

## New nematode species and genera (Chromadorida, Microlaimidae) from the deep sea of the eastern tropical South Pacific (Peru Basin)

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### Abstract

Six new nematode species are described from the sediment of a manganese nodule area of the abyssal eastern South Pacific: *Aponema nympha* sp.n., *Caligocanna mirabilis* gen.n. sp.n., *Microlaimus discolensis* sp.n., *M. clancularius* sp.n., *M. porosus* sp.n., and *Bathynox clavata* gen.n. sp.n.. The new genera *Caligocanna* and *Bathynox* are considered to belong to the Microlaimidae MICOLETZKY, 1922. The genus *Caligocanna* gen.n. differs from all other genera of the family Microlaimidae in combining the following characters: The six cephalic setae of the second cirlet longer than the four cephalic setae of the third cirlet. Annulated cuticle; annules with numerous longitudinal bars. Monospiral amphids turn ventrally. The genus *Bathynox* gen.n. differs from all other genera of the family Microlaimidae in having projecting, club-shaped corpora gelata and somatic setae positioned on peduncles.

Key words: Nematoda, Chromadorida, Microlaimidae, new genus, new species, deep sea, South Pacific Ocean.

### Zusammenfassung

Es werden sechs neue Arten und zwei neue Gattungen der Nematoda aus dem Sediment eines Manganknollenfeldes des südlichen Ost-Pazifiks (Peru Becken) beschrieben: *Aponema nympha* sp.n., *Microlaimus clancularius* sp.n., *M. discolensis* sp.n., *M. porosus* sp.n., *Caligocanna mirabilis* gen.n. sp.n. und *Bathynox clavata* gen.n. sp.n. Die neuen Gattungen *Caligocanna* und *Bathynox* werden den Microlaimidae MICOLETZKY, 1922 zugeordnet. Die Gattung *Caligocanna* gen.n. unterscheidet sich von allen anderen Gattungen der Microlaimidae durch die Kombination folgender Merkmale: Die sechs Kopfborsten des zweiten Kreises sind länger als die vier Kopfborsten des dritten Kreises. Die Cuticula ist geringelt, jeder Ring ist mit Längslinien versehen. Die Seitenorgane sind mit einer Windung ventralgewunden. Die Gattung *Bathynox* gen.n. unterscheidet sich von allen anderen Gattungen der Microlaimidae durch folgende Merkmale: Das Corpus gelatum tritt keulenförmig hervor, die Körperborsten stehen auf Sockeln.

### Introduction

This paper based on material taken from the abyssal eastern South Pacific in February 1989. At that time a DISTurbance and reCOLonisation experiment (DISCOL) was started in the vicinity of a German nodule-mining claim in the Peru Basin, 600 km south of the Galapagos Islands and more than 800 km off the South American continent (THIEL & SCHRIEVER 1990). The major purpose of DISCOL was to study the reaction of benthic organisms to physical seafloor disturbances. Faunistic analyses revealed that the nematode community was dominated by species belonging to the families Chromadoridae,

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Desmoscolecidae, Diplopeltidae, Microlaimidae Oxystominidae, Xyalidae, and Monhysteridae, which contribute about 80 % to total nematode abundance; Microlaimidae alone makes up 6-10 % (BUSSAU 1993, VOPEL & THIEL 1999). The total number of nematode species at the study site was estimated at about 300 (BUSSAU 1995), of which 137 were described in the doctoral dissertation of BUSSAU (1993). However, most of these descriptions have not been published. Here we present six new microlaimid species, two of them being accommodated in new genera.

### Material and Methods

Sediment samples were obtained from multiple-corer deployments from the DISCOL Experimental Area (DEA) in February and March 1989 (Tab. 1). The DEA is a 3754 m diameter circle having an area of 10.8 km<sup>2</sup> and centered upon 07°04'4" S, 88°27'6" W (Peru Basin) at a water depth of 4100-4200 m. Between 5 to 30 % of the bottom at this site was covered with mammillated, botryoidal nodules (cauliflower type) exceeding 10 cm in diameter. Detailed descriptions of the site may be found in THIEL & SCHRIEVER (1990) and BOROWSKI & THIEL (1998). The sediment consisted of a 5-10 cm thick surface layer of semi-liquid dark brown ooze with underlying compact, whitish clay. Meiofauna samples were collected with a multiple corer. Each core (71 cm<sup>2</sup>) was subdivided into 4 slices with a thickness of 1 or 2 cm (0-1, 1-2, 2-4, 4-6 cm). Samples were preserved in 4 % formaldehyde-seawater solution. From these samples, 10 cm<sup>3</sup> subsamples were taken for taxonomic analyses, the material washed on a 40 µm mesh size sieve, and the remaining material stained with Rose Bengal. Nematodes were isolated under a stereomicroscope and transferred into a mixture of 3 % glycerin and 97 % distilled water. The fluid in the vessels evaporated at room temperature in a desiccator. Thereafter the nematodes remained in anhydrous glycerin and the specimens were placed onto slides for identification and description. Drawings were made with the aid of a drawing tube on a microscope with interference contrast equipment. All measurements are in micrometers; curved structures are measured along the median line. The classification of *Microlaimus* DE MAN, 1880 is: Order Chromadorida, suborder Chromadorina, family Microlaimidae (LORENZEN 1981). The holotypes and paratypes are deposited in the collection of the Natural History Museum Vienna.

Tab. 1: Stations in the experimental area.

station	date	position	water depth
MC 184	02/09/1989	07°05.04'S - 88°26.66'W	4174 m
MC 185	02/10/1989	07°04.39'S - 88°27.45'W	4157 m
MC 186	02/11/1989	07°04.42'S - 88°27.86'W	4136 m
MC 187	02/13/1989	07°03.91'S - 88°28.07'W	4132 m
MC 189	02/14/1989	07°03.39'S - 88°27.69'W	4146 m
MC 193	02/18/1989	07°04.39'S - 88°27.86'W	4147 m
MC 194	02/18/1989	07°04.44'S - 88°27.92'W	4138 m
MC 195	02/19/1989	07°01.52'S - 88°27.56'W	4178 m
MC 197	02/19/1989	07°01.31'S - 88°27.53'W	4180 m
MC 198	02/19/1989	07°04.22'S - 88°27.46'W	4168 m
MC 200	03/20/1989	07°05.10'S - 88°27.04'W	4169 m
MC 201	03/20/1989	07°05.20'S - 88°27.20'W	4170 m

## Family Microlaimidae MICOLETZKY, 1922

Genus *Aponema* JENSEN, 1978*Aponema nympha* sp.n.

(Figs 1-6)

**Type material:** Holotype: ♂<sub>1</sub> (NHMW-EV 3836). Paratypes: ♂<sub>2</sub> (NHMW-EV 3837), ♂<sub>3</sub> (NHMW-EV 3840), ♀<sub>1</sub> (NHMW-EV 3839), ♀<sub>2</sub> (NHMW-EV 3838).

**Type locality:** Abyssal eastern tropical South Pacific Ocean (Peru Basin), top sediment layer (0-1 cm); ♂<sub>1</sub>, ♂<sub>2</sub>, ♀<sub>2</sub>, MC 184; ♂<sub>3</sub>, ♀<sub>1</sub>, MC 186 (Tab. 1).

**Etymology:** *Nymphe*, Gr. = bride.

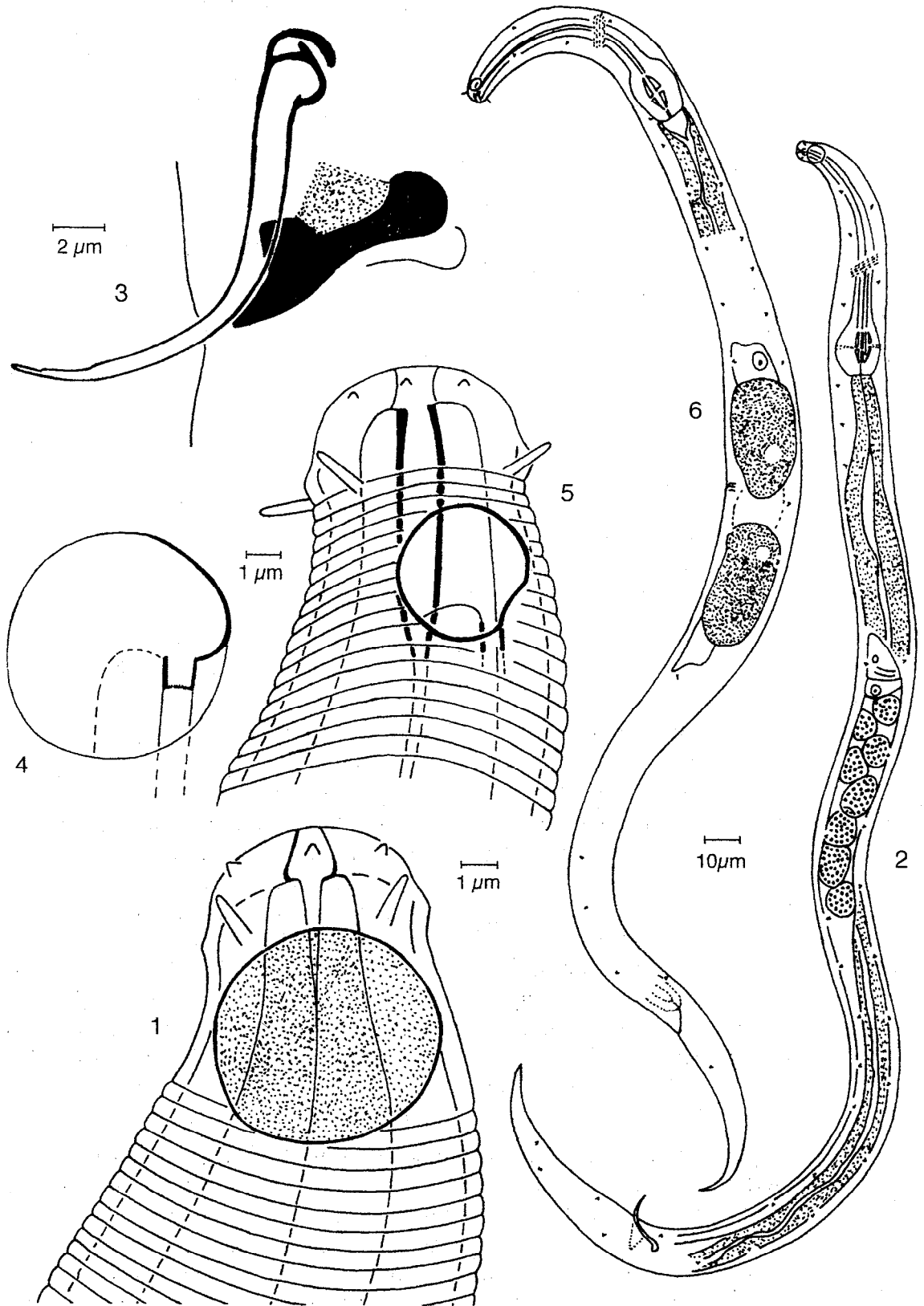
**Measurements:**

♂ <sub>1</sub> :	-	75	M	380	445 μm; a = 26.2; b = 5.9; c = 6.8
	6	16	17	13	
♂ <sub>2</sub> :	-	80	M	365	430 μm; a = 25.3; b = 5.4; c = 6.6
	6	17	17	14	
♂ <sub>3</sub> :	-	75	M	388	445 μm; a = 27.8; b = 5.9; c = 7.8
	6	16	16	12	
♀ <sub>1</sub> :	-	78	189	365	420 μm; a = 19.1; b = 5.4; c = 7.6; V = 45.0 %
	6	16	22	11	
♀ <sub>2</sub> :	-	78	195	375	440 μm; a = 22.0; b = 5.6; c = 6.8; V = 44.3 %
	7	17	20	12	

**Description:** Holotype (♂<sub>1</sub>): Cuticle 0.5 μm thick at mid-body and weakly annulated with 0.5 μm wide annules. Numerous sublateral somatic setae (1-1.5 μm length). On the left body side 23 ventro-sublateral and 18 dorso-sublateral setae discernible. First cirlet of sensilla on lips not observed. Six small cephalic papillae (second cirlet) at anterior tip of head. The four cephalic setae of the third cirlet (1.5 μm long) positioned 3 μm behind the anterior end. Amphids 6 μm wide. Their anterior margins located 3 μm posterior to the head tip. The corpus gelatum protrudes slightly from the aperture. Small, unarmed, funnel-shaped buccal cavity. Pharynx posteriorly enlarged to a muscular bulb with sclerotised internal lining. Valve structures of pharyngeal bulb transversely divided into two parts. Nerve ring at 60 % of pharynx length. Cervical gland, porus and cardia not observed. The single, anterior, outstretched testis positioned on right side of intestine. Curved spicules 20 μm long. Gubernaculum with two dorsally oriented apophyses. Precloacal supplements not observed. Tail length five times body diameter at anus. Caudal glands open to exterior through a common duct.

Paratypes. Paratypes resemble holotype in most respects. Males (♂<sub>2</sub>, ♂<sub>3</sub>): Monospiral amphids of ♂<sub>3</sub> (7 μm diameter) turn ventrally, the corpus gelatum does not protrude. Amphids of ♂<sub>2</sub> 6 μm in diameter with slightly protruded corpora gelata. One anterior, outstretched testis on the left side (♂<sub>2</sub>) or ventral (♂<sub>3</sub>) to the intestine. Females (♀<sub>1</sub>, ♀<sub>2</sub>) with monospiral amphids (4 μm diameter) turning ventrally; the corpus gelatum does not protrude. Two outstretched ovaries, the anterior on the left, the posterior on the right side of the intestine.

**Diagnosis:** *Aponema nympha* sp.n. differs from the two *Aponema*-species, *A. papillatum* PASTOR, 1980 and *A. torosus* (LORENZEN, 1973), by the combination of the following



Figs. 1-6: *Aponema nympha* sp.n.. Head (1), habitus (2), and copulatory apparatus (3) of ♂<sub>1</sub>; amphid of ♂<sub>3</sub> (4); head of ♀<sub>1</sub> (5); habitus of ♀<sub>1</sub> (6).

characters: small body size, amphids close to the anterior end, morphology of the copulatory apparatus. A sexual dimorphism in the diameter of the amphids seems to be present; the males have larger amphids, the females small ones.

### Genus *Caligocanna* gen.n.

**Generic diagnoses:** Microlaimidae. The six cephalic setae of the second circlet longer than the four cephalic setae of the third circlet. Cuticle annulated, each ring with numerous longitudinal bars. Labial papillae of the first circlet not observed. Monospiral amphids turn ventrally. Vestibule bears 12 cuticularised ribs. Buccal cavity armed with four teeth. Pharynx posteriorly enlarged to a muscular bulb. Males with two opposed, outstretched testes; females with two outstretched ovaries. Caudal glands open to exterior through a common terminal duct. Males, females, and juveniles are assumed to build sediment tubes.

**Etymology:** *Caligo*, Lat. = darkness; *canna*, Lat. = tube. The name refers to life in darkness and the assumed tube-building ability.

**Type species:** *Caligocanna mirabilis* sp.n.

### *Caligocanna mirabilis* sp.n.

(Figs 7-13)

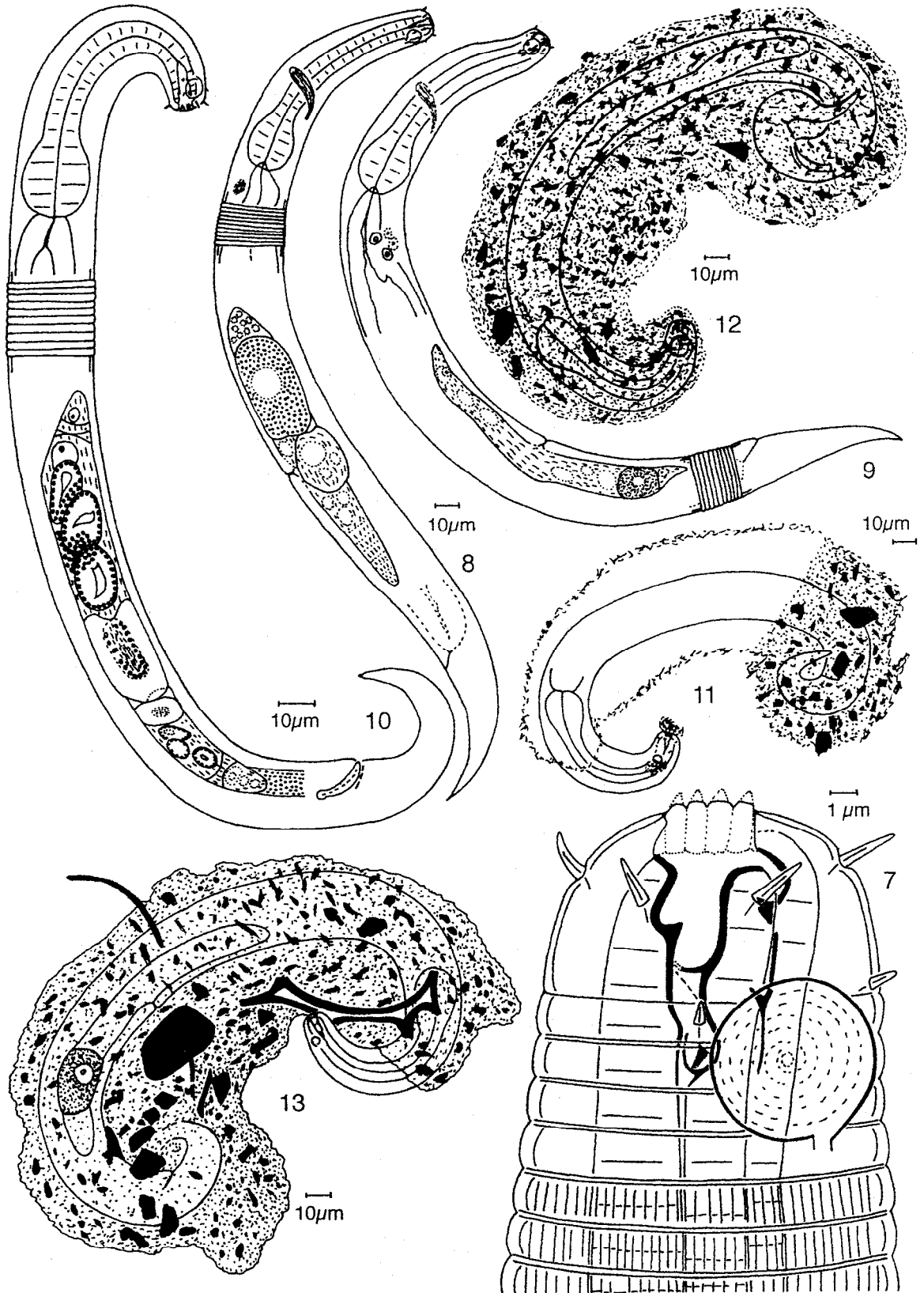
**Type material:** **Holotype:** ♂<sub>1</sub> (NHMW-EV 3841). **Paratypes:** ♂<sub>2</sub> (NHMW-EV 3842), ♀<sub>1</sub> (NHMW-EV 3843), ♀<sub>2</sub> (NHMW-EV 3844), ♀<sub>3</sub> (NHMW-EV 3845), ♀<sub>4</sub> (NHMW-EV 3846), juv.<sub>1</sub> (NHMW-EV 3847), juv.<sub>2</sub> (NHMW-EV 3848).

**Type locality:** Abyssal eastern tropical South Pacific (Peru Basin), top sediment layer (0-1 cm); ♂<sub>1</sub> (holotype) MC 198; ♂<sub>2</sub> MC 185; ♀<sub>1</sub>, ♀<sub>2</sub>, ♀<sub>3</sub>, ♀<sub>4</sub>, MC 184; juv.<sub>1</sub> MC 197; juv.<sub>2</sub> MC 194 (Tab. 1).

**Etymology:** *Mirabilis*, Lat. = wonderful.

### Measurements:

♂ <sub>1</sub> :	-	85	M	300	360 μm; a = 14.4; b = 4.2; c = 6.0
	11	24	25	20	
♂ <sub>2</sub> :	-	98	M	375	450 μm; a = 18.0; b = 4.6; c = 6.0
	13	25	25	18	
♀ <sub>1</sub> :	-	105	240	353	425 μm; a = 13.3; b = 4.1; c = 5.9; V = 56.5 %
	12	28	32	22	
♀ <sub>2</sub> :	-	108	258	367	435 μm; a = 13.6; b = 4.0; c = 6.4; V = 59.3 %
	14	26	32	21	
♀ <sub>3</sub> :	-	95	220	332	395 μm; a = 14.6; b = 4.2; c = 6.3; V = 55.7 %
	12	24	27	17	
♀ <sub>4</sub> :	-	100	255	395	>430 μm; end of tail covered with sediment
	12	26	30	21	
juv. <sub>1</sub> :	-	74	M	173	215 μm; a = 12.6; b = 2.9; c = 5.1
	9	17	14	13	
juv. <sub>2</sub> :	-	87	M	173	305 μm; a = 12.7; b = 3.5; c = 6.1
	11	22	24	18	



Figs. 7-13: *Caligocanna mirabilis* gen.n. sp.n.. Head (7) and habitus (8) of ♀<sub>1</sub>; habitus of ♀<sub>2</sub> (9); Habitus ♂<sub>1</sub> (10); habitus of juv.<sub>2</sub> (11), ♂<sub>2</sub> (12), and ♂<sub>4</sub> (13) embedded in sediment agglutinations.

**Description:** Holotype ( $\sigma_1$ ): Cuticle 1  $\mu\text{m}$  thick at mid-body and annulated with 1.5  $\mu\text{m}$  wide annules. Each ring with numerous longitudinal bars. Head not annulated. Only few sublateral somatic papillae (1  $\mu\text{m}$  long), each deriving from a cuticle pore. Lateral epidermal cords 10  $\mu\text{m}$  wide at mid-body region. Labial papillae (first cirlet) not observed. Six cephalic setae (second cirlet) 2  $\mu\text{m}$  long, positioned 2  $\mu\text{m}$  behind tip of head. The four cephalic setae of third cirlet (1  $\mu\text{m}$  long) 6  $\mu\text{m}$  behind anterior end. Monospiral amphids (7  $\mu\text{m}$  diameter) turn ventrally. Anterior margins of amphids located 4  $\mu\text{m}$  behind anterior end. Vestibule bears 12 cuticularised ribs. Buccal cavity sclerotised and armed with 2 large teeth in anterior and 2 small teeth in posterior compartment. Exact position of teeth not recognisable. Pharynx posteriorly enlarged to a muscular bulb. Cardia small and inconspicuous. Cervical gland, porus and nerve ring not observed. Two opposed, outstretched testes right and ventrally of intestine. Sperm cells large (30 x 15  $\mu\text{m}$ ); their surface covered with small papillae. Curved spicules slightly sclerotised and 17  $\mu\text{m}$  long. An inconspicuous gubernaculum adjacent to the spicules. Tail length 3 times body diameter at anus. Caudal glands open to exterior through a common duct.

Paratypes. Paratypes resemble holotype in most respects. Male ( $\sigma_2$ ): Two opposed, outstretched testes; the anterior on left side, the posterior on right side of intestine. Spicules 23  $\mu\text{m}$  long, gubernaculum measures 10  $\mu\text{m}$ . Females ( $\varphi_1, \varphi_2, \varphi_3, \varphi_4$ ): Nerve ring of  $\varphi_1$  at 61 % of pharynx length. Two outstretched ovaries ventral to intestine. Subventral of the posterior end of pharynx, two ( $\varphi_1$ ) or four ( $\varphi_2$ ) fluid-spheres (which resemble the „pigment bodies“ of *Desmoscolex*). Juveniles ( $\text{juv}_1, \text{juv}_2$ ) similar to the adults in most respects. Male ( $\sigma_2$ ), female  $\varphi_4$  and juvenile ( $\text{juv}_2$ ) embedded in a sediment agglutination.

**Diagnosis:** With the exception of *Spirobolbolaimus bathyalis* SOETAERT & VINCX, 1988 and *S. boucherorum* GOURBAULT & VINCX, 1990, all species of the Microlaimidae possess six cephalic setae in the second circle which are shorter than or approximately as long as the four cephalic setae of the third circle. In *Caligocanna mirabilis* gen.n. sp.n. and the above-mentioned species the setae of the second cirlet are longer than those of the third cirlet. *C. mirabilis* gen.n. sp.n. differs from *S. bathyalis* and *S. boucherorum* in lacking postamphidial setae and having monospiral amphids. Within the Microlaimidae an annulated cuticle with longitudinal bars has previously only been known from *Bolbolaimus teutonicus* (RIEMANN, 1967), *Cinctonema polare* (COBB, 1914), *Microlaimus annelisa* JENSEN, 1976 and *M. ostracion* STEKHOVEN, 1935. In these species the cephalic setae of the third cirlet are much longer than those of the second cirlet. The presence of six long and four short cephalic setae and of an annulated cuticle with longitudinal bars sets the new genus *Caligocanna* apart from all other genera of the Microlaimidae.

## Genus *Microlaimus* DE MAN, 1880

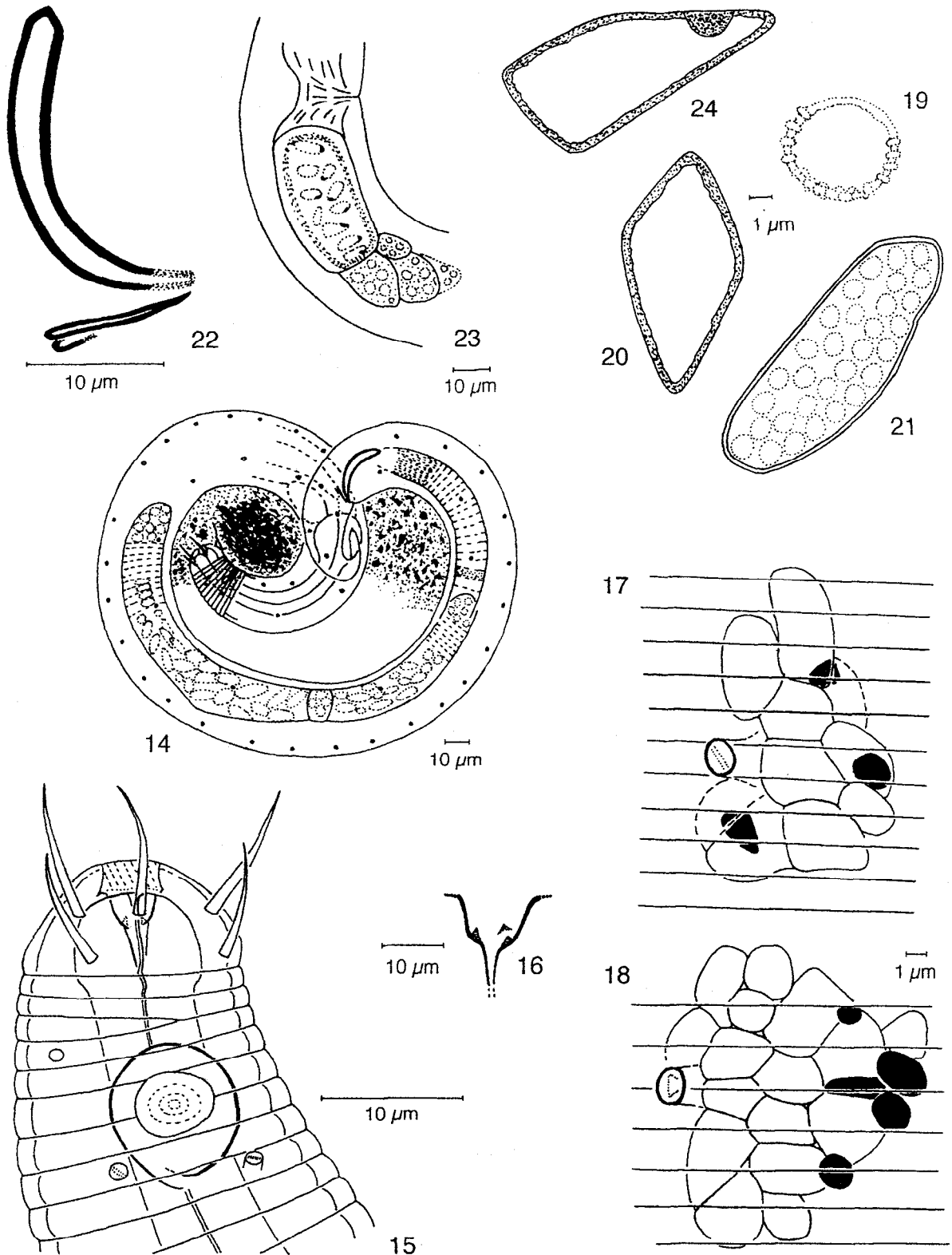
### *Microlaimus discolensis* sp.n.

(Figs 14-24)

**Type material:** Holotype:  $\sigma_1$  (NHMW-EV 3849). Paratypes:  $\sigma_2$  (NHMW-EV 3850),  $\varphi_1$  (NHMW-EV 3851),  $\varphi_2$  (NHMW-EV 3852),  $\text{juv}_1$  (NHMW-EV 3853).

**Type locality:** Abyssal eastern tropical South Pacific (Peru Basin), top sediment layer (0-1 cm);  $\sigma_1, \sigma_2$ , MC 197;  $\varphi_1$ , MC 189;  $\varphi_2$ , MC 186;  $\text{juv}_1$  MC 193 (Tab. 1).

**Etymology:** The name refers to the „DISCOL“-area.



Figs. 14-24: *Microlaimus discolensis* sp.n.. Habitus (14) and head (15) of  $\delta_1$ ; buccal cavity of  $\varphi_2$  (16); epidermal gland and pore of  $\delta_1$  (17) and  $\varphi_1$  (18); sperm cells of young (19,  $\delta_1$ ), medium (20,  $\delta_2$ ), and old (21,  $\delta_1$ ) developing stage; copulatory apparatus of  $\delta_1$  (22); vulvar region of  $\varphi_1$  (23); sperm cell inside the reproductive organs of  $\varphi_1$  (24).



**Measurements:**

$\sigma_1$ :	-	85	M	507	560 $\mu\text{m}$ ; a = 18.7; b = 6.6; c = 10.6
	14	29	30	23	
$\sigma_2$ :	-	?	M	375	425 $\mu\text{m}$ ; a = 15.2; b = ?; c = 8.5
	15	?	28	22	
$\varphi_1$ :	-	90	310	512	565 $\mu\text{m}$ ; a = 15.3; b = 6.3; c = 10.7; V = 54.9 %
	14	29	37	22	
$\varphi_2$ :	-	94	293	442	505 $\mu\text{m}$ ; a = 16.8; b = 5.4; c = 8.0; V = 58.0 %
	13	30	29	19	
juv. <sub>1</sub> :	-	72	M	253	305 $\mu\text{m}$ ; a = 13.9; b = 4.2; c = 5.9
	11	20	22	15	

**Description:** Holotype ( $\sigma_1$ ): Specimen curved and partly covered with sediment at the head- and tail-region. Annulated cuticle 2  $\mu\text{m}$  thick at mid-body region; rings 1  $\mu\text{m}$  wide. Somatic setae absent. Numerous cuticular pores (2  $\mu\text{m}$  diameter); on right body side 35 subdorsal and 15 subventral pores discernible. Conspicuous glandular structures located beneath each pore. Labial papillae (first cirlet) not visible. The six cephalic setae (second cirlet, 9  $\mu\text{m}$  long) positioned 4  $\mu\text{m}$  behind anterior tip of head. The four cephalic setae of third cirlet (8  $\mu\text{m}$  long) situated 7  $\mu\text{m}$  behind anterior end. Monospiral amphids turn ventrally (9  $\mu\text{m}$  diameter); their anterior margins located 13  $\mu\text{m}$  behind tip of the head. Vestibule bears 12 cuticularised ribs. Buccal cavity armed with 3 teeth (one dorsal, two subventral). Pharynx provided with a muscular terminal bulb. Cervical gland ventrally, close behind the pharyngeal bulb. Porus, nerve ring and cardia not observed. Males with two opposed, outstretched testes – the anterior to right, the posterior to left side of intestine. Reproductive organs contain sperm of different stages of maturity. Spicula curved and 28  $\mu\text{m}$  long. Gubernaculum 11  $\mu\text{m}$  long, V-shaped, distally unpaired and proximally paired and free from the spicules. Tail length 2.4 times body diameter at anus. The caudal glands open to the exterior through a common duct.

Paratypes ( $\sigma_2$ ,  $\varphi_1$ ,  $\varphi_2$ , juv.<sub>1</sub>): Paratypes resemble holotype in most respects. All paratypes curved. Conspicuous glands with cuticular pores. Females with two outstretched ovaries positioned ventral to intestines. Numerous sperm in female reproductive system.

***Microlaimus porosus* sp.n.**

(Figs 25-27)

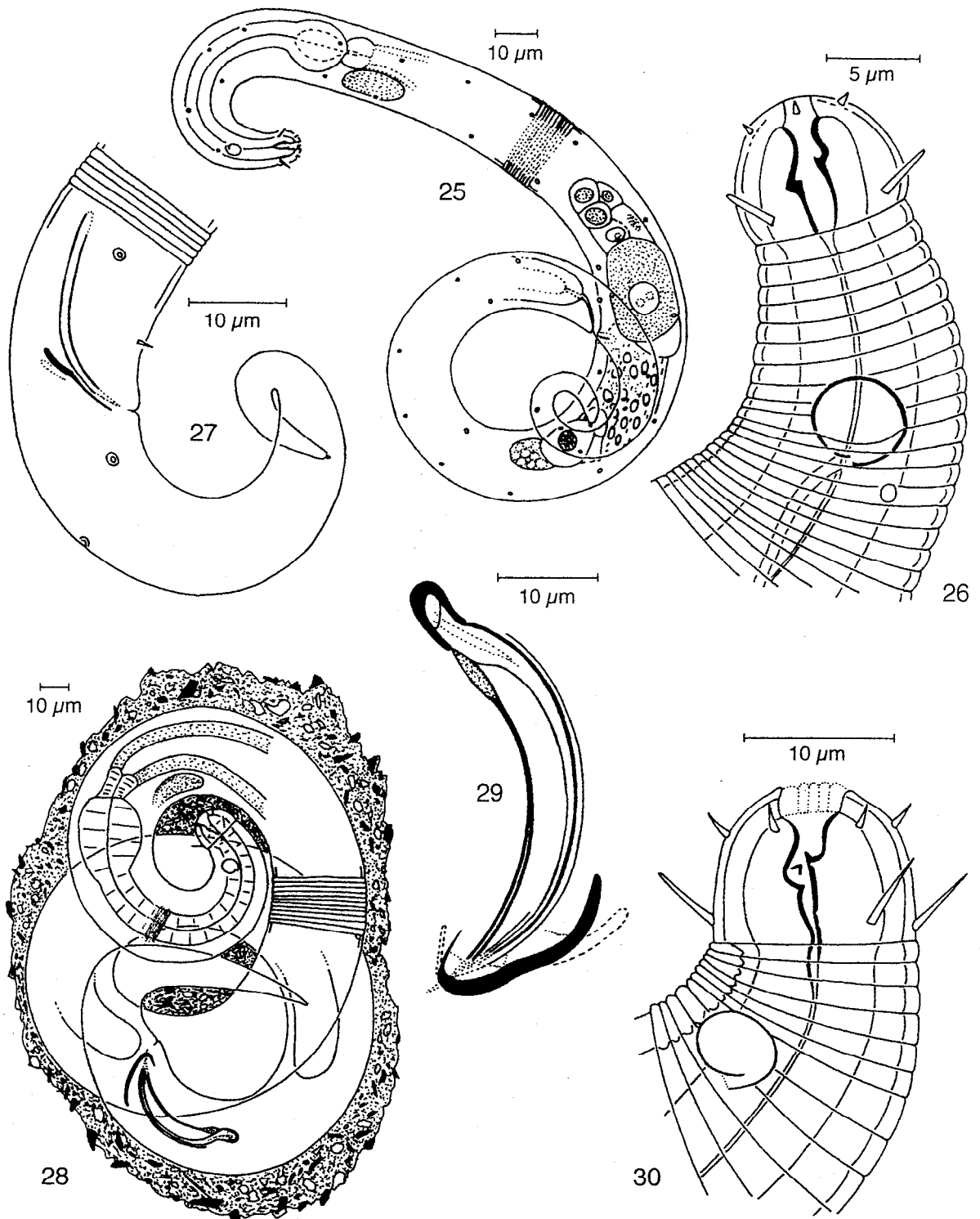
**Type material:** Holotype:  $\sigma_1$  (NHMW-EV 3854). Paratypes:  $\varphi_1$  (NHMW-EV 3855),  $\varphi_2$  (NHMW-EV 3856), juv.<sub>1</sub> (NHMW-EV 3857), juv.<sub>2</sub> (NHMW-EV 3858).

**Type locality:** Abyssal eastern tropical South Pacific (Peru Basin), top sediment layer (0-1 cm);  $\sigma_1$ , MC 195;  $\varphi_1$ , juv.<sub>1</sub>, MC 198;  $\varphi_2$ , MC 187; juv.<sub>2</sub> MC 197 (Tab. 1).

**Etymology:** *Poros*, Gr. = pore.

**Measurements:**

$\sigma_1$ :	-	77	M	309	380 $\mu\text{m}$ ; a = 21.1; b = 4.9; c = 5.4
	8	17	18	14	
$\varphi_1$ :	-	80	200	352	435 $\mu\text{m}$ ; a = 19.8; b = 5.1; c = 5.2; V = 46.0 %
	8	17	22	12	



Figs. 25-30: *Microlaimus porosus* sp.n. (25-27); habitus (25) and head (26) of ♀<sub>1</sub>; copulatory apparatus of ♂<sub>1</sub> (27). *Microlaimus clancularius* sp.n. (28-30); habitus (28) copulatory apparatus (29) and head of ♂<sub>1</sub> (30); the body of ♂<sub>1</sub> is embedded in a sediment agglutination.

♀ <sub>2</sub> :	-	90	213	361	440 µm; a = 22.0; b = 4.8; c = 5.6; V = 48.4 %
	7	20	20	14	
juv. <sub>1</sub> :	-	73	M	285	350 µm; a = 19.4; b = 4.8; c = 5.4
	7	18	15	12	
juv. <sub>2</sub> :	-	67	M	212	265 µm; a = 16.6; b = 4.0; c = 5.0
	8	16	16	11	

**Description:** Holotype (♂<sub>1</sub>): Cuticle 1 µm thick at mid-body and annulated with 1 µm wide annules. Numerous large, sublateral cuticular pores (1 µm diameter). Head 7 µm long, not annulated. Labial papillae (first cirlet) not observed. The six papillae of the second cirlet (1 µm long) positioned 1.5 µm behind the anterior tip of the head. The four cephalic setae of third cirlet (3 µm long) situated 5 µm behind anterior end. Monospiral amphids turn ventrally (5 µm diameter). Distance between their anterior margins and anterior tip of head measured 13 µm. Buccal cavity armed with two small teeth. Pharynx provided with a muscular terminal bulb. Cardia 6 µm long and 8 µm wide. Cervical gland ventrally, close behind posterior end of pharynx. Its porus and nerve ring not observed. Two opposed outstretched testes positioned on right side of intestine. Curved spicula 24 µm long. Gubernaculum V-shaped and 10 µm long. Tail length 5.2 times body diameter at anus. Caudal glands open to exterior through a common duct.

Paratypes (♀<sub>1</sub>, ♀<sub>2</sub>, juv.<sub>1</sub>, juv.<sub>2</sub>): Paratypes resemble holotype in most respects. Females with two outstretched ovaries, the anterior to the left, the posterior to the right of intestine. Amphids of ♀<sub>2</sub> measure 5 µm in diameter. Their anterior margins positioned 19 µm behind anterior tip of head.

### *Microilaimus clancularius* sp.n.

(Figs 28-30)

**Type material:** Holotype: ♂<sub>1</sub> (NHMW-EV 3859). Paratype: ♂<sub>2</sub>, (NHMW-EV 3860).

**Type locality:** Abyssal eastern tropical South Pacific (Peru Basin), top sediment layer (0-1 cm); ♂<sub>1</sub>, ♂<sub>2</sub>, MC 195 (Tab. 1).

**Etymology:** *Clanculum*, Lat. = secret.

#### Measurements:

♂ <sub>1</sub> :	-	112	M	560	650 µm; a = 21.7; b = 5.8; c = 7.2
	14	26	30	26	
♂ <sub>2</sub> :	-	103	M	550	625 µm; a = 21.6; b = 6.1; c = 8.3
	13	26	29	23	

**Description:** Holotype (♂<sub>1</sub>): Male curved and embedded in a sediment agglutination. Annulated cuticle 1.5 µm thick at mid-body region; rings 1.5 µm wide. Only few sublateral pores (1 µm diameter) of epidermal glands discernible. Head not annulated and 11 µm long. Labial sensilla (first cirlet) and somatic setae not observed. The six cephalic setae of the second cirlet (2 µm long) positioned 3 µm behind anterior end. The four cephalic setae of the third cirlet (5 µm long) 10 µm behind anterior end. Monospiral

amphids turn ventrally (6  $\mu\text{m}$  wide, 4.5  $\mu\text{m}$  long). The anterior margins of the amphids located 17  $\mu\text{m}$  behind anterior tip of head. Buccal cavity armed with three teeth (one dorsal, two subventral). Pharynx posteriorly enlarged to a muscular bulb. Nerve ring at 56 % of pharynx length. Cervical gland ventrally, closely behind pharyngeal bulb. Its porus not observed. Cardia 10  $\mu\text{m}$  long and 8  $\mu\text{m}$  wide. Two opposed, outstretched testes, the anterior one to the left side, the posterior one to the right side of intestine. Curved spicula 50  $\mu\text{m}$  long. X-shaped gubernaculum (one unpaired median piece with a pair of dorsal and ventral projections each) 30  $\mu\text{m}$  long surrounding distal parts of spicules. Tail length 3.5 times body diameter at anus. Caudal glands open to exterior through a common duct.

Paratype ( $\sigma_2$ ): Paratype resemble holotype in most respects. Male contracted and embedded in a sediment agglutination. Two opposed, outstretched testes, the anterior one on the left side, the posterior on the right side of intestine.

**Discussion and diagnosis:** Epidermal glands which open through pores or hollow setae have been described for many Adenophorea (CHITWOOD & CHITWOOD 1950, MAGGENTI 1964, 1981, DE CONINCK 1965, BIRD 1971, LIPPENS 1974, MCLAREN 1976a, b, LORENZEN 1977, 1981, BUSSAU 1995). Setae connected with glands are common in Draconematidae, Epsilonematidae and Desmoscolecidae (NEBELSICK & al. 1992). In the Stilbonematinae, both pores (*Leptonemella cincta* COBB, 1920, and *Catanema porosum* HOPPER & CEFALU, 1973) and somatic setae (COBB 1920, INGLIS 1967, HOPPER & CEFALU 1973) were observed. Three ultrastructural investigations have dealt with the fine structure of complex epidermal glands in free-living nematodes: LIPPENS (1974) and NEBELSICK & al. (1992, 1995). The multicellular glandular sensory organs in Stilbonematinae terminate in setae. They are distributed in longitudinal rows along the body and most probably resemble the glandular structures in *Microloaimus discolensis* sp.n.. Epidermal glands are observed in *Microloaimus cyatholaimoides* DE MAN, 1922, but those are associated with short somatic setae and do not terminate in large pores (DE MAN 1922, HOPPER & MEYERS 1967). As far as we know, large cuticle pores have previously not been known within the genus *Microloaimus*.

*Microloaimus discolensis* sp.n. differs from all other microlaimid species in having numerous large cuticular pores (and epidermal glands), long cephalic setae in the second and third circllet of approximately equal length. *Microloaimus porosus* sp.n. differs from other species of the genus *Microloaimus* and from *Calomicroloaimus acanthus* (JAYASREE & WARWICK, 1977) and *C. parahonestus* (GERLACH, 1950) in combining the characters: large, conspicuous cuticular pores and the position and size of sensory projections. In *M. clancularius* sp.n. and *M. discolensis* sp.n. the cephalic setae of the second and third circllet are longer than those of *M. porosus* sp.n.. *M. clancularius* differs from *C. acanthus* and *C. parahonestus* in the arrangement and size of the cephalic organs. *Microloaimus africanensis* (FURSTENBERG & VINCX, 1992) is more than 3 times longer than *M. clancularius*.

### Genus *Bathynox* gen.n.

**Generic diagnosis:** Microlaimidae. Amphids far behind anterior tip of head. Amphids possess a very small aperture. Club-shaped, projecting corpus gelatum, with constant

length and solid outer wall. Somatic setae on peduncles. Cuticle annulated. Labial papillae of the first cirlet not observed. The second cirlet with six short cephalic setae and the third cirlet with four long cephalic setae widely spaced. Buccal cavity armed with one dorsal tooth and one or two subventral teeth. Male with one anterior outstretched testis, females with two outstretched ovaries. Caudal glands open to exterior through a common duct.

**Type species:** *Bathynox clavata* sp.n..

**Etymology:** *Bathos*, Gr. = abyss; *nox*, Lat. = darkness.

***Bathynox clavata* sp.n.**  
(Figs 31-37)

**Type material:** Holotype: ♂<sub>1</sub> (NHMW-EV 3861). Paratypes: ♀<sub>1</sub> (NHMW-EV 3862), ♀<sub>2</sub> (NHMW-EV 3863), juv.<sub>1</sub> (NHMW-EV 3864).

**Type locality:** Abyssal eastern tropical South Pacific (Peru Basin), top sediment layer (0-1 cm); ♂<sub>1</sub>, MC 200; ♀<sub>1</sub>, MC 198; ♀<sub>2</sub>, MC 194; juv.<sub>2</sub> MC 201 (Tab. 1).

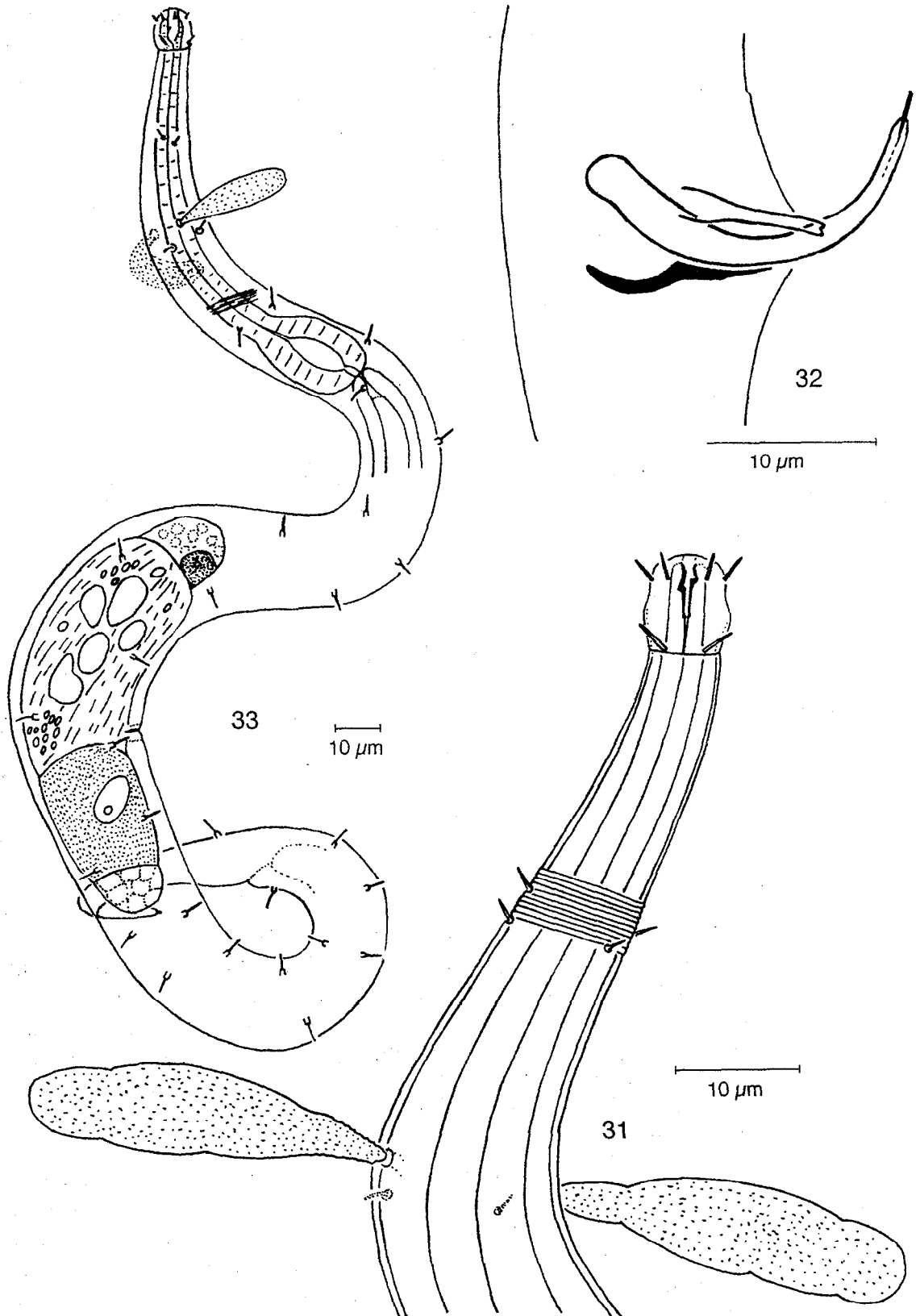
**Etymology:** *Clava*, Lat. = club.

**Measurements:**

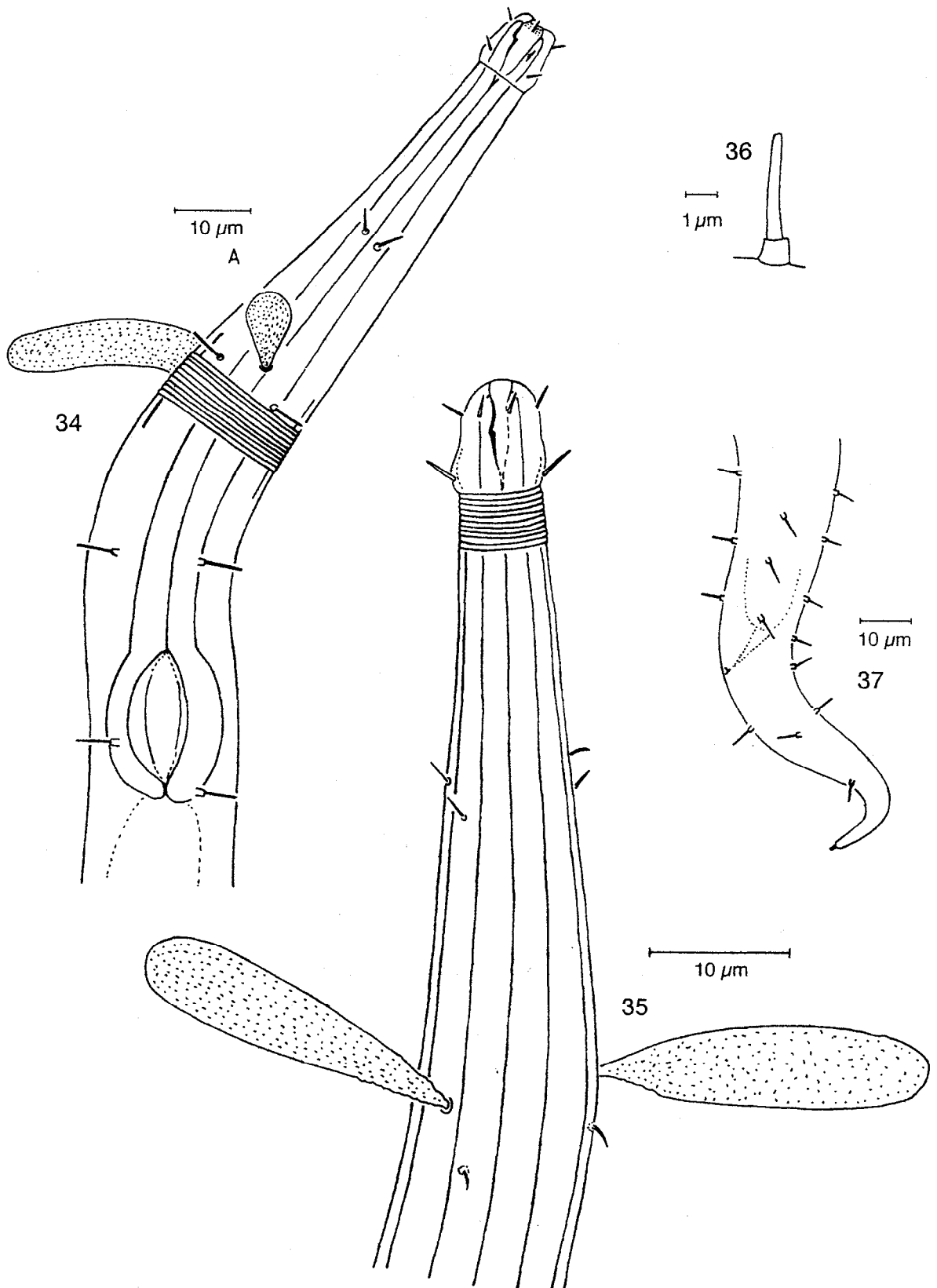
♂ <sub>1</sub> :	-	115	M	350	405 μm; a = 20.3; b = 3.5; c = 7.4
	7	20	20	15	
♀ <sub>1</sub> :	-	100	230	370	430 μm; a = 14.8; b = 4.3; c = 7.2; V = 53.5 %
	7	18	29	15	
♀ <sub>2</sub> :	-	117	293	478	555 μm; a = 15.9; b = 4.7; c = 7.2; V = 52.8 %
	8	19	35	17	
juv. <sub>1</sub> :	-	105	M	345	400 μm; a = 18.2; b = 3.8; c = 7.3
	8	18	22	14	

**Description:** Holotype (♂<sub>1</sub>): Posterior region of body covered with fine sediment particles. Faintly annulated cuticle 1 μm thick at the mid-body region; rings 0.3 μm wide. Somatic setae of the cervical region derive from pores, those of the remaining body (5 μm long) from peduncles measuring 1 μm in height. Head 8 μm long and not annulated. No sensilla observed on lips. The six cephalic setae (second cirlet, 2 μm long) positioned 2 μm behind anterior end. The four cephalic setae of the third cirlet (3 μm long) positioned 8 μm behind anterior end. Club-shaped corpus gelatum (29 μm long, up to 7 μm thick) projects 58 μm behind anterior end and possesses a solid outer wall. Buccal cavity funnel-shaped, slightly cuticularised and armed with a small dorsal tooth and one or two small subventral teeth. Pharynx posterior enlarged to a muscular bulb. Nerve ring, cardia, cervical gland and its porus not observed. One anterior outstretched testis on left side of intestine. Spicula 22 μm long. Gubernaculum measured 10 μm. Two lateral accessory pieces (6 μm long). Precloacal supplements absent. Tail length 3.7 times body diameter at anus. Caudal glands open to exterior through a common duct.

Paratypes (♀<sub>1</sub>, ♀<sub>2</sub>, juv.<sub>1</sub>): Paratypes resemble holotype in most respects. Females with two outstretched ovaries positioned to the left of the intestine.



Figs. 31-33: *Bathynox clavata* gen.n. sp.n. Anterior body (31) and copulatory apparatus (32) of  $\delta_1$ ; habitus of  $\varphi_1$  (33).



Figs. 34-37: *Bathynox clavata* gen. n. sp.n.. Anterior body of ♀<sub>1</sub> (34); Anterior body (35); somatic seta (36) and tail (37) of juv.<sub>1</sub>.

**Diagnosis:** Within Microlaimidae rod-shaped corpora gelata are known from *Calomicrolaimus pecticauda* MURPHY, 1966, *C. rugatus* LORENZEN, 1976, *Ixonema sordidum* LORENZEN, 1971 and *Microlaimus ostracion* STEKHOVEN, 1935. A gelatinous, rod-shaped corpus gelatum apparently consists of a large amount of secretion which is produced by the amphidial gland and penetrates through the apertura (RIEMANN & al. 1970, LORENZEN 1976). The amphidial secretions of the new genus *Bathynox*, however, project in a club-like manner as is known from many species of Desmoscolecoidea. There are two obvious differences between a rod-shaped and a club-shaped corpus gelatum: 1) The diameter of its distal part is much thicker than that of the apertura. 2) Both clubs are of the same length. In contrast, rod and apertura possess diameters of equal size and there is much variation in the length of the rods. The amphids of *I. sordidum* and *C. rugatus* are located far behind the anterior end and the apertura is very small. The new genus *Bathynox* differs from these two species by the position of setae on peduncles. This character occurs in Desmoscolecoidea and Peresianidae. The presence of only one anterior, outstretched testis is common only in *Aponema* JENSEN, 1978 and *Bathynox* gen.n.. The new genus *Bathynox* can be differentiated from all other genera of the Microlaimidae by its amphids, which are located far behind the anterior end, the very small apertura, club-shaped corpora gelata, and somatic setae positioned on peduncles.

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#### References

- BAUER-NEBELSICK, M., BLUMER, M., URBANCIK, W. & OTT, J. 1995: The glandular sensory organ of Desmodoridae (Nematoda) – ultrastructure and phylogenetic implications. – *Invertebrate Biology* 114(3): 211-219.
- BIRD, A.F. 1971: The structure of nematodes. – Academic Press, New York London, 318 pp.
- BOROWSKI, C. & THIEL, H. 1998: Deep-sea macrofaunal impacts of a large-scale physical disturbance experiment in the Southeast Pacific. – *Deep-Sea Research* 45: 55-81.
- BUSSAU, C. 1993: Taxonomische und ökologische Untersuchungen an Nematoden des Peru-Beckens. – Ph.D. Thesis, Kiel University, 621 pp.
- BUSSAU, C. 1995: New deep-sea nematoda (Enoplida, Thoracostomopsidae, Oncholaimidae, Enchelidiidae) from a manganese nodule area of the eastern South Pacific. – *Zoologica Scripta* 24(1): 1-12.
- BUSSAU, C., SCHRIEVER, G. & THIEL, H. 1995: Evaluation of abyssal metazoan meiofauna from a manganese nodule area of the eastern South Pacific. – *Vie Milieu* 45 (1): 39-48.
- CHITWOOD, B.G. & CHITWOOD, M.B. 1950: Introduction to nematology. – University Park Press, Baltimore London Tokyo, 213 pp.
- COBB, N.A. 1920: One hundred new nemas. – *Contributions to a Science of Nematology* 9: 217-343.
- CONINCK, L.A. DE 1965: Classe des Nématodes – Systématique des Nématodes et sous-classe des Adenophorea. – In: GRASSÉ, P.-P. (ed.): *Traité de Zoologie* 4(2): 586-681



- FURSTENBERG, J.P. & VINCX, M. 1992: Two new species of the family Microlaimidae (Nematoda: order Chromadorida) from South Africa. – *Cahiers de Biologie Marine* 33: 245-251
- HOPPER, B.E. & CEFALU, R.C. 1973: Free-living marine nematodes from Biscayne Bay, Florida V. Stilbonematinae: Contributions to the taxonomy and morphology of the genus *Eubostrichus* GREEFF and related genera. – *Transactions of the American Microscopical Society* 92(4): 578-591.
- HOPPER, B.E. & MEYERS, S.P. 1967: Follicolous marine nematodes on turtle grass, *Thalassia testudinum* König, in Biscayne Bay, Florida. – *Bulletin of Marine Science* 17: 471-571.
- INGLIS, W.G. 1967: Interstitial nematodes from St. Vincent's Bay New Caledonia. – *Editions de la Fondation Singer-Polignac*, pp 29-74.
- LIPPENS, P.L. 1974: Ultrastructure of a marine nematode, *Chromadorina germanica* (BUETSCHLI, 1874) II. cytology of lateral epidermal glands and associated neurocytes. – *Zeitschrift für Morphologie der Tiere* 79: 283-294.
- LORENZEN, S. 1976: *Calomicrolaimus rugatus* n.gen., n.sp. (Desmodoridae, Nematodes) from a sandy beach in Colombia. – *Mitt. Inst. Colombo-Aleman Invest. Cient.* 8: 79-82.
- LORENZEN, S. 1977: Haftborsten bei dem Nematoden *Haptotricoma arenaria* gen. n.; sp. n. (Desmoscolecidae) aus sublitoralem Sand bei Helgoland. – *Veröffentlichungen des Institutes für Meeresforschung in Bremerhaven* 16: 117-124.
- LORENZEN, S. 1981: Entwurf eines phylogenetischen System der freilebenden Nematoden. – *Veröffentlichungen des Institutes für Meeresforschung in Bremerhaven Suppl.* 7: 1-472.
- MAGGENTI, A. 1981: *General nematology*. – Springer, New York Heidelberg Berlin, 372 pp.
- MAGGENTI, A.R. 1964: Morphology of somatic setae: *Thoracostoma californicum* (Nematoda: Enoplidae). – *Proceedings of the Helminthological Society of Washington* 31(2): 159-166.
- MAN, J.G. DE 1922: Über einige marine Nematoden von der Küste von Walcheren, neu für die Wissenschaft und für unsere Fauna, unter welchen der sehr merkwürdige *Catalaimus Max Weberi* n. sp.. – *Bijdragen tot de Dierkunde (Feest-Nummer Max Weber)*: 117-124.
- MCLAREN, D.L. 1976a: Nematode sense organs. – *Advances in Parasitology* 14: 195-265.
- MCLAREN, D.L. 1976b: Sense organs and their secretion. – In: CROLL, N.A. (ed) *The organization of nematodes*. Academic Press, London New York, pp 139-161.
- NEBELSICK, M., BLUMER, M., NOVAK, R. & OTT, J. 1992: A new glandular sensory organ in *Catanema* sp. (Nematoda, Stilbonematinae). – *Zoomorphology* 112: 17-26.
- RIEMANN, F., RACHOR, E. & FREUDENHAMMER, I. 1970: Das Seitenorgan von *Halalaimus*. Zur Morphologie eines vermutlich sensorischen Organs von freilebenden Nematoden. – *Veröffentlichungen des Institutes für Meeresforschung in Bremerhaven* 12: 429-441.
- THIEL, H. & SCHRIEVER, G. 1990: Deep-sea mining, environmental impact and the DISCOL project. – *Ambio* 19: 245-250.
- VOPEL, K. & THIEL, H. 1999: Comparing abyssal nematode assemblages of physically disturbed and adjacent sites of the eastern equatorial Pacific. – *Deep-Sea Research* (in press).