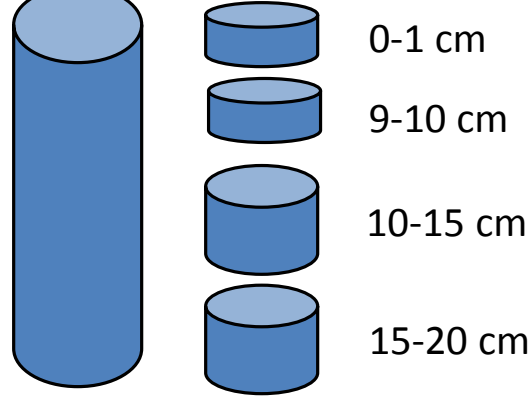
A microscopic image of a nematode, showing its segmented body and head region. The nematode is oriented vertically, with its head at the top. The body is covered in numerous small, dark, circular structures, likely representing internal organs or cells. The background is a light, slightly textured surface.

Nematode biomass and morphometric attributes as biological indicators of local environmental conditions in Arctic fjords

Katarzyna Grzelak, Marta Gluchowska, Klaudia Gregorczyk, Aleksandra Winogradow & Jan Marcin Węstawski

manuskrypt przyjęty do publikacji w Ecological Indicators

Meiofauna



500 μm - 32 μm

Gastrotricha



Loricifera



Ostracoda



Kinoryncha



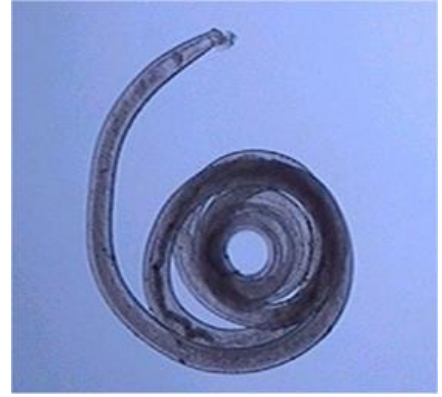
Tardigrada



Harpacticoida

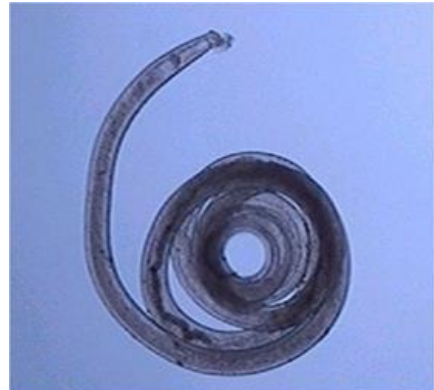


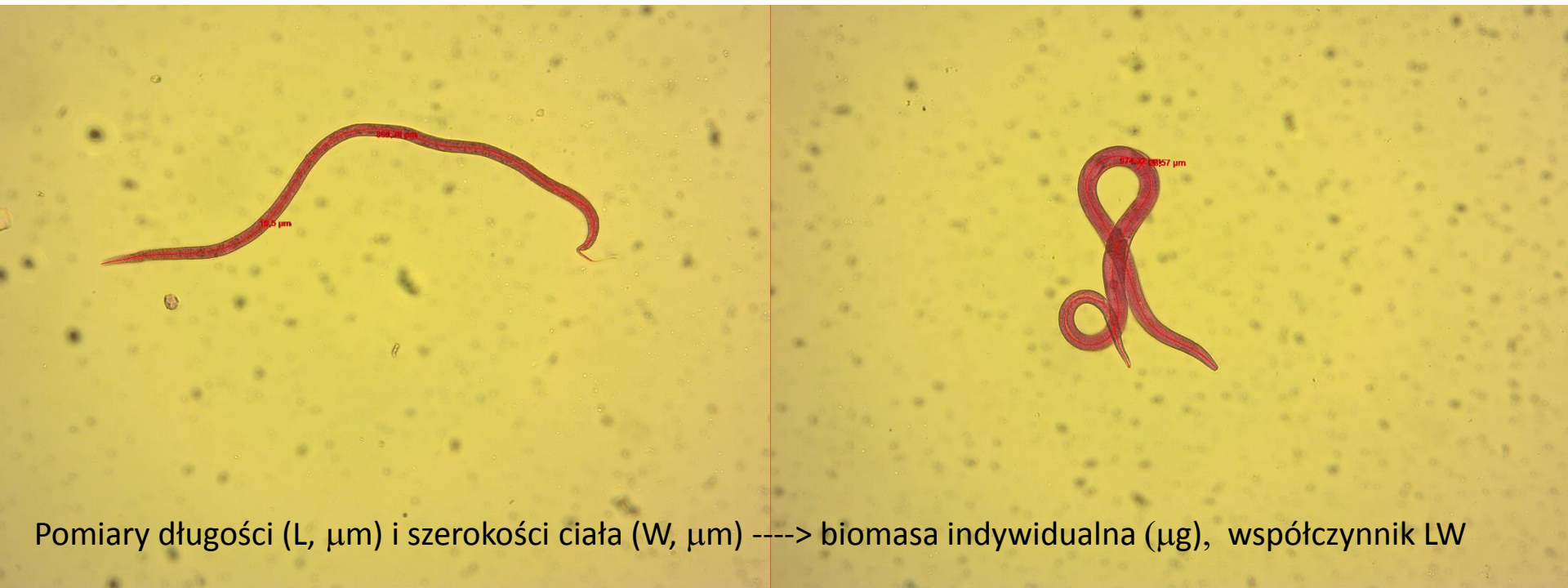
Nematoda



Nematoda

(3) Tv123 (100%)





Q: Does quality and quantity of the organic matter flux to the seabed lead to differing biogeochemical properties in the sediments and, consequently, to differences in the morphological characteristics of the nematodes inhabiting the two fjords?

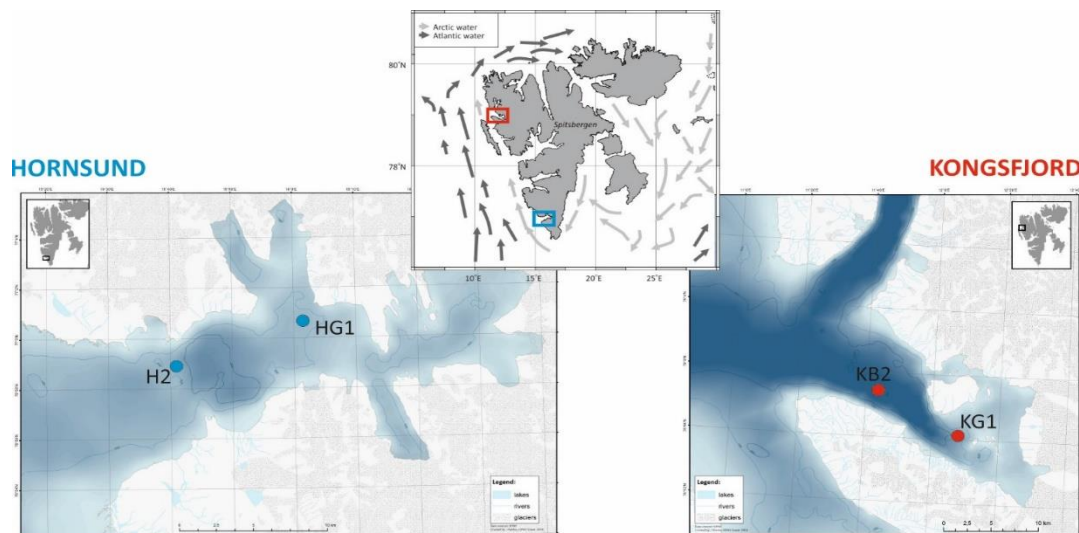


Fig. 1 Map of the Svalbard Archipelago showing the location of Hornsund and Kongsfjord and sampling stations

Table 1. Coordinates of the sampling stations, together with the characteristics and chemical composition of the sediments: chlorophyll *a* concentration (chl *a*), organic carbon-to-nitrogen ratio (C/N), organic carbon content (C_{org}), and carbon isotopic composition values ($\delta^{13}C_{org}$); mean (min–max)

Fjord	Hornsund		Kongsfjord	
Station	HG1 (inner)	H2 (central)	KG1 (inner)	KB2 (central)
Latitude (°N)	77°00.02'N	76°58.77'N	78°55.85'N	78°58.69'N
Longitude (E)	16°05.44'E	15°42.30'E	12°08.37'E	11°42.79'E
depth (m)	78	145	105	310
POC _{flux} (g/m ² /24h)	3.6-5.2	0.8-1.3	12.4-13.0	2.8-4.1
mean (mm)	15.06 (14.0-17.2)	16.04 (12.3-18.9)	15.15 (14.2-17.2)	14.97 (14.2-15.4)
sorting (mm)	2.89 (2.5-3.3)	3.13 (2.3-4.5)	2.54 (2.4-2.9)	2.46 (2.3-2.5)
chl <i>a</i> (mg/g)	2.03 (0.7-3.5)	0.84 (0.5-1.2)	2.04 (0.7-3.0)	1.54 (0.7-2.9)
C/N	8.24 (7.1-8.6)	9.38 (9.0-9.5)	6.09 (5.7-6.2)	8.08 (7.8-8.2)
C_{org} (%)	1.36 (1.2-1.5)	1.26 (1.1-1.3)	0.46 (0.3-0.6)	1.21 (1.0-1.4)
$\delta^{13}C_{org}$ (‰)	-24.56 (-24.9-24.0)	-23.86 (-24.1-23.8)	-22.47 (-22.6-22.2)	-22.16 (-22.3-22.0)

Table 2. Results of multivariate (granulometric characteristics) and univariate PERMANOVA tests for differences in environmental variables between fjords (Fj), basins (Ba) and among sediment layers (Sl); significant effect: *p < 0.05, **p < 0.001 are indicated next to the values of PERMANOVA 'pseudo' F statistics (Pseudo-F)

Source	Granulometric			chl a		C/N		C _{org}		δ ¹³ C _{org}	
	df	MS	Pseudo-F	MS	Pseudo-F	MS	Pseudo-F	MS	Pseudo-F	MS	Pseudo-F
Fj	1	0.304	1.603	0.670	2.318	14.909	141.080**	1.144	96.255**	17.886	484.580**
Ba	1	0.028	0.147	3.697	12.790*	12.183	115.290**	0.530	44.585**	1.290	34.959**
Sl	4	0.109	0.576	2.545	8.805*	0.272	2.576	0.026	2.167	0.070	1.898
FjxBa	1	0.093	0.489	0.663	2.292	0.875	8.278*	0.923	77.712**	0.188	5.081
FjxSl	4	0.194	1.025	0.062	0.213	0.149	1.406	0.023	1.959	0.014	0.375
BaxSl	4	0.192	1.014	0.528	1.828	0.065	0.620	0.004	0.330	0.074	2.004
Res	4	0.190		0.289		0.106		0.012		0.037	
Total	19										

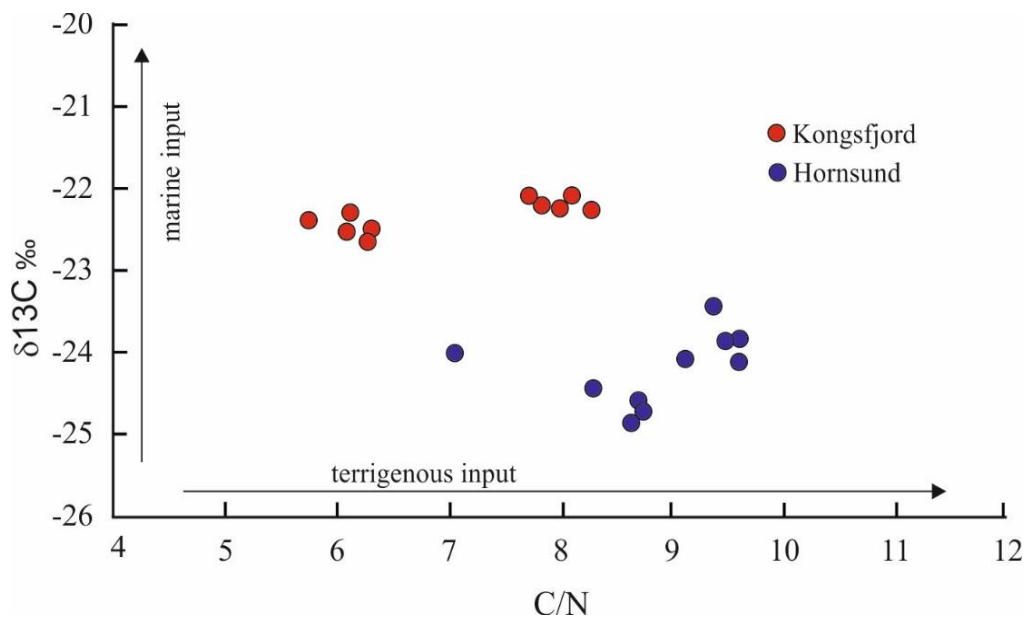


Fig. 2 Relationship between C/N ratio and δ¹³C_{org} values indicating source and fate of organic matter in the investigated fjords

Table 3. Mean values (mean \pm SE) of nematode total abundance, total biomass, body length, width, the L/W ratio and individual biomass; for length, width and individual biomass, geometric means/arithmetic means are presented

Fjord	Hornsund		Kongsfjord	
Station	HG1 (inner)	H2 (central)	KG1 (inner)	KB2 (central)
Abundance (ind./10cm ²)	8547 \pm 2107.4	4477 \pm 1255.7	11650 \pm 196.3	5119 \pm 104.9
Biomass(mg/10cm ²)	1189	517	1606	950
Length (mm)	673.8/765.4	756.9/869.5	622.4/775.6	843.4/976.1
Width (mm)	24.3/26.5	24.1/26.9	27.2/29.9	28.8/32.6
L/W	27.7/30.9	31.3/34.0	22.8/26.8	29.2/31.6
Ind. Biomass(mg)	0.062/0.148	0.069/0.300	0.072/0.262	0.109/0.341

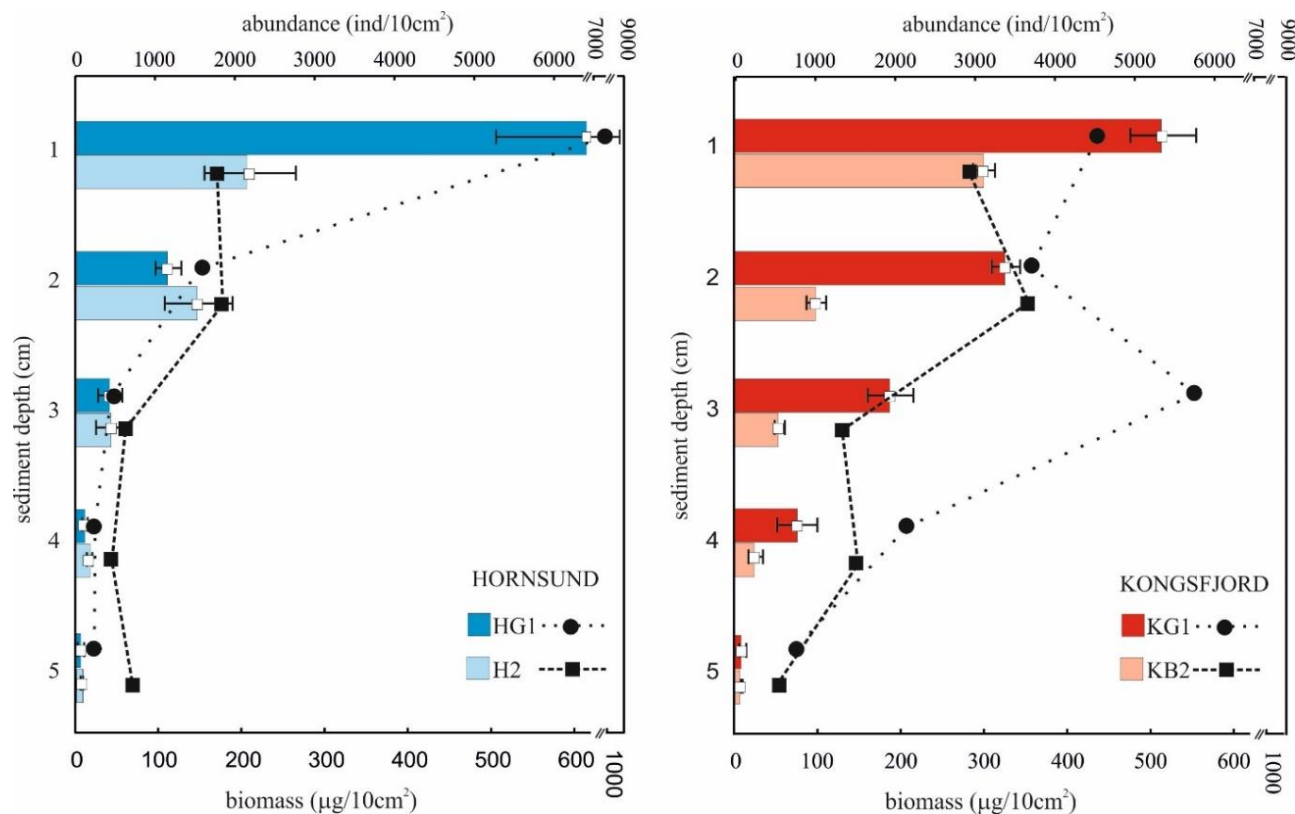


Fig. 3 Mean nematode abundance (\pm SE) (bars) and biomass (dotted lines) along the vertical profile of the sediment

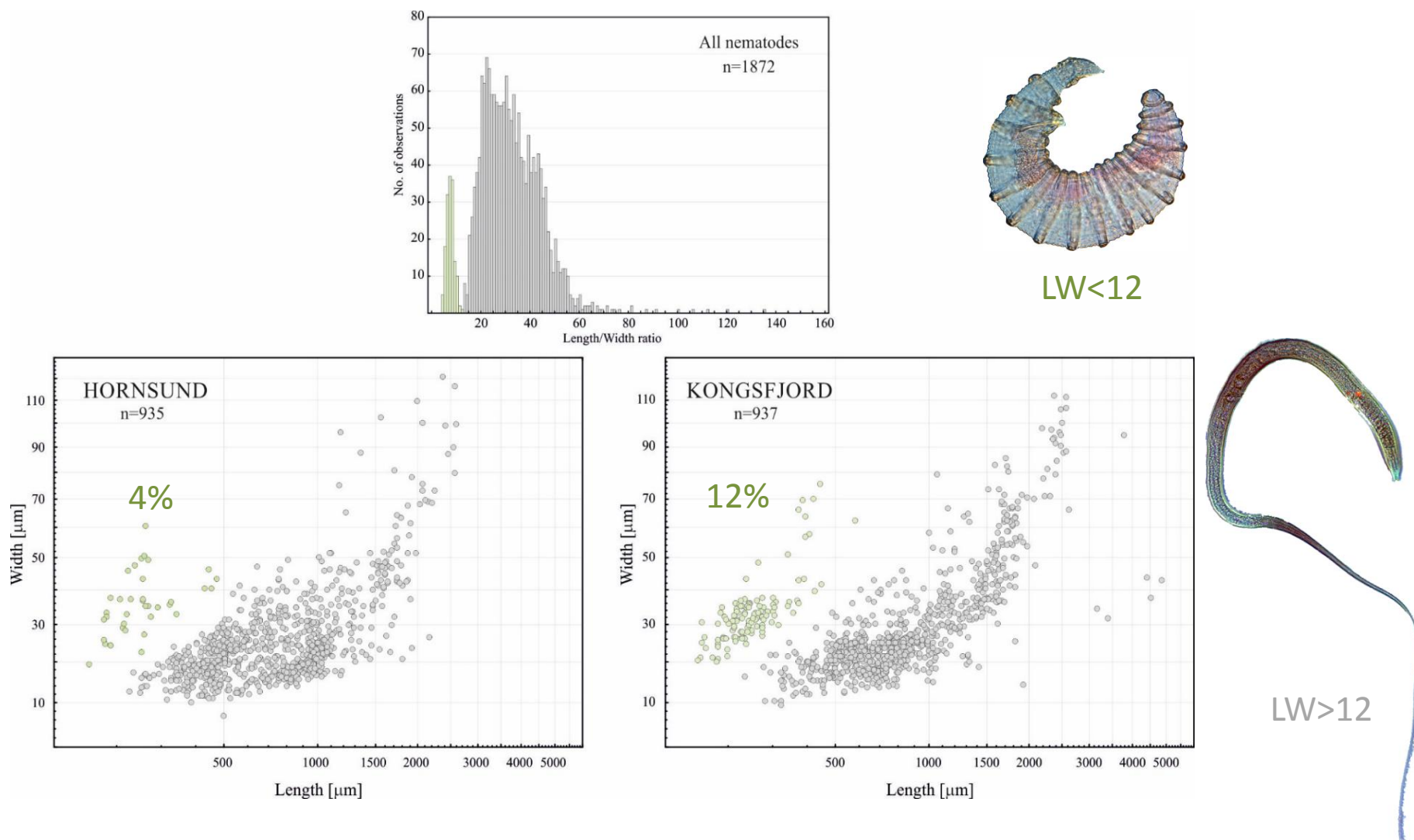


Fig. 4 Morphological diversity of Spitsbergen nematodes. Upper graph: L/W histogram for all available data; lower graphs: L/W relationship plots (log scale) for the fjords. Coloration is a function of L/W ratio values: LW < 12 – green (group I), LW > 12 – grey (group II)

Grupa I – LW<12



rodzina Desmoscolecidae

Grupa II – LW>12

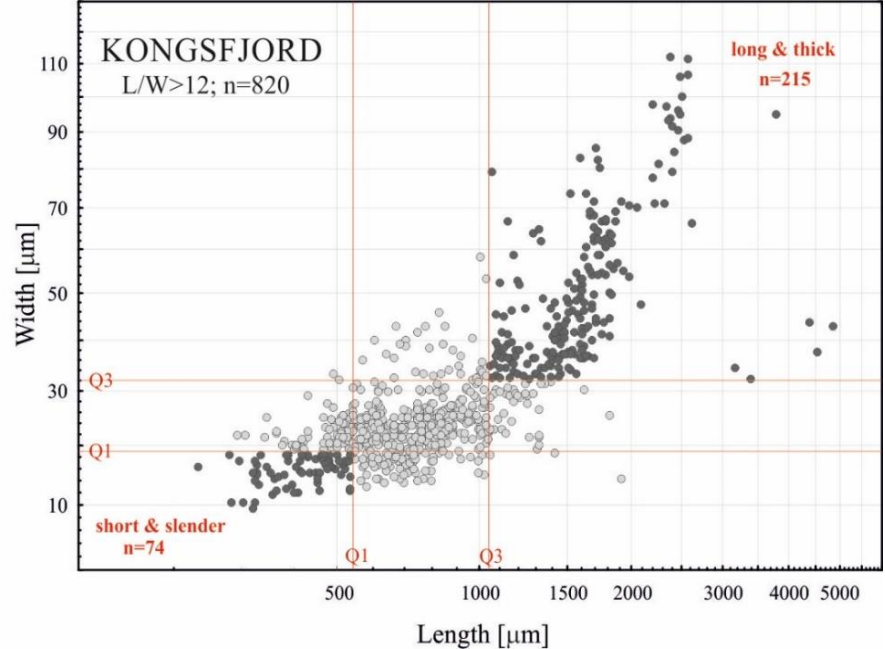
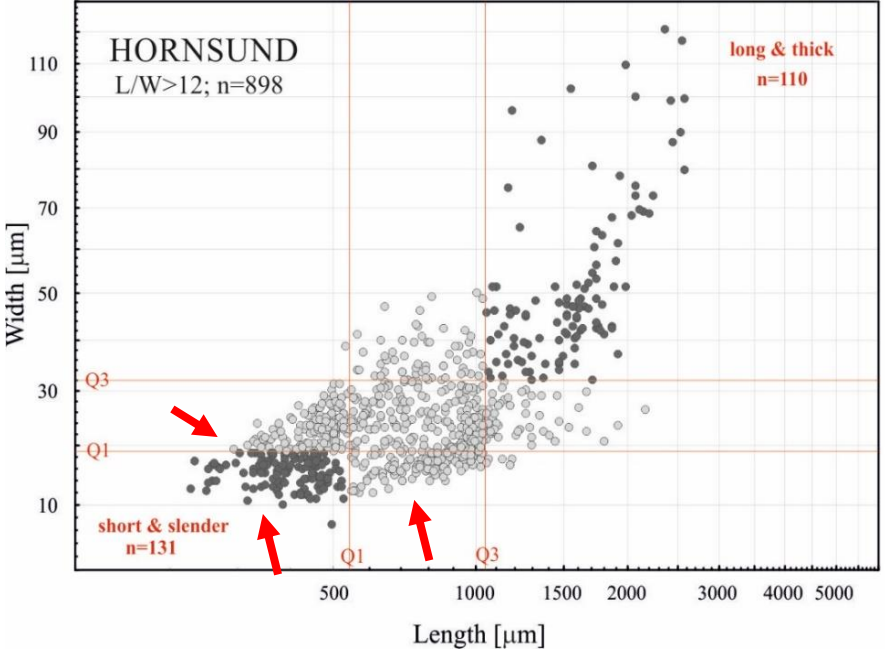
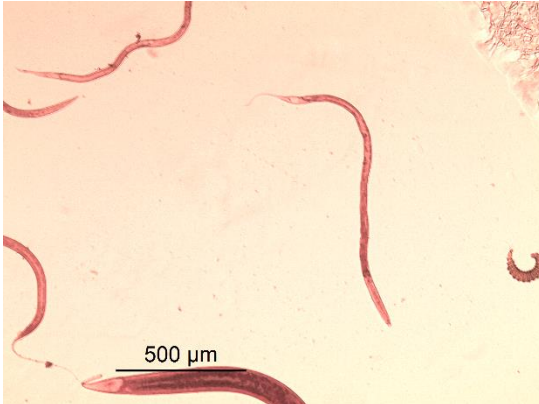
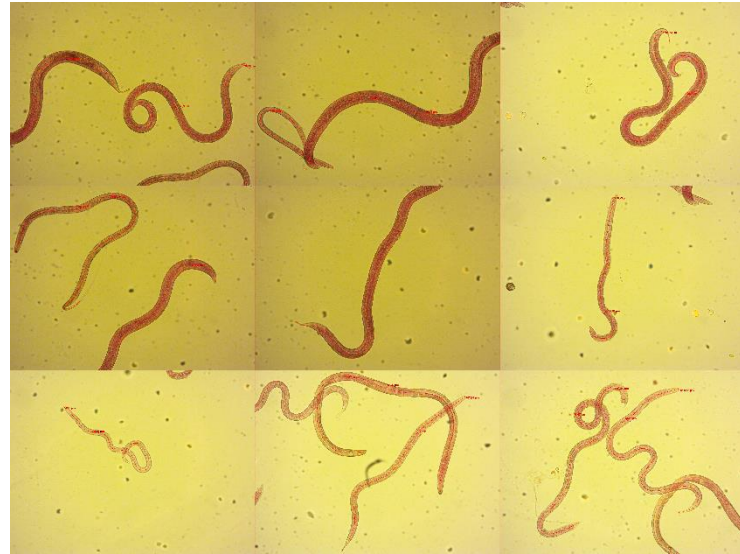
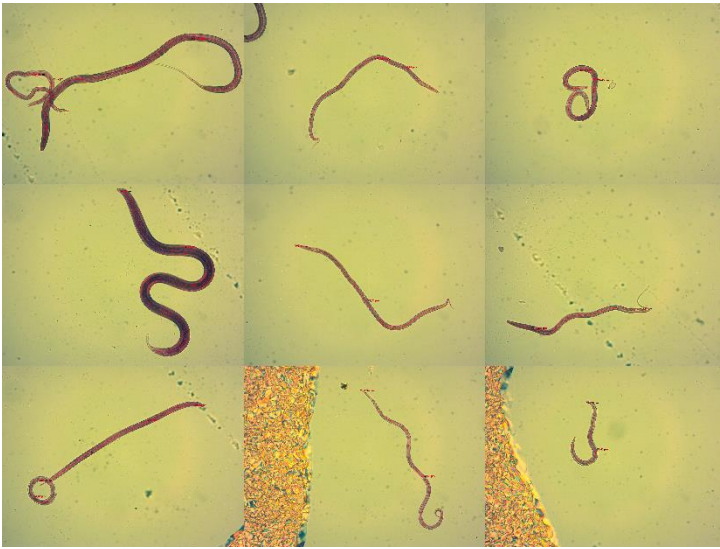


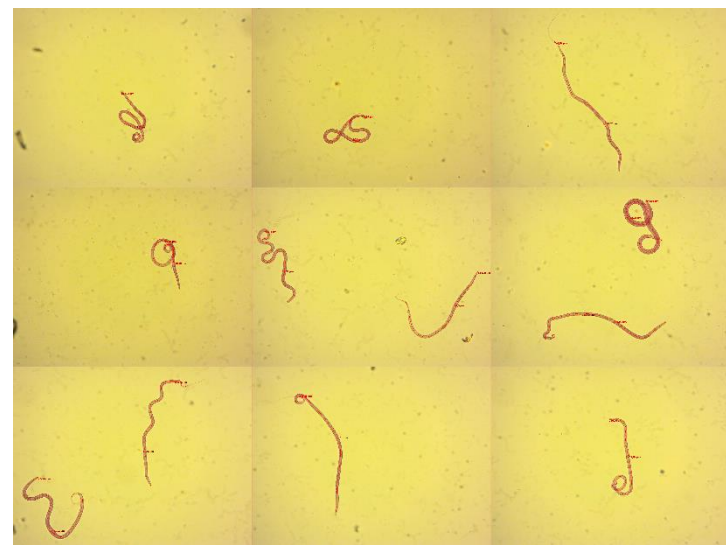
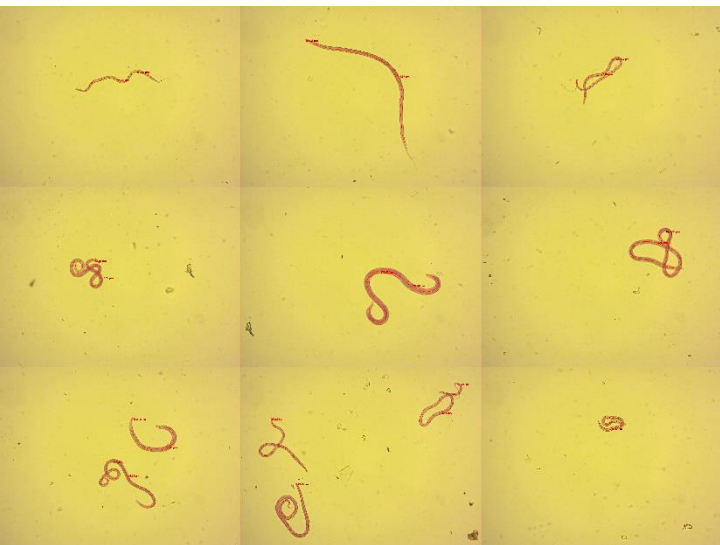
Fig. 5 Length–width relationship plots (log scale) for group II ($L/W > 12$) nematodes, with indications for the first and third quartiles (Q1, Q3)



KONGSFJORD: long&thick



HORNSUND: short&slender, medium&slender, short&medium



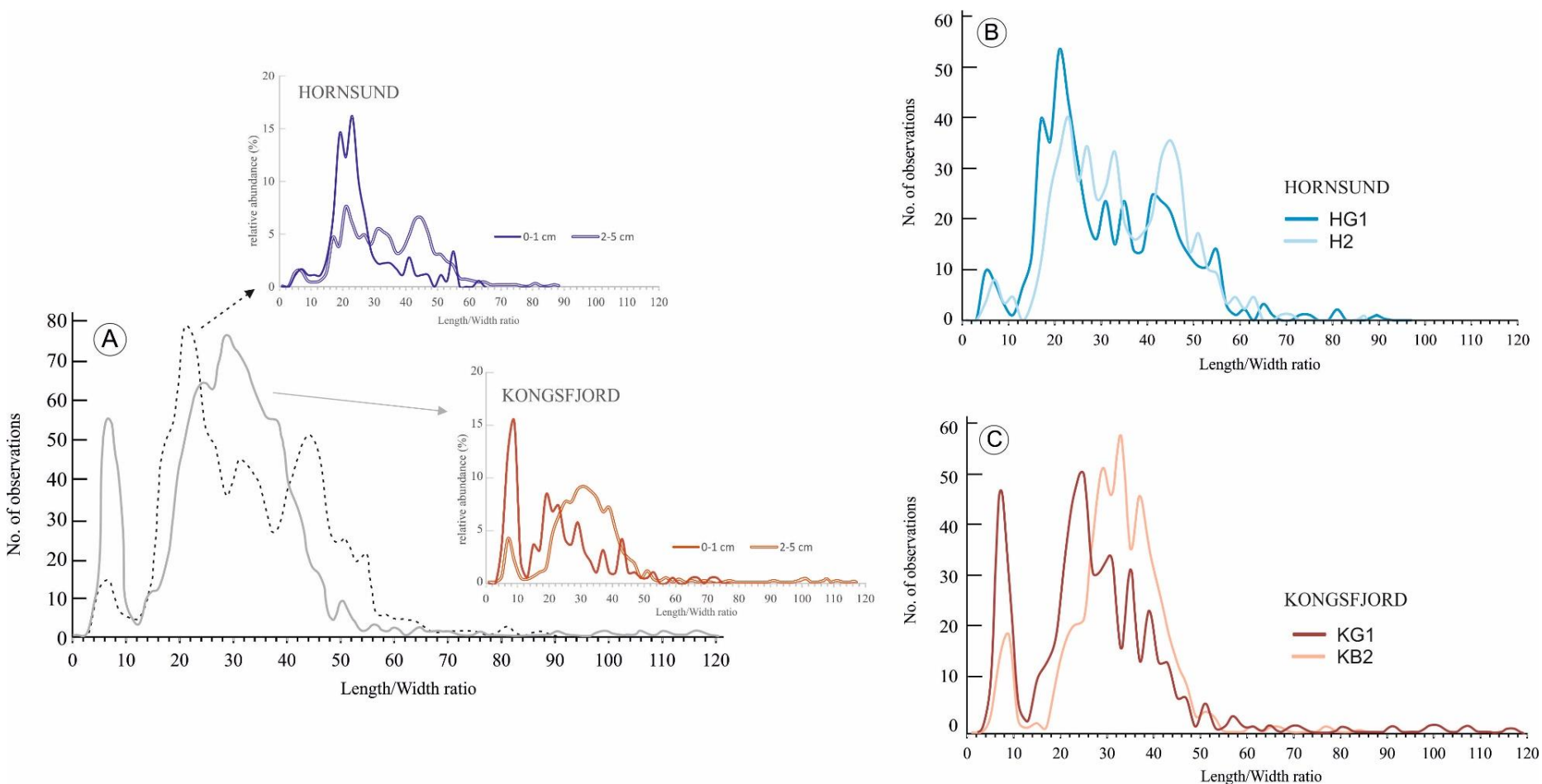


Fig. 6 Length/width ratio distribution plots for nematode assemblages for A) Hornsund and Kongsfjord (large plot), for the surface layer (0–1 cm) and at lower depths (2–5 cm), separately in both fjords (smaller panels) – due to the high disproportion in the number of measurements for the surface layer and deeper depths, the relative abundance of nematodes in L/W classes is presented; B) Hornsund central and outer basin; C) Kongsfjord central and outer basin

Nematode Biomass Spectra (Vanaverbeke et al., 2003)

e.g. the biomass in size class 1 is the sum of the biomass of all organisms with a dry weight range of $\geq 2^1$ to $< 2^2$, which is $\geq 2 \mu\text{g}$ to $< 4 \mu\text{g}$

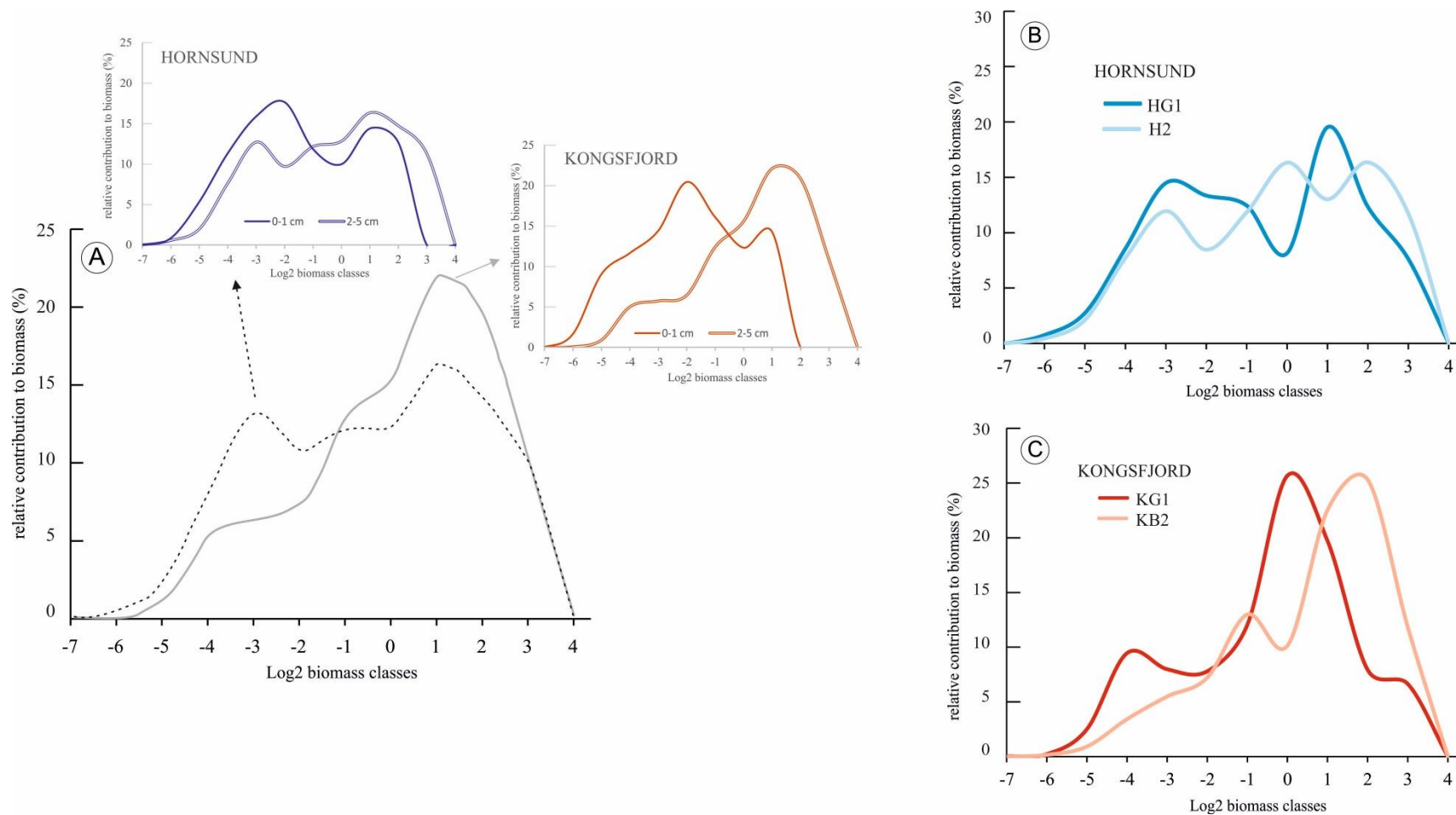
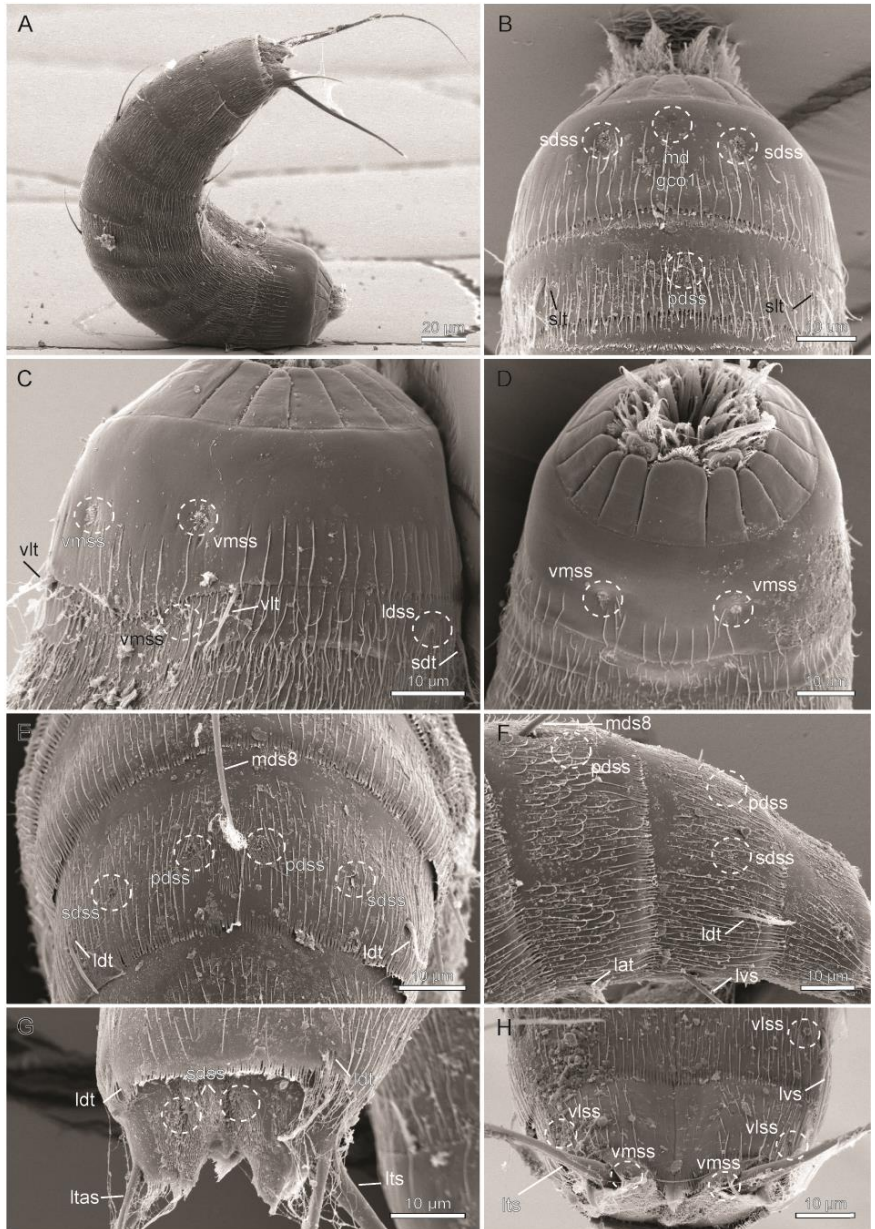
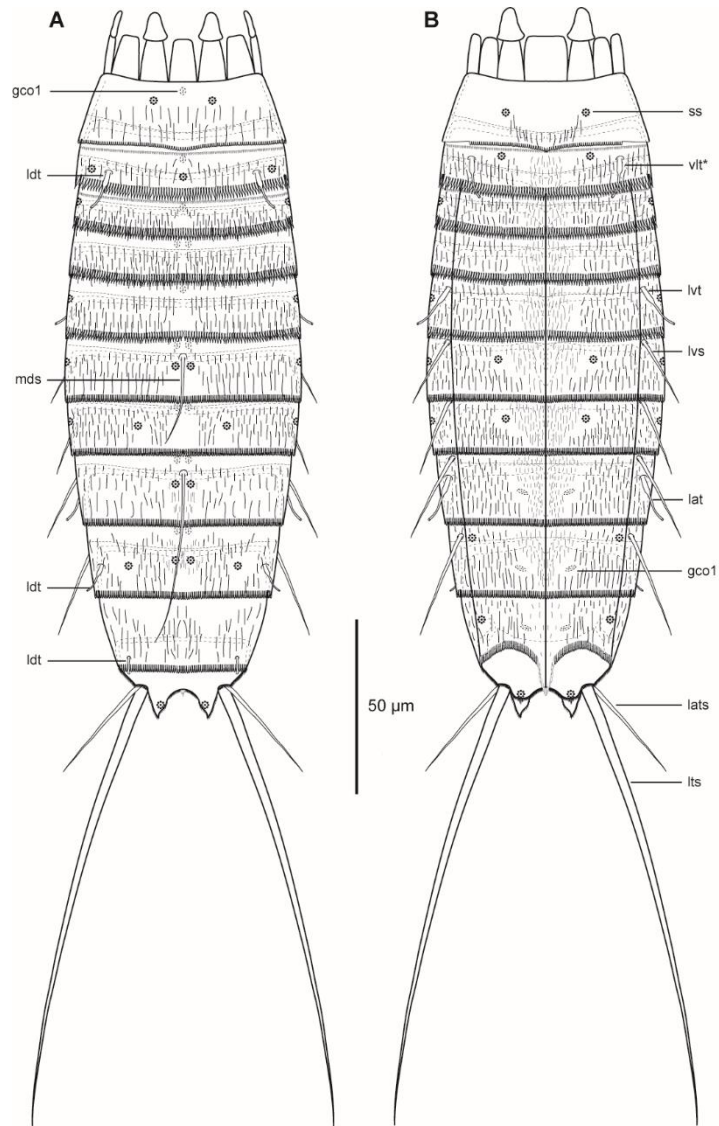


Fig. 7 Biomass spectra for nematode assemblages for A) Hornsund and Kongsfjord (large plot), for the surface layer (0–1 cm) and at lower depths (2–5 cm), separately in both fjords (smaller panels); B) Hornsund central and outer basin; C) Kongsfjord central and outer basin

W trakcie realizacji

- Analiza taksonomiczna Nematoda
- Określenie grup troficznych
- Bioróżnorodność Kinorhyncha fiordów- manuskrypt w trakcie przygotowań, pismo docelowe *Marine Biodiversity*

Echinoderes sp.nov.

Echinoderes sp.nov.

Character	n	Range	Mean	SD
TL	15	197 – 289	246	28.97
MSW-6	11	52 – 60	57	2.65
MSW-6/TL	11	21.0 – 29.0%	24%	2.51
SW-10	12	42 – 53	49	3.20
SW-10/TL	12	17.0 – 24.0%	20.3%	2.22
S1	15	23 – 27	26	1.12
S2	15	21 – 26	24	1.66
S3	15	24 – 29	26	1.88
S4	15	26 – 31	28	1.39
S5	15	28 – 34	31	1.53
S6	15	32 – 38	34	2.10
S7	15	33 – 40	36	2.10
S8	15	36 – 41	39	1.64
S9	15	39 – 45	41	1.77
S10	14	32 – 39	35	2.12
S11	15	21 – 26	23	1.81
MD6 (ac)	14	25 – 36	32	3.03
MD8 (ac)	15	47 – 54	50	1.88
LV5 (tu)	11	11 – 14	13	1.19
LV6 (ac)	13	17 – 24	20	1.89
LV7 (ac)	14	22 – 26	24	1.46
LA8 (ac)	15	25 – 29	27	1.37
LV9 (ac)	15	29 – 32	30	0.90
LTS	14	126 – 144	132	4.99
LTS/TL	14	46.5 – 65.5%	54.7%	6.42%
LTAS	15	28 – 32	30	1.20