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Research article

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New species of *Thelonema*, *Metasphaerolaimus*, and *Monhystrella* (Nematoda, Monhysterida) from Kermadec Trench, Southwest Pacific

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Abstract. Three new species of the order Monhysterida are described based on specimens obtained at depths of 8081 and 9177 m in the Kermadec Trench. *Thelonema clarki* sp. nov. is characterised by a large body size (3230–4461 µm), short cylindrical buccal cavity, gubernaculum without apophyses, and long conico-cylindrical tail. This is the first record of the genus since its original description over two decades ago from the Peru Basin. *Metasphaerolaimus constrictus* sp. nov. is characterised by a relatively long body (1232–1623 µm), slightly arcuate spicules without gubernaculum, and conico-cylindrical tail with inner cuticle conspicuously thickened immediately anterior to cylindrical portion. *Monhystrella kermadecensis* sp. nov. is characterised by a circle of papillose outer labial sensillae slightly anterior to the four short cephalic setae, gubernaculum with caudal apophyses, the presence of distinct cuticularised piece along anterior vaginal wall, and a relatively short conical (males) or conico-cylindrical tail (females) with conical, ventrally-curved spinneret. *M. kermadecensis* sp. nov. can be differentiated from all other species of the genus, and, indeed, the entire family, based on the variable position of the anterior gonad relative to the intestine. The new species is classified within the Monhysteridae, and not the closely-related Xyalidae, based on the small body size, a smooth cuticle, and the presence of six outer labial papillae and only one testis. Further work is required to clarify the placement of *M. kermadecensis* sp. nov. relative to other monhysterid genera. A tabular key to all ten valid *Metasphaerolaimus* species is presented.

Keywords. Linhomoeidae, Sphaerolaimidae, Monhysteridae, hadal, New Zealand.

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Introduction

The Order Monhysterida is well represented in hadal trench samples (> 6000 m depth), with the family Monhysteridae often dominant (Gambi *et al.* 2003; Vanhove *et al.* 2004). The families Sphaerolaimidae and Linhomoeidae are also common in hadal trench samples, but are typically much less abundant (e.g., Tietjen 1989). Whilst species of the families Sphaerolaimidae and Linhomoeidae are relatively large (> 1 mm in length) and easy to identify, species of the family Monhysteridae are typically small (< 0.8 mm in

length) and often represented by many morphologically similar species in deep-sea samples (D. Leduc unpublished data). As a result, data on the distribution of Monhysteridae species in the deep sea are scarce despite their high abundance (Tietjen 1989; Miljutin *et al.* 2010). In addition, there has been some confusion related to the identification of the small and morphologically similar genera *Monhystrella* Cobb, 1918 and *Thalassomonhystera* Jacobs, 1987. Vanhove *et al.* (2004) and Gambi *et al.* (2003) recorded high densities of the genus *Monhystera* Bastian, 1865 in hadal trenches, despite a taxonomic revision by Jacobs (1987) almost two decades earlier resulting in all marine *Monhystera* species being transferred to either *Thalassomonhystera* or *Monhystrella* (Fonseca & Decraemer 2008). More work is clearly needed on the taxonomy of this family, as well as other Monhysterida, in order to identify patterns in species distribution within and among trenches.

Of the fifteen nematode species so far described / recorded from hadal trench environments worldwide (Miljutin *et al.* 2010; Leduc 2015), three are known from Kermadec Trench: *Synonchoides galathea* Wieser, 1956 (4570 m depth), *Manganonema rowdeni* Leduc, 2015 (8081 m) and *Manganonema majusculum* Leduc, 2015 (8081 m). Here, three new species of the Order Monhysterida, one species each of the families Linhomoeidae, Sphaerolaimidae and Monhysteridae, are described based on specimens obtained at depths of 8081 and 9177 m.

Materials and methods

Kermadec Trench is situated in the Southwest Pacific Ocean and is formed by the subduction of the Pacific Plate under the Indo-Australian Plate. It extends from approximately 26° to 36º S near the northeastern tip of New Zealand's North Island. Samples were collected from the axis of Kermadec Trench at depths of 8081 and 9177 m during the Woods Hole Oceanographic Institute (WHOI) cruise TN309 (*RV Thomas G. Thompson*) in May 2014. The sediment cores were obtained using the submersible *ROV Nereus* (core internal diameter = 6.35 cm). Cores were sliced into 0–1, 1–2, 2–3, 3–4, 4–5 and 5–10 cm layers and fixed in 10% buffered formalin. Samples were rinsed on a 20 µm sieve to retain nematodes. Nematodes were extracted from the remaining sediments by Ludox flotation, stained with Rose Bengal, and transferred to pure glycerol (Somerfield & Warwick 1996). Species descriptions were made from glycerol mounts using differential interference contrast microscopy and drawings were made with the aid of a camera lucida.

All measurements are in µm, and all curved structures are measured along the arc. Type specimens are held in the NIWA Invertebrate Collection, Wellington, New Zealand. Abbreviations in the text are as follows:

a = body length / maximum body diameter
abd = anal body diameter
b = body length / oesophagus length
c = body length / tail length
cbd = corresponding body diameter
%V = vulva distance from anterior end of body × 100 / total body length

Results

Class Chromadorea Inglis, 1983
Order Monhysterida Filipjev, 1929
Superfamily Siphonolaimoidea Filipjev, 1918

Family **Linhomoeidae** Filipjev, 1922

Diagnosis (From Fonseca & Bezerra 2014)

Cuticle often striated, sometimes smooth. Inner labial sensillae papillose or not observable. Amphideal fovea usually circular, rarely unispiral. Inner side of labial region formed by an annular, soft-skinned pad that narrows the buccal opening. Cardia long and conspicuous. Usually two outstretched and opposed gonads, rarely single gonad present. Anterior gonad to the left or right of intestine, posterior gonad to the opposite side.

Subfamily **Thelonematinae** Bussau, 1993

Type and only genus

Thelonema Bussau, 1993.

Diagnosis

See diagnosis of type and only genus *Thelonema*.

Thelonema Bussau, 1993

Diagnosis (modified from Bussau 1993)

Inner labial sensillae not observable with light microscopy. Six outer labial setae situated in separate circle from the four sensillae of the third circle; the latter consists of papillae located in depressions. Four sub-cephalic setae located immediately posterior to the cephalic papillae. Large circular amphideal fovea located far posteriorly, and with nerve process usually visible. Buccal cavity cylindrical or funnel-shaped, cuticularised, without teeth. Pharynx with weak posterior bulb; cardia long and gradually widening posteriorly. Female with two outstretched and opposed ovaries and male with two outstretched and opposed testes. Tail conico-cylindrical.

Type species

Thelonema majum Bussau, 1993.

Thelonema clarki sp. nov.
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Figs 1–3, Table 1

Diagnosis

Thelonema clarki sp. nov. is characterised by large adult body size (3230–4461 µm), short cylindrical buccal cavity with cuticularised walls, sub-cephalic setae of similar length or shorter than outer labial setae, secretory-excretory system with two or three renette cells, gubernaculum without apophyses, and conico-cylindrical tail 6.4–10.4 abd long.

Etymology

This species is named after Malcolm R. Clark, principal investigator of the HADES project (HADal Ecosystem Studies) who has made an outstanding contribution to the field of deep-sea ecology and who kindly supported the involvement of the author on the Kermadec Trench voyage.

Material examined

Holotype

KERMADEC TRENCH: ♂ (NIWA 99760), collected 6 May 2014 (WHOI cruise TN309, *Nereus* dive N074).

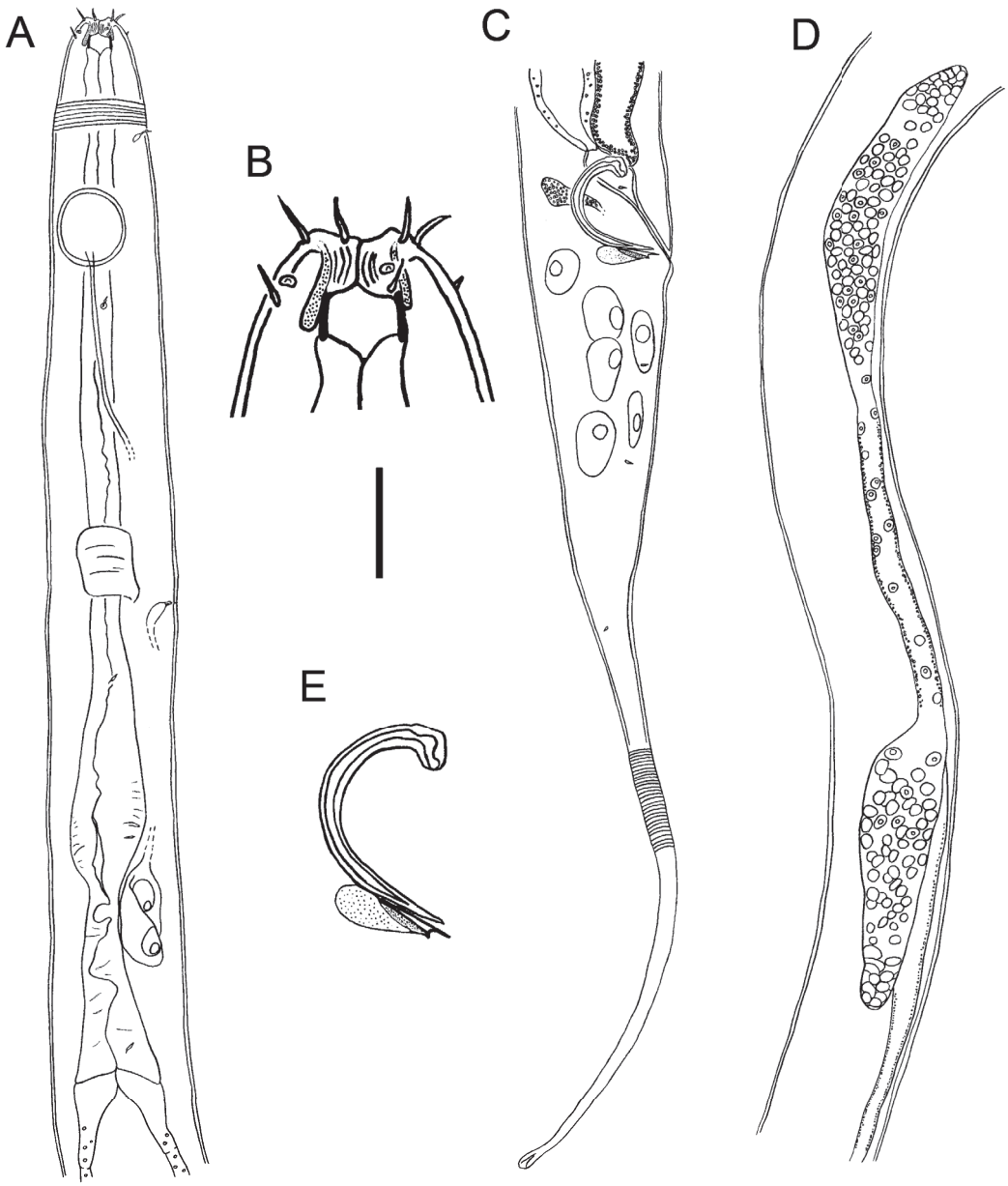

Fig. 1. *Thelonema clarki* sp. nov. Holotype, ♂. **A**. Anterior body region. **B**. Head, showing buccal cavity and cephalic sensillae. **C**. Posterior body region. **D**. Gonads, right-hand side view. **E**. Spicule and gubernaculum. Scale bar: A, C = 40 µm; B = 12 µm; D = 45 µm; E = 20 µm.

Paratypes

KERMADEC TRENCH: 2 ♀♀ (NIWA 99761) and 1 juvenile (NIWA 99762), collected 7 May 2014 (WHOI cruise TN309, *Nereus* dive N075).

Type habitat

KERMADEC TRENCH: water depth: 8081 m (178.17571º W, 34.34030º S), sediment depth: 2–3 cm (holotype); water depth: 9177 m (177.65414º W, 32.85037º S), sediment depth: 0–2 cm (paratype).

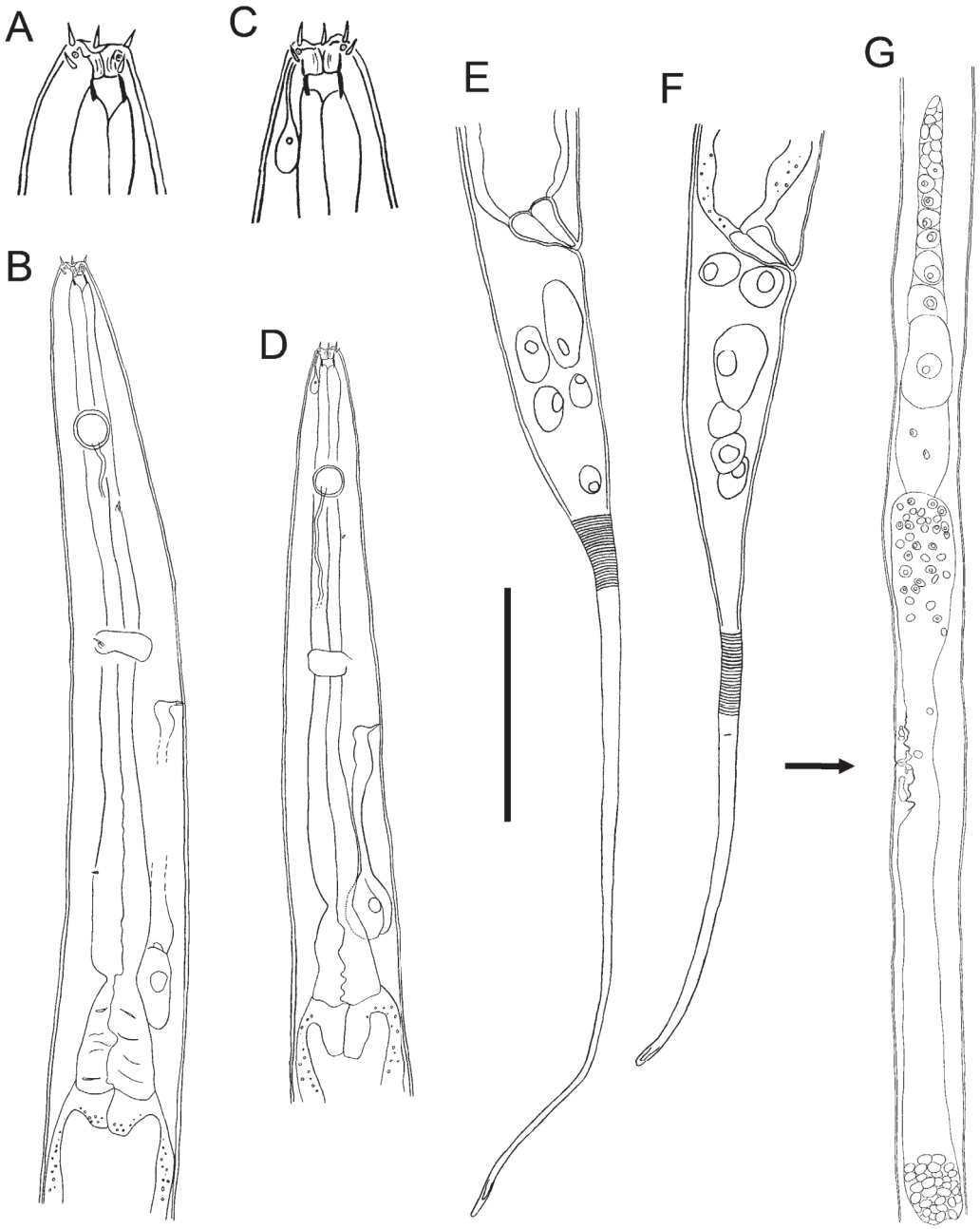

Fig. 2. *Thelonema clarki* sp. nov. Paratypes, ♀ and juvenile. **A**. Female head. **B**. Female anterior body region. **C**. Juvenile head. **D**. Juvenile anterior body region. **E**. Female posterior body region. **F**. Juvenile posterior body region. **G**. Female reproductive system. Arrow shows position of vulva. Scale bar: A–C = 40 µm; B–D = 100 µm; E–F = 90 µm; G = 210 µm.

Description

Male

Body cylindrical, tapering slightly towards both extremities. Cuticle striated from level of buccal cavity to near tail tip. Somatic setae absent except for a few 1 µm long setae in pharyngeal region. Lip region slightly concave; head region otherwise rounded. Internal labial sensillae not observed. Six outer labial setae, 5 µm long, situated in separate circle from the four sensillae of third circle; the latter consists of papillae located in depressions (Fig. 3B). Small, granular glands sometimes observed, apparently connected to base of outer labial setae (Fig. 1B); larger unicellular glands also sometimes observed and apparently connected to cephalic sensillae (Fig. 2C). Four sub-cephalic setae located immediately posterior to the cephalic papillae, 3–4 µm long, similar in length or slightly shorter than outer labial setae. Large circular amphideal fovea with cuticularised outline situated 1.7 cbd from anterior body extremity. Mouth opening narrow, surrounded by bulge of inner portion of lip region; buccal cavity cylindrical, 7 µm deep, 9 µm wide, with cuticularised walls, not surrounded by pharyngeal tissue. Pharynx narrow, muscular, with oval posterior bulb; pharyngeal glands and their orifices indistinct. Nerve ring slightly posterior to middle of pharynx length. Secretory-excretory system with two or three renette cells (third cell may sometimes be obscured) all situated just posterior to pharyngeal bulb; ampulla and pore between nerve ring and posterior pharyngeal bulb. Cardia conspicuous, 90 µm long, widening posteriorly, not surrounded by intestine walls.

Reproductive system diorchic with two opposed and outstretched testes, anterior testis to the left of intestine and posterior testis to the right of intestine. Mature sperm globular, nucleated, 4–5 × 6–7 µm. Spicules paired, 1.2 abd long, strongly arcuate, with well-developed capitulum and pointed distal end. Gubernaculum thin, pointed at both ends, without apophyses but with rounded glandular tissue extending dorsally. Rectal glands not observed; one ejaculatory gland situated between spicules. Pre-cloacal supplements absent. Tail long, conico-cylindrical, with rounded tip. Caudal glands not observed; short and sparse caudal setae present, no terminal setae. Intestine with numerous transparent crystalline structures, square to rhomboid-shaped, up to 14 × 14 µm (Fig. 3C–D).

Female

Similar to males but with lower values of a, b, and c, slightly smaller amphids (0.42–0.44 vs 0.65 cbd) and longer tail (9.0–10.4 vs 6.4 abd). Buccal cavity 5 µm wide and 4–5 µm deep. Reproductive system didelphic; anterior branch outstretched, to the right of intestine, posteror branch poorly developed, to the left of intestine. Spermatheca present in anterior branch only, simple, not cuticularised. Vulva transverse, situated slightly posterior to mid-body; small vaginal glands present on either side of vagina; muscular pars proximalis vaginae.

Juvenile

Similar to females, but with shorter body and lower values of a and b.

Remarks

Thelonema clarki sp. nov. can be differentiated from the only other species of the genus, *T. majum*, by the larger body size (3230–4461 vs 1000–1460 µm), short cylindrical buccal cavity (vs long and funnel-shaped in *T. majum*), sub-cephalic setae of similar length or shorter than outer labial setae (sub-cephalic setae longer than outer labial setae in *T. majum*), secretory-excretory system with two or three renette cells (secretory-excretory system not observed in *T. majum*), absence of gubernacular apophyses (vs dorso-caudal apophyses present in *T. majum*), and longer tail (6.4–10.4 vs 2.7 abd).

This is the first time that *Thelonema* is recorded outside the type locality in the Peru Basin (~ 4150 m depth) since the original description of the genus by Bussau (1993). The genus was not included in

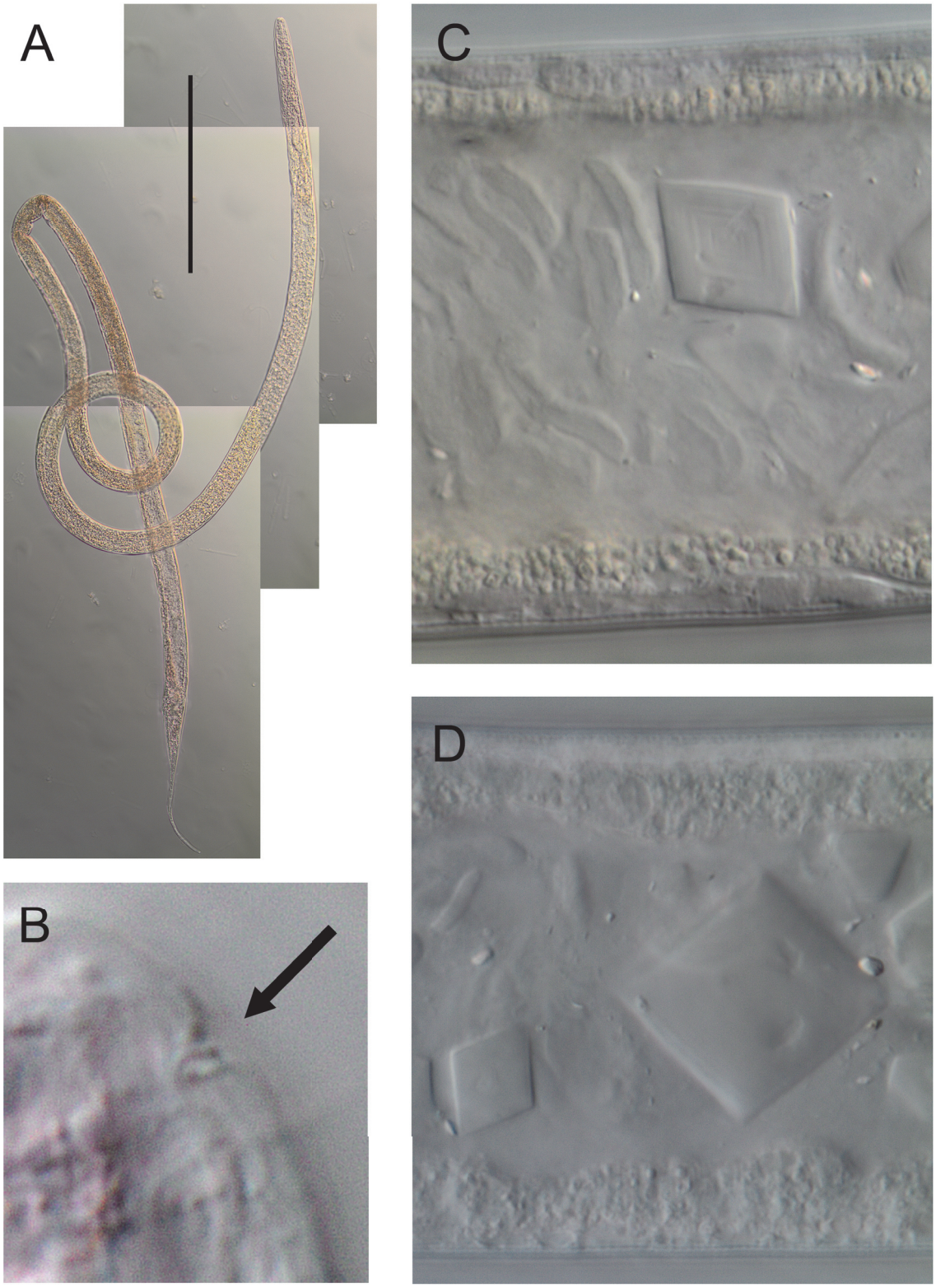

Fig. 3. *Thelonema clarki* sp. nov. Light micrographs. **A**. Holotype, ♂, entire biody. **B**. Cross-section view of sunken papilla, second circle of cephalic sensillae. **C**. Female gut content, showing crystalline structures and other unidentified contents. **D**. Juvenile gut showing crystalline structures. Arrow shows position of sunken papilla of third circle of cephalic sensillae. Scale bar: A = 520 µm; B = 5 µm; C–D = 20 µm.

Table 1. Morphometrics (µm) of *Thelonema clarki* sp. nov., *Metasphaerolaimus constrictus* sp. nov., and *Monhystrella kermadecensis* sp. nov. (n, number of specimens; L, body length; V, vulva distance from anterior end of body).

Species	***Thelonema clarki* sp. nov.**			***Metasphaerolaimus constrictus* sp. nov.**		***Monhystrella kermadecensis* sp. nov.**		
	Male	**Females**	**Juvenile**	**Male**	**Females**	**Males**		**Females**
	Holotype	**Paratypes**	**Paratype**	**Holotype**	**Paratypes**	**Holotype**	**Paratypes**	**Paratypes**
n	–	2	1	–	3	–	2	5
L	4461	3230, 3251	2217	1232	1604–1623	497	473, 492	429–480
a	81	49, 52	38	33	30–33	36	36, 41	32–35
b	14	11	9	5	6	5	5	5
c	13	8, 9	9	13	12–14	7	6, 7	7
Head diam. at ceph. setae	21	13, 15	12	20	21–26	4	4	3–4
Head diam. at amphid	40	34, 36	29	31	36–37	7	6, 7	6–7
Length of sub–cephalic setae	4	3	3	3–7	4–9	1–2	1–2	1–2
Length of cephalic setae	–	–	–	2–3	2–3	1	1	1
Amphid height	29	16	14	15	5	3	3	3
Amphid width	26	15	14	15	4–5	3	3	2–3
Amphid width/cbd (%)	65	42, 44	48	48	11–14	43	43, 50	33–43
Amphid from anterior end	66	64, 65	51	42	38–49	13	12, 13	12–14
Nerve ring from anterior end	156	152, 156	119	117	126–135	55	55	51–58
Nerve ring cbd	48	47, 49	39	37	46–47	11	10	10–11
Excretory pore from anterior end	221	188, 191	167	–	–	–	–	–
Pharynx length	323	289, 290	238	234	271–283	93	88, 97	87–95
Pharynx diameter at base	28	23, 25	23	25	32–37	7	7, 8	6–7
Pharynx cbd at base	51	53, 57	49	36	47–49	12	12, 13	11–12
Max. body diam.	55	63, 66	58	37	49–54	14	12, 13	12–14
Spicule length	62	–	–	40	–	20	19, 21	–
Gubernaculum length	16	–	–	–	–	5	5	–
Anal body diam.	53	40, 41	39	31	41–46	12	12	6–9
Tail length	338	361, 427	285	94	118–132	74	70, 80	66–78
Tail length/abd	6.4	9.0, 10.4	7.3	3.0	2.9–3.1	6.2	5.8, 6.7	7.8–11.0
V	–	1785, 1835	–	–	995–1025	–	–	272–308
%V	–	55, 57	–	–	62–64	–	–	62–64
Vulval body diam.	–	63, 65	–	–	49–54	–	–	11–13

the recent overview of all Monhysterida by Fonseca & Bezerra (2014), but the discovery of a new *Thelonema* species in the Southwest Pacific confirms the validity of the genus.

The presence of crystalline structures in the intestine is intriguing, as many appear too large to have been ingested (the structures are up to 14 µm wide, and the width of the cuticularised buccal cavity is 4–9 µm). It seems unlikely that the buccal cavity can stretch to accommodate such large particles given the presence of cuticularised walls. The crystalline structures may have grown through accretion whilst in the intestine, but this process would presumably require a relatively long period of time.

Superfamily Sphaerolaimoidea Filipjev, 1918

Family **Sphaerolaimidae** Filipjev, 1918

Diagnosis (from Fonseca & Bezerra 2014)

Cuticle striated or annulated. Six outer labial setae and four cephalic setae in one circle, with cephalic setae longer than outer labial setae. Eight groups of sub-cephalic setae present (four groups in *Megalamphis*). Buccal cavity wide, barrel-shaped (except for *Subsphaerolaimus* Lorenzen, 1978, which is conical), with longitudinal ribs, surrounded only at the base by pharyngeal tissue. Pharyngeal lumen with thick cuticle. Renette cell usually present, opening behind nerve ring. Females with one outstretched anterior ovary at left or right of intestine. Males usually with two testes; anterior one either to the left or right of intestine, posterior one at opposite side.

Subfamily **Metasphaerolaiminae** Gourbault & Boucher, 1981

Type genus

Metasphaerolaimus Gourbault & Boucher, 1981.

Diagnosis

See diagnosis of type and only genus *Metasphaerolaimus*.

Genus ***Metasphaerolaimus*** Gourbault & Boucher, 1981

Ceratosphaerolaimus Fadeeva, 1983: 1329, fig. 5. (see Jensen 1992: 8)

Diagnosis (modified from Fonseca & Bezerra 2014)

Cuticle finely striated. Six inner labial papillae; six outer labial setae at same level as four longer cephalic setae; eight groups of sub-cephalic setae. Amphideal fovea circular, situated posteriorly to buccal cavity. Buccal cavity strongly cuticularised with six H- or X-shaped mandibles, hooked anteriorly and articulating on cuticularised rim posteriorly. Pharynx cylindrical with strongly cuticularised lumen.

Type species

M. cancellatus Gourbault & Boucher, 1981.

Metasphaerolaimus constrictus sp. nov.
urn:lsid:zoobank.org:act:C2DD1CB2-2B9B-4C31-BF13-C0E1A143A275
Figs 4–5, Table 1

Diagnosis

Metasphaerolaimus constrictus sp. nov. is characterised by a relatively long body (1232–1623 µm), amphids located 1.0–1.4 cbd from anterior extremity, slightly arcuate spicules 1.3 abd long without

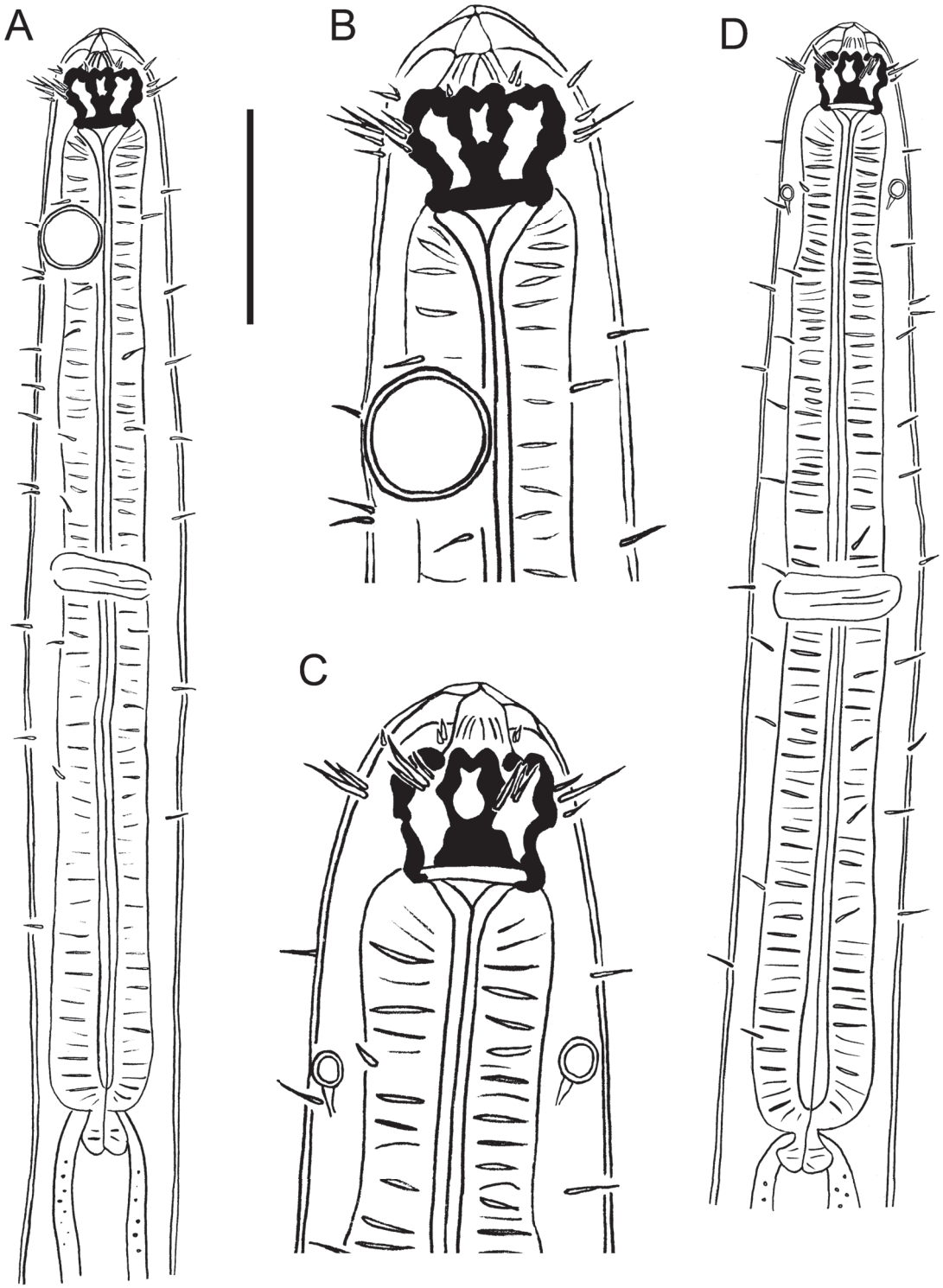

Fig. 4. *Metasphaerolaimus constrictus* sp. nov. **A**. Holotype, ♂, anterior body region. **B**. Holotype, ♂, head. **C**. Female head. **D**. Female anterior body region. Scale bar: A = 50 µm; B–C = 25 µm; D = 55 µm.

gubernaculum, tail conico-cylindrical with inner cuticle conspicuously thickened immediately anterior to cylindrical portion and with three short terminal setae.

Etymology

The species name is derived from the latin *constrictus* (= drawn together or contracted), and refers to the distinctive shape of the tail with thickening of the inner cuticle.

Material examined

Holotype

KERMADEC TRENCH: ♂ (NIWA 99763), collected 6 May 2014 (WHOI cruise TN309, *Nereus* dive N074).

Paratypes

KERMADEC TRENCH: 3 ♀♀ (NIWA 99764-6), collected 7 May 2014 (WHOI cruise TN309, *Nereus* dive N075).

Type habitat

KERMADEC TRENCH: water depth: 8081 m (178.17571º W, 34.34030º S), sediment depth: 2–3 cm (holotype); water depth: 9177 m (177.65414º W, 32.85037º S), sediment depth: 0–2 cm (paratype).

Description

Male

Body cylindrical, tapering slightly towards both extremities. Cuticle faintly striated along entire body. Eight rows of somatic setae, relatively long (4–7 µm) and numerous in pharyngeal region, short and sparse elsewhere. Head rounded, with well-developed lip region. Inner labial sensillae not observed; six outer labial setae, 1–2 µm long, and four cephalic setae, 2–3 µm long, in one circle. Eight groups of three to four sub-cephalic setae, 3–8 µm long. Large circular amphideal fovea with strongly cuticularised outline, 1.4 cbd from anterior body extremity. Buccal cavity large, 24 µm deep and 13 µm wide; six H-shaped mandibles hooked anteriorly and with wide base articulating onto cuticularised rim posteriorly. Posterior portion of buccal cavity surrounded by pharyngeal tissue. Pharynx muscular, cylindrical, widening very slightly towards posterior extremity, with strongly cuticularised lumen. Cardia extend into intestine lumen. Nerve ring situated at middle of pharynx length. Secretory-excretory system not observed.

Reproductive system diorchic with two outstretched testes; anterior testis to the left and posterior testis to the right of intestine. Mature sperm cells nucleated, spherical to globular, 9 × 9–13 µm. Spicules 1.3 abd long, slightly arcuate, with swollen proximal ends and pointed distal ends. Gubernaculum and pre-cloacal supplements absent. Tail conico-cylindrical with conspicuous thickening of inner cuticle (maximum thickness ~7 µm) immediately anterior to cylindrical portion (Fig. 5D); cylindrical portion shorter than conical portion. A few short, sparse caudal setae present sub-ventrally and sub-dorsally; three short terminal setae, 2 µm long. Caudal glands not observed.

Female

Similar to male, but with longer body and substantially smaller amphids (0.11–0.14 vs 0.48 cbd) situated 1.0–1.4 cbd from anterior body extremity. Reproductive system monodelphic with outstretched anterior branch to the left or right of intestine. Spermatheca present, simple and not cuticularised. Vulva transverse, situated at almost two thirds of body length from anterior. Vaginal glands not observed. Three caudal glands observed in one specimen. Cuticle immediately anterior to cylindrical portion of tail up to 9 µm thick.

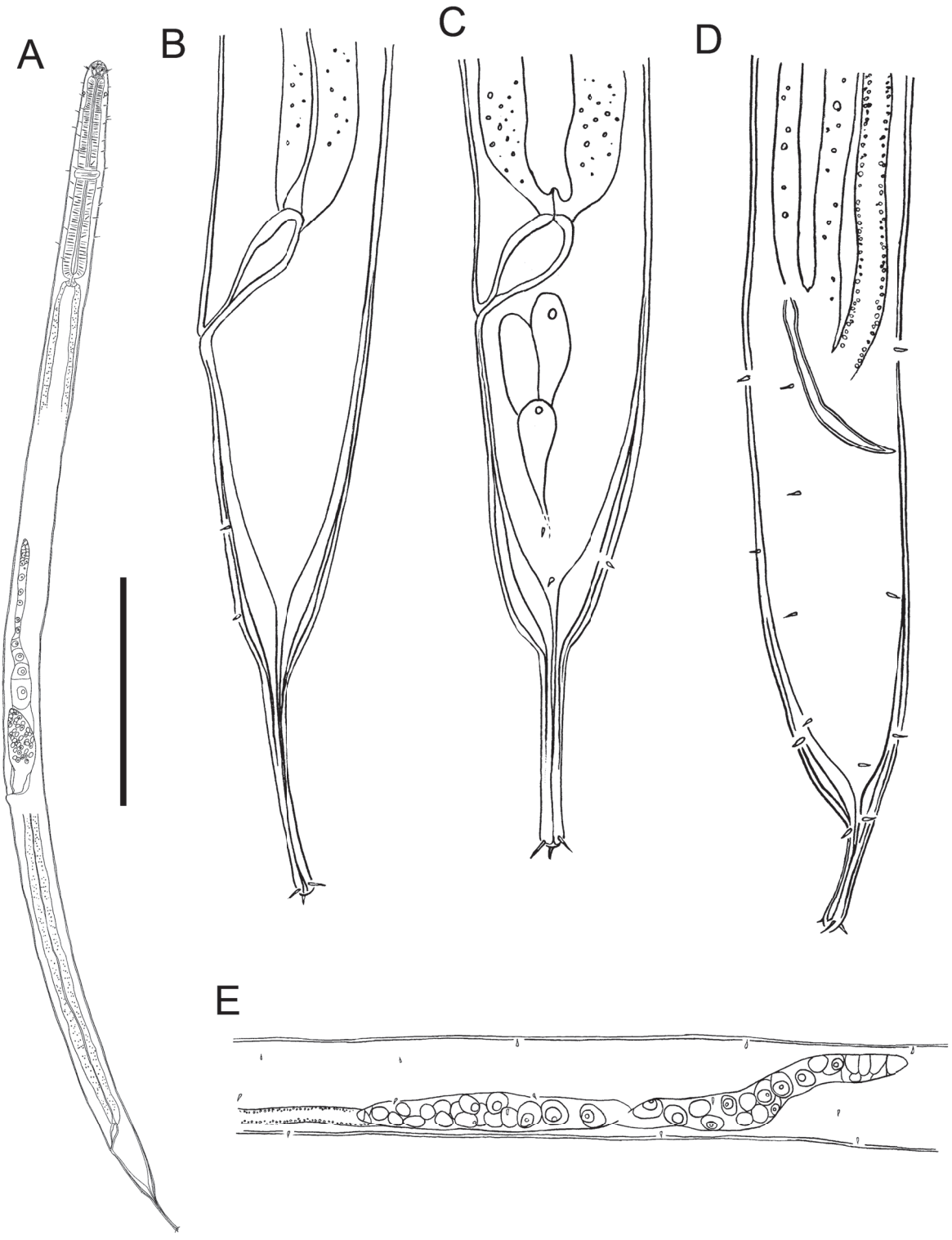

Fig. 5. *Metasphaerolaimus constrictus* sp. nov. **A**. Entire ♀. **B–C**. Female posterior body region. **D**. Male posterior body region. **E**. Male gonads. Scale bar: A = 300 µm; B–C = 55 µm; D = 45 mm; E = 80 µm.

Remarks

Metasphaerolaimus constrictus sp. nov. can be differentiated from all other species of the genus by the distinctive tail shape with conspicuous thickening of cuticle (up to 7–9 µm thick) immediately anterior to the cylindrical portion. *M. constrictus* sp. nov. is most similar to *M. gerlachi* Jensen, 1992, *M. hadalis* (Freudenhammer, 1975), and *M. inglisi* Gourbault & Boucher, 1981. The new species can be differentiated from *M. gerlachi* based on larger body size (1232–1623 vs 893–971 µm), larger amphids in males (0.48 vs 0.30–0.40 cbd), and presence of short terminal setae (vs long terminal setae in *M. gerlachi*); from *M. hadalis* by higher values of a (30–38 vs 26–27), larger amphids in males (0.48 vs 0.35 cbd) and shorter tail (2.9–3.1 vs 3.4–3.8 abd); from M. *inglisi* by the absence of setae immediately anterior to amphids in females (vs three long setae in *M. inglisi*), and presence of terminal setae (absent in M. *inglisi*).

Metasphaerolaimus was initially described by Gourbault & Boucher (1981) to accommodate species similar to *Sphaerolaimus* Bastian, 1865, but with a buccal cavity with six mandibles instead of a solid, heavily cuticularised capsule. Gourbault & Boucher (1981) described three new species (*Metasphaerolaimus cancellatus* Gourbault & Boucher, 1981*, M. hamatus* Gourbault & Boucher, 1981 and *M. inglisi* Gourbault & Boucher, 1981), and transferred the species *Sphaerolaimus campbelli* Allgén, 1927, *Sphaerolaimus hadalis* Freudenhammer, 1975, and *Sphaerolaimus crassicauda* Freudenhammer, 1975 to *Metasphaerolaimus*. Fadeeva (1983) later described the identical genus *Ceratosphaerolaimus* Fadeeva, 1893, including one new species (*Ceratosphaerolaimus japonicus* Fadeeva, 1983); the latter author also transferred *Sphaerolaimus horrendus* Sergeeva, 1981 to *Ceratosphaerolaimus*. *Ceratosphaerolaimus* was synonymised with *Metasphaerolaimus* by Jensen (1992), who also described *Metasphaerolaimus gerlachi* Jensen, 1992. There are currently ten valid *Metasphaerolaimus* species including *Metasphaerolaimus constrictus* sp. nov. (Table 2). Species of this genus are mainly differentiated based on amphideal fovea size, spicule length, and length and shape of the tail. The majority of species occur in the deep sea below 1000 m depth, except for *Metasphaerolaimus campbelli*, *M. horrendus*, and *M. japonicus*, which were described from coastal waters. These three shallow water species are also the only species of the genus that possess a gubernaculum with dorso-caudal apophyses.

Superfamily Monhysteroidea Filipjev, 1929

Family **Monhysteridae** de Man, 1876

Diagnosis (modified from Fonseca & Decraemer 2008)

Small, slender nematodes usually less than 2.5 mm long. Cuticle smooth or striated. Anterior sensillae in two circles: anterior circle with six inner labial sensillae (usually papilliform) and posterior circle with six outer labial sensillae and four cephalic sensillae (both usually setiform). Amphideal fovea circular or cryptocircular. Buccal cavity small to medium-sized, bipartite or single, with or without denticles. Pharynx with or without posterior bulb. Secretory-excretory system present or absent. Female reproductive system monodelphic with outstretched gonad to the right of intestine; male monorchic with anterior testis to the right of intestine (except *Monhystrella kermadecensis* sp. nov. where position of anterior gonad relative to intestine is variable). Spicules usually simple and arcuate. Tail conical to conico-cylindrical; terminal setae absent.

Genus ***Monhystrella*** Cobb, 1918

Diagnosis (modified from Fonseca & Decraemer 2008)

Short body length (< 0.8 mm). Small somatic setae often present. Six outer labial and four cephalic sensillae usually setiform. Buccal cavity tubiform, funnel-shaped or conoid, often with cuticularised walls; denticles usually present, but difficult to observe in small species. Circular amphideal fovea

Table 2. Key morphological characteristics of all valid *Metasphaerolaimus* species, and their bathymetric distribution. A: dorso-caudal apophyses present; Co = conical; CoC = conico-cylindrical; G = gurbernaculum present; nd = no data; - = absent. Depth range data based on type locality and additional distribution data summarised by Jensen (1992).

	L	a	b	c	Amphid width % cbd (male, female)	Spicule length	Gubenaculum?/ Dorso–caudal apophyses?	%V	Tail shape	Tail length abd	Depth range (m)
M. campbelli (Allgén, 1927)	830	24	4	7	37, nd	41	G/A	nd	CoC	4.6	<20
M. cancellatus Gourbault & Boucher, 1981	730–1050	26–35	4–5	8–10	50–58, 22	30	G/-	61	CoC	3.6–5.0	4308
M. constrictus sp. nov.	1232–1623	30–38	5–6	12–14	48, 11–14	40	-/-	62–64	CoC	2.9–3.1	8081–9177
M. crassicauda (Freudenhammer, 1975)	650–810	25–34	4–5	10–16	47–50, 12–15	20–26	-/-	63–69	Co	2.3–3.0	970–4725
M. gerlachi Jensen, 1992	893–971	28–32	4	8–9	32–40, nd	30	-/-	nd	CoC	3.3	1245–1426
M. hadalis (Freudenhammer, 1975)	1230–1440	26–27	4–5	10–11	35, 14	46	-/-	65	CoC	3.4–3.8	1920–6313
M. hamatus Gourbault &z Boucher, 1981	885–951	25–31	4–5	10–11	50, 20–21	30	G/-**	58–59	Co	2.9–3.1	1286–2944
*M. horrendus (*Sergeeva, 1981)	663–998	16–27	4–6	8–11	21–25, 12–15	23–29	G/A	59–63	Co	2.6–3.2	60–110
M. inglisi Gourbault & Boucher, 1981	1100–1350	23–24	4	9	nd, 17–20	nd	nd	70–74	CoC	3.4–3.6	2063–2944
M. japonicus (Fadeeva, 1983)	1120–2100	16–26	3–5	6–9	35, 15	63–78	G/A*	50–77	CoC	4.0–5.0	16–32

*Dorso–caudal apophyses present but very thin and may be difficult to observe.
**From re–description by Jensen (1992)

usually 1.5–2.0 or more head diameters from anterior end. Posterior part of pharynx enlarged forming a single or double bulb without valves. Secretory-excretory system usually absent. Female reproductive system short to medium sized; vulva near mid-body. Spicules mostly arcuate and short (< 2 abd). Tail usually with ventrally curved conical anterior portion and dorsally curved cylindrical filiform posterior portion. Spinneret a long and slender cone or cylinder.

Remarks

The taxonomy of all marine *Monhystrella* species was revised by Fonseca & Decraemer (2008), who provided a detailed diagnosis of the genus and a key to all thirteen valid marine species; no new marine species have been described since.

Monhystrella kermadecensis sp. nov.
urn:lsid:zoobank.org:act:AA638C6A-E7A8-4636-A03D-8CF851B70498
Fig. 6, Table 1

Diagnosis

Monhystrella kermadecensis sp. nov. is characterised by circle of papillose outer labial sensillae slightly anterior to circle of four short cephalic setae, amphideal fovea 1.9 cbd from anterior extremity and 0.33–0.43 cbd (females) or 0.43–0.50 cbd (males), gubernaculum with caudal apophyses, presence of distinct cuticularised piece along anterior vaginal wall, relatively short conical (males) or conico-cylindrical tail (females) with conical, ventrally-curved spinneret.

Etymology

This species is named after the type locality.

Material examined

Holotype

KERMADEC TRENCH: ♂ (NIWA 99767), collected 6 May 2014 (WHOI cruise TN309, *Nereus* dive N074).

Paratypes

KERMADEC TRENCH: 2 ♂♂ (NIWA 99768) and 5 ♀♀ (NIWA 99769) same data as holotype.

Type habitat

KERMADEC TRENCH: water depth: 8081 m (178.17571º W, 34.34030º S), sediment depth: 0–1 cm.

Description

Male

Body cylindrical, tapering slightly towards both extremities. Cuticle smooth. Anterior end rounded or slightly truncated. Six minute inner labial papillae, difficult to observe; circle of six small outer labial papillae slightly anterior to circle of four short cephalic setae, 0.23 cbd long. Amphideal fovea medium-sized, circular, situated 1.9 cbd from anterior end, outline not cuticularised. Two short setae situated in sublateral row posterior to amphideal fovea. Buccal cavity small, funnel-shaped, surrounded by pharyngeal tissue. Pharynx gradually widening posteriorly, apparently forming a weak posterior bulb in some cases. Nerve ring situated slightly posterior to middle of pharynx. Secretory-excretory system not observed. Cardia small, partly surrounded by intestinal tissue. Progaster not observed. Distinct layer of glycocalyx present in intestinal lumen.

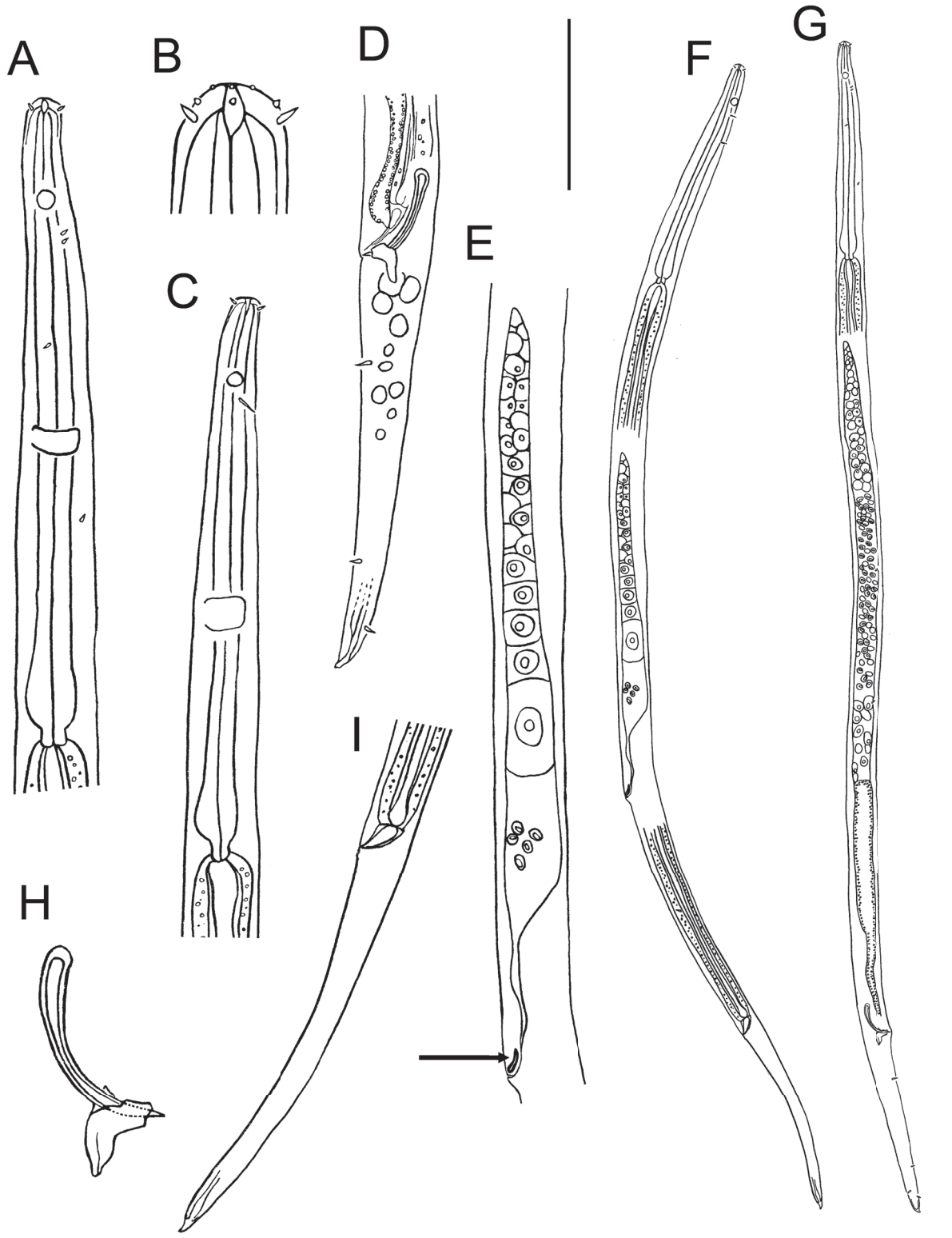

Fig. 6. *Monhystrella kermadecensis* sp. nov. **A**. Male anterior body region. **B**. Male head region. **C**. Female anterior body region. **D**. Male posterior body region. **E**. Female reproductive system. **F**. Entire ♀. **G**. Entire ♂, holotype. **H**. Male copulatory apparatus. **I**. Female posterior body region. Arrow shows position of cuticularised piece anterior to vulva. Scale bar: A, C–E, I = 25 µm; B = 7 µm; F–G = 70 µm; H = 12 µm.

Reproductive system monorchic with anterior outstretched testis situated to left or right of intestine. Mature sperm nucleated, globular, 1.3–2.0 × 1.5–2.4 µm. Spicules paired, arcuate, without capitulum, widest at proximal end and with pointed distal tip. Gubernaculum with caudal apophyses and wide lateral crurae. Pre-cloacal supplements or setae not observed. Tail conical, with two pairs of sub-ventral setae and one pair of sub-dorsal setae. Well-developed, ventrally curved, conical spinneret; caudal glands not observed.

Female

Similar to males but body widest immediately anterior to vulva, then markedly smaller immediately posterior to vulva; body width decreases gradually towards both extremities. Amphideal fovea slightly smaller than in males (0.33–0.43 vs 0.43–0.50 cbd), only one seta present posterior to amphideal fovea; tail longer than in males (7.8–11.0 vs 6.2–6.7 abd), conico-cylindrical, without setae. Reproductive system monodelphic with outstretched anterior branch to the left (two specimens) or right of intestine (three specimens). Mature egg dimensions up to 12 × 39 µm. Vulva located at almost two thirds of body length from anterior. Vagina transverse or oblique, with distinct cuticularised piece situated along anterior wall (Fig. 6D). No vaginal glands visible. Post-vulvar sac not observed.

Remarks

Monhystrella kermadecensis sp. nov. differs from most other *Monhystrella* species (except *M. marina* Timm, 1964) by the relatively short tail lacking a cylindrical filiform posterior portion. This trait may suggest affinities with *Thalassomonhystera* Jacobs, 1987, but species of this genus always possess a well-developed secretory-excretory system and lack a posterior pharyngeal bulb (Fonseca & Decraemer 2008). *M. kermadecensis* sp. nov. is also unusual in the position of the vulva at almost two thirds of body length from the anterior extremity instead of near mid-body, a trait which suggests affinities with *Halomonhystera* Andrássy, 2006. The vulva in *M. kermadecensis* sp. nov. is, however, situated more anteriorly than in *Halomonhystera* (62–64 vs 76–92% of body length from anterior extremity); the new species also differs from *Halomonhystera* in the absence of secretory-excretory system and shape of the buccal cavity (Fonseca & Decraemer 2008). Elucidating the taxonomic relationships between *M. kermadecensis* sp. nov. and other Monhysteridae will require detailed molecular analyses which are not possible at present based on available specimens.

The holophyly of the Monhysteridae was established based on the anterior gonad always positioned to the right of the intestine (Lorenzen 1981). *Monhystrella kermadecensis* sp. nov. can be differentiated from all other species of the genus, and indeed the entire family, based on the variable position of the anterior gonad relative to the intestine (to the right or left of intestine in both sexes). The holophyly of the closely related family Xyalidae was established based on the anterior gonad always positioned to the left of the intestine and the posterior gonad (when present) always to the right of it (Lorenzen 1981). The new species therefore shows affinities with both the Mohysteridae and Xyalidae; within the Xyalidae it resembles the genus *Theristus* Bastian, 1965 most due to the conical shape of the tail and lack of terminal setae. The following traits, however, suggest closer affinities with the Monhysteridae: small body size (< 500 µm in length), smooth cuticle (always striated in Xyalidae; Lorenzen 1981), presence of only four setae in second circle (always ten setae in *Theristus*), and presence of only one testis (two testes often present in Xyalidae).

Discussion

Monhystrella kermadecensis sp. nov. was among the most common species at the 8081 m site in Kermadec Trench and represented 8% of total nematode abundance (D. Leduc unpublished data). This species, however, was not present at the 9177 m site. *Thelonema clarki* sp. nov. and *Metasphaerolaimus constrictus* sp. nov. were relatively common at the 9177 m site, representing 3 and 5%, respectively, of

total nematode abundance. These two species were also present at the 8081 m site but in lower numbers (≤ 1% of total nematode abundance). The present study increases the number of nematode species known from hadal trench environments from fifteen to eighteen. Many more species are yet to be discovered and described, and future sampling in trench environments should ensure that preservation and fixation methods allow for both morphological and molecular analyses to be conducted (Yoder *et al.* 2006).

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References

Bussau C. 1993. *Taxonomische und ökologische Untersuchungen an Nematoden des Peru-Beckens*. PhD thesis, University of Kiel, Germany.

Fadeeva N.P. 1983. A contribution to the family Sphaerolaimidae Filipjev, 1918 (Nematoda, Monhysterida) from the Sea of Japan. *Zoologichesky Zhurnal* 9: 1321–1333.

Fonseca G. & Decraemer W. 2008. State of the art of the free-living marine Monhysteridae. *Journal of the Marine Biological Association of the United Kingdom* 88: 1371–1390. http://dx.doi.org/10.1017/S0025315408001719

Fonseca G. & Bezerra T.N. 2014. Order Monhysterida. *In*: Schmidt-Rhaesa A. (ed.) *Handbook of Zoology Gastrotricha, Cyclioneura and Gnathifera* Volume 2, *Nematoda*: 435−465. De Gruyter, Hamburg.

Gambi C., Vanreusel A. & Danovaro R. 2003. Biodiversity of nematode assemblages from deep-sea sediments of the Atacama Slope and Trench (South Pacific Ocean). *Deep-Sea Research I* 50: 103–117.

Gourbault N. & Boucher G. 1981. Nématodes abyssaux (Campagne Walda du N/O "Jean Charcot") III. Une sous-famille et six espèces nouvelles de Sphaerolaimidae. *Bulletin du Museum national d'Histoire naturelle de Paris* 4: 1035–1052.

Jacobs L.J. 1987. A redefinition of the genus *Monhystrella* Cobb (Nematoda, Monhysteridae) with keys to the species. *Zoologica Scripta* 16: 191–197. http://dx.doi.org/10.1111/j.1463-6409.1987.tb00066.x

Jensen P. 1992. Predatory nematodes from the deep sea: description of species from the Norwegian Sea, diversity of feeding types and geographical distribution. *Cahiers de Biologie Marine* 33: 1–23.

Leduc D. 2015. One new genus and five new nematode species (Monhysterida, Xyalidae) from Tonga and Kermadec Trenches, Southwest Pacific. *Zootaxa* 3964: 501–525. http://dx.doi.org/10.11646/zootaxa.3964.5.1

Lorenzen S. 1981. *Entwurf eines phylogenetischen Systems der freilebenden Nematoden*. Veröffentlichungen des Instituts für Meeresforschung in Bremerhaven 7, Suppl., Institut für Meeresforschung, Bremerhaven.

Miljutin D.M., Gad G., Miljutina M.M., Mokievsky V.O., Fonseca-Genevois V. & Esteves A.M. 2010. The state of knowledge on deep-sea nematode taxonomy: how many valid species are known down there? *Marine Biodiversity* 40: 143−159. http://dx.doi.org/10.1007/s12526-010-0041-4

Somerfield P.J. & Warwick R.M. 1996. *Meiofauna in Marine Pollution Monitoring Programmes: a Laboratory Manual*. Ministry of Agriculture, Fisheries and Food, Lowestoft.

Tietjen J.H. 1989. Ecology of deep-sea nematodes from the Puerto Rico Trench area and hatteras Abyssal Plain. *Deep-Sea Research* 36: 1579–1594. http://dx.doi.org/10.1016/0198-0149(89)90059-9

Vanhove S., Vermeeren H. & Vanreusel A. 2004. Meiofauna towards the South Sandwich Trench (750–6300 m), focus on nematodes. *Deep-Sea Research II* 51: 1665–1687.

Yoder M., Tandingan De Ley I., King I.W., Mundo-Campo M., Mann J., Blaxter M., Poiras L. & De Ley P. 2006. DESS: a versatile solution for preserving morphology and extractable DNA for nematodes. *Nematology* 8: 367–376. http://dx.doi.org/10.1163/156854106778493448

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