TWO NEW SPECIES OF THE GENUS *CHITWOODIA* GERLACH, 1956 (NEMATODA, AXONOLAIMIDAE) FROM A POLLUTED SANDY BEACH IN THE FIRTH OF CLYDE, SCOTLAND AND A REVISION OF THE GENUS.

by

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Résumé

Deux nouvelles espèces de Nématodes libres marins du genre rare *Chitwoodia* Gerlach, 1956, C. *tripapillata* sp. nov. et C. *warwicki* sp. nov., sont décrites. Une révision et une clé du genre sont données.

Introduction

During an investigation of the taxonomy and ecology of the free-living nematode fauna of a polluted sandy beach in the Firth of Clyde, on the West coast of Scotland, two new species belonging to the rare genus *Chitwoodia* Gerlach, 1956 were encountered. This paper deals with the descriptions of these two species and a revision of the genus. A key to the genus is also provided. Further details of the investigation will be published subsequently.

The descriptions and drawings are based on glycerine mounts. The drawings were accomplished with the aid of a Wild drawing tube fitted to a Wild -20 microscope. Curved structures such as spicules have been measured as the chord and not as the curve. The syntypes studied have been deposited at the British Museum (Natural History).

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CHITWOODIA TRIPAPILLATA sp. nov. (Fig. 1)

Material studied:

2 ♂♂ ; B.M. (N.H.) Reg. No. 1976

Measurements

δ_1 — 210 M 1240 / 16.5 22 25 25 L = 1510 µm ; a = 60.4 ; b = 7.2 ; c = 5.6
Spicule = 24 µm

δ_2 — 198 M 1196 / 16.5 22 25 25 L = 1460 µm ; a = 58.4 ; b = 7.4 ; c = 5.5
Spicule = 24 µm

Description

Cuticle striated, striae about 1.5 µm wide. Buccal cavity absent. Head distinctly attenuated and bears six small, dome-shaped cephalic papillae and two separate circles of truncated cephalic setae; first circle of six and second circle of four setae of almost equal length, 12-13 µm long (0.7-0.8 head diameter long). Amphids very distinct, thick-walled, each with a circular loop and an elongated dorsal limb, resembling a sheperd's crook; 7-8 µm wide (40-50 percent of corresponding body diameter) and 11-12 µm long (dorsal limb) ; situated at 7-10 µm behind anterior end. A distinct glandular structure opens at the posterior end of the elongated dorsal limb of each amphid by way of a duct. Oesophagus relatively weakly developed with an indistinct swelling (clearly visible only under phase contrast illumination) in its mid-region (situated at about 40 percent of oesophageal length behind anterior end) and with a gradual basal swelling; but a true basal bulb lacking. The lumen of the oesophagus faint and indistinct especially, posterior to the mid-oesophageal swelling. Nerve ring lies just posterior to the mid-oesophageal swelling. Excretory pore situated at 56-58 percent of oesophageal length behind anterior end. Somatic setae absent. Tail tapers, gradually posteriorly; 11 cloacal diameter long in males.

Spicules paired, equal, arcuate, proximally cephalated and distally bearing a small hook; about 1 cloacal diameter long; ventral alae present. Gubernaculum paired, barrel-shaped, bearing paired long and slender caudally directed apophyses. Three papilloid precloacal supplements present. A faint tubular structure was observed in the vicinity of each supplement, but the connection of these structures with the supplements could not be traced.

Discussion

In some respects such as the body dimensions and the structure of the head region, *Chitwoodia tripapillata* sp. nov. is closest to *C. falcata* Gerlach, 1956; but, differs from it in the structure of the

spicular apparatus, in the proportion of the tail in relation to the body length, and above all in its possession of precloacal supplements. *C. tripapillata* sp. nov. is the only species of the genus which possesses precloacal supplements.

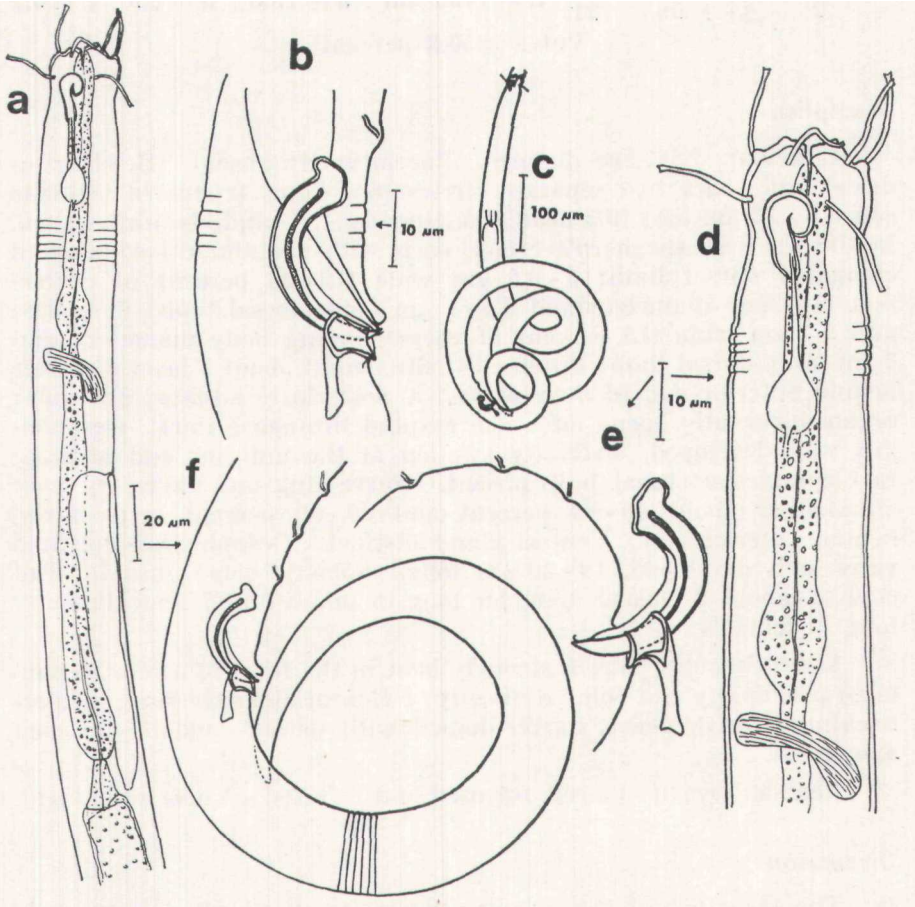

FIG. 1

Chitwoodia tripapillata sp. nov. a : oesophageal region of ♂2 ; b : spicular apparatus of ♂2 ; c : ♂2 entire ; d : anterior region of ♂2 ; e : spicular apparatus of ♂1 ; f : tail region of ♂2.

CHITWOODIA WARWICKI * sp. nov. (Fig. 2)

Material studied:

2 ♂♂ and 1 ♀; B.M. (N.H.) Reg. No. 1976

Measurements

$$\delta_1 \frac{\text{—} \quad 214 \quad \text{M} \quad 1210}{21 \quad 30 \quad 38 \quad 27}$$ L = 1460 µm ; a = 38.4 ; b = 6.8 ; c = 5.8

Spicule = 27 µm

(*) This species is dedicated to Dr. Richard M. Warwick.

δ_2 — 193 M 1182 / 21 30 37 26 L = 1410 µm ; a = 38.1 ; b = 7.3 ; c = 6.2
Spicule = 26 µm

♀ — 216 750 1266 / 28 44 56 31 L = 1490 µm ; a = 26.6 ; b = 6.9 ; c = 6.7
Vulva = 50.3 percent

Description

Cuticular striations distinct. Buccal cavity absent. Head cylindrical and bears two separate circles (6 + 4) of truncated cephalic setae, 6 - 7.5 µm long (0.3 head diameter long). Amphids thick-walled, in the form of shepherd's crook, each with a circular loop and an elongated dorsal limb; 5-6.5 µm wide (19-26 percent of corresponding body diameter) and 6.5-9 µm long (dorsal limb) in males; and 5.5 µm wide (15 percent of corresponding body diameter) and 7 µm long (dorsal limb) in females; situated at about 1 head diameter behind anterior end in both sexes. A posteriorly situated glandular organ apparently opens into each amphid through a duct. Oesophagus well developed, distinctly swollen at the anterior end and the rest cylindrical; basal bulb absent. Nerve ring and excretory pore situated at about 40 - 44 percent and 60 - 66 percent respectively, behind anterior end. Ventral gland distinct. Oesophageal-intestinal valve well developed, 18 - 20 µm long. Somatic setae absent. Tail conical, about 9 cloacal diameter long in males and 7 anal diameter long in females.

Male: Spicules paired, strongly bent in the form of a bow, cephalated proximally and pointed distally; 1 cloacal diameter long. Gubernaculum paired, dense, barrel-shaped with paired caudally directed apophyses.

Female: Ovaries paired, opposed and reflexed. Vulva prominent.

Discussion

The structure of the spicular apparatus of *Chiwoodia warwicki* sp. nov. closely resembles that of *C. tripapillata* sp. nov. However, the former species can be distinguished from the latter in the absence of precloacal supplements in male, in its cylindrical head region and in its possession of a well developed oesophagus with an anterior swelling, in which feature it also differs from all the other species of the genus.

REVISION OF THE GENUS *CHITWOODIA* GERLACH, 1956.

The genus *Chitwoodia* was established by Gerlach (1956) based on two species, namely, *Chitwoodia falcata* Gerlach, 1956 (Type) and *C. menora* Gerlach, 1956. The finding of two new species described above, makes it possible to affirm the systematic status of the genus.

Since some additional features not included in the original definition of the genus given by Gerlach (1956), were observed in the above-described species, the genus has been redefined here as follows.

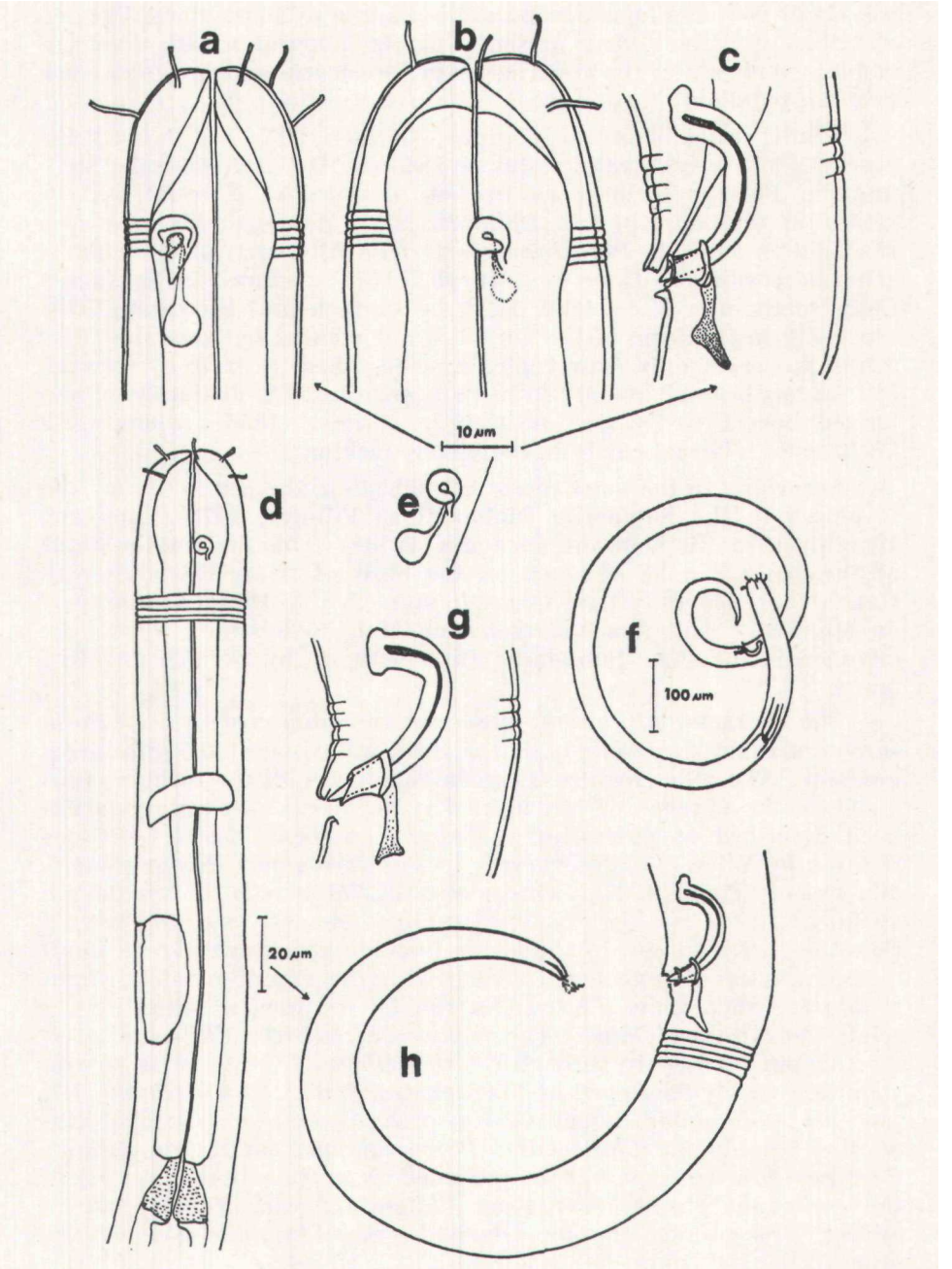

FIG. 2
Chitwoodia warwicki sp. nov.

a : head of ♂1 ; b : head of ♀ ; c : spicular apparatus of ♂1 ; d : oesophageal region of ♂2 ; e : amphid of ♂2 ; f : ♂1 entire ; g : spicular apparatus of ♂2 ; h : tail region of ♂1.

Axonolaimidae; Diplopeltinae; buccal cavity absent; cephalic setae arranged in two separate circles, first circle of six and second circle of four setae; amphids thick-walled with circular loop and elongated dorsal limb; resembling a shepherd's crook; oesophagus weakly or well developed; bulbular swelling in mid-oesophageal region absent or indistinct when present; spicular apparatus with dorsal or caudal apophyses of the gubernaculum ; precloacal supplements, when present, papilloid.

Whilst establishing this genus, Gerlach (1956) discussed the obscurity of its systematic status and stated "Die systematische Stellung der Formen bleibt noch dunkel...", and that it could best be placed in relationship with Diplopeltids an Axonolaimids. He also related the genus to *Parachromagasteriella* Allgen, 1933 (a doubtful genus, according to Hope and Murphy, 1972; included in Subfamily Cylindrolaiminae, Micoletzky, 1922, by Gerlach and Riemann, 1973) especially in the form of the amphids, but pointed out that the latter genus possesses only four cephalic setae. Besides, *Parachromagasteriella* has been characterised in its possession of a distinctly cuticularised buccal cavity (see revision by Wieser, 1956), whereas, in *Chitwoodia* a buccal cavity is completely lacking.

According to the most recent classification, the genus *Chitwoodia* is placed in the Subfamily Diplopeltinae Filipjev, 1918 (Hope and Murphy, 1972; Gerlach and Riemann, 1973). This systematic status of the genus can be affirmed on the basis of its relationship with three other genera viz., *Pararaeolaimus* Timm, 1961, *Araeolaimus* de Man 1888 and *Araeolaimoides* de Man 1893 which have been included in the same Subfamily (Diplopeltinae) by Gerlach and Riemann (1973).

The character *Chitwoodia* possesses in common with both *Pararaeolaimus* and *Araeolaimus,* is the thick-walled amphids with circular loop. The other feature it has in common with the former genus alone, is the absence of buecal cavity and ocelli. *Araeolaimus* has been described as possessing a distinct mid-oesophageal bulb (see revision by Wieser, 1956) whereas in *Pararaeolaimus* this is completely absent (Timm, 1961). One species of *Chitwoodia* (*C. tripapillata* sp. nov.) has a weakly developed mid-oesophageal swelling, but all the other three species of the genus (including *C. warwicki* sp. nov.) do not possess this feature. Thus, with the exception of *C. tripapillata* sp. nov., genus *Chitwoodia* can be regarded as most closely related to *Pararaeolaimus.* The relationship between *Chitwoodia* and *Araeolaimoides* is only through *C. tripapillata* sp. nov., in its possession of a weakly developed mid-oesophageal bulb. In *Araeolaimoides,* however, the amphid has an oval loop as opposed to a circular loop of the amphid in *Chitwoodia, Pararaeolaimus* and *Araeolaimus. C. tripapillata* sp. nov. can be regarded as a transitional species in the evolutionary line, connecting *Chitwoodia* with *Pararaeolaimus* and/or *Araeolaimus* on one side and with *Araeolaimoides* on the other.

In addition to all the above-discussed characters which *Chitwoodia* possesses in common with the allied genera of Diplopeltinae, there is one feature characteristic of the genus viz., its possession of two separate circles (6 + 4) of cephalic setae, which enables one

to distinguish this genus from the other related genera discussed above, all of which have only one circle of four cephalic setae. While discussing this generic feature of *Chitwoodia*, Gerlach (1956) stated "... eine so starke Entwicklung des vorderen Kopfborstenkranzes einmalig ist." Nevertheless, the greater number of cephalic setae of one of its species—*C tripapillata* sp. nov.—do seem to be stronger adaptations acquired during the evolutionary process.

Key to the genus *Chitwoodia*

A Supplements in male present: *C. tripapillata* sp. nov.

B Supplements in male absent

1. Oesophagus well developed with prominent anterior swelling: *C. warwicki* sp. nov.
2. Oesophagus weakly developed
   a. Head slightly attenuated; tail less than 10 cloacal diameter long: *C. falcata* Gerlach, 1956.
   b. Head cylindrical; tail over 10 cloacal diameter long: *C. menora* Gerlach, 1956.

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Summary

Two new species of free-living marine nematodes belonging to the rare genus *Chitwoodia* Gerlach, 1956, viz., *C. tripapillata* sp. nov. and *C. warwicki* sp. nov. are described. A revision of the genus together with a key to its species is provided.

REFERENCES

ALLGEN, CA., 1933. — Freilebende Nematoden aus dem Trondhjemsfjord. *Capita zool.* 4 (2), pp. 1-162.

FILIPJEV, *I.*, 1918. — Free-living marine Nematodes of the Sevastopol area (*in Russian). Trudy osob. zool. Lab. sevastop. biol. Sta.* (2) 4, pp. 1-350.

GERLACH, S.A., 1956. — Diagnosen neuer Nematoden aus der Kieler Bucht. *Kieler Meeresforsch.* 12, *pp.* 85-109.

GERLACH, S.A., and HIEMANN, F., 1973. — The Bremerhaven Checklist of Aquatic Nematodes. *Veröff. Inst. Meeresforsch.,* Suppl. 4 (1), *pp.* 1-404.

HOPE, W.D. and MURPHY, D.G., 1972. — A taxonomic hierarchy and checklist of the genera and higher taxa of marine Nematodes. *Smithson. Contr. Zool.* 137, *pp.* 1-101.

DE MAN, J.G., 1888. — Sur quelques Nématodes libres de la mer du Nord nouveaux ou peu connus. *Mém. Soc. zool. France* 1, pp. 1-51.

DE MAN, J.G., 1893. — Cinquième note sur les Nématodes libres de la mer du Nord et de la Manche. *Ibid.* 6, *pp.* 81-125.

MICOLETZKY, H., 1922. — Die freilebenden Erdnematoden. *Arch. Naturgesch.* 87 A, *pp.* 1-650.

TIMM, R.W., 1961. — The marine nematodes of the Bay of Bengal. *Proc. Pakist. Acad. Sci.* 1, pp. 1-88.

WIESER, w., 1956. — Free-living marine nematodes. III. Axonolaimoidea and Monhysteroidea. ***Acta Univ. lund*** (N.F. 2) 52 (13), *pp.* 1-115.