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Free-living nematodes from the deep-sea Håkon Mosby Mud Volcano, including the description of two new and three known species*

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Abstract

Two new and three known species of the genera *Aponema* Jensen, 1978, *Molgolaimus* Ditlevsen, 1921, *Sabatieria* Rouville, 1903, and *Terschellingia* De Mann, 1888 were found at the deep-sea Håkon Mosby Mud Volcano, at a depth of 1250m, in the Norwegian Sea. *Aponema ninae* sp. n. is characterized by short body length, short spicules, gubernaculum with wide apophyses, which are bevelled on the top, and long narrowed tail with drop-shape thickened tip and caudal setae. The new species most resembles *Aponema torosa* (Lorenzen, 1973). *Molgolaimus haakonmosbiensis* sp. n. differs from all other species of *Molgolaimus* by shape and length of spicules; relations of spicule length to the anal body diameter; presence of two supplements. Spicules of the new species are short (30.5 µm), slender, twisted with amplate and excurved proximal parts. The appearance of our specimen of *Sabatieria ornata* fits well with the original description of Ditlevsen, 1918. Specimens of *Terschellingia distlamphida* Juario, 1974 also fit the original description based on nematodes sampled from the sub littoral of the German Bight. However, the Norwegian specimens have a shorter (1010 µm vs. 1343 µm) and thicker body (a=64.6 µm vs. a=32.0 µm). The Håkon Mosby specimens of *Terschellingia longicaudata* De Mann, 1907 differ from the original description in body length and thickness: 1094 µm vs. 1429 µm, and a=22.3 µm vs. 49.0 µm correspondingly, but agree with descriptions by other authors, especially with the one by Chitwood (1951).

Key words: *Aponema*, marine nematodes, *Molgolaimus*, mud volcano, *Sabatieria*, taxonomy, *Terschellingia*

Introduction

Recently there have been a series of varied studies into the meiobenthic community of the Håkon Mosby Mud Volcano (HMMV), of which the current study forms a part. Study of meiobenthos of HMMV began in 2002 (Soltwedel *et al.* 2005) with analyses of spatial distribution of all metazoan meiobenthos, and the community structure of nematodes and foraminifera.

The Håkon Mosby Mud Volcano is characterized by a very complicated mosaic of habitats with irregular distributed bacterial mats, patchy populations of pogonophorans, active bubbling areas and bare sediments (Soltwedel *et al.* 2005). One of the features of meiofauna of reducing biotopes is a gradual replacement of multi-species communities by those with few or even single species, along with a decrease of oxygen concentration (Mokievsky *et al.* 2005).

At HMMV the nematode diversity varied from 35 species per sample in the background sediments to 27–29 species per sample in methane rich sediments, and further changed to a monoculture of a single nematode species in the most reduced habitat, the bacterial mat. The nematode community from pogonophorans was dominated by *Terschellingia distlamphida* Juario, 1974 and *Terschellingia longicaudata*

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De Mann, 1907 jointly constituting 21–32% of specimens whilst *Aponema ninae* sp.n. was 12–13% specimens. One of the abundant species in the sample from 'bare' sediment was *Sabatieria ornata* Ditlevsen, 1918, and it dominated at one of the stations of pogonophoran fields (27% of identified specimens in samples). Several species of nematodes were recorded only from reduced sediments in the caldera and they were absent in the background sediment samples. Among them was the new species of *Molgolaimus* Ditlevsen, 1921; this species was also present on pogonophoran fields (4–5% of identified specimens) (Portnova *et al.* submitted).

Materials and methods

Sediment samples were obtained at the Håkon Mosby Mud Volcano by the RV POLARSTERN expedition ARK XVIII/I in summer 2002 (Soltwedel et al. 2005). A total of 11 stations were sampled with a video-controlled multiple corer (MUC) taking almost undisturbed sediment samples. Six stations were analyzed for nematode community diversity and distribution patterns (Soltwedel *et al.* 2005; Portnova *et al.*, submitted). Sediment samples were taken from 1277–1294 m depth (Table 1). One station (272) was located in the centre of caldera. Four stations were aligned along a short transect at the southern rim of the volcano: these were three stations (263B, 283A and 283B) from pogonophoran fields and one station was from the bacterial mat (263A). The station 274 was taken about 1km east of volcano's rim. Environmental parameters were analysed at each station in sub-samples taken randomly from cores in each cast. Further details have been given by Soltwedel *et al.* (2005).

TABLE 1. Site description and habitat characteristics.

Station	Coordinates		Depth (m)	Habitat
St.263A	72°00.048'N	14°43.504'E	1288	Bacterial mat
St.263B	72°00.017'N	14°43.900'E	1294	Pogonophoran fields
St.283A	72°00.034'N	14°43.212'E	1288	Pogonophoran fields
St.283B	72°00.034'N	14°43.425'E	1287	Pogonophoran fields
St.272	72°00.234'N	14°43.728'E	1288	Bare sediment from centre of caldera
St.274	72°00.096'N	14°45.890'E	1277	Background sediment

Samples for faunal analyses were taken randomly from each multicorer tube at each station with 20 ml disposable syringes with cut–off anterior ends; the surface area of a syringe was 3.2 cm^2. Samples were sectioned horizontally in 1 cm layers and analyzed separately down to 5 cm depth. Each layer was fixed by 7% formalin on board. For investigations of meiofauna, sediment samples were stained with Rose Bengal, washed through a set of sieves with mesh sizes of 500, 250, 125, 65 and 32 µm and sorted under a low power stereo microscope. Extracted nematodes were placed into bowls with Seinhorst solution (70 parts of distilled water, 29 parts 95% ethanol and 1 part of glycerine) (Seinhorst 1959). Then the bowls were warmed up in thermostat set at 30°C to evaporate alcohol and water. During this procedure nematodes gradually got saturated with glycerine and, as a result, got lighter. Then specimens were mounted into permanent glycerine slides with a paraffin ring, using glass beads as separators for microscopy. Taxonomic studies were examined using a Olympus CX-41 and BX-50 microscopes.

Drawings and all measurements were made with Olympus BX–41 microscope.

Type specimens were deposited in the collection of the P.P. Shirshov Institute of Oceanology (Moscow, Russia).

Abbreviations

a—body length divided by maximum body diameter;

a.b.d.—anal body diameter, (µm);

am.w.—width of the amphidial fovea, as percentage of corresponding body diameter, (%);
amph.w.—width of the amphidial fovea, (µm);
ant.ren.—distance from anterior end to glandular cell of renetta, (µm);
ant.c.s.amph.—distance from the anterior end to the cephalic setae behind the amphidial fovea, (µm);
b—body length divided by esophageal length;
c'—tail length divided by cloacae level;
c—body length divided by tail length;
c.b.d.—corresponding body diameter;
con.t.l.—length of conical part of tail (µm);
diam.am.—body diameter at the level of amphidial fovea, (µm);
diam.amph.s—body diameter at the level of cervical setae behind of amphidial fovea (µm);
diam.bulb—diameter of esophageal bulb (µm);
diam.c.s.—body diameter at the level of cephalic setae, (µm);
diam.ca.—body diameter at the level of cardia, (µm);
diam.midb.—midbody diameter, (µm);
diam.n.r.—body diameter at the level of nerve ring, (µm);
diam.o.s.—body diameter at the level of outer labial sensilla, (µm);
dis.am.—distance from the cephalic apex to the anterior rim of the amphidial fovea, (µm);
eggs—width of biggest ripe egg, (µm);
gub.ap.—length of apophysis of the gubernaculum, (µm);
l.c.s.—length of cephalic setae, (µm);
l.ce.cp.—length from the cephalic end of body to the end of conical part of tail, (µm);
l.o.s.—length of outer labial sensilla, (µm);
l.s.s.—length of somatic setae (µm);
l.tail—tail length, (µm);
L—body length, (µm);
spic.arch—length of spicule along the arch, (µm);
spic.chord—length of spicule along the chord, (µm);
st.l.—total stoma length, (µm);
st.w.—maximal width of stoma, (µm);
sup.an.—distance from first precloacal supplement to anus (µm);
sup–sup.—distance between two neighbour precloacal supplements (µm);
V (%)—distance of vulva from anterior end as percentage of body length, (%).

Taxonomy

Terschellingia distalamphida Juario, 1974

Figure 1, Table 2

Material studied: Three males, five females. Glycerine slides. Males in glycerine slides from Nos. M-1/39 to 1/40; females Nos. M-1/41 to M-1/43 in glycerine slides.

Locality: Norwegian Sea, Håkon Mosby Mud Volcano, station 283B. Sediment from the pogonophoran fields.

Description: Body elongate, slender and fusiform. The anterior end oblique and slightly narrowed. Cuticle optically not striated and smooth. Inner papillae very short, 2 µm in length. Outer labial sensilla invisible. Four cephalic setae, 3–4 µm in length. Amphidial fovea circular and distinctly sclerotized. Diameter of amphids 6 µm, i.e. about 43–50 % of c.b.d. Distance from cephalic end to anterior border of amphidial fovea 13–14 µm (2.8–3.4 of the head diameter), identical for males and females. No cervical setae. Buccal

cavity small, narrow, triangular, weakly sclerotized. The width of stoma 3–4 µm in width and 10 µm in length. No teeth in stoma.

TABLE 2. Morphometrics of *Terschellingia distalamphida* Juario, 1974 (all measurements are in µm unless otherwise stated, except ratios a, b, c and c').

	male 1	**males (n=2)**	**females (n=5)**
L	1010	872.1–1063	750–937.5
a	32.5	29.1–37.9	22.7–29.3
в	13.2	11.4–13.9	12.3–15.3
c	7.3	2.7–2.8	2.5
V %			32.6–40.8
l.ce.cp.	562.5	500–625	500–566
l.c.s.	3	3	3
diam.c.s.	9	7–8	7–8
st.w.	3	3–4	3–4
amph.w.	6	6	6
diam.amph.	12	13	12–13
dis.amph.	14	13–14	13
diam.n.r.	20	20–21	20–22
diam.bulb.	21	20	20
diam. ca.	27	24–26	24–25
ant. ren.	54.9		54–54.9
diam.midb.	31	28–30	32–33
a.b.d.	24	22–23	20–21
con.t.l.	61.2	61.2	43–55
l.tail	137.7	321.3–382.5	375
c'	5.7	14–17.4	18.8
gub.ap.	9.2	9.2	
spic.chord	15.2	12.2–18.3	
spic.arch	24.4	24.4	
eggs			21–22

Oesophagus narrow, cylindrical and muscular along its entire length, posteriorly forming a pronounced spherical bulb. Intestine gleam well visible. Hypodermal cells of intestine with green granular content. Cardia small, slightly extended. Length of cardia 10–11 µm. Glandular body of the renetta cell porrect, settles down below the cardia, well seen in the light microscope. Excretory pore situated beneath to the nerve ring, 30–35 µm from the posterior end of the bulb.

Male reproductive system diorchic, with oustreched anterior testis and reflexed posterior one. Both of them located to the left of the intestine. Unripe spermatozoa are large, oval or triangular–shaped. Spermatozoa in the anterior testis slightly bigger than in the posterior one. Vas deferens long and thin. Spicules paired, equal, arcuate, with cuticle crest, proximally cephalated and tapered distally. Gubernaculum short, with awide caudal apophysis. Precloacal supplements absent. Female reproductive system didelphic, with outstretched ovaries, identical in length, located to the left of intestine. Oviduct contains 3 eggs, the biggest 20–25 µm in size. Tail elongate, with three caudal glands, basal part conical, measuring 61.2 µm in males and 42.7–54.9 µm in females, with threadlike distal part. Conical part of the tail scattered with few somatic setae, 2 µm. No terminal setae at the tip of the tail. Tail length exceeds a.b.d. 17.8 times in both male and female.

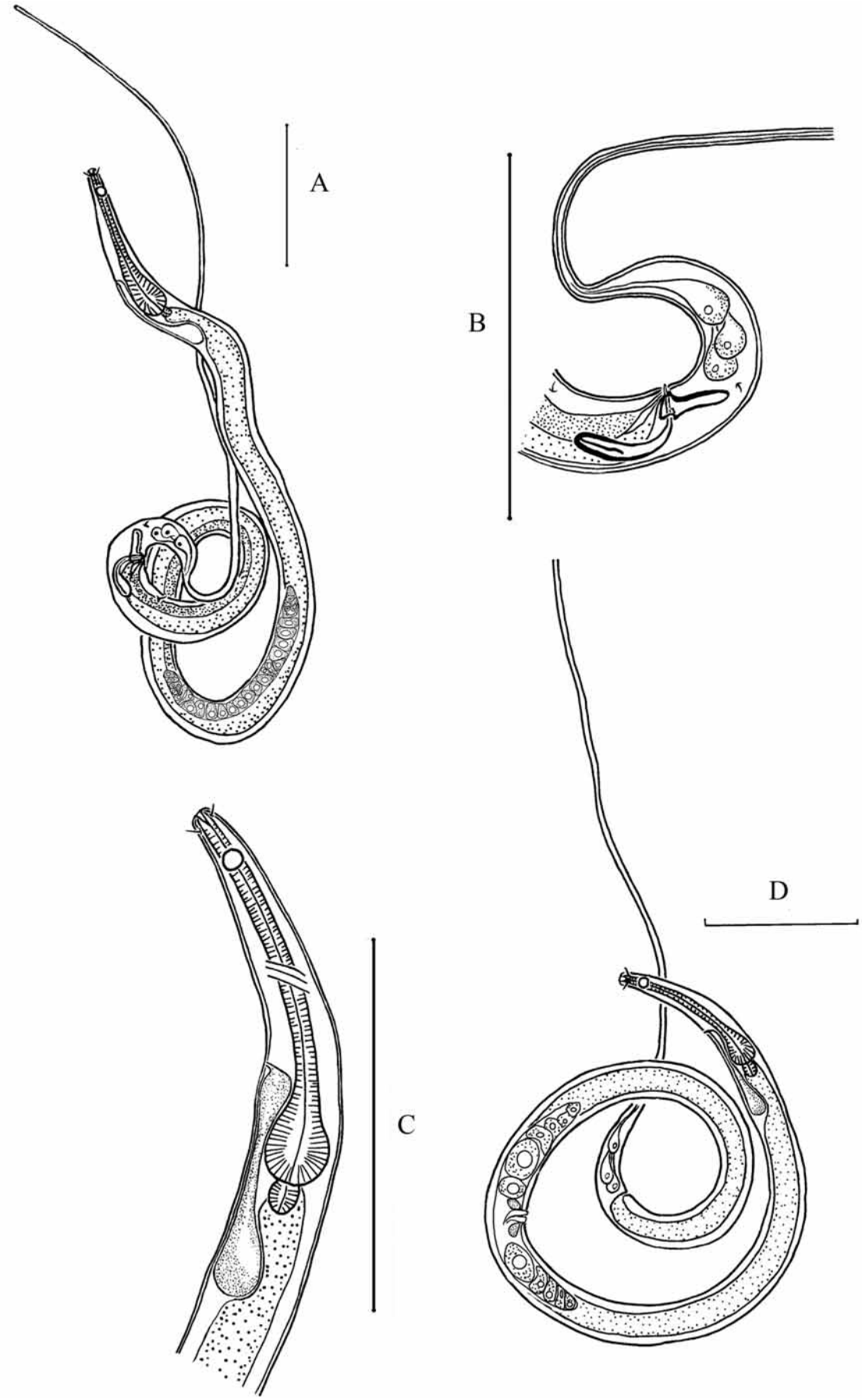

FIGURE 1. *Terschellingia distalamphida* Juario, 1974, details. A: male 1, total view; B: tail region; C: female, cephalic end; D: female, total view. Scale bars: 100 μm.

Remarks The Håkon Mosby specimens in general fit the original description of Juario (1974), except in the case of value "a" which was several times lower in type specimens (a=29.1–37.1 vs. 48.4–64.6) and slight difference in the body length: 872.1–1063 µm vs. 1162–1343 µm.

Terschellingia longicaudata De Mann, 1907

Figures 2, Table 3

Material studied: Three males, four females. Glycerine slides. Males in glycerin slide from Nos. M-1/35 to M-1/38; females from Nos. M-1/35 to M-1/37.

Locality: Norwegian Sea, Håkon Mosby Mud Volcano, station 283A. Sediment from the pogonophoran field.

TABLE 3. Morphometrics of *Terschellingia longicaudata* De Mann, 1907 (all measurements are in µm unless otherwise stated, except ratios a, b, c and c').

	male 1	males (n=2)	females (n=4)
L	1094	1062.5–1250	1250–1437.5
a	22.3	26.6–28.4	19.8–23.2
в	11.9	10–11.6	11.7–15.65
c	4.4	2.85–4.3	3.3–4
V (%)			39–40
l.o.s.	2	2	2
diam.o.s.	15	14–17	17–19
l.c.s	4	4	4
diam.c.s.	26	22–25	24–25
ant.c.s.amph.	18	17–18	16–19
st.w.	6	6	6–7
st.l.	2	2	2
amph.w.	10	10	9–10
diam.amph.	19	20	21–22
dis.amph.	5	5	5–6
diam.n.r.	32	35–36	36–44
diam.bulb.	39	37–40	41–48
diam.ca.	44	41–45	47–56
ant.ren.	58	67.1–100	61–70.2
diam.midb.	49	40–44	61–62
a.b.d.	35	35	36–42
con.t.l.	55	61–61.2	61.2–68.8
l.tail	250	245–437.5	312.5–375
c'	7.1	7–12.5	8.4–10.1
gub.ap.	12.2	12.2–15	
spic.chord	24.4	24.4–27.5	
spic.arch	30.5	30.5–36.6	
eggs			41–60

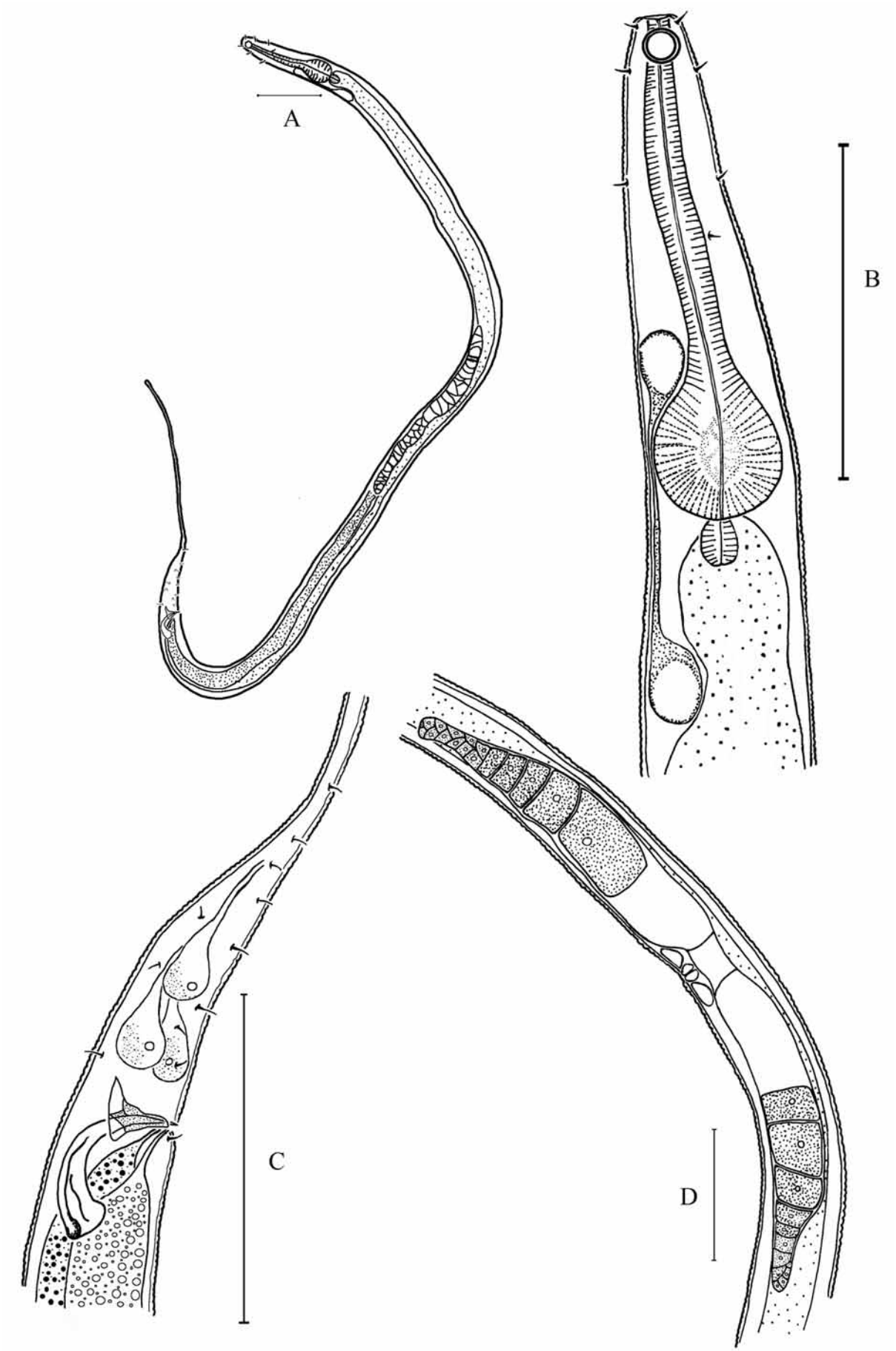

FIGURE 2. *Terschellingia longicaudata* De Mann, 1907, details. A: male 1, total view; B male 2, cephalic end; C: posterior end; D: vulva. Scale bars: 100 µm.

Description: Body slender, long and fusiform. Cuticle with disappearing thin striation, which is poorly visible under light microscope. Head anteriorly rounded and slightly truncate on the top. Six inner, labial papillae 1μm long. Six outer, labial, setiform sensilla 2–3 μm long. Four cephalic setae 3–4 μm long, forming a circle slightly under the amphid. These setae located 17–18 μm and 16–19 μm from the anterior end in males and females, respectively. Somatic setae scattered irregularly at pharyngeal part of the body, untill excretory pore of ventral gland. Amphidial fovea circular and sclerotized. Diameter of amphidial fovea 9–10 μm, i.e. ca. 41–50 % of c.b.d. Distance from apex to anterior border of the amphidial fovea 5–7 μm, identical in males and females. Buccal cavity small, saucer-shaped, unarmed, 6–7 μm wide and 2 μm long. Oesophagus narrow, cylindrical, muscular along its entire length, posteriorly forming a well-pronounced bulb. The diameter of the bulb is 37–40 μm in males and 40–48 μm in females. Intestine gleam easily visible.

Cardia oval, 20 μm long. Renetta big, easily visible, consisting of 2 spheres connected with each other by a thin channel. Glandular body with nuclei of renetta clearly seen below the cardia. Renetta ampulla slightly widens and oval. Excretory pore located ventrally, beyond the level of the nerve ring.

The reproductive system of males diorchic. Outstretched anterior testis and reflexed posterior are similar in length. Both testes lie to the left of intestine. Vas deferens long and thin, with granulated content. Spermatozoa oval with easily visible nuclei. Spicules bent, strongly arched, 30.5–36.6 μm (arch) or 24.4–27.5 μm (chord), distally acute, proximally broadened and cephalic. Gubernaculum short with wide, pointed, caudal apophysis, 12.2–15 μm long. One precloacal seta, 2–3 μm long. Precloacal supplements absent.

Females reproductive system didelphic, with two outstretched ovaries. Posterior and anterior ovaries of similar length. Ovaries located to the left of intestine. The width of the biggest egg in the oviduct was 41–60 μm.

Tail elongate-filiform, with basal conical part, containing three caudal glands. Tail length 7–12 a.b.d. Ventral and dorsal sides of conical part of the tail with scattered somatic setae, 4μm long.

Remarks: The Håkon Mosby specimens fit the original description by De Mann (1907). Specimens from the mud volcano also correspond well to the redescription of *T. longicaudata* by Chitwood (1951) based on nematodes from the sea weeds of Copano Bay, Texas. Distinction only between lengths of spicules. The spicules on the specimens of *T. longicaudata* from the Håkon Mosby mud volcano were shorter than on the specimens from Chitwood's description (30.5–36.6 μm vs. 40μm).

***Sabatieria ornata* Ditlevsen, 1918**
Figures 3, Table 4

Material studied: four males, three females. Glycerine slides. Males in glycerin slide Nos. from C-1/22 and C-1/23; females from No. C-1/24.

Locality: Norwegian Sea, Håkon Mosby Mud Volcano, station 263B, 272. Sediment from the pogonophoran field and bare sediment from the centre of caldera.

Description: Body elongate, spindle-shaped to cylindrical. Cuticle transversally striated, but striation poorly visible. Cuticle bears transversal rows of punctation. Lateral dots slightly larger than median and submedian dots, arranged disorderly. Somatic setae distributed along the body, shorter than cephalic ones.

Cephalic end separated from the body, narrowing at the level of amphid. Labial setae short, 1 μm long. Cephalic setae 3–6 μm in males and 7 μm in females. Amphidial fovea coiled spirally in three turns, large, with precise cuticle edging. In males diameter of amphidial fovea 12–14 μm, i.e. 70–77 % of c.b.d., in females 12–14 μm, i.e. 70–87% of c.b.d. correspondly. Distance from the anterior end to the amphidial fovea 7–10 μm in males and 8–10 μm in females.

Cuticle at the anterior end thick. Stoma small and cup-shaped, walls not sclerotized. Small projection like denticles on the dorsal side at the base of stoma.

Oesophagus long, slightly muscular along its length, gradually extending to posterior end. Cardia small.

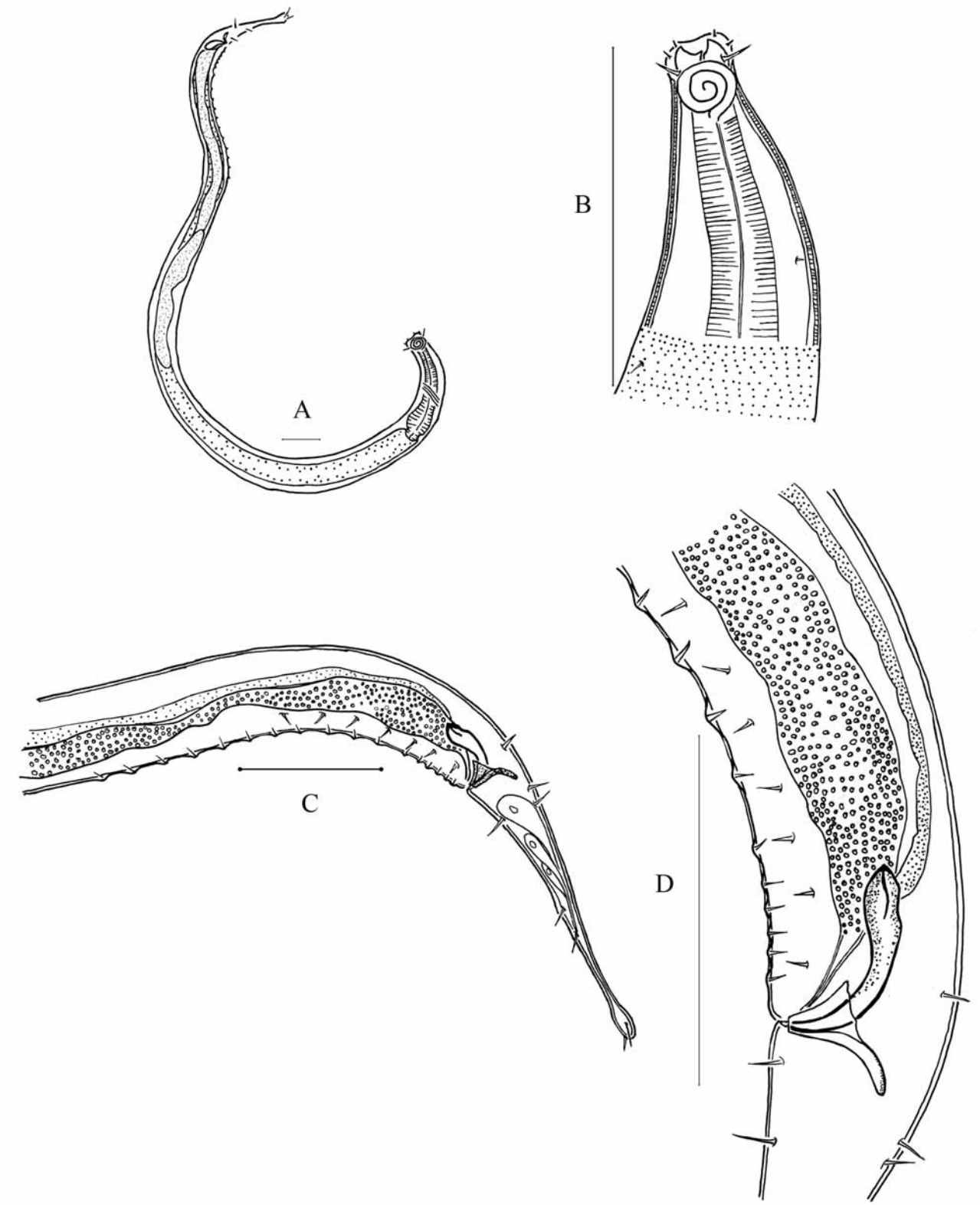

FIGURE 3. *Sabatieria ornata* Ditlevsen, 1918, details. A: male 1, total view; B: male 1, cephalic region; C: cloacal region; D: male 1, spicules. Scale bars: 100μm.

The glandular body of renetta cell sacciform, filled by granulated content. Ventral pore situated at the level of nerve ring, visible in one specimen. Distance between anterior end and excretory pore difficult to measure. Posterior part of renetta cell located below cardia. Distance between anterior end to the glandular body of renetta cell 153–168.3 μm in males and 153–183.6 μm in females.

TABLE 4. Morphometrics of *Sabatieria ornata* Ditlevsen, 1918 (all measurements are in µm unless otherwise stated, except ratios a, b, c and c').

	male 1	males (n=3)	females (n=3)
L	2332.4	1999–2499	2499–2832.2
a	34.3	32.2–35.7	23–32.2
b	9.3	6.4–9.9	7.6–10
c	9.3	8–13.3	9–9.9
V (%)			45–48.3
l.c.s.	4	4–5	3–4
l.s.s.	4	4–5	3–4
diam.c.s.	18	17–18	18
st.w.	7	6–7	7–8
st.l.	5	4–6	4–6
amph.w.	13	12–14	12–14
diam.amph.	17	17–18	16–17
dis.amph.	8	7–10	8–10
diam.n.r.	56	53–65	60–83
diam.ca.	65	58–74	83–93
ant.ren.	168.3	153–168.3	153–183.6
diam.midb.	68	62–77	97–108
a.b.d.	45	44–49	52–55
l.tail	250	187.5–219	250–313
c'	5.5	3.9–5.7	4.5–6
gub.ap.	22	22–25	
spic.chord	61.2	53.5–61.2	
spic.arch	61.2	61.2–76.5	
sup.an.	12	11–12	
eggs			50–84

Anterior and posterior testes outstretched and situated to the left of the intestine. Vas deferens lies to the right of intestine. Sperm cells inside the testes seed-like, filled very densely. Spicules short, arcuate, 61.2–76.5 µm (arch) and 53.5–61.2 µm (chord) with weakly visible thickenings at their ends. Proximally cephalic and distally acute. Gubernaculum with slightly arched dorso–caudal apophysis. Length of gubernaculum 22–25 µm. Long row of 17–18 midventral precloacal supplements present in males. All supplements bulging, cupola-shaped with axial canals. Distance from cloaca to the nearest cupola 11–12 µm. Five posteriormost supplements located very close to each other. The sixth supplements a little bit further from the fifth one; other 11 and 12 located at similar distance from each other. Additional precloacal setae (4–5 µm) located anterior to supplements.

Female reproductive system didelfic. Ovaries outstretched and of similar length. Anterior ovary to the left of intestine, the posterior one right. The width of the biggest egg in the oviduct is 84 µm in one female and 50 µm in the other two females.

Tail subdived into proximal conical and distal cylindrical parts. Length of the cylindrical part of tail more than 50% of the length of the conical one, with drop-like thickened tip. On the top of tail 3 caudal setae are visible. Short somatic setae sparsely distributed along conical part of the tail.

Remarks: Species from the Håkon Mosby resemble the *Sabatieria-ornata*-group based on the arrangement of precloacal supplements (5 supplements very close to each other), amphidial fovea with 3–4 turns, and slightly curved dorso-caudal apophyses. The male described by Ditlevsen (1918) was more slender

than specimens from the mud volcano (a=47 vs. a=34.3), with 14 precloacal supplements vs. 17-18 supplements in individuals from Håkon Mosby. All other measurements in the original description and all other descriptions (Platt 1985; Platt & Warwick 1988; Schuurmans Stekhoven 1946; Tchesunov 2000) are similar to those in the specimens from the Håkon Mosby mud volcano.

***Molgolaimus haakonmosbiensis* sp. n.**
Figures 4, Table 5

Type material: five males, three females. Glycerine slides. Holotype: male in glycerin slide No. D-1/18–1. Paratypes: males, nos. from D-1/18 to D-1/20; females, nos. from D-1/19 to D-1/21.

Type locality: Norwegian Sea, Håkon Mosby Mud Volcano, stations 283A, 283B. Sediment from the pogonophoran fields.

Etymology: referring to the Håkon Mosby Mud Volcano.

TABLE 5. Morphometrics of *Molgolaimus haakonmosbiensis* sp. n. (all measurements are in µm unless otherwise stated, except ratios a, b, c, c', l.tail/c, spic/abd, L/spic.arch, l.tail/spic.arch/a.b.d.).

	male 1	**males (n=4)**	**females (n=3)**
L	581.4	535.5–612	550.8–581.4
a	20.8	21.3–22.4	13.5–17.7
b	7.6	8.4–10	9–9.5
c	9.5	8.75–13.2	9–9.5
V (%)			41.7–52.6
l.c.s.	4	3	4
diam.c.s.	8	9	9
st.w.	1	1	1
st.l.	1	1	1
amph.w.	5	5	5
diam.amph.	10	10–11	10–11
dis.am.	11	10	10
diam.n.r.	21	20–23	21
diam.ca.	24	23–24	24–29
diam.midb.	28	26–28	31–43
a.b.d.	22	21–23	20–28
l.tail	61.2	61.2	61.2
c'	2.8	2–2.9	2.2–3.06
l.tail/c	6.4	6.1–6.9	6.4–6.8
gub.ap.	12.2	12.2	
spic.chord	24.4	24.4	
spic.arch	30.5	30.5	
suppl.an.	12.2	12.2	
sup–sup.	6.1	6.1	
eggs			23
spic/abd	1.4	1.32–1.45	
L/spic.arch	19.06	17.5–20	
l.tail/spic.arch/a.b.d	43.7	42.2–46.3	

Description: Body short, cylindrical. Cuticle finely striated, striation especially visible on the tail. Cuticle thickens at the head. Head small and wide, separated from body by small narrowing before head setae. Inner and outer labial sensilla indistinct.

Four cephalic setae 3–4 µm long, arranged slightly over the cephalic constriction. Amphidial fovea circular, distinctly sclerotized, 5–6 µm in diameter (45–50 % of c.b.d.). Distance from apex to anterior border of amphidial fovea 10–11 µm, identical for males and females. No somatic setae along the body.

Stoma small, very narrow, weakly sclerotized, without teeth. Oesophagus narrow, cylindrical, and muscular along its entire length, posteriorly forming a pronounced spherical bulb. Diameter of the bulb 20 µm. Intestine gleam well looked through. Cardia small and extended.

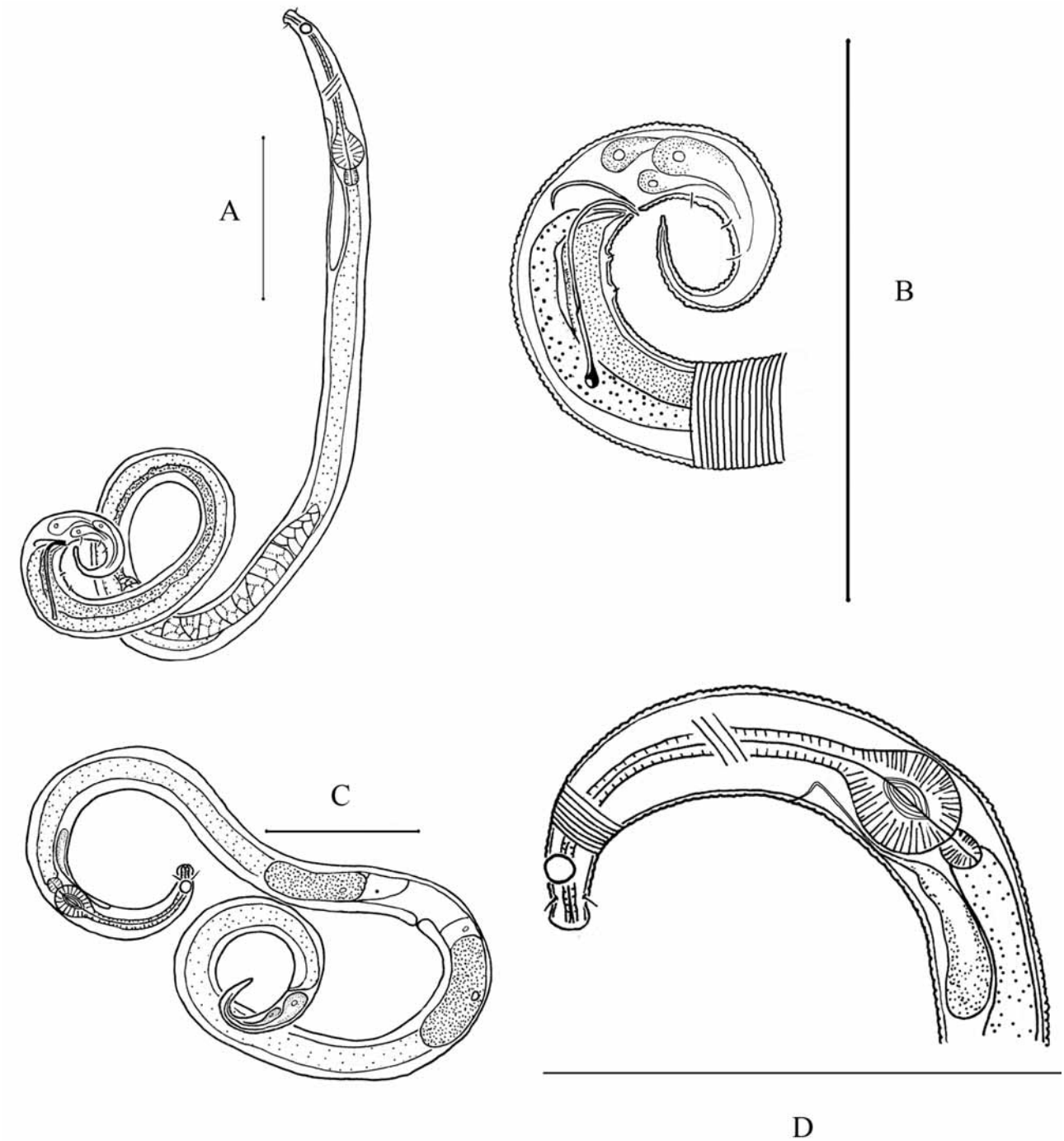

FIGURE 4. *Molgolaimus haakonmosbiensis* sp. n., details. A: holotype male, total view; B: holotype male, cloacal region; C paratype female, total view; D paratype female, cephalic region. Scale bars: 50 µm

Glandular body of the renetta cell porrect, lies below cardia at the ventral side of the body. Excretory pore located between the nervous ring and bulb.

Male reproductive system monorchic. Outstretched testis situated to the left of intestine. Vas deferens long and thin. Spermatozoa oval and trapezium-shape filling the testes very dense.

Spicules short, thin, flexuous, ventrally bent, with dilated and excurved proximal parts. Length of spicules 30.5 µm (arch), and 24.4 µm (chord). Relation of spicules length vs. a.b.d. 1.32–1.45.

Gubernaculum with thin, long, claw–like, hamose front apophysis. Length of apophysis 12.2 µm. The two precloacal papilla formed supplements with short terminal setae present in all males. Distance between anus and nearest supplement 12.2 µm. Distance between two supplements 6.1 µm.

Female reproductive system didelphic, with reflexed ovaries. Anterior ovary slightly longer than posterior one. The ovaries located to the left of the intestine. A formed egg well visible only in a single female, its diameter in the oviduct is 23 µm.

Tail conical, evenly tapering. Relation of spicules length vs. a.b.d. is 2–2.9. Relation of body length vs. spicules length is 17.5–20. Relation of the tail length vs. spicules length/a.b.d. is 42.2–46.3. The row of somatic setae 1–2 µm long present at the ventral side of the tail.

Diagnosis: Short body length (550.8–612 µm), relatively large head diameter (7–9 µm). Cuticle finely striated. Amphidial fovea circular, distinctly sclerotized. Stoma small, narrow, without teeth. Oesophagus narrow, posteriorly forming a pronounced spherical bulb. Female reproductive system didelphic, both ovaries reflexed, located to the left of intestine. Monorchic, outstretched testis. Slender short spicules with amplated and excurved proximal parts. Clawform and hamose front apophysis. Two precloacal supplements. Tail conical.

Discussion: Based on the set of measurements, specimens from Håkon Mosby Mud Volcano belong to group 1a sensu Fonseca *et al.* (2006). New species differs from 5 known species of the group 1a by length and form of spicules and apophyses. *M. citrus* Gerlach, 1959 and *M. lazonus* Vitiello, 1971 have more straight and short (15 µm and 21 µm vs. 30.5 µm) spicules. In *M. turgofrons* Lorenzen, 1972 and *M. cuanensis* Platt, 1973 the body is longer than in the new species (746 µm and 1200–1500 µm vs. 536–612 µm). *M. lazonus* Vitiello, 1971 and *M. turgofrons* Lorenzen, 1972 lack the precloacal supplements. *M. parallgeni* Vitiello and Boucher, 1971 differs from the new species by having longer cephalic setae (6 µm vs. 3–4 µm) and more curved spicules.

The new species resembles *M. exceptionregulum* Fonseca *et al.*, 2006 in the ratio of body length to spicules length. However, *M. exceptionregulum* differs from *M. haakonmosbiensis* sp.n. by the form of spicules (with a pronounced capitulum and ventrally curved blade), longer gubernaculum (19 µm vs. 12.2 µm), presence of only one precloacal supplement and digitate prolongation on its tail.

***Aponema ninae* sp. n.**
Figures 5, Table 6

Type material: 6 males, 4 females. Holotype: male in glycerin slide No. D–1/14–3. Paratypes: males, Nos. from D-1/14 to D-1/17; females, Nos. from D-1/14 to D-1/15.

Type locality: Norwegian Sea, Håkon Mosby Mud Volcano, southern rim, depth 1288m and 1287m. Sediment from the pogonophoran fields.

Etymology: named in honour of the author's mother Nina V. Portnova.

Description: Body short, slender. Cuticle thin and finely striated. Striation is easily visible all over the body. Four rows of pores associated with hypodermal glands situated sublateral along the whole body.

Amphidial fovea distinctly sclerotized and circular, with interruption in the posterior part 4–5 µm, in diameter (about 44.4–55.5 % of c.b.d). Distance from cephalic end to anterior border of amphidial fovea 10–12 µm. Head small, offset by a slight constriction, with four cephalic setae, 2.5–3 µm long. Inner and outer labial sensilla not visible using light microscope. Somatic setae 2–4 µm long, scattered along the body.

Stoma small, narrow and weakly sclerotized. The dorsal thickening of cuticle observed in buccal cavity. This thickening resembles the subventral tooth described by other authors. Obvious dorsal and subventral teeth not present. Oesophagus cylindrical and muscular along its entire length. Posteriorly it is enlarged into spherical bulb 18 µm by width and 20 µm by length. Intestine gleam examined. Cardia small, oval. Glandular body of renetta cell sacciform, extended, with granular content.

Single anterior testis to the left side of intestine. Spicules are short, curved, slightly widened and cephalated proximally, 18.3 µm (arch), 12.2 µm (chord). Gubernaculum strongly sclerotized with wide and bevelled top to the apophyses, 6.1 µm long. Sperm cells of irregular form, densely filled testis. Precloacal supplements absent.

The female reproductive system didelphic, posterior and anterior ovaries of equal length, outstretched. The ovaries located to the right of the intestine. The width of the biggest formed eggs in the oviduct was 18–28 µm.

Tail long, slender, narrowed, with drop–shaped tip, 3.2–3.6 a.b.d in males and 3.8–4.4 a.b.d. in females. One caudal seta on the terminal part of the tail, 3–4 µm long.

TABLE 6. Morphometrics of *Aponema ninae* sp.n**.** (all measurements are in µm unless otherwise stated, except ratios a, b, c and c').

	male 1	**males (n=5)**	**female (n=4)**
L	382.5	351.9–382.5	367.2–382.5
a	16	17.4–19.5	10.5–16
b	6.25	5.2–6.25	6–6.3
c	6.25	5.7–6.25	6–6.3
V (%)			39.5–52
l.c.s.	2.5	3	3
l.s.s.	2	2–4	2
diam.c.s.	7	6	6–8
st.w.	2	1.5–2	1.5
st.l.	4	5	5
amph.w.	4	4	4
diam.amph.	8	8	9
dis.amph.	11	11	10
diam.n.r.	19	17–19	15–22
diam.ca.	22	20–23	21–27
diam.midb.	24	18–22	23–37
a.b.d.	19	17–18	14–16
l.tail	61.2	61.2–64.3	61.2
c'	3.2	3.6	4
gub.ap.	6.1	6.1	
spic.chord	12.2	12.2	
spic.arch	18.3	18.3	
eggs			18–28

Diagnosis: Body short, cuticle thin and striated. Amphidial fovea circular in outline with interruption in the posterior part. Monorchic, anterior testis to the left side of intestine. Gubernaculum with wide, beveled on the top apophysis. The female reproductive system didelphic, both ovaries similar in length, outstretched. Tail elongated, narrowed and the end of the tail drop–shape, tip thickened with caudal setae.

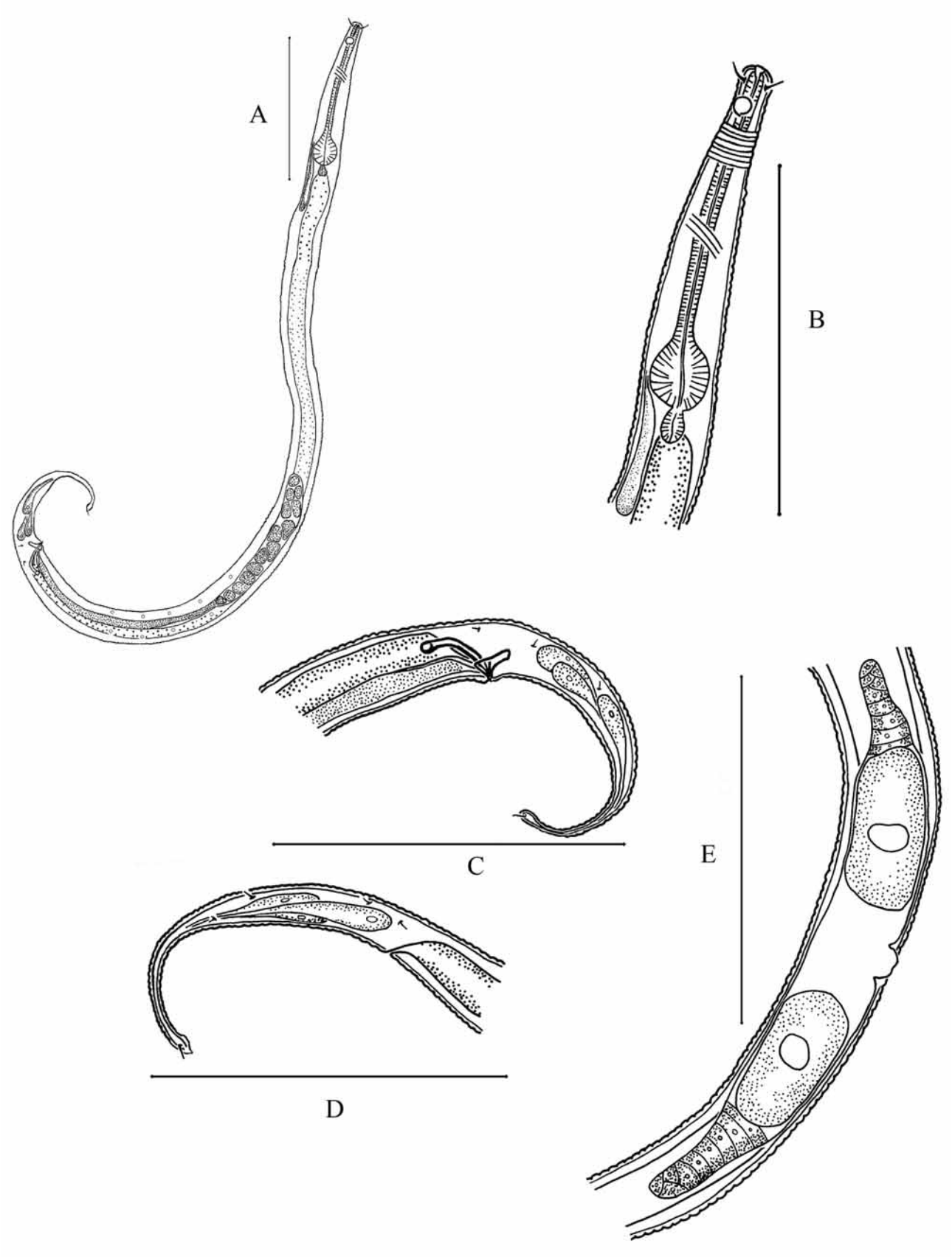

FIGURE 5. *Aponema ninae* sp.n., sp.n., details. A: Holotype male, total view; B: holotype male, cephalic region; C: holotype male, tail region; D: paratype female, tail region; E: paratype female, vulva. Scale bars: A–C 50 µm; D–E 100 µm.

Discussion: The new species differs from the all known *Aponema* species by its small length (352–382.5µm). It mostly resembles *A. mnazi, A. nympha, A. decramerae* and *A. torosa*. The new species of *Aponema* differs from *A. mnazi* Mithumbi & Vincx, 1999 by curved spicules and lack of precloacal supplement. *A. ninae* sp.n. differs from *A. nympha* Bussau & Vopel, 1999 and *A. decramerae* Mithumbi & Vincx, 1999 by the absence of sexual dimorphism in diameter of amphidial fovea. It most resembles *A. torosa* Lorenzen, 1973. However, the new species differs by shorter body (352–382.5 µm vs. 740 µm), shorter spicules (18.3 µm vs. 35–37 µm) and slender tail.

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