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Recent benthic Ostracoda from Hornsund, south Spitsbergen, Svalbard Archipelago

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Abstract: This paper includes a check-list of Recent Svalbard marine ostracods based on published sources and on diploma theses as well as some new studies. This is the first study of this group of crustaceans from Hornsund. A total of 41 species belonging to 12 families were collected at 55 sampling stations from dredged sediments. Seven species are reported for the first time from the Svalbard Archipelago. *Polycope orbicularis* Sars is the most abundant species in the present fauna. Species compositions of Hornsund and the Liefdefjorden are seen to have the highest similarity (S = 50.6).

Key words: Arctic, Svalbard, Ostracoda, Recent.

Introduction

Although the history of ostracod investigation of Svalbard is more than 150 years old, our knowledge of this group of meiofauna remains unsatisfactory. Distribution and details of the morphology of individual species was described, *e.g.* by Brady (1868), Sars (1866, 1922–1928), Scott (1899), Skogsberg (1920), Elofson (1941) and Klie (1942). However, this literature, apart from Klie's paper (1942), gives no data on species abundances. During the last 60 years, only four papers have been published on the taxonomy and ecology of Ostracoda in this region. Neale and Howe (1975) examined the Spitsbergen Shelf fauna, while Hartmann (1992, 1993, 1994) studied marine ostracod faunas from the littoral waters of the Liefdefjorden (N Spitsbergen). There are several papers regarding frequency and biomass of Ostracoda as a group, but none of these include taxonomic data (Węsławski *et al*. 1990; Kotwicki *et al*. 2004).

Ostracods constitute a minor component of the total meiofauna of shelf seas, but they are one of the microfossil groups most useful for palaeoenvironmental studies.

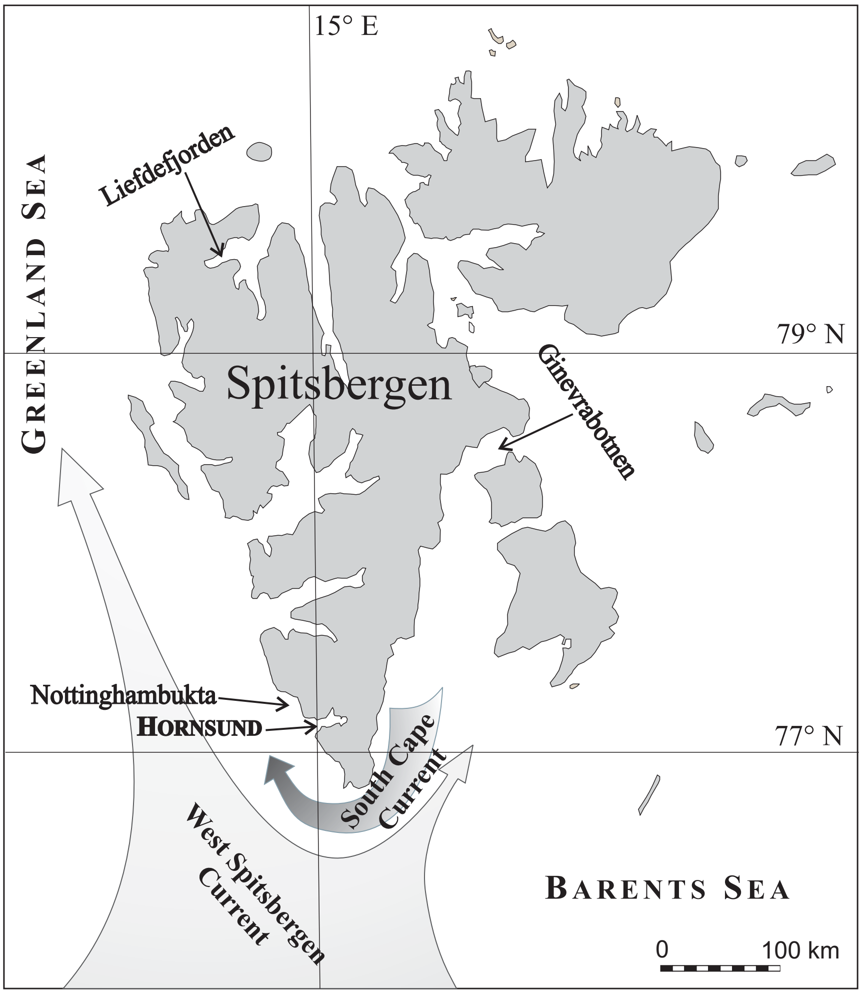

Fig. 1. Map of the Svalbard Archipelago with investigated area.

This paper represents a first attempt to list the ostracod fauna from the Hornsund fiord – a place nominated as one of the European Marine Biodiversity Focal Sites (www.biomareweb.org).

Study area

Hornsund is a medium sized fiord situated on the southern tip of Spitsbergen (Fig. 1). The cold South Cape Current and the relatively warm West Spitsbergen Current have an effect on hydrological conditions (Swerpel 1985). The temperature of the bottom layer varies greatly in time and space. Generally in summer, the

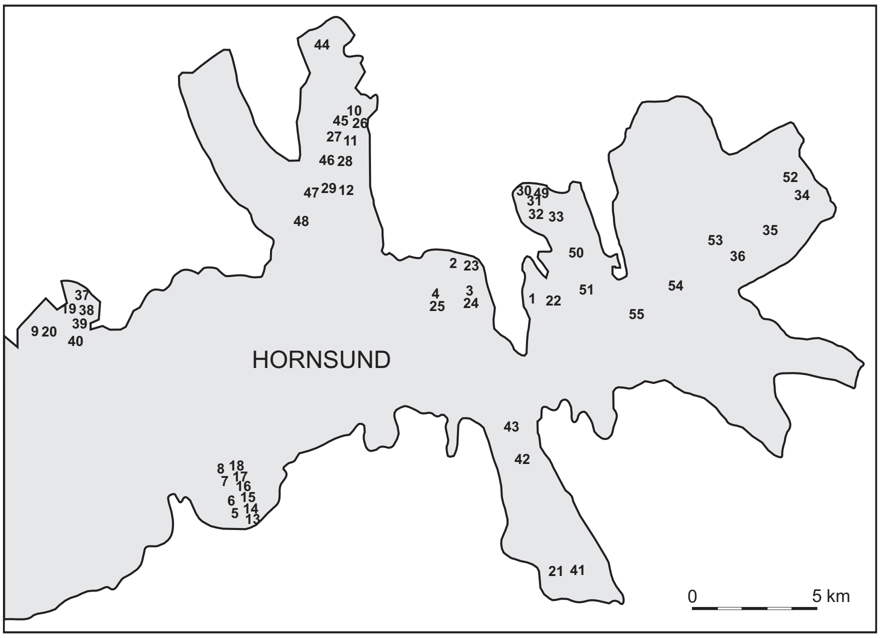

Fig. 2. Map showing location of sampling stations in Hornsund.

temperature oscillates between about 0°C in the outer and central basins, and –1.9°C in the inner area (Urbański *et al.* 1980). In winter, it is nearly –2°C in the entire fiord (Görlich and Stepko 1992). Bottom salinity ranges from approximately 33 to 35 in the practical salinity units. The complicated coast line is formed mainly by tidal glaciers. Few lateral bays in the fiord represent diversified habitats.

Materials and method

Dredged sediment samples were collected from seven bays in the fiord during the 1990 (stations 1–5), 1991 (stations 6–12), 2000 (stations 13–36) and 2003 (stations 37–55) summer seasons. Distributions of the sampling stations are shown in Fig. 2. A total of 55 samples were taken from water depths between 0.5 and 135 m (Table 1).

Sediments were washed over 0.075 mm sieves and preserved in a 4% buffered formaldehyde solution or in a 96% alcohol. In the laboratory, ostracods were picked and identified (based on hard and soft parts of body) with the use of various monographs, especially by Sars (1922–1928), Klie (1938), Elofson (1941), Neale and Howe (1975), Athersuch *et al.* (1989) and Hartmann (1992, 1993).

The taxonomy used in this paper was based on a check-list of ostracods prepared by Horne *et al.* (2001). It was presented in the European Register of Marine Species.

Table 1

Station data for the Hornsund samples

Sample station	Latitude	Longitude	Depth [m]	Sample station	Latitude	Longitude	Depth [m]
1	77°00.29'N	16°18.31'E	1	29	77°02.78'N	15°58.80'E	26–50
2	77°01.27'N	16°10.36'E	1	30	77°02.40'N	16°16.62'E	35
3	77°00.54'N	16°11.3'E	25–30	31	77°02.23'N	16°16.09'E	26
4	77°00.54'N	16°10.27'E	35–40	32	77°02.13'N	16°16.40'E	30
5	76°56.46'N	15°48.52'E	7–10	33	77°01.90'N	16°16.29'E	13
6	76°56.58'N	15°48.92'E	15–20	34	77°02.53'N	16°37.00'E	50.5
7	76°56.83'N	15°48.92'E	30–40	35	77°01.47'N	16°36.75'E	18
8	76°56.95'N	15°48.87'E	40–50	36	77°00.75'N	16°33.91'E	16
9	76°59.96'N	15°35.06'E	30–35	37	77°00.79'N	15°37.65'E	41–71
10	77°03.93'N	16°02.15'E	5–13	38	77°00.51'N	15°38.29'E	18–49
11	77°03.26'N	16°01.02'E	20–25	39	76°59.99'N	15°38.41'E	24–25
12	77°02.78'N	15°58.8'E	45	40	76°59.74'N	15°38.69'E	30–38
13	76°56.47'N	15°52.47'E	0.5–5	41	76°55.26'N	16°17.21'E	60–85
14	76°56.46'N	15°48.52'E	5–10	42	76°57.15'N	16°14.70'E	107–119
15	76°56.58'N	15°48.92'E	10–20	43	76°57.38'N	16°15.16'E	99–120
16	76°56.77'N	15°49.43'E	20–30	44	77°05.15'N	15°57.10'E	87–110
17	76°56.83'N	15°48.92'E	40–30	45	77°03.93'N	16°02.14'E	8–13
18	76°56.95'N	15°48.87'E	40–50	46	77°03.30'N	15°59.96'E	30–37
19	77°00.52'N	15°38.14'E	25.5	47	77°02.61'N	15°59.99'E	43–46
20	76°59.96'N	15°35.06'E	12	48	77°02.23'N	15°57.30'E	50
21	76°55.26'N	16°17.21'E	74–82	49	77°02.37'N	16°16.08'E	20
22	77°00.29'N	16°18.31'E	15	50	77°01.66'N	16°17.66'E	16–22
23	77°01.27'N	16°10.36'E	1	51	77°00.46'N	16°19.97'E	25–79
24	77°00.54'N	16°11.3'E	25	52	77°02.37'N	16°37.80'E	18–23
25	77°00.54'N	16°10.27'E	35	53	77°01.90'N	16°30.49'E	85–95
26	77°03.93'N	16°02.15'E	7–15	54	77°00.40'N	16°27.60'E	100–135
27	77°03.26'N	16°01.02'E	5–20	55	76°59.98'N	16°24.96'E	116–128
28	77°01.90'N	16°16.29'E	15–25				

The similarities between comparative arctic areas were calculated by means of the Bray-Curtis index (Clarke and Warwick 2001):

$$S_{jk} = 100\left\{1 - \frac{\sum_{i=1}^{p} \left|y_{ij} - y_{ik}\right|}{\sum_{i=1}^{p} \left(y_{ij} - y_{ik}\right)}\right\} = 100\,\frac{\sum_{i=1}^{p} 2\min\left(y_{ij}, y_{ik}\right)}{\sum_{i=1}^{p} \left(y_{ij} - y_{ik}\right)},$$

where S_{jk} is the similarity between samples *j* and *k* and y_{ij} the abundance *i*-species in *j*-sample.

Clastering on the basis of group-average linking and presence/absence data, was performed to distinguish groups of areas with similar species composition. The PRIMER v. 5 package (Clarke and Gorley 2001) was used for the analyses.

All ostracod specimens have been deposited in the collections of the Department of Genetics, University of Gdańsk, Poland. SEM microphotographs were made in the Institute of Paleobiology of the Polish Academy of Science (Warszawa).

Results and discussion

The ostracod collection from Hornsund yielded a total of 22 612 living specimens representing 44 taxa of which 41 were identified to the species level (Table 2). Figs 6–9 illustrate majority of identified species. Samples 1, 2, 9, 13 19, 21, 23 and 37 did not yield ostracods. Four most abundant species in Hornsund were: *Polycope orbicularis* (52.4%), *Roundstonia macchesneyi* (12.5%), *Cytheropteron pseudomontrosiense* (7.4%) and *Cytheropteron montrosiense* (5.3%). Twenty one species were represented by a few specimens only.

In the Hornsund collection, 7 species were recovered as new for the archipelago. Some of this are considered generally relatively rare. *Sclerochilus truncatus* (Fig. 6.6) has been so far reported only from the type locality in British Isles (Athersuch *et al.* 1989). *Cytheropteron laptevensis* (Fig. 7.5) was only been known from Pleistocene of Ireland, northern Russia (Whatley and Masson 1979), the North Sea and late Pleistocene and Holocene of the Laptev Sea (Stepanova *et al*. 2004). *Cytheropteron excavoalatum* (Fig. 7.3) has been recorded from Recent sediments of Baffin Island (Whatley and Masson 1979) and the Beaufort Sea (Cronin *et al*. 1995). As a fossil, this species has been noted from Pleistocene of Great Britain and northern Russia, Holocene sediments of Lake Champlain (NE United States) and Quaternary deposits of the North Sea (Whatley and Masson 1979). *Cytheropteron biconvexa* (Fig. 7.1) was described by Whatley and Masson (1979) from late glacial sediments of the North Sea and the Lodin Elv Formation (late Pliocene) in East Greenland (Penney 1993). It was also recorded in Recent sediments of the Beaufort Sea (Cronin *et al*. 1995), the East Arctic Ocean (Jones *et al*. 1998) and the Laptev Sea (Stepanova *et al.* 2003). *Acetabulastoma hyperboreum* (Fig. 9.1) has been noted from north Norway, Franz Joseph Land, western Greenland (Whatley 1982) and the White Sea (Chavtur and Shornikov 2000). *Cytherura atra* (Fig. 7.10) was originally found in Lofoten Islands by Sars (1866, 1922–28). The species is known from the Baltic Sea (Klie 1929, 1938; Rosenfeld 1977), Helgoland (Klie 1929), Shetlands (Sars 1922–28), northern Norway (Freiwald and Mostafawi 1998) and western Greenland (Whatley 1982). It has also been recorded from Pleistocene deposits in Norway and Scotland (Whatley 1982).

Table 2

Occurrence ostracod species in the Hornsund samples

Sample station	*A. dunelmensis*	*A. hyperboreum*	*B. howei*	*B. constricta*	*C. biconvexa*	*C. dimlingtonensis*	*C. excavoalatum*	*C. furreri*	*C. laptevensis*	*C. montrosiense*	*C. nodosoalatum*	*C. pseudomontrosiense*	*C. pyramidale*	*Cytheropteron* sp. I	*Cytheropteron* sp.	*Cytherura atra*	*Cytherura* sp.	*E. concinna*	*F. logani*	*H. emarginata*	*H. clathrata*	*H. sorbyana*	*P. limicola*	*Paracytherois* sp. A
3	112			3		20				16		1		4						10		1		
4	32					4				7										2		1		
5	3					1													11	4				
6	1										2		1					10	3	1	1		1	
7			1			3												2						
8			34								2		43	2				9	1		8			
10	76					441				32		6			9					1	2			
11	124					18				60		6												
12	7					11				87		19									1			
14		1														711								
15	1	1				1										5		2		4				
16	3		1			1							2					3				2		
17			1										1					11			2			
18	1		13										23			3		5		1	8		1	3
20													1			5								
22	1									19		130												
24	12			1		7				3								4				2		
25	21					13				2								1						
26						34				23		145												
27	59					13				26		136												
28	7					8				3		17												
29	6			1		3			1	10		11												
30						1				4		234												
31												52												
32												137												
33												1												
34																								
35												45												
36												462												
38								6												3				
39								11								6			1	3	1			
40	3							301					29			7			18	15	4			
41						18				6		3												
42						3	7		2	22		15					1							
43						4	4		1	9		6					1							
44						4	1			15		2												
45	159			1		58				131		53												
46	890			301		83	42		20	212		80												
47	50			16		16	9		6	23		31												
48	4					9				23		9												
49										2		1												
50										3		25												
51	1				2	9	10		48	59		14								1				
52																								
53										205		2												
54							8		1	126		16												
55							1		2	69		4												
Total	1573	2	50	323	2	783	82	318	81	1197	4	1663	100	6	9	737	2	47	34	45	27	6	2	3
%	6.956	0.009	0.221	1.428	0.009	3.463	0.363	1.406	0.358	5.294	0.018	7.355	0.442	0.027	0.04	3.259	0.009	0.208	0.15	0.199	0.119	0.027	0.009	0.013

Table 2 – continued.

Sample station	*P. arcticum*	*Paradoxostoma* sp. A	*Paradoxostoma* sp. B	*P. brenda*	*P. orbicularis*	*R. septentrionalis*	*R. tuberculatus*	*R. globulifera*	*R. macchesneyi*	*R. robertsoni*	*S. macrolaminata*	*Sarsicytheridea* sp. N	*S. contortus*	*S. makeoyanensis*	*S. truncatus*	*Sclerochilus* sp. 1	*Sclerochilus* sp. 2	*S. glaseri*	*X. labiata*	*Xestoleberis* sp.	Total specimens
3					7	1			14	4				1							194
4				1			1			1											49
5				398	2	9	19		539			12									998
6	4				14		56				2			1							97
7							2							1							9
8	5				68		22							8	2	1	2		1		208
10					55	3			278					1							904
11					19	10			215												452
12									1												126
14						2			78												792
15			1	1		41	2		814			2	1						1		877
16		1	1		1		41	6							2						64
17			1		3		38							4						1	62
18			4		55		10					1		10	1		3		1		143
20																					6
22					224				1												375
24					1	7	7														44
25						7	1														45
26					34				194												430
27					41	2			78												355
28					37				6												78
29					10																42
30					92																331
31					7																59
32					10																147
33																					1
34					3																3
35					58																103
36					688							1									1151
38					4														1	1	15
39		2																	3		27
40		1						4	477										2		861
41					87				1					1						1	117
42					20			4	1												75
43					82				1												108
44					753													1			776
45					1463	3			122												1990
46				1	1822	49			1												3501
47					178																329
48					69				1												115
49					512																515
50					45																73
51					2173		1		1									2			2321
52					237																237
53					1481																1688
54					620		1														772
55					871																947
Total	9	4	7	401	11846	134	201	14	2823	5	2	16	1	27	5	1	5	3	9	3	22612
%	0.04	0.018	0.031	1.773	52.388	0.593	0.889	0.062	12.485	0.022	0.009	0.071	0.004	0.119	0.022	0.004	0.022	0.013	0.04	0.013	100

Table 3

List of the Recent benthic ostracod taxa from Svalbard Archipelago. Data from: A – Sars (1922–28), B – Müller (1931), C – Klie (1942), D – Neale and Howe (1975), E – Hartmann (1992, 1993, 1994), F – Wiśniewska (1999), G – present paper.

Family	Species	A	B	C	D	E	F	G
Cypridinidae	*Philomedes brenda* (Baird, 1850)	+		+		+		+
Polycopidae	*Polycope orbicularis* Sars, 1866					+		+
	Polycope spec. (Profil 3/2) Hartmann, 1992					+		
Bythocytheridae	*Bythocythere constricta* Sars, 1866	+	+			+		+
	Bythocythere turgida Sars, 1866	+	+					
	Sclerochilus contortus (Norman, 1861)	+	+	+	+			+
	Sclerochilus makeøyanensis Hartmann, 1994					+		+
	Sclerochilus truncatus (Malcomson, 1886)							+
	Sclerochilus sp. 1							+
	Sclerochilus sp. 2							+
Cytheridae	*Cythereis* (*Eucythereis*) *costata* (Brady, 1866)			+				
	Palmenella limicola (Norman, 1865)					+		+
Cytherideidae	*Heterocyprideis sorbyana* (Jones, 1856)	+	+	+		+		+
	Sarsicytheridea bradii (Norman, 1865)	+	+			+		
	Sarsicytheridea macrolaminata (Elofson, 1939)				+	+		+
	Sarsicytheridea punctillata (Brady, 1865)	+	+		+	+		
	Sarsicytheridea sp. N							+
Cytheruridae	*Cytheropteron angulatum* Brady *et* Robertson, 1872			+				
	Cytheropteron biconvexa Whatley *et* Masson, 1979							+
	Cytheropteron dimlingtonensis Neale *et* Howe, 1973					+		+
	Cytheropteron excavoalatum Whatley *et* Masson, 1979							+
	Cytheropteron furreri Hartmann, 1993					+		+
	Cytheropteron hamatum Sars, 1869	+	+					
	Cytheropteron laptevensis Stepanova, 2004							+
	Cytheropteron latissimum (Norman, 1865)	+	+					
	Cytheropteron montrosiense Brady, Crosskey *et* Robertson, 1874		+					+
	Cytheropteron nodosoalatum Neale *et* Howe, 1973				+	+		+
	Cytheropteron nodosum Brady, 1868			+				
	Cytheropteron pseudomontrosiense Whatley *et* Masson, 1979					+		+
	Cytheropteron pyramidale (Brady, 1898)		+	+	+			+
	Cytheropteron cf. *pyramidale* (Brady, 1898)					+		
	Cytheropteron sp. I							+
	Cytheropteron sp.							+
	Cytherura atra Sars, 1866							+
	Cytherura sp.							+
	Hemicytherura clathrata (Sars, 1866)	+	+	+	+	+		+
	Semicytherura affinis (Sars, 1866)			+	+			
	Semicytherura concentrica (Brady, Crosskey *et* Robertson, 1874)		+					
	Semicytherura glaseri Hartmann, 1992					+		+
	Semicytherura nigrescens (Baird, 1838)					+		
	Semicytherura rudis (Brady, 1868)		+					
	Semicytherura undata (Sars, 1866)		+	+				

Table 3 – continued.

Hemicytheridae	*Baffinicythere howei* Hazel, 1967			+	+	+		+
	Elofsonella concinna (Jones, 1857)	+				+		+
	Finmarchinella (*B.*) *barentzovoensis* (Mandelstam, 1957)					+		
	Finmarchinella (*B.*) *logani* (Brady *et* Crosskey, 1871)					+		+
	Finmarchinella (*F.*) *finmarchica* (Sars, 1866)				+			
	Hemicythere emarginata (Sars, 1866)		+	+	+	+	+	+
	Muellerina abyssicola (Sars, 1866)	+	+					
	Thaerocythere crenulata (Sars, 1866)		+	+				
Krithidae	*Krithe producta* Brady, 1880		+	+		+		
Leptocytheridae	*Cluthia cluthae* (Brady, Crosskey *et* Robertson, 1874)		+		+			
	Leptocythere spec. M 4a Hartmann, 1992					+		
Loxoconchidae	*Roundstonia globulifera* (Brady, 1868)		+					+
	Roundstonia macchesneyi (Brady *et* Crosskey, 1871)					+	+	+
	Roundstonia robertsoni (Brady, 1868)							+
Paradoxo-stomatidae	*Acetabulastoma hyperboreum* (Scott 1889)							+
	Paracytherois cf. *flexuosa* Brady, 1866				+			
	Paracytherois af. *flexuosum* Brady, 1866					+		
	Paracytherois sp.							+
	Paradoxostoma arcticum Elofson, 1941		+			+		+
	Paradoxostoma rostratum Sars, 1865					+		
	Paradoxostoma sp. A							+
	Paradoxostoma sp. B							+
	Paradoxostoma spec. M 8 Hartmann, 1992					+		
	Paradoxostoma normani Brady, 1898				+			
	Paradoxostoma variabile (Baird, 1835)	+	+	+				
	Paradoxostoma spec. Hartmann, 1992					+		
Trachyleberididae	*Acanthocythereis dunelmensis* (Norman, 1865)	+	+			+		+
	Pterygocythereis jonesii (Baird, 1850)		+					
	Robertsonites tuberculatus (Sars, 1866)	+	+			+		+
	Trachyleberididae spec. Profil 1(2)a Hartmann, 1992					+		
	Trachyleberididae spec. Profil 1(2)b Hartmann, 1992					+		
Xestoleberididae	*Xestoleberis bluemeli* Hartmann, 1992					+		
	Xestoleberis depressa Sars, 1866		+	+	+		+	
	Xestoleberis labiata Brady *et* Robertson, 1874							+
	Xestoleberis sp.							+
Pontocyprididae	*Argilloecia liefdefjordensis* Hartmann, 1992					+		
	Argilloecia conoidea Sars, 1923				+			
incertae sedis	*Rabilimis mirabilis* (Brady, 1866)					+		
	Rabilimis septentrionalis (Brady, 1866)					+		+
	Species a Neale *et* Howe, 1975				+			
	Species b Neale *et* Howe, 1975				+			
	Undetermined (2 species) Neale *et* Howe, 1975				+			
Total	85	15	26	16	18	39	3	44

Table 4

The list of species which are common to Hornsund and selected high-latitudes areas and the Bray-Curtis index calculated for a pair (Hornsund, comparison area).

		Sources	*Acanthocythereis dunelmensis*	*Acetabulastoma hyperboreum*	*Baffinicythere howei*	*Bythocythere constricta*	*Sclerochilus makeøyanensis*	*Cytheropteron biconvexa*	*C. dimlingtonensis*	*C. excavoalatum*	*C. furreri*	*C. montrosiense*	*C. nodosoalatum*	*C. pseudomontrosiense*	*C. pyramidale*
Spitsbergen	Liefdefjorden	a	+		+	+	+		+		+		+	+	
	Ginevrabotnen	b			+										+
Barents Sea	Spitsbergen Shelf	c			+										+
	Tromsø	d	+										+		+
	Novaya Zemlya	c	+		+	+							+		+
	Franz Josef Land	c	+		+									+	+
White Sea		e	+	+								+	+		+
Kara Sea		e f	+											+	
Laptev Sea		e f g	+		+	+		+				+	+	+	
East-Siberian Sea		e f	+									+		+	
Chukchi Sea		e	+												
Beaufort Sea		f	+					+		+		+	+		+
Greenland	Baffin Bay	f i	+	+	+								+		+
	Bredefjord	h											+		
	Greenland Sea / Scoresby Sound	f k	+		+	+		+				+	+		+

The last species from the group of seven, *Roundstonia robertsoni* (Fig. 8.10) occurs commonly in Europe (Athersuch *et al.* 1989).

The further species, *Xestoleberis labiata* (Fig. 9.8, 9) has only been reported previously from Svalbard as subfossil (Hartmann 1992, indicates therein *Xestoleberis* aff. *labiata*).

The "larger" and "smaller" forms of *Acanthocythereis dunelmensis* (Fig. 9.6; originally distinguished by Elofson (1941) as "Grössere Form" and "Kleinere Form") found in the Hornsund are considered provisionally as one taxon in this paper, because the taxonomic status of these forms still needs further investigations (for discussion see Athersuch *et al.* 1989).

A species-area plot (as illustrated in Fig. 3) suggested that the asymptote of the accumulation curve is almost reached and the noted number of species is approximately fully sampled.

Table 4 – continued.

Cytherura atra	*Elofsonella concinna*	*Finmarchinella (B.) logani*	*Hemicythere emarginata*	*Hemicytherura clathrata*	*Heterocyprideis sorbyana*	*Palmenella limicola*	*Paradoxostoma arcticum*	*Philomedes brenda*	*Polycope orbicularis*	*Rabilimis septentrionalis*	*Robertsonites tuberculatus*	*Roundstonia globulifera*	*R. macchesneyi*	*Sarsicytheridea macrolaminata*	*Sclerochilus contortus*	*Semicytherura glaseri*	Total number of species	Number of species in common with the Hornsund	Bray-Curtis similarity coefficient (presence/absence data)
	+	+	+	+	+	+	+	+	+	+	+		+	+		+	36	22	53.01
			+	+	+			+							+		16	7	23.33
			+	+										+	+		18	6	19.67
+	+		+	+		+				+	+						61	10	19.42
		+	+	+	+	+	+			+	+	+	+	+	+		45	17	39,53
			+	+	+	+	+		+	+	+				+		37	13	32.10
		+	+	+	+	+	+	+		+		+		+		+	89	16	24,06
					+	+		+		+					+		39	7	16.87
	+				+	+		+	+	+	+	+	+	+	+		78	18	29.51
	+				+			+		+					+		21	8	24.62
	+				+	+	+	+		+		+	+	+			68	10	17.86
	+	+	+	+	+	+				+	+	+	+	+	+		83	18	28.35
+	+	+	+	+	+	+	+			+	+	+		+	+		59	18	36.89
+		+	+				+	+			+	+					18	8	25.81
		+	+	+	+	+			+	+	+	+		+			97	17	24.11

Sources: a – Hartmann (1992, 1993, 1994), b – Klie (1942), c – Neale and Howe (1975), d – Freiwald and Mostafawi (1998), e – Chavtur and Shornikov (2000), f – Cronin *et al.* (1995), g – Stepanova *et al.* (2003, 2004), h – Penney (1989), i – Whatley (1982), k – Whatley *et al.* (1996, 1998).

The Recent ostracods of the Hornsund were represented by 44 taxa. Somewhat fewer species (39) were observed by Hartmann (1992, 1993 and 1994) in the Liefdefjorden (N Spitsbergen). Klie (1942) published list of ostracod species (16) collected by Römer and Schaudinn from Ginevrabotnen in 1898. In the tidal zone of Nottinghambukta (SW Spitsbergen), Wiśniewska (1999) found only three species (compare Table 3).

The number of species (85) observed on the Svalbard Archipelago is relatively high (Table 4). Figure 4 shows geographical positions of Arctic sites which were compared in respect of species number and species composition. Cronin *et al.* (1995) listed 61 species from the Greenland Sea with *Krithe glacialis* and *Thaerocythere crenulata* as predominates. Whatley *et al.* (1996, 1998) described 59 taxa

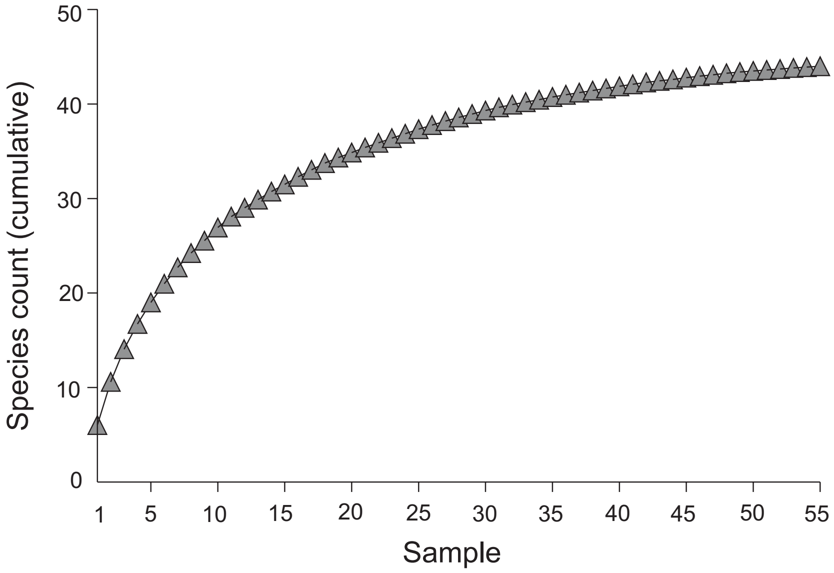

Fig. 3. Species-area curve: based on 44 taxa and 55 samples.

from East Greenland. In Scoresby Sound, *Cytheropteron pyramidale*, *Cytheropteron pseudoinflatum*, *Cytheropteron testudo* and *Polycope orbicularis* have the highest abundance. The same number of species were documented from Baffin Bay and west Greenland where *Robertsonites tuberculatus*, *Finmarchinella logani*, *Sarsicytheridea bradii* (Cronin *et al*. 1995) and *Acetabulastoma hyperboreum* (Whatley 1982) occur in high numbers. Penney (1989) recognized 18 species in Bredefjord, South Greenland. Two species: *Hemicythere borealis* and *Leptocythere castanea* were a much important. Neale and Howe (1975) recorded 45 species in Russian Harbour, Novaya Zemlya of which *Robertsonites tuberculatus*, *Baffinicythere howei*, *Hemicythere emarginata* and *Sarsicytheridea punctillata* were commonest species. From Franz Josef Land altogether 37 species are present (Neale and Howe 1975; Cronin *et al*. 1995). Only *Krithe glacialis* was a dominant (Cronin *et al*. 1995). The Recent ostracods from North Norway were examined thoroughly by Freiwald and Mostafawi (1998) who recognized 61 taxa. Two most abundant species were: *Xestoleberis* cf. *depressa* and *Cythere lutea*. The list of species which occur in the White Sea (89) and the Chukchi Sea (68) was compiled by Chavtur and Shornikov (2000) on the basis of their collections and literature. The species composition of the Laptev Sea has been examined by several authors (Cronin *et al*. 1995, Chavtur and Shornikov 2000, Stepanova *et al.* 2003, 2004), who recorded a total of 78. *Krithe glacialis*, *Sarsicytheridea pseudopunctillata* (Cronin *et al*. 1995) and additionally *Rabilimis septentrionalis* (Stepanova *et al.* 2003) achieve maximum abundance in this sea. Two further Arctic areas are imperfectly known: in the East Siberian Sea 20 species have been observed

Fig. 4. Map of Arctic sites which were compared with Hornsund in respect of species composition.

whereas in the Kara Sea's 39 are recorded (Cronin *et al*. 1995, Chavtur and Shornikov 2000). Finally, a total of 83 species from the Beaufort Sea was documented by Cronin *et al*. 1995 in the Arctic Ostracode Database. *Heterocyprideis sorbyana* and *Paracyprideis pseudopunctillata* reveal the highest abundances.

Some of the above papers comprise only qualitative data. So, comparisons between different Arctic sites were performed with the use of presence/absence data (Clarke and Warwick 2001). Table 4 shows the list of species which are common to Hornsund and other high-latitudes areas. Applying the Bray-Curtis similarity coefficient (Table 4), species compositions of Hornsund and Liefdefjorden are seen to have the highest similarity (S = 50.60). Slightly lower values of the index were computed between Hornsund and following areas: Novaya Zemlya (39.53), Baffin Bay (36.89) and Franz Joseph Land (32.10). The last result was unexpected, especially taking into consideration the values between Hornsund and closely ad-

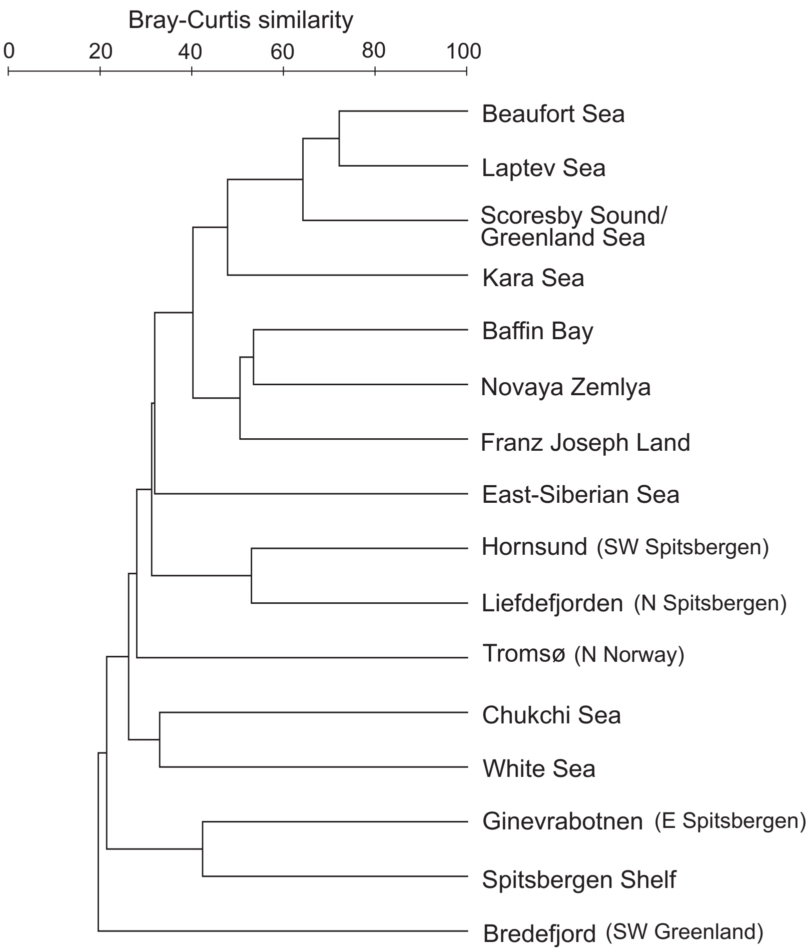

Fig. 5. Dendrogram of hierarchical clustering of the 16 Arctic regions, using group-average linking of Bray-Curtis similarities calculated on presence/absence data.

jacent localities (Spitsbergen Shelf – 19.67, Tromsø – 19.42 and Greenland Sea/Scoresby Sound – 24.11). The result of hierarchical clustering of Arctic sites based on qualitative data is demonstrated by a dendrogram (Fig. 5). The plot showed that within the Arctic, no clear geographical trends of grouping were observed. Different sites in the Arctic, have the similar ostracod fauna, still, the species dominance structure is specific for each site.

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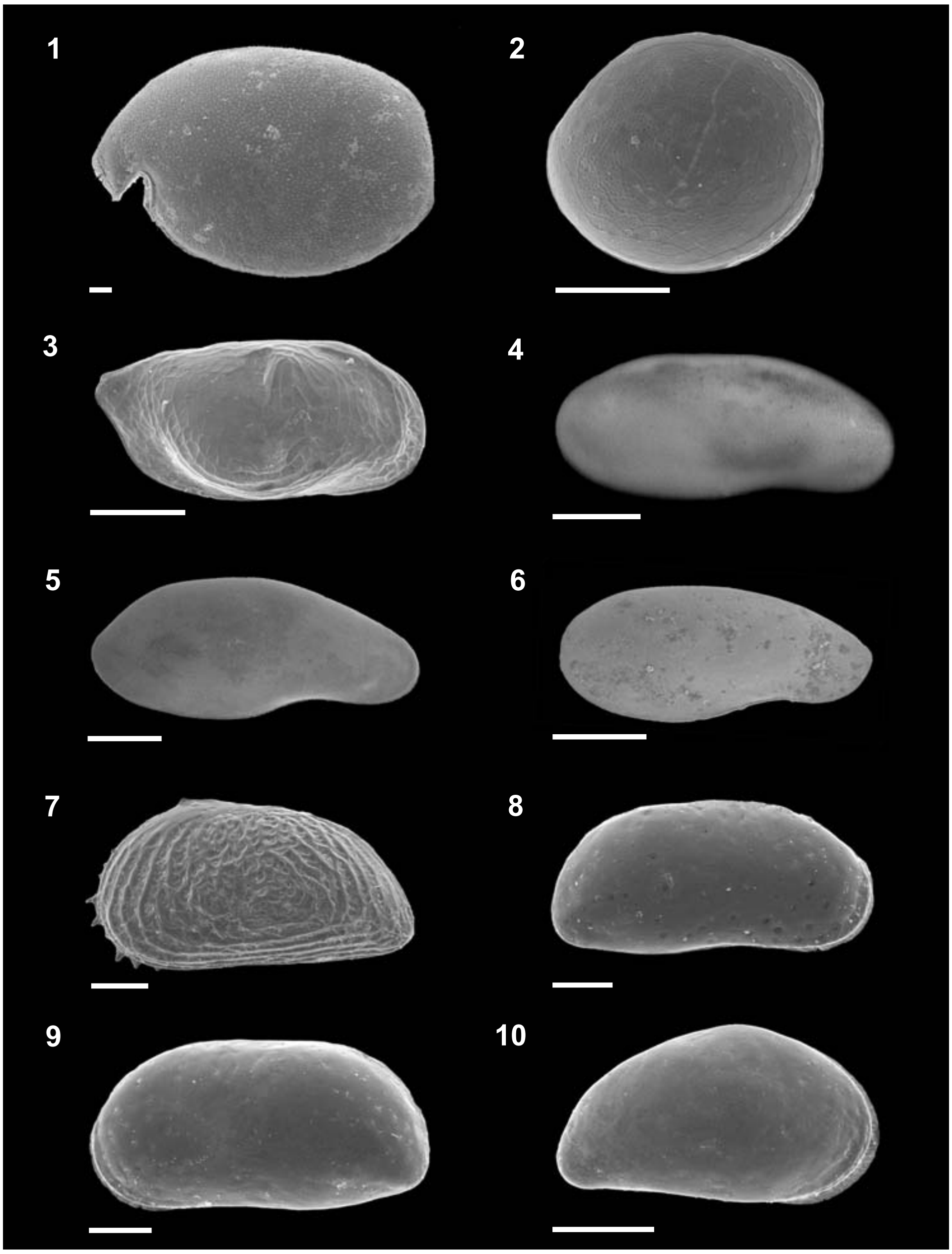

Fig. 6. **1**. *Philomedes brenda* (Baird, 1850), SEM, LV, female, AM1990G1. **2**. *Polycope orbicularis* Sars, 1866, SEM, RV, female, AM2003B1. **3**. *Bythocythere constricta* Sars, 1866*,* SEM, RV, male, AM 2003B2. **4**. *Sclerochilus contortus* (Norman, 1861), stereomicroscope, RV, male, AM2000G2; **5**. *Sclerochilus makeøyanensis* Hartmann 1994, SEM, RV, male, AM2000G3. **6**. *Sclerochilus truncatus* (Malcomson, 1886), SEM, RV, male, AM2000G4. **7**. *Heterocyprideis sorbyana* (Jones, 1856), SEM, LV, AM2002S1. **8–9**. *Sarsicytheridea* sp. N, SEM, RV, LV, male, AM1990G2. **10**. *Sarsicytheridea macrolaminata* (Elofson, 1939), SEM, RV, AM2002S2. Scale bars 200 µm.

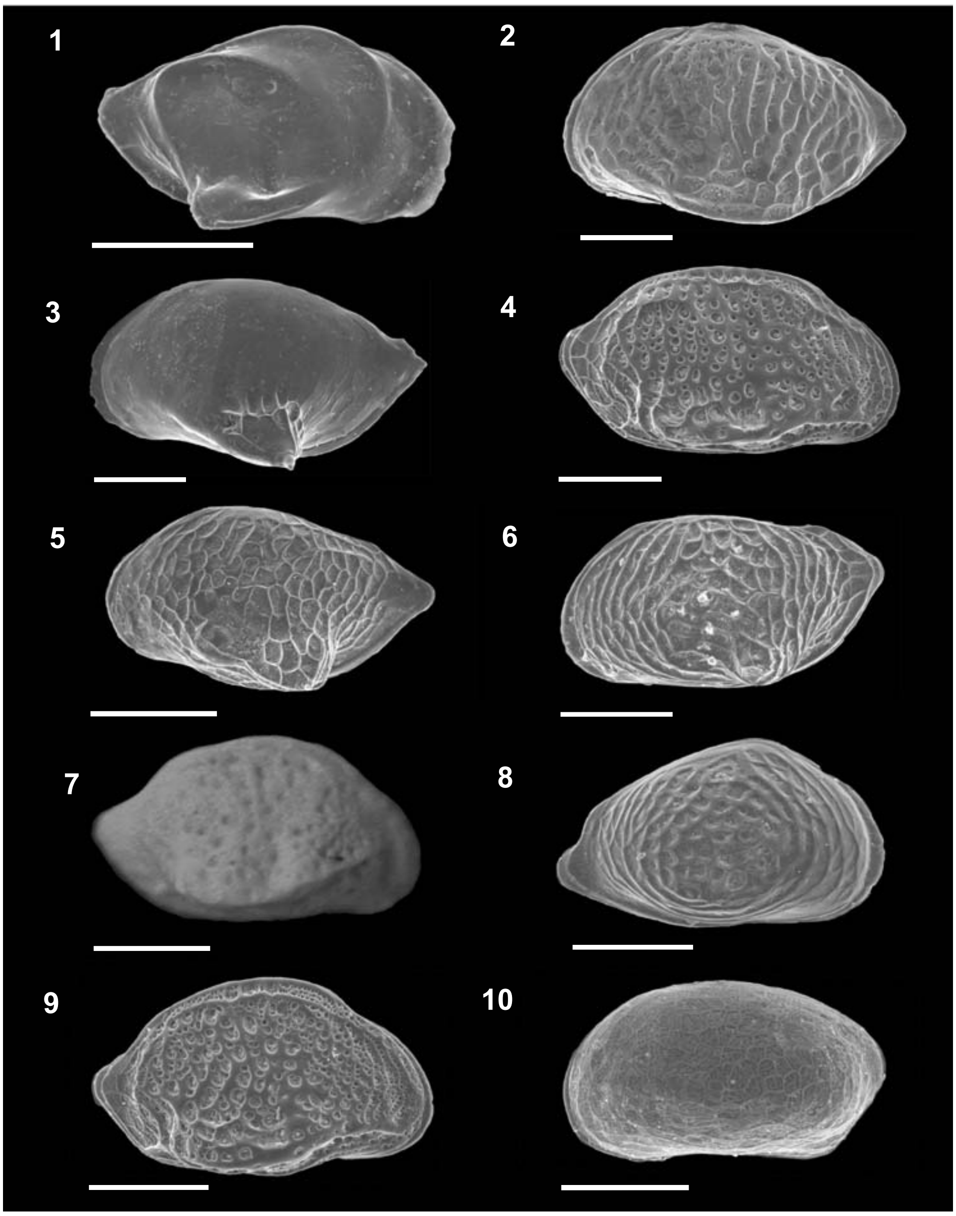

Fig. 7. **1**. *Cytheropteron biconvexa* Whatley *et* Masson, 1979, SEM, RV, AM2003Hy3. **2**. *Cytheropteron dimlingtonensis* Neale *et* Howe, 1973, SEM, LV, female, AM2003B3. **3**. *Cytheropteron excavoalatum* Whatley *et* Masson, 1979, SEM, LV, female, AM2003Hy1. **4**. *Cytheropteron furreri* Hartmann, 1993, SEM, RV, male, AM2003H1. **5**. *Cytheropteron laptevensis* Stepanova 2004, SEM, LV, female, AM2003Hy2. **6**. *Cytheropteron montrosiense* Brady, Crosskey *et* Robertson, 1874, SEM, LV, male, AM2003B8. **7**. *Cytheropteron nodosoalatum* Neale *et* Howe, 1973, stereomicroscope, RV, male, AM1991G3. **8**. *Cytheropteron pseudomontrosiense* Whatley *et* Masson, 1979, SEM, RV, female, AM2003B4. **9**. *Cytheropteron pyramidale* (Brady, 1898), RV, male, AM2003H4; **10**. *Cytherura atra* Sars, 1866, SEM, LV, female, AM2002H2. Scale bars 200 μm.

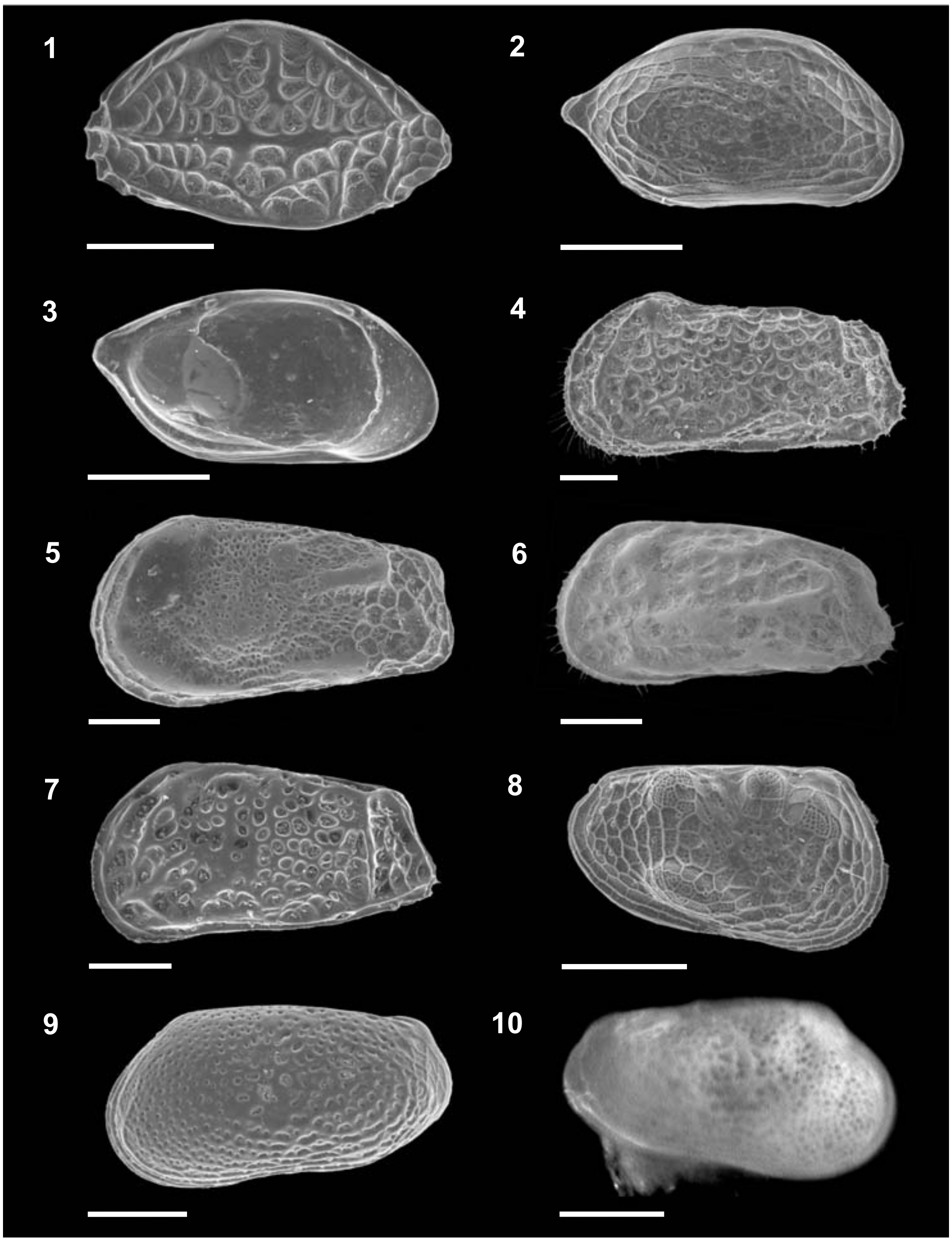

Fig. 8. **1**. *Hemicytherura clathrata* (Sars, 1866), SEM, LV, male, AM2003H3. **2–3**. *Semicytherura glaseri* Hartmann 1992, SEM, RV, LV inner, female, AM2003Hy4. **4**. *Baffinicythere howei* Hazel, 1967, LV, male, AM1991G1. **5**. *Elofsonella concinna* (Jones, 1857), SEM, LV, male, AM1991G2. **6**. *Finmarchinella logani* (Brady *et* Crosskey, 1871), SEM, LV, male, AM2003I1. **7**. *Hemicythere emarginata* (Sars, 1866), SEM, LV, male, AM1990G5. **8**. *Roundstonia globulifera* (Brady, 1868), SEM, RV, female, 2003H2. **9**. *Roundstonia macchesneyi* (Brady *et* Crosskey, 1871), SEM, LV, female, AM1990G3. **10**. *Roundstonia robertsoni* (Brady, 1868), stereomicroscope, RV, female, AM1990A1. Scale bars 200 µm.

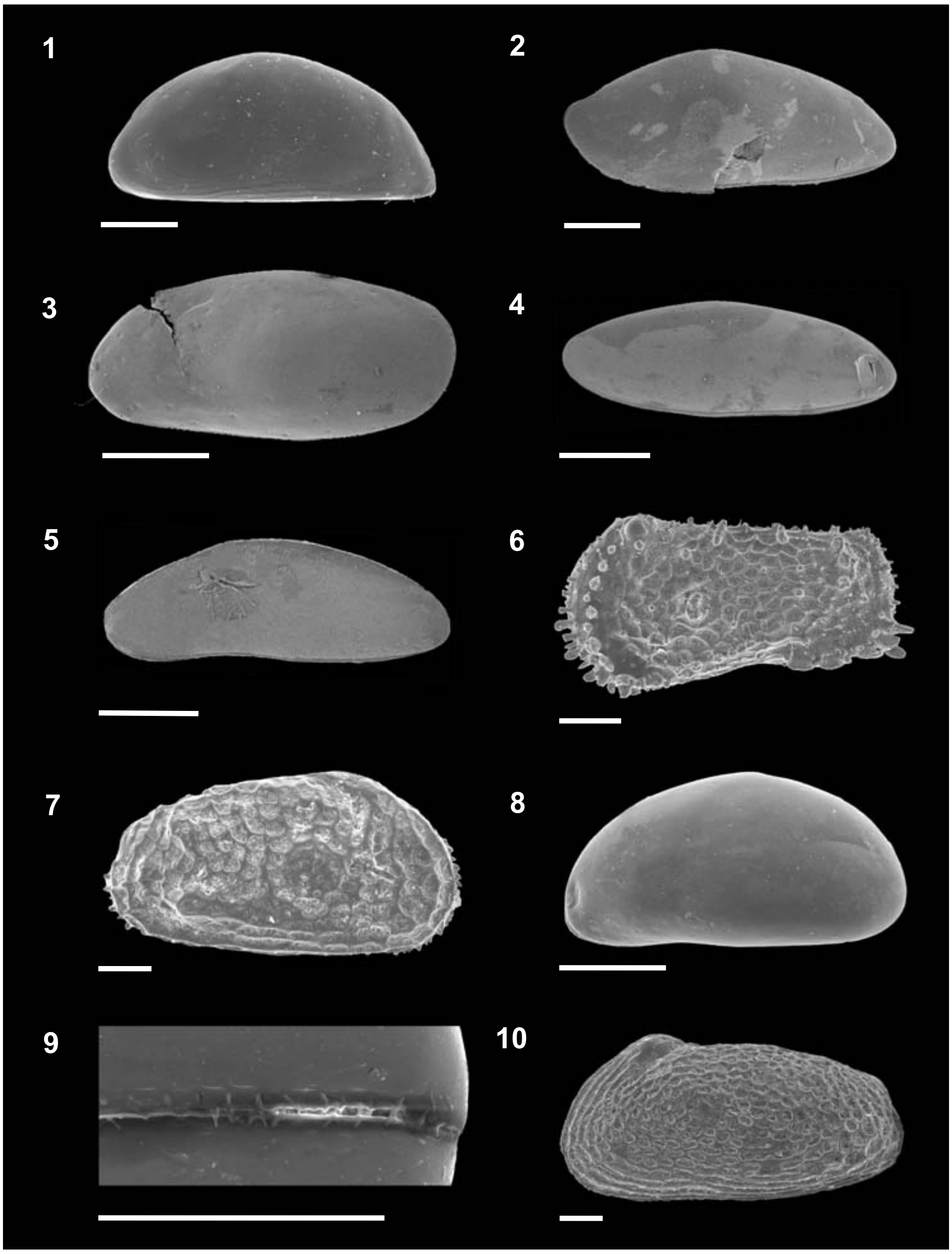

Fig. 9. **1**. *Acetabulastoma hyperboreum* (Scott 1889), SEM, RV, female, AM2000G1. **2**. *Paradoxostoma arcticum* Elofson, 1941, SEM, RV, male, AM2000G5. **3**. *Paradoxostoma* sp. A, SEM, LV, AM2000G6. **4**. *Paradoxostoma* sp. B, SEM, RV, AM2000G7. **5**. *Paracytherois* sp. A, SEM, LV, AM2000G7. **6**. *Acanthocythereis dunelmensis* (Norman, 1865), SEM, LV, male, AM2003B6. **7**. *Robertsonites tuberculatus* (Sars, 1866), SEM, RV, female AM1990G4. **8–9**. *Xestoleberis labiata* Brady *et* Robertson, 1874, SEM, LV, labium, female, AM2002H1 **10**. *Rabilimis septentrionalis* (Brady, 1866), SEM, LV, male, AM1991B1. Scale bars 200 µm.

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