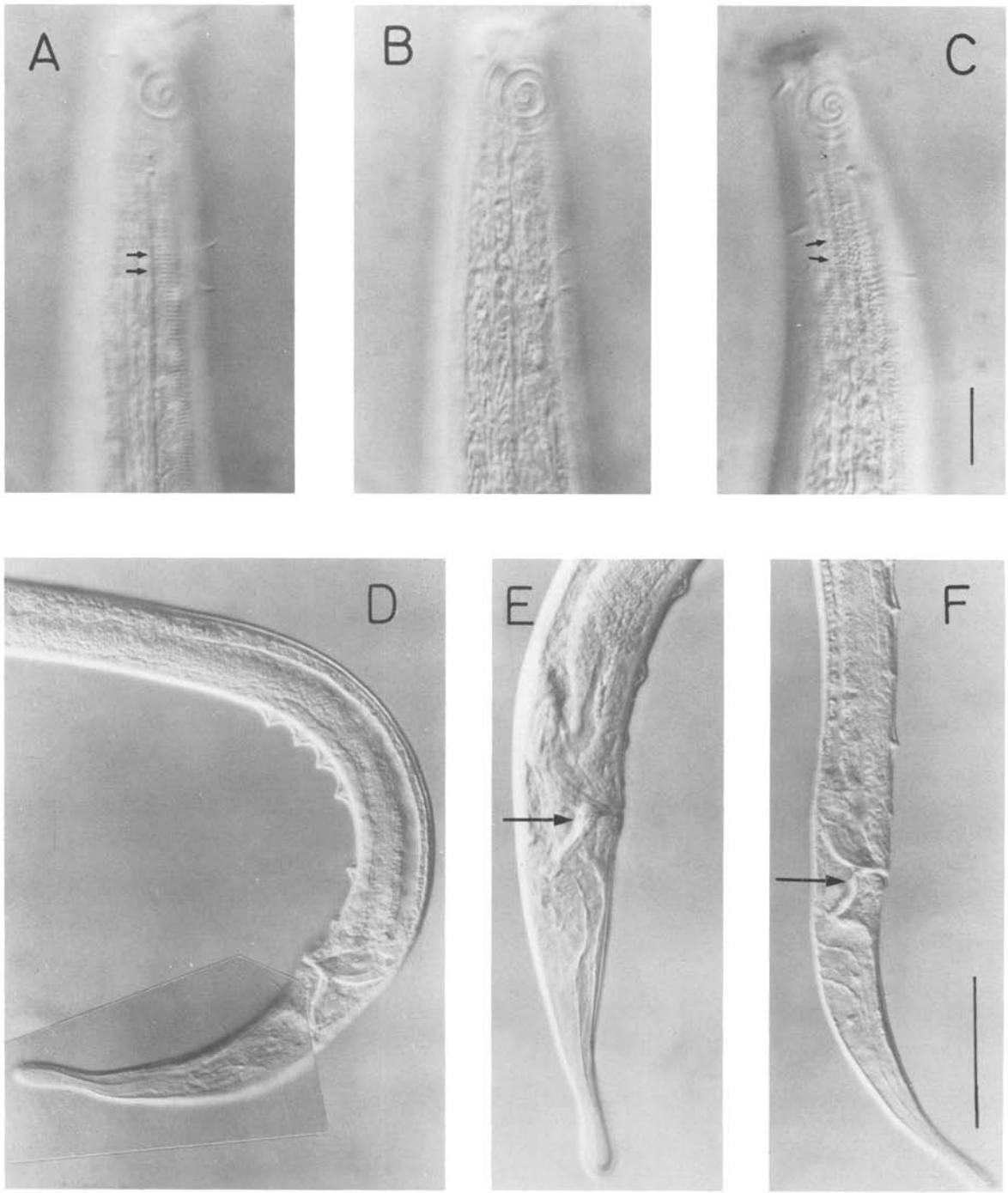

Fig. 17. Sabatieria punctata: A–C. Head ends of males, arrows indicate cuticular pattern; D–F. Tail region of males, arrows indicate gubernacular apophyses. (A–C: scale bar is 10 μm; D–F: scale bar is 50 μm).

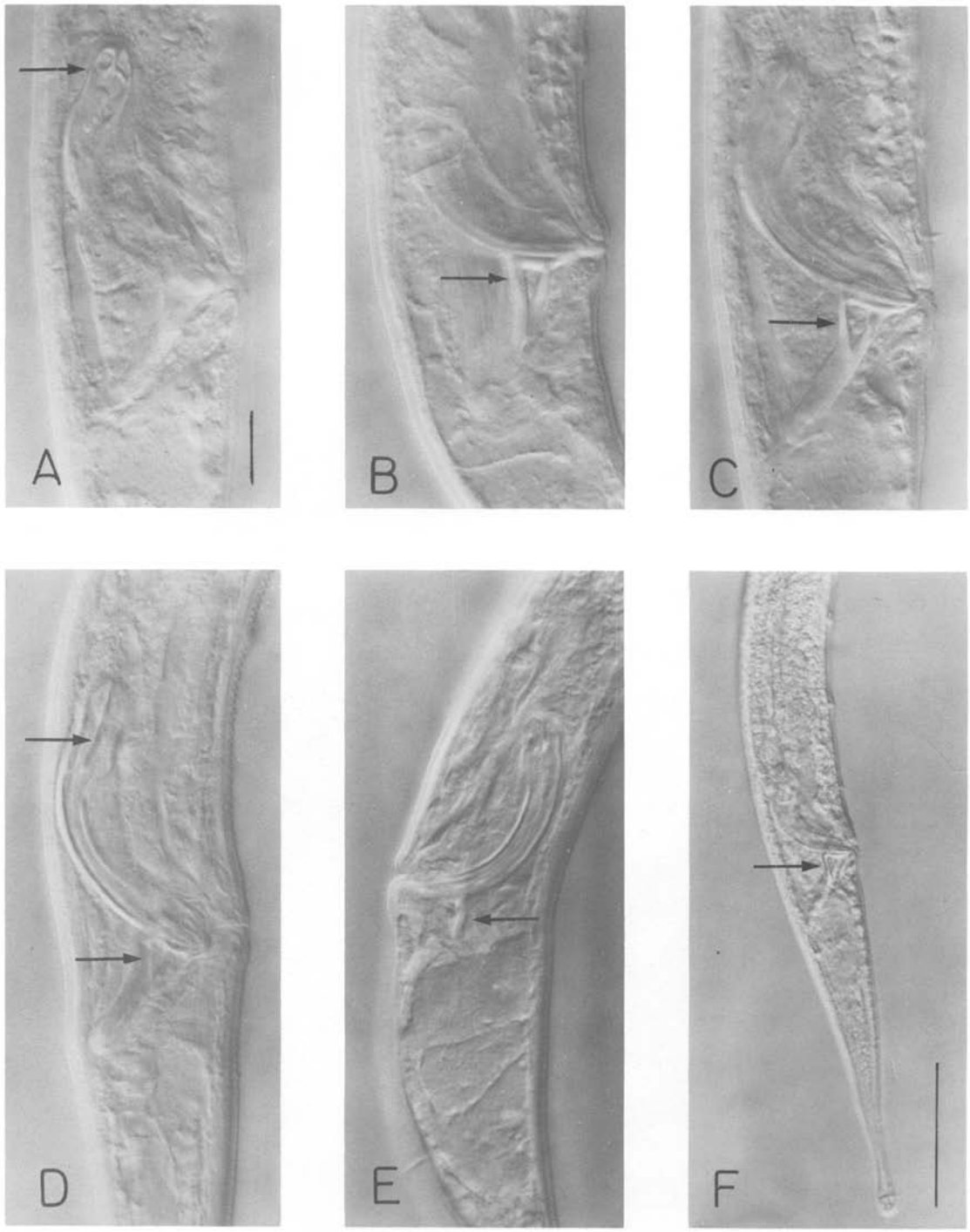

Fig. 18. Sabatieria punctata: A–F. Spicular apparatus; A. Arrow indicates capitulum; B–C. Arrow indicates cuneus of the gubernaculum; D. Arrow indicates central rib of spicule; E, F. Cuneus of the gubernaculum (scale bar is 10 μm for A–E; scale bar is 50 μm for F).

to coarse sand with silt content between 5 and 90%. Abundance of the species more than 10% (even 95% in some coastal stations) with median grain size of the sand fraction between 100–250 μm and more than 10% silt. 34 localities mainly in the coastal region (Fig. 12). Collected between 1972 and 1985.

Measurements

σ_1: $\frac{-\ 95\ 118\ 176\ M\ 1398}{14\ 33\ \ 35\ \ 36\ 44\ \ \ 43}$ 1560 (slide no. 10114; Fig. 16A, F)

a = 35.5 b = 8.9 c = 9.6 c′ = 3.8 spic = 49 μm 5 p.s.

σ_2: $\frac{-\ 102\ 116\ 172\ M\ 1669}{14\ \ 24\ \ 24\ \ 28\ 31\ \ \ 31}$ 1810 (slide no. 10115; Fig. 16B, G)

a = 58.4 b = 10.5 c = 12.8 c′ = 4.5 spic = 48 μm 6 p.s.

σ_3: $\frac{-\ 115\ 131\ 192\ M\ 1351}{14\ \ 36\ \ 37\ \ 39\ 39\ \ \ 37}$ 1490 (slide no. 10116; Fig. 16C, H)

a = 38.2 b = 7.8 c = 10.7 c′ = 3.8 spic = 54 μm 5 p.s.

σ_4: $\frac{-\ 94\ 104\ 157\ M\ 1056}{12\ 23\ \ 24\ \ 26\ 26\ \ \ 32}$ 1180 (slide no. 10117; Fig. 16D, I)

a = 36.9 b = 7.5 c = 9.5 c′ = 3.8 spic = 41 μm 7 p.s.

σ_5: $\frac{-\ 95\ 113\ 180\ M\ 1590}{13\ 35\ \ 36\ \ 41\ 48\ \ \ 44}$ 1740 (slide no. 10118; Fig. 16E, J)

a = 36.3 b = 9.7 c = 11.6 c′ = 3.4 spic = 45 μm 8 p.s.

φ_1: $\frac{-\ \ 120\ \ 136\ \ 214\ \ 857\ \ 1439}{17\ \ \ 40\ \ \ 42\ \ \ 44\ \ \ 52\ \ \ 35}$ 1595

a = 30.7 b = 7.5 c = 10.2 c′ = 4.5 V = 54%

Others:

	Males (n = 25)	Females (n = 10)
L	: 1095 – 2400 μm	1300 – 1690 μm
a	: 22.0 – 43.0	27.6 – 34.8
b	: 7.2 – 10.5	7.5 – 8.6
c	: 10.0 – 15.9	10.1 – 12.1
c′	: 3.1 – 4.5	4.1 – 5.2
spic:	37 – 52 μm	V: 49 – 55%
p.s.:	5 – 8	

Description

Males. Body cylindrical with rounded head and a cylindroconical tail with a swollen tip.

Cuticle punctuated; in the pharyngeal and caudal region of some specimens, the punctuation is present in transverse rows and coarse dots are separated by rows of smaller dots; in this case, no lateral differentiation is present; in other specimens, the annulation is more regular and with or without lateral differentiation. In the mid-body region the difference between the three types of cuticular pattern is no longer present.

Somatic setae short and arranged in four sublateral rows throughout the body. Two pairs of sublateral cervical setae (3–5 μm long) are situated posterior to the amphideal fovea; in some specimens some of these setae are lacking (cfr. Fig. 16A–D). The six external labial sensillae are longer (2 μm) and situated at the level of the base of the buccal cavity. The four cephalic setae (4–5 μm long; i.e. 20–30% of the c.b.d.) are situated at the anterior border of the amphideal fovea. Amphideal fovea spiral, described 3 1/4–3 3/4 turns (i.e. 60–90% of c.b.d.) and is ventrally wound.

Nerve ring at 54–61% of the pharyngeal length. Ventral pore at 63–68% of the pharyngeal length. In all specimens examined, the 'supplementary lateral cells' of the excretory system (as described by Jensen, 1979) are situated in the neighbourhood of the ventral gland.

Buccal cavity small and cup-shaped; a small dorsal tooth-like structure is mostly present at its base.

Muscular pharynx with a weakly developed bulb (cfr. figures in Platt, 1984, 1985).

Diorchic with opposite testes; the anterior one at the left, the posterior one at the right of the intestine.

Paired spicules of equal size and curved, 41–54 μm long or 1.0–1.6 a.b.d. The proximal part is broader, with sometimes a weakly developed capitulum; the inner side of the capitulum is connected with the distal tip of the spicule by a weakly

cuticularized median lamella which is thickened in its proximal part. The gubernaculum surrounds the distal end of the spicule and has two dorsocaudally or caudally orientated apophyses (20–24 μm long); the apophyses are interconnected at their distal part by a strongly sclerotized median part, the cuneus. The cuneus has a caudally directed bar extending from its dorsal end. The apophyses may have a ventrally curved bend which is obvious only in some views (cfr. Fig. 16H–G).

The muscles of the spicular apparatus are well developed; the protractor of the spicule consists of two parts: one part extends from the ventral side of the capitulum to the subventral body wall and the other part extends from the medium cuticularized lamella of the spicule to the dorsal side of the gubernacular apophysis. The retractor of the spiculum extends from the capitulum to the dorsolateral body wall; in Fig. 16K, another muscle, extending from the median part of the spicule to the dorsolateral body wall is represented (this muscle is not always obvious).

The protractors of the gubernaculum extend from the proximal ventral part of the apophyses to the subventral body wall; the retractors consist of two pairs: one situated between cuneus and dorsolateral body walls; and the other is orientated caudally from the dorsal proximal tip of the apophyses to the dorsolateral body walls.

The number of preanal supplements varies from 5–8; 211 males were examined: 24 have five preanal supplements; 167 males have six p.s.; 16 males have seven p.s. and 4 males have eight p.s. Supplements 1 and 2 (most close to the anus) are more distant from each other than 3, 4, 5 or 6 more anteriorly located supplements.

The tail is cylindro-conical with a swollen tip; the length of the cylindrical part between the swollen tip and the conical anterior part of the tail varies from almost nothing to 20 μm. Several subventral somatic setae are located on the tail; the cell bodies of the three caudal glands are restricted to the tail.

Females. Morphological variation in the females is not as large as in the males.

Only characters which were considered diagnostic will be discussed here. For a general description of the females we refer to Platt (1984) for the description of *Sabatieria breviseta* and *Sabatieria punctata* (see also discussion).

The females have a smaller amphid (2–3 turns or 50% of the c.b.d.); the cuticular pattern consists of an irregular punctation which may show in some specimens a slight lateral differentiation in that the points in the lateral field are somewhat larger (this differentiation only occurs in the pharyngeal and caudal region only).

Discussion

In the Southern Bight of the North Sea, the *Sabatieria*-population of the '*pulchra*-group' (as defined by Platt, 1985) is characterized by species which have the features of four (five?) *Sabatieria*-species, described earlier; i.e. *S. breviseta* (Stekhoven, 1935), *S. clavicauda* (Filipjev, 1918), *S. punctata* (Kreis, 1924), *S. vulgaris* (de Man, 1907) and *S. pulchra* (G. Schneider, 1906). Recently, Platt (1985) considered three of these as valid species: *S. breviseta, S. punctata* and *S. pulchra*. He synonymized *S. clavicauda* and *S. vulgaris* with *S. pulchra* (G. Schneider, 1906) (as proposed earlier respectively by Gerlach (1965) and Riemann (1970)).

The difference between the sympatric species *S. punctata* and *S. breviseta* is determined by Platt (1984) as follows: characters which are 'conspiciously different' are: cuticular pattern, male amphid size and relative development of the supplements; minor differences have *S. punctata* and *S. breviseta* in following characters: the length of the cephalic setae (0.4 c.b.d. for *S. punctata* and 0.3 h.d. for *S. breviseta*), slightly less curved and shorter spicules (1.3 c.b.d. vs. 1.5–1.6 c.b.d. as arc), less conspicious median piece, slimmer tail and a different orientation of the ovaries to the gut (based on 1 and 2 females resp.). Both species have six preanal supplements.

Fig. 16 illustrates that a different combination of diagnostic characters between the several specimens exists in one population of *Sabatieria* species of the '*pulchra*-group'. Therefore *S. breviseta* is synonymized with *S. punctata. S. vulgaris* sensu Gerlach (1965) and sensu Riemann (1966) are also synonymous with *S. punctata.* Riemann (1966) also discussed the variability in some characters (amphid size, cuticle, ...) of 'his' *S. vulgaris*; most of the males have 6–7 p.s. (one specimen with 5 and one with 8). Specimens described by Gerlach (1965) have also six p.s. and large amphids as most of the specimens considered as *S. punctata* now.

The original description of *S. vulgaris* (de Man, 1907) is very similar with the description of *S. pulchra* and, therefore, the two species are considered synonymous as stated already by Platt (1985).

Eventhough, problems do exist about the identity of the different species in the '*pulchra*-group'.

S. propisinna Vitiello, 1976 and *S. pisinna* Vitiello, 1970 were considered clearly different from the other species of the group because of their small body size (i.e. 670–780 μm and 657–777 μm resp.). The difference between these two species is discussed by Vitiello (1976).

The intraspecific variation for *S. mortenseni* (Ditlevsen, 1921) corresponds with the variation encountered in *S. punctata*. Therefore we consider *S. mortenseni* (type material disappeared) synonymous with *S. punctata*.

S. pulchra (G. Schneider, 1906) appears to be a true brackish water (mesohaline) species (cfr. Jensen, 1979) which shows in its habitat an intraspecific variation of less than 10% of 11 adult characters. The number of preanal supplements shows little variation in specimens from the type locality (Jensen, 1979): 118 ind. have eight supplements, 106 ind. have seven supplements, three ind. have 5, 6 or 9 supplements. In the Dievengat (a polyhaline pond near the Belgian coast), *S. pulchra* has individuals with 7 and 8 preanal supplements (17 males with 7 and 3 males with 8 supplements) (Smol, pers. comm.).

The marine *S. punctata* has mostly 5–6 preanal supplements. However, the differences between females of the two species *S. punctata* and *S. pulchra* are not obvious at all.

But, as in many other nematode genera, true brackish-water species do exist and perhaps that following differences with the marine *S. punctata* are diagnostic; *S. pulchra* has: two turns in the amphideal fovea; a very slender tail end with a cylindrical part that ends in a clearly delineated swollen tip.

Because of minor differences, the species of *S. pulchra*-group (Platt, 1985) (except *S. pisinna* and *S. propisinna*) may be considered as different ecophenotypes, in which the marine and the polymesohaline *Sabatieria* specimens are two distinct types which show only clear variation in the number of preanal supplements. Nevertheless, the low variability in characters for *S. pulchra* compared with *S. punctata* is striking. The two phenotypes are found in the same geographic range but in different habitats and may be called therefore species with a microallopatric distribution.

If *S. pulchra* and *S. punctata* are two different species, it is probable that localised hybridisation or introgression occurs regularly in some groups. Wiley (1981) says that species which do not hybridize or introgress under normal circumstances may do so in disturbed habitats. Either may also occur under special ecological circumstances.

The marine *Sabatieria* species of the '*pulchra*-group', which show a large variability live in an area that is very disturbed and loaded with a variety of pollutants (in some sediments of this area, nematodes are the only metazoans which can survive).

Sabatieria sp. *1 (Figs. 12, 19A, B, D, E)*

Material

One male and two juveniles.

Locality

Southern Bight of the North Sea. Fine to coarse sand with silt content between 0–20%. Three localities (Fig. 12). Collected Sep. 1978 and Apr. 1972.

Measurements

$$\sigma_1: \frac{-\ 140\ 160\ 271\ M\ 2797}{19\ \ 22\ \ 24\ \ 27\ 41\ \ \ 41}\ 2970 \text{ (slide no. 10119)}$$

a = 72.4 b = 11.0 c = 17.2 c′ = 4.2 spic = 84 μm p.s. = 18

Description

Body cylindrical; cuticular ornamentation approximately in transverse rows; a lateral field of coarser punctations is present throughout the body length. The labial sensilla are papilliform; the four cephalic setae are 10 μm long, i.e. 53% of the c.b.d.; amphideal fovea spiral with two turns, ventrally wound; 67% of the c.b.d. Four rows of somatic setae are arranged over the whole body length.

Nerve ring at 52% of pharyngeal length; ventral pore at 59% of pharyngeal length.

Buccal cavity and pharynx typical for the genus.

Diorchic, with outstretched testes, anterior testis at the left, posterior testis at the right of the intestine. Spicules heavily sclerotized, twice c.b.d., with

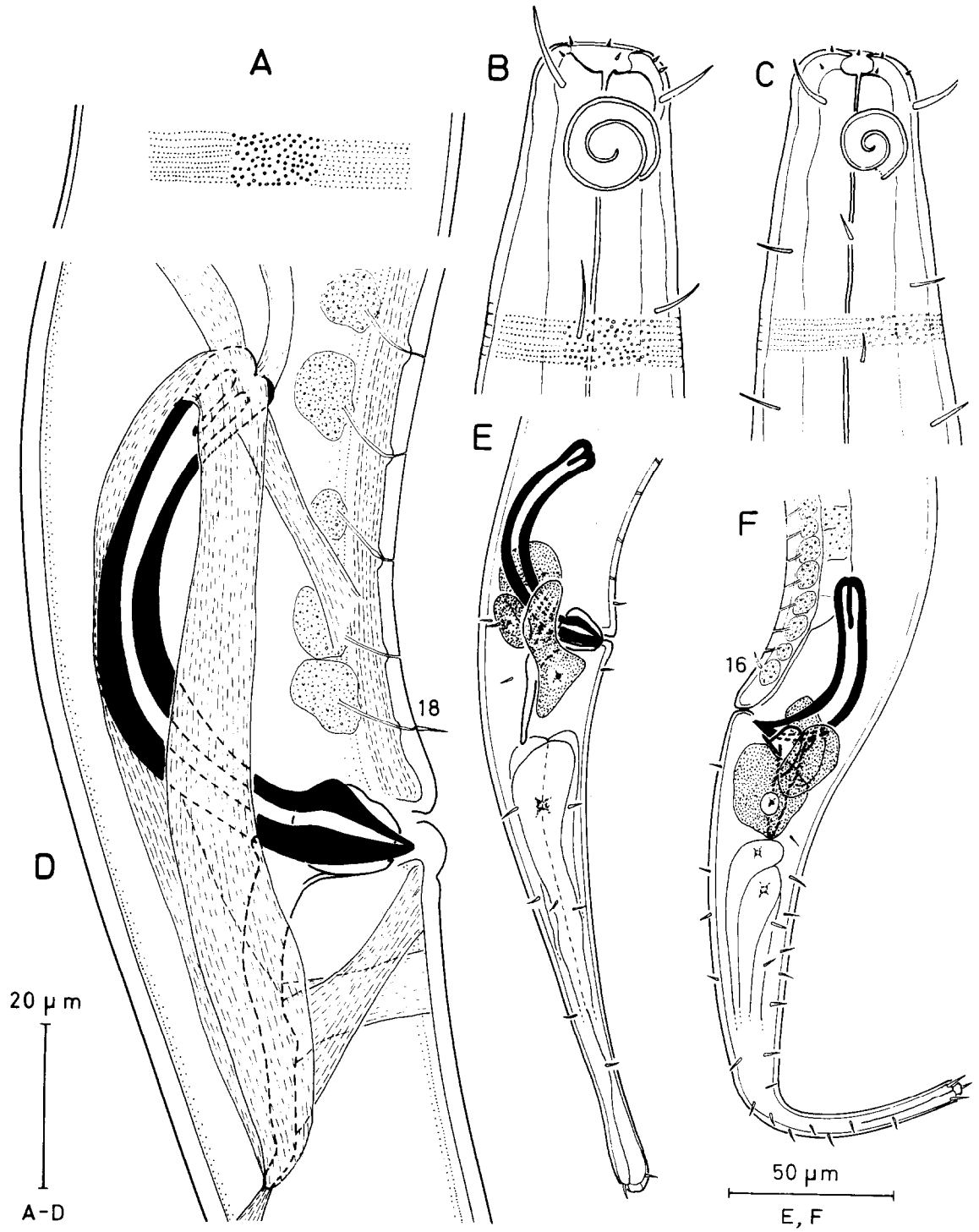

Fig. 19. Sabatieria sp. 1: A. Cuticular pattern at the cardial level σ_1; B. Head end σ_1; D. Spicular apparatus σ_1; E. Tail region σ_1. *Sabatieria* sp. 2: C. Head end σ_1; F. Tail region σ_1.

slightly developed capitulum and a short cuticularized internal projection from the proximal end; median lamella absent; the distal end shows a triangular elevation. The gubernaculum has two long nearly straight apophyses (41 μm) which are caudally directed. Eighteen tubular preanal supplements are weakly sclerotized; they are connected with glandular cells; last supplement provided with one seta.

The protractors of the spicules consist of two parts; one from the ventral side of the capitulum to the subventral body wall; the other is splitted into two branches, one at the outer side of the spicule between the capitulum and the caudal end of the gubernacular apophysis and one at the inner side of the spicule between the dorsal side of the capitulum and the gubernacular apophysis. The retractor of the spicules extends between the capitulum and the subdorsal body wall. The protractors of the gubernaculum extend between the middle part of the apophysis and the ventral body wall; the retractor between the caudal tip of the apophysis and the dorsal body wall.

Glands (anal or cloacal) are present, one obscure the gubernacular structure. One is situated between the distal end of the spicules and one pair is situated at the lateral side of the spicules. Tail is cylindroconical, slightly swollen at the tip and with three terminal setae. Females not found.

Discussion

This species belongs to the '*Sabatieria praedatrix*-subgroup' (cfr. Platt, 1985) which is characterized by species with simple tubular or pore-like supplements and straight gubernacular apophyses. As the group is currently constituted, none have spicules with the central lamella apart from the proximal projection and most have a cuticular differentiation with large, more widely spaced dots.

Sabatieria sp. 1 is close to *S. praedatrix* but differences are: longer gubernacular apophysis, higher a-ratio. However, also within this subgroup very little is known about the intraspecific variability.

Sabatieria sp. 2 (Figs. 12, 19C, F)

Material

One male, one female (poorly preserved).

Locality

Southern Bight of the North Sea. Median grain size of the sand fraction is 150 μm; 5% silt. One locality (Fig. 12). Collected 4 Apr. 1972 and 26 June 1972.

Measurements

σ_1: $\frac{-\ 116\ 134\ 232\ M\ 2314}{15\ \ 33\ \ 33\ \ 36\ 48\ \ \ 40}$ 2510 (slide no. 10120)

a = 52.3 b = 10.8 c = 12.8 c′ = 4.9 spic = 67 μm p.s. = 1 + 15

φ_1: $\frac{-\ ?\ ?\ 262\ 1170\ 2068}{17\ ?\ ?\ \ 42\ \ \ \ 52\ \ \ 44}$ 2260 (slide no. 10121)

a = 43.5 b = 8.6 c = 11.8 c′ = 4.4 V = 51.8%

Description

General body shape similar to *Sabatieria* sp. 1, except the longer tail. Cuticular punctations arranged in transverse rows; the lateral differentiation consists of coarser points. Somatic setae arranged in eight longitudinal rows. Labial sensillae papilliform; the four cephalic setae are 7 μm long, i.e. 47% of the c.b.d. Amphideal fovea spiral with 2 1/4 turns; 8 μm diameter or 50% of the c.b.d.

Buccal cavity and pharynx typical for the genus. Nerve ring at 50% of the pharyngeal length; ventral pore 58% of the pharyngeal length. Diorchic with outstretched testis, anterior left, posterior right of intestine.

Spicules heavily sclerotized, 67 μm long, i.e. 1.7 times a.b.d.; a rather pronounced (13 μm) internal cuticularized projection from the proximal end; no central lamella developed. The gubernaculum has two long, straight, caudally directed apophyses (29 μm). Anal cloacal glands present. One precloacal setae and 15 tiny tubular preanal supplements are weakly cuticularized; each one is connected with a glandular cell. Spicular muscles not obvious.

Female. Not well preserved; detailed description not possible. Didelphic, ovaries outstretched, anterior left, posterior right of intestine.

Discussion

Sabatieria sp. 2 belongs to the '*Sabatieria praedatrix*-sub-group' (Platt, 1985); it resembles *S. praedatrix* but the latter species has a different median piece of the gubernaculum.

The real identity of *Sabatieria* sp. 2 can be confirmed by examination of more material.

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References

Benwell, M. P., 1981. A new species of *Gonionchus* (Nematoda, Xyalidae) from the Firth of Clyde, with a redescription of *Enoploides spiculohamatus* Schulz (Nematoda, Enoplidae). Cah. Biol. mar., XXII: 177–184.

Blome, D., 1974. Zur Systematik von Nematoden aus dem Sandstrand der Nordseeinsel Sylt. Mikrofauna Meeresboden 33: 1–25.

Blome, D., 1982. Systematik der Nematoda eines Sandstrandes der Nordseeinsel Sylt. Mikrofauna Meeresboden 86: 1–194.

Boucher, G., 1976. Nématodes des sables fins infralittoraux de la Pierre Noire (Manche Occidentale). II. Chromadorida. Bull. Mus. natn. Hist. nat. Paris, 3è séc., 352, Zool. 245: 25–61.

Gerlach, S. A., 1965. Freilebende Meeresnematoden aus der Gezeitenzone von Spitzbergen. Veroff. Inst. Meeresforsch. Bremerh. 9: 109–172.

Herman, R., M. Vincx & C. Heip, 1985. Meiofauna of the Belgian coastal waters: spatial and temporal variability and productivity. In: C. Heip & Ph. Polk (eds). Biological Processes and Translocations, Min. Sci. Policy, Brussels: 41–63.

Hull, D. L., 1968. The operational imperative – sense and nonsense in operationalism. Syst. Zool. 17: 438–457.

Hull, D. L., 1971. Contemporary systematic philosophies. Annu. Rev. Syst. Ecol. 1: 19–54.

Jensen, P., 1979. Nematodes from the brackish waters of the southern archipelago of Finland. Benthic species. Ann. Zool. Fennici 16: 151–168.

Jensen, P., 1986. The nematode fauna in the sulphide-rich brine seep and adjacent bottoms of the East Flower Garden, NW Gulf of Mexico. II. Monhysterida. Zoologica Scripta, 15, 1: 1–11.

Lorenzen, S., 1972. Die Nematodenfauna im Verklappungsgebiet fur Industrieabwasser nordwestlich von Helgoland. II. Desmodorida und Chromadorida. Zool. Anz. 187 (5/6): 283–302.

Lorenzen, S., 1977. Revision der Xyalidae (freilebende Nematoden) aus der Grundlage einer kritischen Analyse von 56 Arten aus Nord- und Ostsee. Veroff. Inst. Meeresforsch. Bremerh. 16: 197–261.

Platt, H. M., 1984. The freeliving marine nematode genus *Sabatieria* (Nematoda: Comesomatidae). II. Redescriptions of five European species. Bulletin of the British Museum (Natural History) Zoology series 46: 355–375.

Platt, H. M., 1985. The freeliving marine nematode genus *Sabatieria* (Nematoda: Comesomatidae). Taxonomic revision and pictoral keys. Zoological Journal of the Linnean Society 83: 27–78.

Riemann, F., 1966. Die interstitielle Fauna in Elbe-Aestuar. Verbreitung und Systematik. Arch. Hydrobiol., Suppl. 31: 1–279.

Riemann, F., 1970. Freilebende Nematoden aus dem Grenzbereich Meer-Suss-Wasser in Kolumbien, Sudamerika. Veroff. Inst. Meeresforsch. Bremerh. 12: 365–412.

Riemann, F., 1976. Meeresnematoden (Chromadorida) mit lateralen Flossenraumen (Alae) und dorsoventraler Abplattung. Zool. Jb., Syst. Bd. 103: 290–308.

Vincx, M., 1981. New and little known Nematodes from the North Sea. Cah. Biol. mar. 22: 431–451.

Vincx, M., J. Sharma & N. Smol, 1982. On the identity and Nomenclature of *Paracanthonchus caecus* (Bastian, 1865) with a redefinition of the genus *Paracanthonchus* Micoletzky (Nematoda, Cyatholaimidae). Zoologica Scripta, 11, 4: 243–263.

Vitiello, P., 1976. Trois nouvelles espèces de Comesomatidae (Nematoda) des Côtes de Provence. Tethys 7: 279–285.

Vitiello, P. & A. Dinet, 1979. Definition et chatillonnage du meiobenthos. Rapp. Comm. int. Mer Médit, 25/26, 4: 279–283.

Ward, A. R., 1972. Two new species of *Xyala* (Nematoda, Monhysteroidea) from sublittoral sediments in Liverpool Bay. Mar. Biol. 13: 176–178.

Warwick, R. M. & H. M. Platt, 1973. New and little known marine nematodes from a scottish sandy beach. Cah. Biol. mar. 14: 135–158.

Wiley, E. O., 1981. Phylogenetics. The theory and practice of phylogenetic Systematics. Ed. John Wiley & Sons, 439 pp.

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