

The nematode fauna in the sulphide-rich brine seep and adjacent bottoms of the East Flower Garden, NW Gulf of Mexico. III. Enoplida

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Six nematode species of the order Enoplida are described from the East Flower Garden at 72 m depth in the north-western Gulf of Mexico. The material is from sandy and rocky bottom samples influenced or beyond the influence of a sulphide-rich brine seep. Four species are new to science: *Enoploides polysetosus* sp.n., *Leptosomatium woodsi* sp.n., *Calyptonema pulchrum* sp.n. and *Symploctoma brevispiculum* sp.n. *Mesacanthoides fibulatus* Wieser & Hopper, 1967 and *Cycolaimus magnus* (Villot, 1875) are redescribed and new characters are added to the existing descriptions.

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Introduction

The present paper is the last in a series of three papers dealing with the taxonomy of nematodes from the East Flower Garden, NW Gulf of Mexico (cf. Jensen 1985, 1986). They form the taxonomical background for a discussion of the impact of the sulphide system at the species level and the adaptive significance of 'thiobiotic' and 'oxybiotic' species (Jensen in prepn).

A brief summary of the environmental conditions in the East Flower Garden is given in Jensen (1985) with a full list of references to studies already done in that particular area.

The material and methods used herein follow those of Jensen (1985).

Descriptions

Thoracostomopsidae

Enoploides polysetosus sp.n. (Fig. 1)

Material. St. 9: 1 juvenile. St. 14: 1 ♂ and 1 ♀ (♂ holotype USNM 76337). St. 17: 1 ♂, 6 ♀♀ and 12 juveniles (5 ♀♀ and 3 juveniles paratypes (USNM 76338, 76340–76346). St. 18: 3 ♂♂. St. 19: 1 ♂. St. 26: 1 ♂ and 2 juveniles (1 ♂ paratype 76339).

Measurements

| | | | | |
|----------------|--------|---------|----------|-----------|
| ♂ ₁ | a = 42 | b = 4.5 | c = 15.5 | |
| | 43 | 223 | 1071 | M 4463 |
| | 63 | 95 | 113 | 113 57 |
| ♀ ₁ | a = 49 | b = 4.3 | c = 10.3 | V = 55% |
| | 42 | — | 1262 | 2995 4905 |
| | 68 | — | 105 | 112 67 |

| | | | | |
|--------------|------------------|------------|-------------|---------------|
| 5 ♂♂ | L = 4380–5160 μm | a = 41–60 | b = 3.8–4.5 | c = 11.7–15.8 |
| 5 ♀♀ | L = 4330–5510 μm | a = 35–50 | b = 3.8–4.4 | c = 10.2–13.3 |
| | | V = 55–59% | | |
| 10 juveniles | L = 1770–3840 μm | a = 39–45 | b = 3.2–4.0 | c = 7.4–11.7 |

Description

Males. Body slender. Cuticle smooth. Somatic setae very faint, 15–22 μm long, appearing in five transverse rows each with 10–12 setae in front of nerve ring. Amphids very small, pocket-shaped, about 40 μm behind front end. Six labial setae 15 μm behind front end, 20 μm long, and one circle of ten cephalic setae about 40 μm behind front end: six setae measuring 45–50 μm and four slender setae 28–30 μm long. Stomodaeal ring appears strongly cuticularized and with subcuticular bundles of striations. Buccal cavity very voluminous with three forked mandibles about 30 μm long and three teeth at base of buccal cavity; distinct striations in buccal cavity and along lips. Oesophagus expanded around buccal cavity, otherwise cylindrical with several interruptions of gland cells. Orthometanemes in dorso-lateral position, their exact length cannot be determined. Testes opposite, outstretched and left of intestine; in one male anterior testis reflexed. Spicules almost straight, slightly curved at distal end; cuticularization with a granulated appearance; 162–174 μm long; gubernaculum slightly curved, distally with two teeth; precloacal organ 132–158 μm in front of cloaca. Tail tip with weakly cuticularized cap.

Females. Similar to males. Ovaries opposite and reflexed; spermathecae present.

Juveniles. Similar to adults.

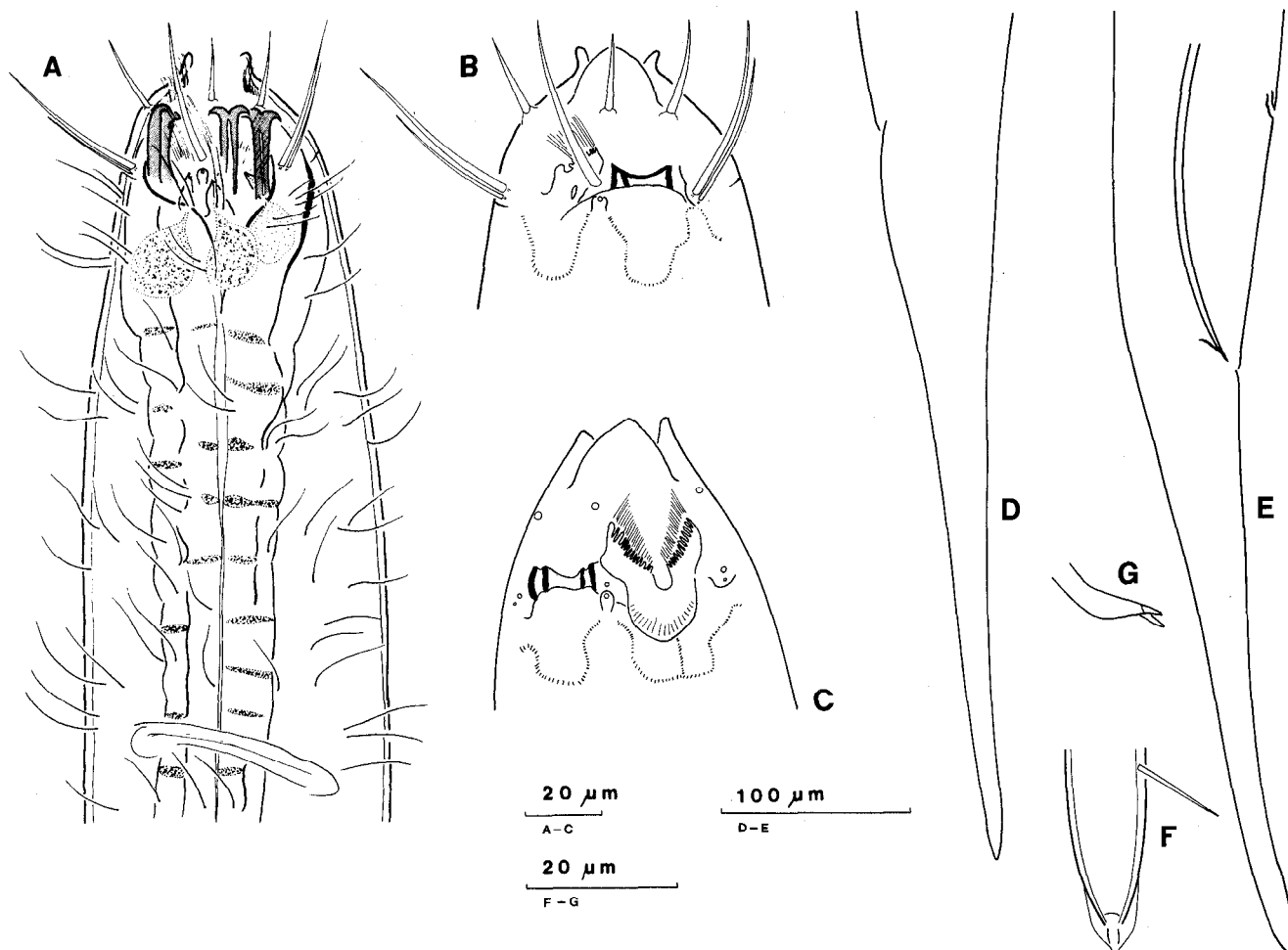


Fig. 1. *Enoploides polysetosus* sp.n.—A. Head of δ_1 .—B. Head in surface view of δ_1 .—C. Head in surface view of a male (insertions of cephalic sense organs indicated by circles).—D. Posterior region of \varnothing_1 .—E. Posterior region of δ_1 .—F. Tail tip of \varnothing_1 .—G. Gubernaculum of a male.

Discussion. *Enoploides polysetosus* is similar to *E. labrostriatus* Southern, 1914 in its size, cephalic sense organs and slender tail. *E. labrostriatus* has, however, a striated cuticle, spicules almost twice as long as those of *E. polysetosus*, and the gubernaculum of the two species is also different. The somatic setae were not depicted for *E. labrostriatus*, but might have been overlooked because of their very faint nature.

Habitat. It was found in Gollum's Canyon at stations 9, 14 and 26, influenced by the sulphide-rich brine seep, and also in the sandy sediment at stations 17, 18 and 19 further downstream from Gollum's Canyon, outside the influence of the sulphide-rich brine seep.

Mesacanthoides fibulatus Wieser & Hopper, 1967 (Fig. 2)

Material. St. 8: 1 ♀. St. 9: 1 ♀ and 1 juvenile. St. 13: 4 ♂♂, 5 ♀♀ and 17 juveniles (2 ♂♂, 3 ♀♀ and 4 juveniles paratypes USNM 76348–76356). St. 23: 1 ♀.

Measurements

| | | | | | | |
|------------|--------|---------|----------|-----|------|--------------------|
| δ_1 | a = 83 | b = 7.5 | c = 15.1 | | | |
| | 36 | 249 | 1129 | M | 7890 | 8448 μm |
| | 60 | 89 | 95 | 102 | 63 | |

Description

Males, females and juveniles. Lips very faint striated.

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Amphids pocket-shaped, very small, 45–50 μm behind front end. Cuticle finely striated. Dorsolateral orthometanemes 200–270 μm long, however, end of frontal filament and posterior end of caudal filament not obvious.

Discussion. The present specimens of *Mesacanthoides fibulatus* are in most respects in full accordance with the original description. The above observations are new characters not described before. The present report is the first since the original description which was based on specimens from Florida, U.S.A.

Habitat. Most specimens were found in Gollum's Canyon at stations 8, 9 and 13, strongly influenced by the sulphide-rich brine seep, while a single specimen was found in the sandy sediment at station 23 far downstream from Gollum's Canyon, outside the influence of the brine.

Leptosomatidae

Leptosomatum woodsi sp.n. (Fig. 3)

Material. St. R₁₄: 1 ♂ and 1 ♀ (δ_1 holotype USNM 76358; ♀ paratype USNM 76359).

Measurements

| | | | | | | |
|------------|--------|---------|----------|----|------|--------------------|
| δ_1 | a = 79 | b = 7.4 | c = 61.2 | | | |
| | 7 | 229 | 667 | M | 4876 | 4957 μm |
| | 18 | 60 | 60 | 63 | 51 | |

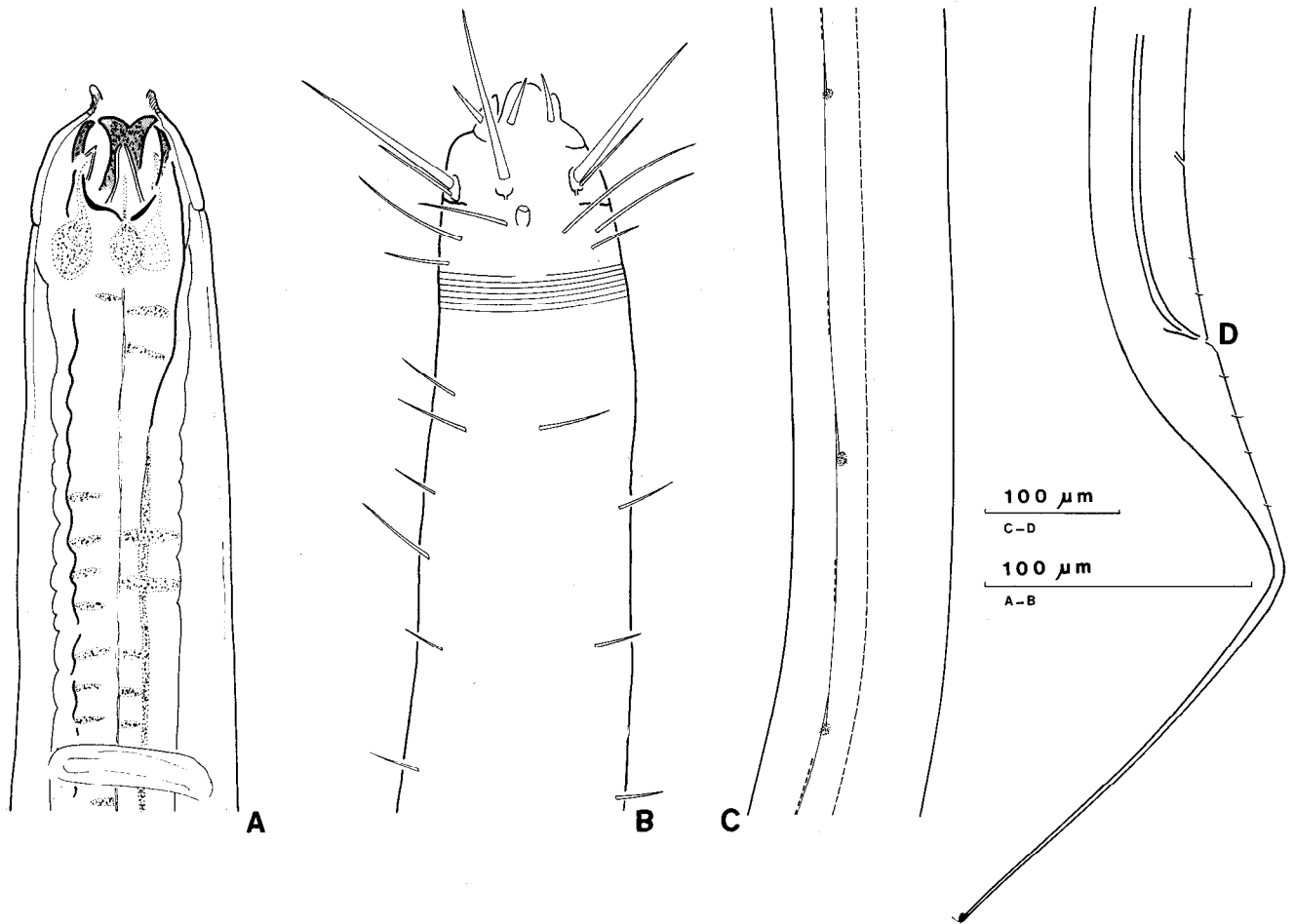


Fig. 2. *Mesacanthoides fibulatus* Wieser & Hopper, 1967.—A. Head in longitudinal optical section of δ_1 .—B. Head in surface view of δ_1 .—C. Metanemes along the lateral chord (broken lines) at oesophageal-intestinal junction of a male.—D. Posterior region of δ_1 (tail tip broken).

φ_1 a = c. 171 b = c. 10 c = c. 103

| | | | | | |
|----|-----|------|----|-------|------------------------------------|
| 10 | 248 | 1014 | ? | 10157 | tail broken at 10248 μm |
| 24 | 60 | 60 | 60 | 48 | |

Description

Male. Body slender, attenuating towards ends. Cuticle smooth. Somatic setae papilloid. Amphids longitudinally in outline with a small aperture, 21 μm behind front end. Ocelli granulated, appearing gold in colour, about 50 μm behind front end. Head capsule not obvious. Ten blunt cephalic setae in one circle 6 μm behind front end, 2–3 μm long. Mouth opening minute and oesophageal lumen without differentiation. Metanemes not observed. Testes opposite and outstretched, anterior testis left, posterior testis and vas deferens right of intestine. Spicules slightly curved, 40 μm along arc; lateral piece weakly cuticularized crossing distal part. Ventral papilla 68 μm in front of cloaca. Spinneret ventrally directed.

Female. Only four cephalic papillae present. Amphids and ocelli located more anteriorly than in male, 15 μm and 33 μm behind front end, respectively. Head capsule distinct. A tooth-like projection in oesophageal musculature close to mouth opening. Vulva and gonads not observed due to a strongly coiled body in that region; the specimen appeared to be mature.

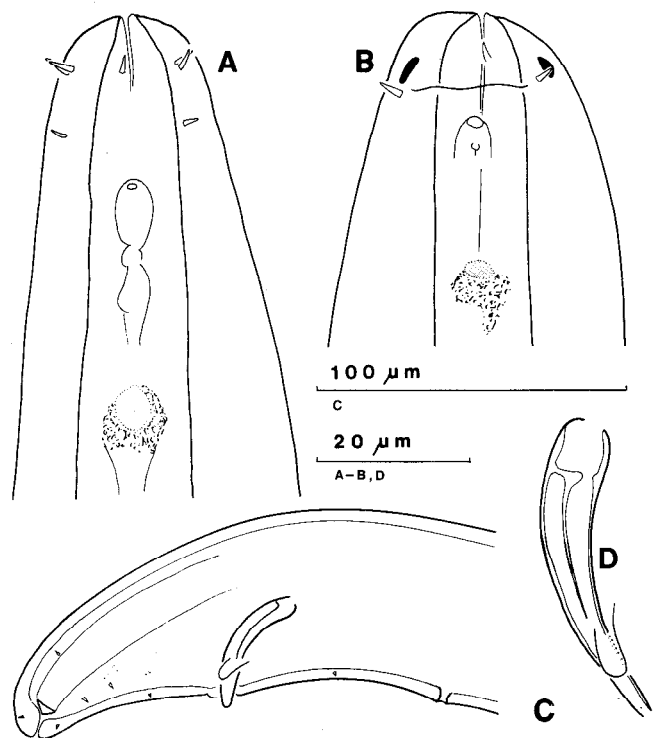


Fig. 3. *Leptosomatum woodsi* sp.n.—A. Head of δ_1 .—B. Head of φ_1 .—C. Posterior region of δ_1 .—D. Right copulatory apparatus of δ_1 .

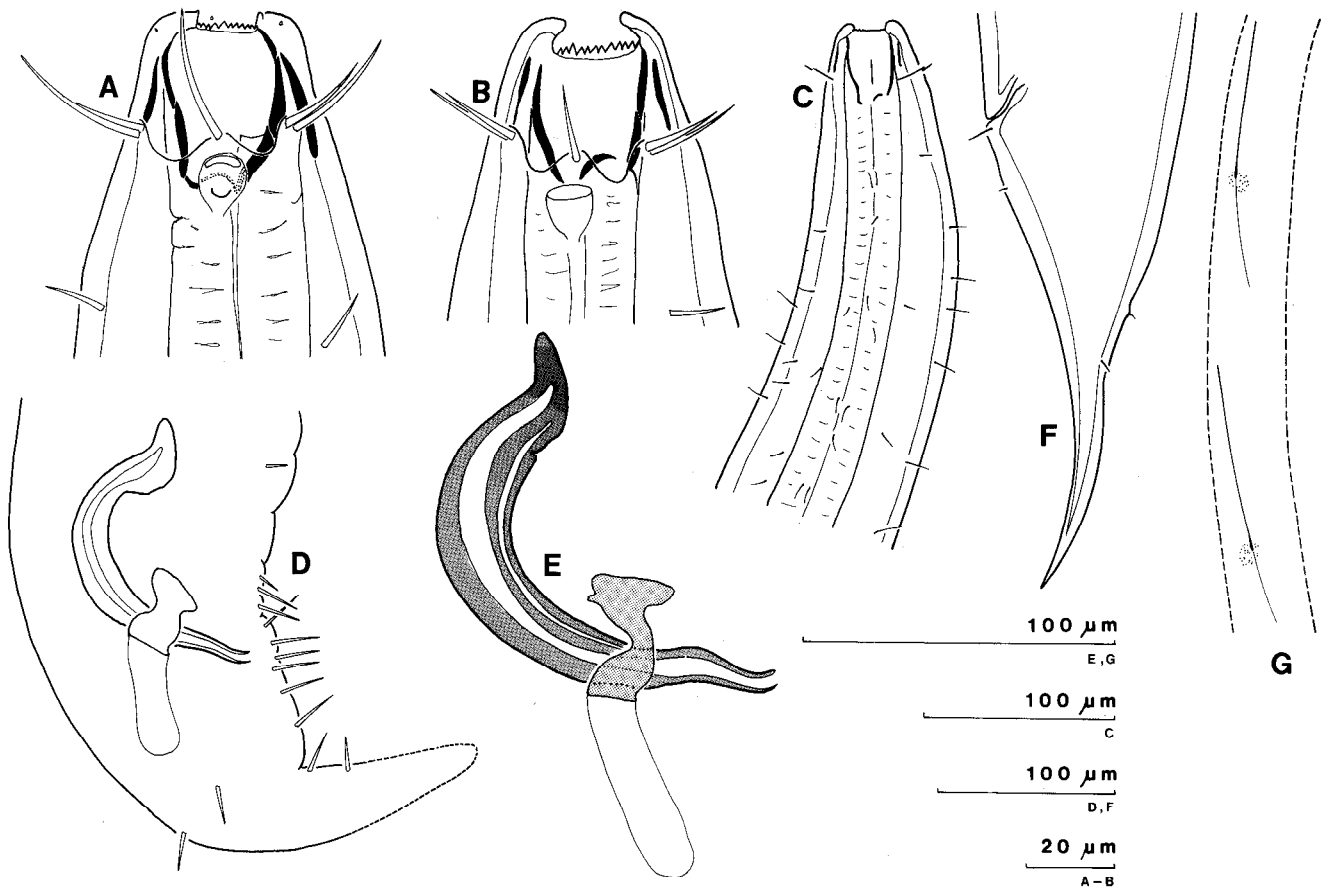


Fig. 4. *Cylicolaimus magnus* (Villot, 1875).—A. Head of ♀₁.—B. Head of ♂₁.—C. Anterior region of ♀₁.—D. Posterior region of ♂₁.—E. Right copulatory apparatus of ♂₁.—F. Posterior region of ♀₁.—G. Metanemes along the lateral chord (broken lines) of ♂₁.

Discussion. On the basis of the revision of *Leptosomatium* Bastian, 1865 by Bongers (1983) it can be concluded that *L. woodsi* (named for Dr A. Woods, co-worker in the group of scientists engaged in the East Flower Garden study) belongs to the *L. bacillatum* complex, which is characterized by the presence of a cephalic capsule in juveniles and females, but absent in males, i.e. *L. bacillatum* (Eberth, 1863), *L. acephalatum* Chitwood, 1936, *L. sachaliense* Platonova, 1978, *L. clavatum* Platonova, 1958 and *L. sundaense* Bongers, 1983. *L. woodsi* is distinguished from these species by the presence of a preloocal papilla, the spinneret being directed ventrally and the short spicules. The female body length of *L. woodsi* is more than twice that of the male; it is, however, usual that females of *L. bacillatum* continue to grow after having reached the adult stage, whereas there is no evidence for this in males (Bongers 1983, p. 821).

Habitat. It was found on the carbonate bank above Gollum's Lake at station R₁₄, outside the influence of the sulphide-rich brine seep.

Cylicolaimus magnus (Villot, 1875) (Fig. 4)

syn. *Leptosomatium magnum* Villot, 1875, designated as type species by De Man (1889).

Material. St. 14: 1 ♂ and 1 ♀ (♂₁ and ♀₁ paratypes USNM 76360–76361).

Measurements

♂₁ a = 108 b = 6.6 c = 99.3

| | | | | | | |
|----------------|---------|---------|----------|---------|-------|----------|
| | 30 | 478 | 2205 | M | 14448 | 14595 μm |
| | 46 | 115 | 135 | 135 | 129 | |
| ♀ ₁ | a = 135 | b = 8.7 | c = 80.1 | V = 62% | | |
| | 29 | 520 | 2507 | 13438 | 21448 | 21719 μm |
| | 47 | 117 | 146 | 161 | 108 | |

Description

Male. Body very slender, slightly attenuating towards ends. Cuticle smooth. Somatic setae in two sublateral rows, two submedian rows, one dorsal row and one ventral row, 10–13 μm long; dense subventral rows of setae on tail and just posterior to cloaca, 25 μm long. Amphids pocket-shaped, 38 μm behind front end. Head capsule present. Ten cephalic setae in one circle, 30 μm behind front end, 17–22 μm long, i.e. just behind head capsule. Buccal cavity conical with strongly cuticularized walls, 40 μm deep; a dentate ring surrounds mouth opening. No details in buccal cavity can be observed due to presence of detritus. Orthometanemes along dorso-lateral border of lateral chord; caudal filament very weakly cuticularized, 25 μm long and anterior filament 50 μm long, however, both ends are extremely difficult to detect. Number of testes and their position cannot be observed. Copulatory apparatus strongly cuticularized; spicules strongly bent proximally, 181 μm along arc, 120 μm along chord; proximal portion enlarged; gubernaculum large with a plate-like caudal apophysis. Two ducts of caudal gland cells in tail, however, other details of tail cannot be observed due to coiling of body.

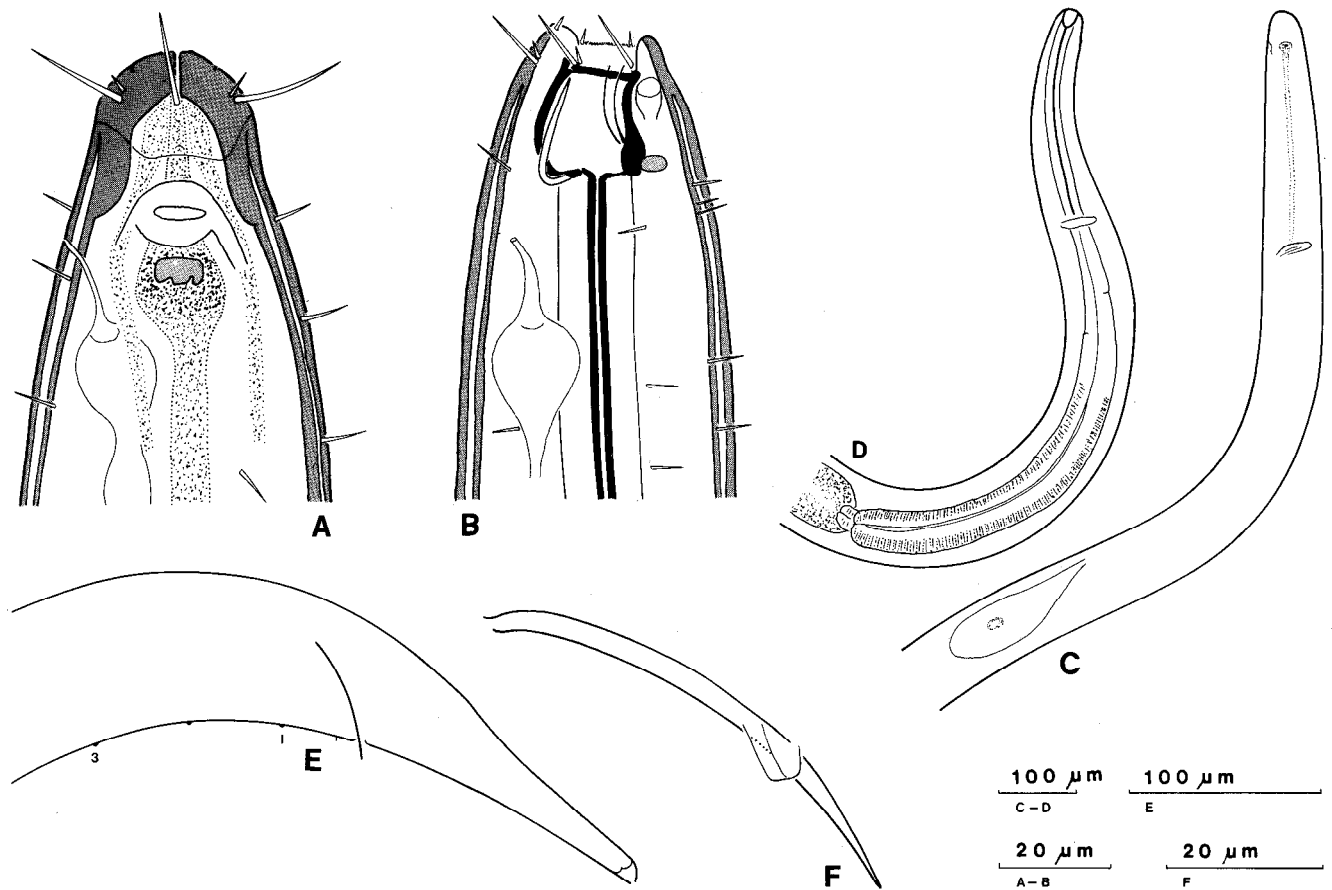


Fig. 5. *Calpytronema pulchrum* sp.n.—A. Head of δ_1 .—B. Head of ♀_1 .—C. Anterior region of δ_1 .—D. Anterior region of ♀_1 .—E. Posterior region of δ_1 .—F. Left copulatory apparatus of δ_1 .

Female. Six minute labial papillae around mouth opening and ten cephalic setae in one circle, $30\ \mu\text{m}$ behind front end, $30\text{--}33\ \mu\text{m}$ long. At base of buccal cavity a weakly cuticularized ridge is present, however, other details cannot be observed due to presence of detritus-like particles in buccal cavity. Ovaries opposite and reflexed; egg size up to $1 \times 0.15\ \text{mm}$; vulva and vagina strongly cuticularized. Tail strongly attenuating without spinneret or ducts of caudal gland cells.

Discussion. These specimens are in most respects in accordance with previous descriptions of *Cylicolaimus magnus* (cf. Villot 1875; De Man 1889; Stekhoven & Adam 1931; Southern 1914). The female has a somewhat aberrant shape of the tail and neither spinneret nor ducts. This is in contrast to the female redescribed by Stekhoven & Adam (1931), with a tail shape as in the present male as well as a normal spinneret. The aberrant tail is possibly a broken and subsequently healed tail. However, normally the tail would then have a more blunt appearance (cf. Jensen & Gerlach 1977). A body size of more than 2 cm is among the largest recorded for a free-living nematode, but not unusual within this group of enoplids (cf. Lorenzen 1981). The present redescription provides new information about the pattern of somatic setae and the presence of metanemes. It is the first record from the U.S.A.

Habitat. It was found at station 14 at the mouth of Gollum's Canyon, weakly influenced by the sulphide-rich brine seep.

Enchelidiidae

Calpytronema pulchrum sp.n. (Fig. 5)

Material. St. R₄: 1 δ , 1 ♀ and 1 juvenile (δ_1 holotype USNM 76362; 1 ♀ and 1 juvenile paratypes USNM 76363, 76368). St. R₅: 3 ♀ and 2 juveniles (2 ♀ and 1 juvenile paratypes USNM 76365–76367). St. R₁₄: 2 ♀ (1 ♀ paratype USNM 76364).

Measurements

| | | | | |
|--------------|--------|---------|----------|--------------------|
| δ_1 | a = 61 | b = — | c = 32.8 | |
| | 9 | 300 | — | M 5115 |
| | 27 | 81 | — | 87 58 |
| | | | | 5276 μm |
| ♀_1 | a = 33 | b = 5.5 | c = 27.7 | V = 58% |
| | 7 | 286 | 875 | 2790 4631 |
| | 25 | 81 | 115 | 144 43 |
| | | | | 4804 μm |

Description

Male. Body slender with a narrow neck region and slender tail with dorsal sector oblique. Cuticle smooth and strongly expanded around head and neck. Somatic setae in two sublateral rows and two submedian rows on each side of body, most dense in cervical region, $7\ \mu\text{m}$ long. Amphids transversally oval, about $25\ \mu\text{m}$ behind front end, $17\ \mu\text{m}$ wide and $13\ \mu\text{m}$ long with posterior directed extensions at margins. Ocelli golden in appearance,

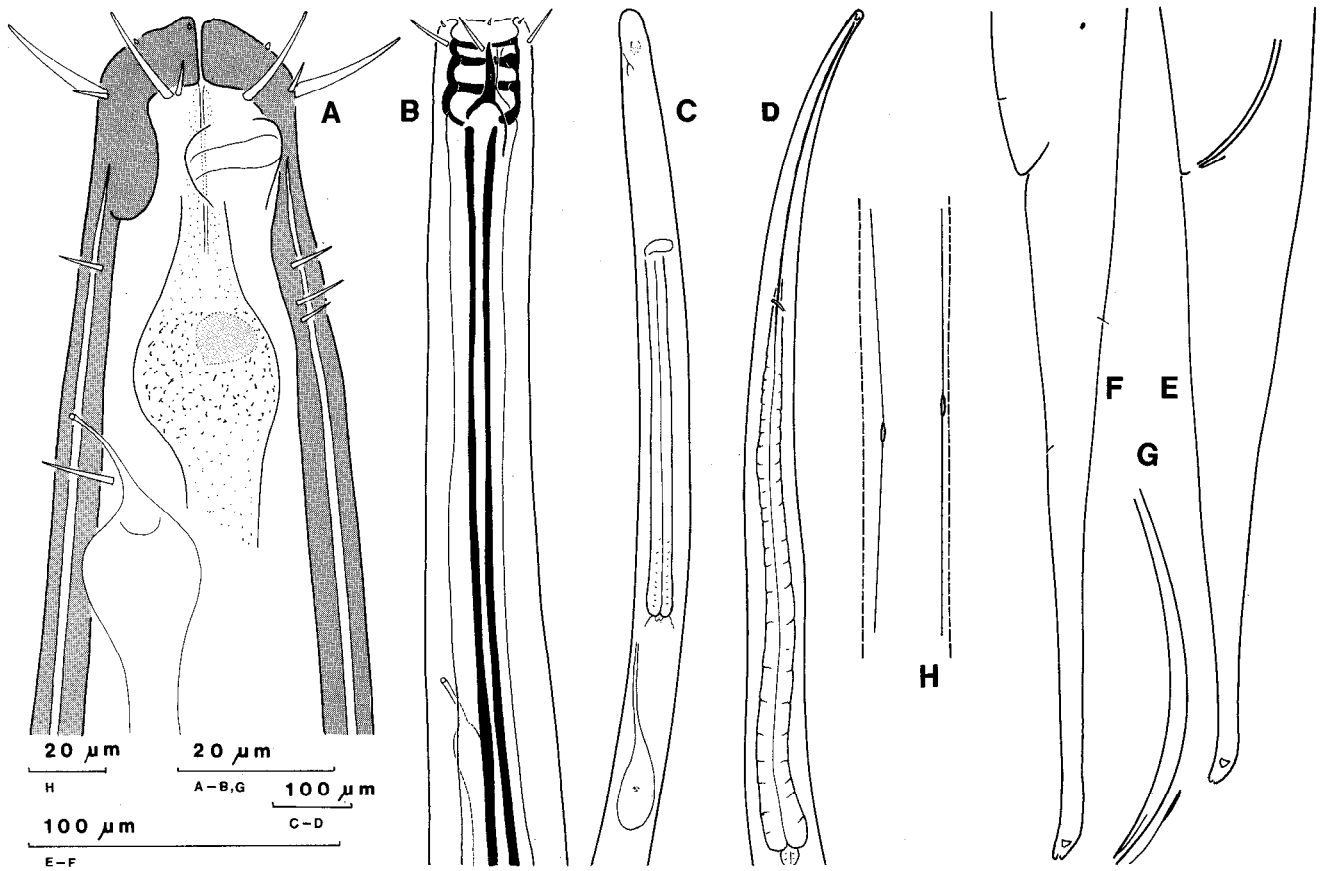


Fig. 6. *Symplocostoma brevispiculum* sp. n.—A. Head of δ_1 .—B. Head of φ_1 .—C. Anterior region of δ_1 .—D. Anterior region of φ_1 .—E. Posterior region of δ_1 .—F. Posterior region of φ_1 .—G. Left copulatory apparatus of δ_1 .—H. Metanemes along the lateral chord (broken lines) of δ_1 .

granulated and extending to mouth opening and posteriorly to nerve ring; lenses posterior to amphids. Six small labial papillae and one circle of ten cephalic setae $9\ \mu\text{m}$ behind front end: six setae $18\text{--}20\ \mu\text{m}$ long and four setae about $4\ \mu\text{m}$. Mouth opening very narrow; buccal cavity appears as a narrow duct through head capsule; two opposite gland cells opening close to mouth. Oesophagus very diffuse. Renette cell large, $850\ \mu\text{m}$ behind front end; excretory pore opening $35\ \mu\text{m}$ behind front end. Metanemes difficult to detect, but orthometanemes present in dorso-lateral sector of lateral chord. Testes opposite, outstretched and left of intestine. Spicules very narrow, slightly curved, $60\ \mu\text{m}$ along arc; gubernaculum as a weakly cuticularized plate at distal end of spicules. Three small ventral papillae in front of cloaca and a single seta. Tail tip curved to ventral side.

Females. Body tapering towards ends. Amphids pocket-shaped, $8\ \mu\text{m}$ behind front end, $5\ \mu\text{m}$ wide. Ocelli as a compact golden lens, $23\ \mu\text{m}$ behind front end. Cephalic sense organs as six small papillae and a circle of ten cephalic setae, $7\ \mu\text{m}$ behind front end: six setae $10\ \mu\text{m}$ long and four setae about $3\ \mu\text{m}$. Buccal cavity almost cylindrical with strongly cuticularized walls separated by a ring of denticles close to mouth opening, and at level of cephalic setae another ring is present. Buccal cavity with one slender tooth, transversally bent at base and opposite

two very thin stylet-like teeth along dorsal sector. Oesophagus narrow from buccal cavity to nerve ring with cuticularized walls of lumen; posterior to nerve ring oesophagus is prominently muscular. Excretory pore opening about $35\ \mu\text{m}$ behind front end. Ovaries opposite and reflexed; in three females both branches right of intestine and in one female anterior ovary left of intestine while location of posterior ovary is unclear.

Discussion. The presence of only three preanal supplements separates *Calyptronema pulchrum* from all other species of the genus with a conical tail. *C. denticulatum* (Micoletzky, 1930) has more anteriorly situated amphids and smaller cephalic sense organs than has *C. pulchrum*. *C. mawsoni* Mawson, 1958 and *C. retrocellatum* Wieser, 1953 have a very distinct gubernaculum; the last mentioned species also has a hook-like apophysis, very different from the condition in *C. pulchrum*.

Habitat. It was found in rocky bottom samples in Gollum's Canyon at stations R_4 and R_5 on Cottonwick Rock and at station 14 on the carbonate bank above Gollum's Lake, outside the influence of the sulphide-rich brine seep.

Symplocostoma brevispiculum sp. n. (Fig. 6)

Material. St. 6: 1 ♀. St. 7: 1 ♂ and 1 ♀ (δ_1 holotype USNM 76369; ♀₁ paratype USNM 76370).

Measurements

♂₁ a = 67 b = 6.0 c = 22.6

| | | | | | |
|----|-----|-----|----|------|---------|
| 10 | 305 | 771 | M | 4428 | 4633 μm |
| 25 | 52 | 67 | 69 | 40 | |

♀₁ a = 36 b = 3.2 c = 15.1 V = 59%

| | | | | | |
|----|-----|------|------|------|---------|
| 3 | 390 | 1081 | 2019 | 3214 | 3442 μm |
| 12 | 45 | 95 | 88 | 34 | |

Description

Male. Body slender with a narrow neck and slender conical tail with slightly swollen tip bent to ventral side. Cuticle smooth and enlarged in head region. Somatic setae very scarce and almost confined to oesophageal region, about 10 μm long. Amphids pocket-shaped, 15 μm behind front end, about 10 μm wide. Ocelli golden in appearance, lenses prominent, about 40 μm behind front end; a granulated field from ocelli to mouth opening. Six minute labial papillae and ten cephalic setae in one circle, 10 μm behind front end: six setae 15 μm long and four setae 4–5 μm long. Mouth opening very narrow and anterior portion of oesophagus, i.e. from nerve ring, very diffuse and without differentiation in head region. Oesophageal musculature distinct from nerve ring and further posteriorly; cardia small. Renette cell posterior to cardia, excretory pore opening 50 μm behind front end. Orthometanemes about 100 μm long, extremely slender and close to edges of lateral chord. Testes opposite and outstretched, anterior testis left, posterior right of intestine. Copulatory apparatus weakly cuticularized; spicules slightly curved, without differentiation, 50 μm along arc, 48 μm along chord; gubernaculum as a very slender rod, 10 μm long.

Females. Body cylindrical, strongly attenuating towards ends. Cuticle smooth with few scattered setae. Amphids not observed. Six small labial papillae close to front end and one circle of six cephalic setae 3 μm behind front end, 6 μm long. Buccal cavity cylindrical and separated by

three bands into four compartments; from base of buccal cavity a prominently cuticularized 8 μm long tooth inserts, together with two slender stylets. Anterior portion of oesophagus, i.e. anterior to nerve ring, is very slender and lumen prominently cuticularized; posterior portion of oesophagus with distinct muscular bundles and without cuticularized lumen; cardia small. Excretory pore opening 85 μm behind front end. Metanemes not observed. Ovaries opposite and reflexed; their exact position relative to intestine cannot be observed; vulva and vagina weakly cuticularized.

Discussion. *Symplocostoma brevispiculum* is similar to *S. tenuicolle* (Eberth, 1863) in most male and female characters. The main distinguishing character is the size of the spicules: 50 μm long in *S. brevispiculum* vs. 160–180 μm in *S. tenuicolle*.

Habitat. It was found in sandy sediment at stations 6 and 7 in Gollum's Lake, outside the influence of the sulphide-rich brine seep.

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