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Preliminary report on modern ostracods in surface sediment samples collected during R.V. *Tansei-maru* Cruise KT04-20 in the southwestern Okhotsk Sea and the northeastern Japan Sea off Hokkaido, north Japan

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Abstract

We studied the species distributions of modern ostracods (Crustracea) from the continental shelf and slope areas of the southwestern Okhotsk Sea and the northeastern Japan Sea off Hokkaido, north Japan, between approximately 41–45°N by examining 28 of 45 surface sediment samples collected from September 13–18, 2004, during cruise KT04-20 of the R.V. *Tansei-maru*. In total, 136 species from 62 genera were identified.

In 9 of the 12 samples from the southwestern Okhotsk Sea off the Shiretoko Peninsula at depths of 76 m to 1,234 m, 75 species of 37 genera were found. Here, we describe the identified species and present scanning electron microscope (SEM) images of dominant and common species. This is the second report to present detailed data on the ostracod fauna and their distributions in the Okhotsk Sea, which demonstrates that some species are common in both the southwestern Okhotsk Sea and the Japan Sea.

Sixteen samples from the northeastern Japan Sea off Okushiri Island, obtained from depths of 65–375 m, contained 115 species of 56 genera. This assemblage consisted of many species typical of the Japan Sea Central Water assemblage and the Japan Sea Intermediate–Proper Water assemblage, defined by Ozawa (2003).

The basic data reported here are significant for paleobiogeographic and paleoenvironmental studies in and around the mid-latitude Japan Sea, which experienced global climatic changes during the late Cenozoic. They can also help clarify the migration and survival–extinction patterns of cryophilic organisms during fluctuations in marine environments, such as those caused by global warming or cooling, not only in the past but also in the present and near future.

Key words: ostracods, crustacea, cryophilic species, off Hokkaido, Okhotsk Sea, Japan Sea, continental shelf, continental slope, species distribution

1. INTRODUCTION

Studies of the geographical distribution of marine organisms during the climate fluctuations of the late Cenozoic have provided key insights into possible near-future responses of marine species to anthropogenic climate change (e.g., Cronin, 1999). Within these studies, investigations of the migrations of cryophilic species in response to climate warming have proved especially valuable to estimate the response to the change (e.g., Roy *et al*., 1995). The southwestern Okhotsk Sea and northwestern Japan Sea around Japan's northern island of Hokkaido are located in the mid-latitudes, and are thus particularly suited to such research. Oceanic conditions in these areas from the Pleistocene through the Holocene would have been susceptible to glacio-eustatic sea-level fluctuations linked to climatic oscillations (e.g., Tada, 1994). However, few studies have compared the distributions of ancient and modern species in and around these areas. Benthic ostracods (Crustacea) are abundant in both late Cenozoic and modern coastal sediments, especially those from the Japan Sea, making them appropriate for study (e.g., Ozawa and Kamiya, 2001, 2005a; Ozawa, 2003a; Ozawa *et al*., 2004a).

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Currently, we have only fragmentary information on the distribution of modern ostracods in the southwestern Okhotsk Sea. Genera that have been identified and described include *Schizocythere* (Hanai, 1970; Tsukagoshi and Briggs, 1998), *Cythere* (Tsukagoshi, 1988), *Baffinicythere* (Irizuki, 1996) and *Xestoleberis* (Sato and Kamiya, 2007); some species have been identified as well (Ikeya and Cronin, 1993; Itoh, 1996). An earlier cruise KT01-14 of the R.V. *Tansei-maru* also produced a detailed ostracod species list and SEM images for the Okhotsk Sea for the first time (Ozawa, 2004; Ozawa *et al.*, 2004b). However, overall, we have little information on species occurrence in this sea.

In contrast, recent studies have expanded the species lists of the modern ostracod fauna from both the continental shelf and the upper part of the continental slope of the northeastern Japan Sea off Hokkaido (Itoh, 1996; Ozawa *et al.*, 1999, 2004b; Tsukawaki *et al.*, 2001; Ozawa, 2004). These studies have detailed the distributions of ostracod species and demonstrated the relationship between assemblages and the oceanic environments created by water-mass structures. A recent study by Ozawa (2003b) described the distribution of dominant species and assemblages in five areas from the southwestern to northeastern Japan Sea. Ozawa (2003b) described the relationships between fauna and water-mass properties, such as water temperature and salinity in summer and winter. However, little information has been obtained from slope areas, especially in the northeast region. Consequently, it has been difficult to compare species distributions of the southwestern Okhotsk Sea with those of the northeastern Japan Sea in slope areas.

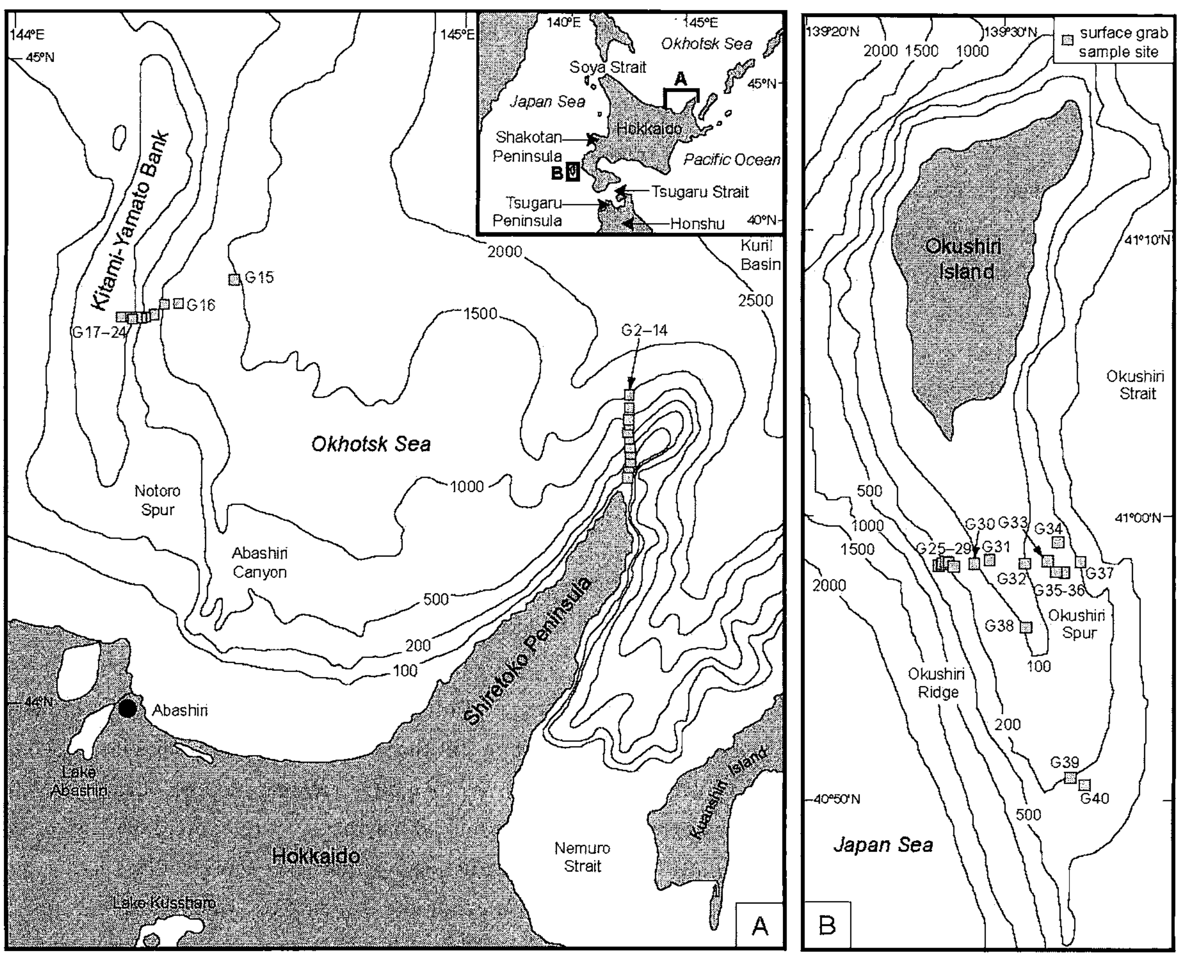

Fig. 1: Submarine topography of studied areas in southwestern part of Okhotsk Sea off northeast Hokkaido (A), and northeastern part of Japan Sea off southwest Hokkaido (B), based on Hydrographic Department, M. S. A., Japan (1980) and Tsukuda *et al.* (1993) respectively.

During the R.V. *Tansei-maru* Cruise KT04-20 in 2004, we collected surface sediment grab samples from both shelf and slope areas in the southwestern Okhotsk Sea and the northeastern Japan Sea off Hokkaido, north Japan. In this article, we describe the identified ostracod species, and present SEM images of the dominant and common species. These basic data will be also useful for considering mid-latitude faunal changes both in the geological past and in the future.

2. SAMPLING AND ANALYTICAL METHODS

Two marginal areas at 44–45°N in the southwestern Okhotsk Sea and 40–41°N in the northeastern Japan Sea were investigated. The southwestern Okhotsk Sea sites are hereafter referred to as being off Shiretoko and around the Kitami-Yamato Bank (Fig. 1A); the northeastern Japan Sea site is hereafter referred to as being off Okushiri (Fig. 1B). Samples were obtained from September 13 to 18, 2004, during Cruise KT04-20 of the R.V. *Tansei-maru* of the JAMSTEC Japan. We collected 45 surface sediment samples in total from the continental shelf and slope, using an Okean-type grab sampler during this cruise (Table 1). In all, 14 samples were obtained off Shiretoko from depths of 76–1,500 m, 11 samples around Kitami-Yamato Bank from depths of 155–1,499 m, and 20 samples off Okushiri from depths of 65–375 m (Fig. 1; Table 1).

The upper 5 mm of surface sediments over an area of about 50 cm x 25 cm (for a total of 625 cm^3) were analyzed for ostracods. Neutralized 10% formalin was added to all samples immediately after sampling. The samples were then washed with water through a 63-μm sieve and oven-dried at 80°C. Up to 200 specimens were selected from fractions between 0.25–1.0 mm of sediments from each quantitative split of a sample. This method ensured that all adults, and, depending on the species, all the A-1 to A-3 juvenile stages were obtained. Eleven samples yielded less than 50 specimens in total, even when all specimens that were present were selected. Ten samples (G-15–G-24) from around the Kitami-Yamato Bank (depths of 155–1,499 m) in the southwestern Okhotsk Sea were not examined in this study, but will be the focus of a future study. For the present study, we examined a total of 28 of the 34 samples collected off Shiretoko and Okushiri.

After identification of the ostracod species, the numbers of individual specimens were counted by summing the total number of single left and right valves that were more than half complete and the number of all the whole carapaces. Totals were calculated without regard to sex, instar stage, or the existence of soft parts. All materials have been deposited at the Department of Geology, National Science Museum, Japan.

3. RESULTS

A total of 135 species belonging to 62 genera were identified from 25 among 28 grab surface samples from two sea areas (Tables 2 and 3; Plates 1 and 2).

Southwestern Okhotsk Sea off Shiretoko

Nine samples (G-2–G-4, G-6–G-10, G-13; Fig. 1A), collected at depths between 76 m and 1,234 m along one survey line across the upper continental shelf to the middle slope, contained 75 species belonging to 37 genera (Table 2). Ostracods were not found in samples G-11, G-12, and G-14. Table 4 lists the 20 most abundant species as well as the number of individuals from each species and their percentage of the total population. Dominant species, defined here as those comprising more than 5% of the population, were *Johnnealella nopporensis*, *Elofsonella* sp. cf. *concinna*, *Munseyella hatatatensis* and *Xestoleberis hanaii*. These four species represented about 40% of all individuals in this area. Ten common species, defined here as those making up 2% to 5% of the total population, were *Laperousecythere robusta*, *Argilloecia toyamaensis*, *Schizocythere okhotskensis*, *Munseyella* sp. 1, *Aurila hataii*, *Cythere golikovi*, *Kotoracythere* sp., *Xestoleberis iturupica*, *Cytheropteron* sp. cf. *sawanense* and *Semicytherura hiberna*. The 14 dominant or common species accounted for approximately 70% of the total population.

Table 1: Results of sampling on the R.V. *Tansei-maru* Cruise KT04-20 in southwestern part of Okhotsk Sea and northeastern part of Japan Sea, off Hokkaido, north Japan.

Station	Locality	Date (D/M/Y)	Time Hit	Longitude (E)	Latitude (N)	Water Depth (m)	Sediment Thickness (cm)	Sediment Type
KT04-20 G-10	off Shiretoko P.	13/09/04	03:31	145 21.2200	44 25.2110	505	14	olive grey homogeneous mud covered by thin brownish grey soft mud, serpent stars on the surface
KT04-20 G- 9	off Shiretoko P.	13/09/04	04:35	145 21.2750	44 23.6460	315	3	olive grey homogeneous mud covered by thin brownish grey soft mud, a little serpent stars on the surface
KT04-20 G- 8	off Shiretoko P.	13/09/04	05:07	145 21.1760	44 23.2990	230	1	*a little amount of olive grey homogeneous sandy mud, no sampling due to opend a lid*
KT04-20 G- 8'	off Shiretoko P.	13/09/04	05:21	145 21.4150	44 23.2670	248	4	olive grey homogeneous muddy sand, no marked difference of the surface, sueprnt stars
KT04-20 G- 6	off Shiretoko P.	13/09/04	06:14	145 21.0350	44 22.5870	170	10	olive grey fine-grained well sorted compact sand, no marked surface layer, shell fragments
KT04-20 G- 7	off Shiretoko P.	13/09/04	06:32	145 21.0940	44 22.9300	215	6	olive grey fine-grained well sorted compact sand, no marked surface layer, shell fragments and s. stars
KT04-20 G-11	off Shiretoko P.	14/09/04	04:06	145 21.1980	44 27.0300	844	1	a little amount of olive grey soft mud, slightly sandy, consolidated mudstone lower, tiny serpent stars
KT04-20 G-12	off Shiretoko P.	14/09/04	04:35	145 20.9120	44 27.4450	987	1	a little amount of olive grey soft and soupy mud, tiny serpent stars
KT04-20 G-13	off Shiretoko P.	14/09/04	06:05	145 20.9340	44 28.0650	1,234	19	soft olive grey homogeneous mud, lower dark olive grey sticky compact mud, serpent stars, lugworms
KT04-20 G-14	off Shiretoko P.	15/09/04	10:11	145 21.4950	44 30.4210	1,500	20	upper 5cms very soft olive grey homogeneous mud, lower dark olive grey sticky compact mud, a little s. stars
KT04-20 G- 5	off Shiretoko P.	15/09/04	11:47	145 21.8380	44 22.5140	185	1	a little amount of dark green basaltic f.- m. grained-sand, well sorted, two basaltic gravels, lids opened due to the gravels
KT04-20 G- 4	off Shiretoko P.	15/09/04	12:25	145 21.8870	44 21.9760	130	1	a little amount of dark olive basaltic f. - m. grained-sand, well sorted, sponges
KT04-20 G- 3	off Shiretoko P.	15/09/04	12:51	145 21.5690	44 21.8240	100	8	molluscan shell fragment-bearing f. - m. grained- well sorted sand
KT04-20 G- 2	off Shiretoko P.	15/09/04	13:16	145 20.9370	44 21.5690	76	6	molluscan shell fragment- and rounded pebble-bearing black well sorted basaltic sand
KT04-20 G-15	off Yubetsu	15/09/04	18:49	144 28.5260	44 39.4540	1,499	18	olive grey / pale olive compact sticky mud covered by thin soupy reddish brown mud
KT04-20 G-16	off Yubetsu	15/09/04	20:25	144 21.9730	44 37.5340	1,244	20	olive grey / pale olive compact sticky mud covered by thin soupy reddish brown mud
KT04-20 G-17	off Yubetsu	15/09/04	21:29	144 19.2830	44 37.0720	1,001	19	olive grey / pale olive compact sticky mud covered by thin soft yellowish brown mud, a serpent star
KT04-20 G-18	off Yubetsu	15/09/04	22:24	144 17.6400	44 36.2880	778	19	olive grey / pale olive compact sticky sandy mud covered by thin soft yellowish brown mud
KT04-20 G-19	off Yubetsu	15/09/04	23:05	144 16.8990	44 35.8750	535	14	rounded and poorly sorted granule- to pebble-gravel (up to 3 cms long)-bearing olive grey soft mud
KT04-20 G-20	off Yubetsu	15/09/04	23:41	144 16.4050	44 35.6240	355	12	rounded and poorly sorted granule- to pebble-gravel (up to 5 cms long)-bearing olive grey soft mud
KT04-20 G-21	off Yubetsu	16/09/04	00:06	144 15.9730	44 35.5010	233	8	rounded and poorly sorted granule- to pebble-gravel (up to 6 cms long)-rich olive grey soft mud
KT04-20 G-23	off Yubetsu	16/09/04	00:28	144 15.8180	44 35.4890	180	6	rounded and poorly sorted granule- to pebble-gravel (up to 3 cms long)-rich olive grey sticky mud
KT04-20 G-22	off Yubetsu	16/09/04	00:59	144 15.9330	44 35.5430	207	10	*no sampling due to loss of the surface a lid opened completely*
KT04-20 G-22 (2)	off Yubetsu	16/09/04	01:11	144 15.9140	44 35.5470	202	12	organic-rich, rounded and poorly sorted granule- to pebble-gravel (up to 3 cms long)-rich olive grey sticky mud
KT04-20 G-24	off Yubetsu	16/09/04	01:46	144 14.8950	44 35.4980	155	6	sponge-rich, rounded and poorly sorted granule- to pebble-gravel (up to 3 cms long)-rich olive grey highly sticky mud
KT04-20 G-31	south off Okushiri I.	17/09/04	15:20	139 29.7210	41 58.2980	65	0	a mass of sponge with a very little amount of fine-grained sand and molluscan shell fragments
KT04-20 G-31 (2)	south off Okushiri I.	17/09/04	15:31	139 29.6990	41 58.3900	65	0	a very little amount of fine-grained sand with molluscan shell fragments and fragments of sponges
KT04-20 G-38	south off Okushiri I.	17/09/04	16:21	139 30.8730	41 56.1800	100	1	fine- to medium-grained shelly sand, a serpent star and a hermit crab
KT04-20 G-39	south off Okushiri I.	17/09/04	17:44	139 33.3690	41 51.1170	205	2	molluscan shell fragment-bearing well sorted v.f.- to fine-grained sand
KT04-20 G-40	south off Okushiri I.	17/09/04	18:37	139 34.0460	41 50.8310	375	3	a little amount of molluscan shell fragment-bearing well sorted fine- to medium-grained olive grey sand
KT04-20 G-25	south off Okushiri I.	17/09/04	20:38	139 26.9010	41 58.3290	250	8	molluscan shell fragment-bearing well sorted dark olive compact fine-grained sand
KT04-20 G-26	south off Okushiri I.	17/09/04	21:01	139 27.0030	41 58.4760	210	0	*a little amount of molluscan shell fragment-bearing fine-grained sand, no samplings due to lids openend by a sponge*
KT04-20 G-26 (2)	south off Okushiri I.	17/09/04	21:25	139 27.0300	41 58.3310	200	4	molluscan shell fragment-bearing well sorted dark olive compact fine-grained sand, serpent stars and sponges
KT04-20 G-27	south off Okushiri I.	17/09/04	21:47	139 27.0470	41 58.3750	175	5	molluscan shell fragment-bearing well sorted dark olive compact fine-grained sand, serpent stars and seaweeds
KT04-20 G-28	south off Okushiri I.	17/09/04	22:10	139 27.1420	41 58.3450	143	6	molluscan shell fragment-bearing well sorted olive grey compact fine-grained sand, serpent stars and sponges
KT04-20 G-29	south off Okushiri I.	17/09/04	22:31	139 27.4410	41 58.2460	127	4	molluscan shell fragment-bearing well sorted olive grey fine- to medium-grained sand
KT04-20 G-30	south off Okushiri I.	17/09/04	22:53	139 28.4440	41 58.3320	100	2	molluscan shell fragment-rich, granule- to pebble-gravel-bearing well sorted olive grey fine- to medium-grained sand
KT04-20 G-32	south off Okushiri I.	17/09/04	23:22	139 31.0940	41 58.3140	100	2	molluscan shell fragment-rich well sorted olive grey fine- to medium-grained sand
KT04-20 G-33	south off Okushiri I.	17/09/04	23:43	139 32.1810	41 58.4010	125	2	molluscan shell fossils and shell fragment-bearing dark olive fine-grained sand
KT04-20 G-34	south off Okushiri I.	18/09/04	00:03	139 32.6560	41 58.3770	150	0	*no recovery due to probably by a lid opened*
KT04-20 G-34 (2)	south off Okushiri I.	18/09/04	00:14	139 32.6169	41 58.3350	148	1	rounded pebble- to cobble-gravel- and molluscan shell fragment-bearing dark olive well sorted fine-grained sand
KT04-20 G-35	south off Okushiri I.	18/09/04	00:39	139 32.7610	41 58.3540	174	0	only a small amount of molluscan shell fragment-bearing fine-grained sand
KT04-20 G-35 (2)	south off Okushiri I.	18/09/04	00:53	139 32.7580	41 58.3220	174	2	rounded pebble- to pebble-gravel- and molluscan shell fragment-bearing dark olive well sorted fine-grained sand
KT04-20 G-36	south off Okushiri I.	18/09/04	01:12	139 32.8800	41 58.2450	196	3	rounded pebble- to pebble-gravel- and molluscan shell fragment-bearing dark olive well sorted fine-grained sand
KT04-20 G-37	south off Okushiri I.	18/09/04	01:38	139 33.2270	41 58.2600	251	6	molluscan shell fragment-bearing dark olive well-sorted fine-grained sand with a little amount of pebble-gravels

Table 2: List of ostracod species from surface sediments of grab samples in southwestern Okhotsk Sea off Shiretoko Peninsula. Numerals in parentheses indicate number of living specimens.

Sample number	G-2	G-3	G-4	G-6	G-7	G-8	G-9	G-10	G-13
Species name/ Water depth (m)	76	100	130	170	215	248	315	505	1234
Aculicythereis ? sp.					3				
Argilloecia toyamaensis Ishizaki & Irizuki			4		3 (2)	3 (3)	13 (10)	14 (9)	
Argilloecia sp. 1				4 (3)		6 (4)			
Argilloecia sp. 2		1					6 (4)		
Aurila hatali Ishizaki	6	17	7			1		3	
Baffinicythere ishizakii Irizuki	4 (1)	4	4						
Baffinicythere reticulata Irizuki		1							
Baffinicythere robusticostata Irizuki		3	8						
Bythoceratina sp. 1		2							
Callistocythere sp.		1						1	
Cornucoquimba alata (Tabuki)	2	4	2					1	
Cornucoquimba sp. cf. *moniwensis* (Ishizaki)		1							
Cythere golikovi Schornikov	2	7	3		2	6	1	7	
Cythere uranipponica Hanai	1	4	3		3	1			
Cytheropteron sp. cf. *miurense* Hanai			1						
Cytheropteron sp. cf. *nodosoalatum* Neal & Howe		1	1						
Cytheropteron sp. cf. *sawanense* Hanai	6	2	1		6		3	4	
Cytheropteron sp. 1			1			1		2	
Cytheropteron sp. 2		1			1		1		
Cytheropteron sp. 3	2 (1)								
Cytheropteron sp. 4		2	4					1	4
Cytherura sp. cf. *daishakaensis* Tabuki	1								
Elofsonella sp. cf. *concinna* (Jones)				1	14 (2)	6 (2)	1	84 (10)	
Finmarchinella japonica s.l. (Ishizaki)	1	3	4						
Finmarchinella nealei Okada	3	6	2		2	1	2		
Finmarchinella uranipponica Ishizaki								2	
Hanaiborchella miurensis (Hanai)			1				1		
Hanaiborchella triagularis (Hanai)					4				
Hemicythere ochotensis Schornikov			4		4	1	1		
Hemicythere orientalis Schornikov	2	6	4		2				
Hemicytherura clathrata (Sars)	2	2	2						
Howeina camptocytheroidea Hanai	2	2	1		1				
Howeina leptocytheroidea Ishizaki	2	3	8		1		1	1	
Howeina sp.			1			1		2	
Howeina ? sp.	2								
Johnnealella nopporensis Hanai & Ikeya	29	56	59		5	2	2	5	
Kobayashiina ? sp.							1		
Kotoracythere sp.		2	4 (1)		9 (2)	9 (8)	1	1	
Krithe sp.					2				
Laperousecythere robusta (Tabuki)	2	7	31 (2)		1 (1)			2	
Loxoconcha hattorii Ishizaki	1								
Loxoconcha sp. cf. *kitanipponica* Ishizaki		1	2		1		1		
Loxoconcha optima Ishizaki	2	2	3		1				
Loxoconcha ozawai Tabuki			1			2		1	
Loxoconcha sp. cf. *subkotoroforma* Ishizaki	2		1		1			1	
Loxoconchidea ? sp.								1 (1)	
Munseyella hatatatensis Ishizaki	7 (2)	5	6 (1)	16 (9)	17 (6)	3 (1)	10 (3)	2	
Munseyella sp. 1	1			16 (6)	3 (2)	15 (14)		1	
Munseyella sp. 2		1	5	1 (1)					
Neonesidea sp.	1	6							
Paijenborchella sp.								1	
Palmenella limicola (Norman)								1	
Paradoxostoma sp. cf. *aculeoliferum* Schornikov	5	4							
Paradoxostoma sp. cf. *brunneum* Schornikov			1						
Paradoxostoma sp. cf. *nigromaculatum* Schornikov		2	2						
Paradoxostoma sp. cf. *setoense* Schornikov		2							
Pectocythere sp.		1							
Phlyctocythere sp.								1	
Pontocythere miurensis (Hanai)					5			4	
Propontocypris ? sp. 1	1	2	1						
Pseudocythere sp.	1 (1)	4							
Robertsonites sp. cf. *irizukii* Yamada		1	1						
Schizocythere ikeyai Tsukagoshi & Briggs		1	4		2	1			
Schizocythere kishinouyei (Kajiyama)		4	3						
Schizocythere okhotskensis Hanai	5	13	18				1		
Sclerochilus sp. 1	6 (1)	6	1		2				
Sclerochilus sp. 2			1					1	
Sclerochilus sp. 3		1	1			2			
Semicytherura hiberna Okubo	8	8	4					1	
Semicytherura sp. cf. *miurensis* (Hanai)	4	2				1		2	
Semicytherura sp. 1	1				1				
Semicytherura sp. 2		1							
Xestoleberis hanaii Ishizaki	19	21	10		1	2			
Xestoleberis iturupica Schornikov	5	16	3						
Xestoleberis setouchiensis Okubo	2	2			1				
Total number	140	244	228	38	98	64	46	147	4

Table 3a: List of ostracod species from surface sediments of grab samples in northeastern Japan Sea off Okushiri Island. Numerals in parentheses indicate number of living specimens.

Sample number	G-25	G-26	G-27	G-28	G-29	G-30	G-31	G-32	G-33	G-34	G-35	G-36	G-37	G-38	G-39	G-40
Species name/ Water depth (m)	250	200	175	143	127	100	65	100	125	148	174	196	251	100	205	375
Acanthocythereis dunelmensis s.l. (Norman)	2	1	3	2	1				3	1	1					
Anchistrocheles ? sp.	1		1		1											
Argilloecia toyamaensis Ishizaki & Irizuki	2	2	3		2	2									4 (3)	
Argilloecia sp. cf. *toyamaensis* Ishizaki & Irizuki												1				
Argilloecia sp. 1										1						
Argilloecia sp. 2			1											1		
Aurila sp.	18	21	28	18	16	32	1							9		
Aurila hatai Ishizaki	4	10	6	1	5	1	1									
Aurila spinifera Schornikov & Tsareva	1	3	9	4												
Australimoosella tomokoae (Ishizaki)	1			1												
Baffinicythere ishizakii Irizuki	1	1	1	2	2				2					8		
Baffinicythere robusticostata Irizuki	1	1	1	1	1				1					1		
Bairdoppilata sp.	11	2	12	8	8	8	1							6		
Bythoceratina sp. 1		1	1	1												
Bythoceratina sp. 2			2			1								1		
Bythoceratina sp. 3					1	1			1							
Bythoceratina sp. 4			1	1	1	5										
Bythocythere sp.	1			1												
Callistocythere alata Hanai	4	3	2													
Callistocythere japonica uranipponica Hanai					2	1										
Callistocythere sp. cf. *reticulata* Hanai		2	4			3										
Callistocythere setanensis Hanai		1		1	1											
Callistocythere sp. cf. *setanensis* Hanai	1	3	3	3	2	1								8		
Callistocythere subjaponica Hanai				1												
Callistocythere undata Hanai	5															
Callistocythere undulatifacialis Hanai	3							1					1			
Cobanocythere ? sp.		1			1											
Cornucoquimba alata (Tabuki)	3	3	5	3	9	7	1		1					11		
Cornucoquimba tosaensis (Ishizaki)	1															
Cornucoquimba sp. cf. *moniwensis* (Ishizaki)		1	1													
Cythere golikovi Schornikov	16	13	11	8	7	5			1							
Cythere uranipponica Hanai	14	9	9	9	4	1	1	1		4						
Cytherois ? sp.			4										1			
Cytheropteron miurense Hanai						1										
Cytheropteron sp. cf. *nodosoalatum* Neal & Howe				1												
Cytheropteron sawanense Hanai	7	5	3		1					1						
Cytheropteron sp. 1														1		
Cytheropteron sp. 3			1	1												
Cytheropteron sp. 4		1														
Cytheropteron sp. 5		2														
Cytherura sp. cf. *daishakaensis* Tabuki			1		1											
Cytherura sp.										1						
Cyhterura ? sp.				1												
Daishakacythere abei (Tabuki)	2	1	5	3	5	4		2	3	3	1	2		5	1	
Daishakacythere posterocostata (Tabuki)	16	10	26	13	14	18				1	3			15	1	
Elofsonella sp. cf. *concinna* (Jones)			1													
Eucythere sp.			1			1 (1)		1 (1)			1					
Falsobuntonia sp.				1		1										
Finmarchinela hanaii Okada	23	16	24	9	7	5	1							1		
Finmarchinella japonica s.l. (Ishizaki)	13	13	18	10	14	13		5			3	4		2	1	
Finmarchinella nealei Okada	8	2	5	2								1		6		
Finmarchinella rectangulata Tabuki	2			1												
Finmarchinella uranipponica Ishizaki	1		2		1	2						1				
Finmarchinella sp.	1		1		2	1				1	1			9		
Finmarchinella ? sp.														1		
Hemicythere emarginata (Sars)			1							1		1				
Hemicythere ochotensis Schornikov	4		7	6	3	2		1		3		1		20		
Hemicythere orientalis Schornikov	1	2	2	3		4	1			1	1			4	1	
Hemicythere ? *miii* (Ishizaki)					1											
Howeina higashimeyaensis Ishizaki	6		3	1			1									
Howeina sp. cf. *higashimeyaensis* Ishizaki				1										1		
Howeina sp.	1	1	1													
Howeina ? sp.		1			1	1										
Johnnealella nopporensis Hanai & Ikeya	2	6	9	5	7	1				4	1	3		11		
Kotoracythere sp.								1	1							
Kotoracythere ? sp.			1													
Krithe sawanensis Hanai	6		2		1											
Laperousecythere robusta (Tabuki)	2		5	1	1	4				3				17		
Laperousecythere sp.						1				2	1			5		
Loxoconcha epetersemi Ishizaki		1														
Loxoconcha hattorii Ishizaki	2		2	2		1										
Loxoconcha japonica Ishizaki	9	8	21	7	11	3										
Loxoconcha sp. cf. *kitanipponica* Ishizaki			1													
Loxoconcha optima Ishizaki	1	1	3	3	1	1										
Munseyella hatatatensis Ishizaki					2											

Table 3b: continued.

Sample number	G-25	G-26	G-27	G-28	G-29	G-30	G-31	G-32	G-33	G-34	G-35	G-36	G-37	G-38	G-39	G-40
Species name/ Water depth (m)	250	200	175	143	127	100	65	100	125	148	174	196	251	100	205	375
Munseyella sp. 3			1		1	2								1		
Neonesidea sp.	26	47	119	70	85	31			1			1		12		
Palmenella limicola (Norman)	2															
Palmoconcha sp.														1		
Paracytheridea bosoensis Yajima	2		10	1	1	2										
Paracytheridea neolongicaudata Ishizaki		3														
Paradoxostoma sp. cf. *aculeoliferum* Schornikov				2	1											
Paradoxostoma sp. cf. *brunneum* Schornikov				1	3											
Paradoxostoma sp. cf. *nigromaculatum* Schornikov		2			1											
Paradoxostoma sp. cf. *setoense* Schornikov	1			1												
Pontocythere subjaponica (Hanai)	2	1	3		2											
Propontocypris uranipponica Ishizaki & Irizuki			1			1										
Propontocypris sp.	3	3	1		3											
Propontocypris ? sp. 2		1	11	11	6	4		1						2		
Pseudocythere sp.					1			2 (1)						1		
Pseudocythere ? sp.													2			
Robertsonites hanaii Tabuki	1	8	5	9	8		1									1
Robertsonites sp. cf. *irizukii* Yamada		1			1	1										
Robustaurila ishizakii (Okubo)	4	3	7		2	1										
Schizocythere ikeyai Tsukagoshi & Briggs									1							
Schizocythere kishinouyei (Kajiyama)			4	2			1									
Schizocythere okhotskensis Hanai	6	3	3	3	6	3					2	2		30		
Sclerochilus sp. 1														1		
Sclerochilus sp. 2		1								1						
Sclerochilus sp. 3	1		4	3		3		2			1		1	1	1	
Sclerochilus sp. 4											1					
Semicytherura hiberna Okubo	3	1	1	1												
Semicytherura sp. cf. *miurensis* (Hanai)	2		1	3	1									1		
Semicytherura sp. cf. *slipperi* Yamada *et al.*	1					1										
Semicytherura sp. cf. *subundata* Hanai	3															
Semicytherura sp. 3	1			1												
Sinoleberis tosaensis (Ishizaki)			1	1												
Trachyleberis niitsumai Ishizaki	1		2	1												
Trachyleberis ? sp.								1								
Xestoleberis hanaii Ishizaki	6	8	7	6	10							1		1		
Xestoleberis sp. cf. *hanaii* Ishizaki	1															
Xestoleberis iturupica Schornikov								1								
Xestoleberis sagamiensis Kajiyama	1															
Xestoleberis setouchiensis Okubo	6	3	4	1	3	1	2						1			
Yezocythere hayashii Hanai & Ikeya	2	3		1	3	3						1		1		
Total number	273	236	439	254	275	185	11	19	15	28	17	19	257	295	9	1

Table 4: Most abundant 20 ostracod species, their individual numbers and their percentages against all individuals from southwestern Okhotsk Sea off Shiretoko Peninsula.

	Species name	no.	%
1	*Johnnealella nopporensis*	158	15.7
2	*Elofsonella* sp. cf. *concinna*	106	10.5
3	*Munseyella hatatatensis*	66	6.5
4	*Xestoleberis hanaii*	53	5.3
5	*Laperousecythere robusta*	43	4.3
6	*Argilloecia toyamaensis*	37	3.7
	Schizocythere okhotskensis	37	3.7
8	*Munseyella* sp. 1	36	3.6
9	*Aurila hataii*	34	3.4
10	*Cythere golikovi*	28	2.8
11	*Kotoracythere* sp.	26	2.6
12	*Xestoleberis iturupica*	24	2.4
13	*Cytheropteron* sp. cf. *sawanense*	22	2.2
14	*Semicytherura hiberna*	21	2.1
15	*Finmarchinella nealei*	16	1.6
	Howeina leptocytheroidea	16	1.6
17	*Sclerochilus* sp. 1	15	1.5
18	*Hemicythere orientalis*	14	1.4
19	*Baffinicythere ishizakii*	12	1.2
	Cythere uranipponica	12	1.2
20	*Baffinicythere robusticostata*	11	1.1
	Cytheropteron sp. 4	11	1.1

Table 5: Most abundant 20 ostracod species, their individual numbers and percentages against all individuals from northeastern Japan Sea off Okushiri Island.

	Species name	no.	%
1	*Neonesidea* sp.	392	19.8
2	*Aurila* sp.	143	7.2
3	*Daishakacythere posterocostata*	117	5.9
4	*Finmarchinella japonica* s.l.	96	4.8
5	*Finmarchinela hanaii*	86	4.3
6	*Cythere golikovi*	61	3.1
7	*Loxoconcha japonica*	59	3.0
8	*Schizocythere okhotskensis*	58	2.9
9	*Bairdoppilata* sp.	56	2.8
10	*Cythere uranipponica*	52	2.6
11	*Johnnealella nopporensis*	49	2.5
12	*Hemicythere ochotensis*	47	2.4
13	*Cornucoquimba alata*	43	2.2
14	*Xestoleberis hanaii*	39	2.0
15	*Daishakacythere abei*	37	1.9
16	*Propontocypris* ? sp. 2	36	1.8
17	*Robertsonites hanaii*	33	1.7
	Laperousecythere robusta	33	1.7
19	*Aurila hataii*	28	1.4
20	*Finmarchinella nealei*	24	1.2

Northeastern Japan Sea off Okushiri

Sixteen samples (G25–G40; Fig. 1B) obtained from depths of 65 m to 375 m on the upper continental shelf to the upper slope contained 115 species belonging to 56 genera (Table 3). Table 5 lists the numbers of individuals and percentages of the total population for these species. The dominant species were *Neonesidea* sp., *Aurila* sp. and *Daishakacythere posterocostata*. These three species together represented more than 30% of all individuals sampled. There were 11 common species: *Finmarchinella japonica* s.l., *Finmarchinella hanaii*, *Cythere golikovi*, *Loxoconcha japonica*, *Schizocythere okhotskensis*, *Bairdoppilata* sp., *Cythere uranipponica*, *Johnnealella nopporensis*, *Hemicythere ochotensis*, *Cornucoquimba alata* and *Xestoleberis hanaii*. The 14 species dominant or common accounted for approximately 70% of the total population.

4. DISCUSSION

Distribution off Shiretoko

Ostracods found off Shiretoko were divided into three types herein, depending on the difference of their depth-range distributions: "shelf species" (water depths of 76–170 m distributed only in the shelf; 26 spp.), "shelf-to-slope species" (76–1,234 m, distributed both in the shelf and slope; 39 spp.), and "slope species" (215–1,234 m, distributed only in the slope; 10 spp.).

The shelf species were *Baffinicythere* spp., *Finmarchinella japonica* s.l., *Neonesidea* sp., *Paradoxostoma* spp., *Schizocythere kishinouyei*, *Xestoleberis iturupica* and 15 other species. The shelf-to-slope species were *Argilloecia toyamaensis*, *Aurila hataii*, *Cytheropteron* sp. cf. *sawanense*, *Elofsonella* sp. cf. *concinna*, *Finmarchinella nealei*, *Johnnealella nopporensis*, *Laperousecythere robusta*, *Munseyella hatatatensis*, *Munseyella* sp. 1, *Schizocythere okhotskensis* and 29 other species. The slope species were *Acuticythereis*? sp., *Kobayashiina*? sp., *Krithe* sp., *Loxoconchidea*? sp., *Paijenborchella* sp., *Palmenella limicola*, *Phlyctocythere* sp. and three other species.

Many of the shelf and the shelf-to-slope species commonly occur in the northern Japan Sea (e.g., Itoh, 1996; Ozawa, 2004; Tables 2, 3 and 6). However, several slope species, such as *Paijenborchella* sp., have not been reported from the Japan Sea (e.g., Ozawa *et al.*, 2004b). Furthermore, *Krithe* sp. may differ from the other congeneric species reported from the Japan Sea. Thus, detailed examination of their carapace morphology and soft-part characteristics will be the subject of future study.

The continental-slope samples in the 844–1,500 m depths (samples G-11 to G-14; include no or few ostracods (Table 2). This result is almost the same as that found for ostracod distributions in samples collected from continental shelf to slope areas during the KT01-14 cruise in the southwestern Okhotsk Sea off Abashiri (Ozawa, 2004; Ozawa *et al.*, 2004b). At water depths of approximately 500–1,500 m in the southwestern Okhotsk Sea, low-oxygen conditions (approximately 0–1 ml of oxygen per liter of seawater) occur throughout the year (e.g., Yoneda, 1985). This environmental factor would explain the small number of ostracods (as in sample G-13) or their absence (as in samples G-11, G-12, G-14) at depths of 844–1,500 m off Shiretoko, as seen in samples from water depths of approximately 500–1,500 m from off Abashiri in the southwestern Okhotsk Sea (Ozawa, 2004; Ozawa *et al.*, 2004b).

Table 6: Correlation of species names between this study and Ozawa *et al.* (2004b). Correlations are represented just for the illustrated species by SEM images in each one or both studies.

This study	Ozawa *et al.* (2004b)
KT04-20 Cruise	KT01-14 Cruise
Acuticythereis ? sp.	*Acuticythereis* ? sp.
Cytheropteron sp. 1	*Cytheropteron* sp. 1
Cytheropteron sp. 2	*Cytheropteron* sp. 2
Cytheropteron sp. 3	*Cytheropteron* sp. 3
Cytheropteron sp. 4	*Cytheropteron* sp. 4
Elofsonella sp. cf. *concinna*	*Elofsonella* cf. *concinna*
Howeina sp.	*Howeina* sp.
Kotoracythere sp.	*Kotoracythere* sp.
Laperousecythere sp.	*Laperousecythere* sp. 1
Munseyella sp. 1	*Munseyella hokkaidoana*
Munseyella sp. 2	*Munseyella* sp. 2
Munseyella sp. 3	*Munseyella* sp. 1
Sclerochilus sp. 3	*Zabythocypris* sp.
Semicytherura sp. cf. *miurensis*	*Semicytherura* sp.

As compared with ostracod distributions found in the modern Japan Sea, such as those reported by Ikeya and Suzuki (1992) and Ozawa (2003b), ostracod water-depth distributions in the modern Okhotsk Sea were less clearly divided on the basis of species and ostracod assemblages. The water-depth ranges and the boundaries of species distributions in the Okhotsk Sea are more vague than those in the Japan Sea. Thus, it is difficult to categorize our ostracod data into discrete assemblages.

The southwestern Okhotsk Sea has distinct seasonal fluctuations in its water masses, especially in shallow water areas, and these fluctuations are known to be more complicated than those in the northern Japan Sea (e.g., Yoneda, 1985; Ozawa, 2004). At the very surface of the water, the Soya Warm Current Water appears in summer, while seasonal sea ice develops in winter. Together with these oceanic changes, several different types of water masses appear in each season (e.g., Yoneda, 1985). The differences in distributional divisions and common characteristics of the ostracod species assemblages between the southwestern Okhotsk Sea and the northern Japan Sea would reflect the distinct seasonal fluctuations throughout the year or other environmental factors. More data are thus needed on the ostracod distributions at various water depths and on the environmental factors causing differences in distributions.

Distribution off Okushiri

The ostracods in samples collected off Okushiri were mostly species typical of the Japan Sea Central Water assemblage defined by Ozawa (2003b). The samples dominantly included *Daishakacythere abei, Daishakacythere posterocostata, Johnnealella nopporensis, Cornucoquimba alata, Laperousecythere robusta, Finmarchinella nealei, Baffinicythere* spp., *Howeina higashimeyaensis* and *Yezocythere hayashii*, and relatively few individuals of species found in the Japan Sea Intermediate–Proper Water by Ozawa (2003b), such as *Acanthocythereis dunelmensis* s.l., *Argilloecia toyamaensis, Krithe sawanensis* and *Robertsonites hanaii*.

These Japan Sea Central Water elements in ostracod assemblage in Okushiri are similar to those reported for the upper continental shelf areas off Hokkaido in the northeastern Japan Sea, such as areas near the Soya Strait, and these species prefer water temperatures of less than 5°C in winter (Ikeya and Cronin, 1993; Itoh, 1996; Ozawa *et al.*, 1999, 2004a; Ozawa, 2003b, 2004, 2006, 2007).

The Japan Sea Intermediate–Proper Water elements in ostracod assemblage in Okushiri also resemble those found in the lower continental shelf and slope areas off Sanin-Mishima Island, the Oki Islands and the Noto Peninsula in the southwestern Japan Sea; off Sado Island and the Tsugaru Peninsula in the eastern Japan Sea; and off Hokkaido in the northeastern Japan Sea (Irizuki, 1989; Ishizaki and Irizuki, 1990; Ikeya and Suzuki, 1992; Ikeya and Cronin, 1993; Tsukawaki *et al.*, 1993, 1997, 1998, 1999, 2000, 2001; Itoh, 1996; Kamiya *et al.*, 1997, 2001, 2006; Ozawa *et al.*, 1999, 2004b; Ozawa, 2003b, 2004; Ozawa and Kamiya, 2001, 2005b). These species tend to inhabit the coldest water environments of the Japan Sea, where temperatures remain below 5–10°C throughout the year (Ikeya and Suzuki, 1992; Ozawa and Kamiya, 2001, 2005b; Ozawa, 2003a).

The depth distributions of the two ostracod assemblages described by Ozawa (2003b) are clearly distinct off northwestern Hokkaido near the Soya Strait (Itoh, 1996; Ozawa *et al.*, 1999; Ozawa, 2003b, 2004). The Japan Sea Central Water assemblage is mainly distributed in areas shallower than approximately 100 m on the upper continental shelf, while the Japan Sea Intermediate–Proper Water assemblage was found at depths deeper than approximately 100 m on the lower continental shelf and slope areas (Itoh, 1996; Ozawa *et al.*, 1999; Ozawa, 2003b, 2004). However, off Okushiri, many individuals of species typical of the Japan Sea Central Water assemblage were also found at 125–250 m, especially in the western area (Table 3). These specimens were mostly dead shells with no remaining soft parts, and many were not well preserved. In this area, living specimens with soft parts were found for some species in the Japan Sea Intermediate–Proper Water assemblage of Ozawa

(2003b) such as *Argilloecia toyamaensis*, and shells without soft parts were found for phytal species living in the intertidal zone in Japan (e.g., Kamiya, 1988; Tsukagoshi, 1988; Kamiya *et al.*, 2001; Sato and Kamiya, 20087) such as *Loxoconcha japonica*, *Aurila hataii*, and *Cythere*, *Xestoleberis* and *Paradoxostoma* species (Table 3).

The shelf areas along western and eastern Okushiri Island are much narrower (approximately 3 km in width) than other shelf areas along the Japan Sea coast, such as the 25 km shelf off the Noto Peninsula of the southwestern areas and the approximately 70 km shelf near the Soya Strait of the northeastern area. Thus, many ostracod dead shells from shallow areas (<100 m) would have been transported to areas on the lower continental shelf and upper slope (>100 m) because of this steep-slope geomorphology, especially west of Okushiri Island. Therefore, the species distribution off Okushiri was not clearly defined at the 100 m depth, and it apparently differs from those in other areas along the Japan Sea coast, e.g., around the Soya Strait.

The western and eastern areas of the Okushiri Spur (Fig. 1B) differed considerably in the numbers of individual specimens collected from lower shelf areas at 100–200 m depths. Many more specimens were found in the western area (about 4,000–14,000 individuals per 625 cm^3 of sampled sediment; samples G-26–G-29) than in the eastern area (about 30–60 individuals per 625 cm^3 of sampled sediment; samples G-32–G-36).

This result reflects differences in the submarine geomorphology and the degree of transportation of ostracod valves from shallow water to deep water on the steep slope of the western area or the relatively gradual slope of the eastern area. Thus, it would be easier for ostracod valves to be transported to deeper waters on steep slopes near the Okushiri Ridge in the western area than on gentle slopes of the eastern area near the Okushiri Strait (Fig. 1B). Differences in the numbers of individuals may also reflect differences in oceanic current velocities from the south through the Okushiri Strait in the eastern area of the Okushiri Spur and in the western area outside the strait (Fig. 1B). The distributions of fine sand, gravel, and shell fragments herein suggest that it would be difficult for ostracod valves and very-fine-grained sediments such as mud to deposit on the sea bottom near this strait (i.e., in the eastern area; Table 1).

On the lower continental shelf and the continental slope of the Japan Sea off Mishima, Oki, Noto, and Tsugaru (i.e., south of the Tsugaru Strait), *Robertsonites hanaii* is more abundant than *Krithe sawanensis* at depths of 150–250 m; however, at depths of 350–1,500 m, *Krithe sawanensis* is dominant (Ozawa, 2003b). The boundary between the relative abundances of these two species south of the strait occurs at a water depth of approximately 300 m. However, off Hokkaido (e.g., off the Shakotan Peninsula between 43–44°N), north of the strait, *Robertsonites hanaii* is more abundant from 125–182 m, but *Krithe sawanensis* is more abundant from 210–528 m (Ozawa *et al.*, 2004b). Off Shakotan, the boundary between the relative abundances of these species occurs at depths of approximately 200 m (Ozawa *et al.*, 2004b). Consequently, the boundary lies at different depths south and north of the Tsugaru Strait, with the depth in the south being approximately 100 m deeper than that in the north.

We found *Krithe sawanensis* in just three samples from 127–250 m water depths (G-25, G-27, G-29) collected west of the Okushiri Spur. The relative occurrences of *Krithe sawanensis* and *Robertsonites hanaii* off Okushiri suggest that the boundary of their depth distribution occurred between 200–250 m in the area where samples G-25 and G-26 were taken. However, only dead specimens without soft parts were found for these two species in this area, in contrast to the living specimens with soft parts found in other areas. Thus, we cannot conclusively determine the distributions of living individuals of these species in this area or the boundary of these distributions.

The different distributional modes of these two species within the Japan Sea south and north of the Tsugaru Strait may be due to slight changes in the water environment, such as changes in water temperature or dissolved oxygen levels during the year, in which case oceanic conditions must differ north and south of the Tsugaru Strait. Future research cruises in the Japan Sea should help clarify the correlations between the distributions of these species and properties of the water-mass structures.

Significance of our data

Shallow water areas of the upper shelf in the northeastern Japan Sea and in the southwestern Okhotsk Sea share many common species including *Johnnealella nopporensis*, *Laperousecythere robusta*, *Schizocythere okhotskensis*, *Finmarchinella nealei*, *Baffinicythere* spp. and *Hemicythere orientalis* (Tables 2 and 3). However, several species such as *Daishakacythere abei*, *Daishakacythere posterocostata* and *Loxoconcha japonica* have been found only in the Japan Sea. Further, *Munseyella* sp. 1 is distributed only in the southwestern Okhotsk Sea (Tables 2, 3 and 6), even though the Soya Strait connecting the Okhotsk and Japan Seas is shallow, with depths of about 50 m.

In addition, several species typical of the Japan Sea Intermediate–Proper Water assemblage reported by Ozawa (2003b) have not been found in the southwestern Okhotsk Sea. For example, few or no occurrences of *Acanthocythereis dunelmensis* s.l., *Robertsonites hanaii*, *Krithe sawanensis*, *Rabilimis septentrionalis* and *Falsobuntonia* sp. have been reported for the southwestern Okhotsk Sea, although many individuals of *Elofsonella* sp. cf. *concinna* and *Argilloecia toyamaensis* have been found.

Previous studies have presented similar results for occurrence modes in these two seas (Itoh, 1996; Ozawa *et al.*, 1999, 2004b; Tsukawaki *et al.*, 2001; Ozawa, 2004, 2006, 2007; Ozawa and Kamiya, 2005b). However, for many species there are not yet clear explanations for their presence or absence or for the differences in distribution. The species distributions reported here are important for examinations of the history of species migration between the seas and the effects of oceanic environmental factors on species distributions.

Sea areas off Shiretoko and Okushiri contain many cryophilic ostracod species that inhabit water environments of less than 5–10°C throughout the year (e.g., *Argilloecia toyamaensis* and *Elofsonella* sp. cf. *concinna*; Ozawa, 2003b, 2004; Ozawa and Kamiya, 2005b) or less than 5°C only in winter (e.g., *Johnnealella nopporensis* and *Laperousecythere robusta*; Ozawa, 2003a, 2003b, 2006, 2007; Ozawa *et al.*, 2004b). Thus, ostracod data from these areas are important for understanding the relationship between the pattern of migration or extinction of cryophilic organisms and environmental fluctuations in the mid-latitudes, which have undergone global warming and cooling events in the geological past and are also susceptible to global warming both at present and in the near future.

5. TAXONOMIC NOTE

Order Podocopida Sars, 1866

Superfamily Cytheroidea Baird, 1850

Family Eucytheridae Puri, 1954

Genus *Munseyella* van den Bold, 1966

Munseyella sp. 1

Plate 2, fig. 11

Munseyella hokkaidoana (Hanai). Ozawa, 2004, Appendix C (list); Ozawa *et al.*, 2004b, Plate 2, fig. 7, Table 1.

Remarks. The lateral outline of this species is very similar to *Munseyella hokkaidoana* (Hanai, 1957), but it is different from the *Munseyella hokkaidoana*, because the following distinct characters on carapace lack in this species; the prominent marginal ridges in entire periphery of carapaces, two prominent tubercles in dorsocentral area, and deep depressions in anterior margin and in posteroventral area. The carapace surface of the present species is relatively smooth, especially in anterior margin and in posteroventral area. The carapace length of this species is ca. 0.6 mm, and slightly larger than that of *Munseyella hokkaidoana* (ca. 0.5 mm; Hanai, 1957).

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Plate 1: Ostracods in samples from KT04-20 Cruise. Specimens of 3, 4, 9, 12 and 16 are from off Shiretoko Peninsula in the southwestern Okhotsk Sea, and those of 1, 2, 5–8, 10, 11, 13–15 and 17–20 are from off Okushiri Island in the northeastern Japan Sea. Scale bars are 0.1 mm: A for 3, 7, 8, 13, 14; B for 1, 2, 4–6, 9–11, 15–20; C for 12. RV: right valve, LV: left valve, RS: right side of carapace, LS: left side of carapace.

1. *Anchistrocheles*? sp.: RV, sample G-27
2. *Argilloecia toyamaensis*: LV, sample G-27
3. *Argilloecia* sp. 1; LS, sample G-8
4. *Argilloecia* sp. 2: RS, sample G-9
5. *Callistocythere* sp. cf. *setanensis*: LV, sample G-38
6. *Aurila* sp.: RV, sample G-28
7. *Bairdoppilata* sp.: LV, sample G-28
8. *Neonesidea* sp.: LV, sample G-28
9. *Aurila hataii*: LV, sample G-3
10. *Bythoceratina* sp. 4: RV, sample G-30
11. *Cytherois*? sp.: RV, sample G-27
12. *Cytheropteron* sp. 4: RS, sample G-3
13. *Daishakacythere abei*: RV, sample G-29
14. *Daishakacythere posterocostata*: RV, sample G-29
15. *Finmarchinella hanaii*: LV, sample G-26
16. *Elofsonella* sp. cf. *concinna*: LV, sample G-10
17. *Finmarchinella japonica* s.l.: LV, sample G-29
18. *Finmarchinella* sp.: LV, sample G-38
19. *Hemicythere ochotensis*: RV, sample G-38
20. *Hemicythere ochotensis*: RV (A-1 juvenile), sample G-38

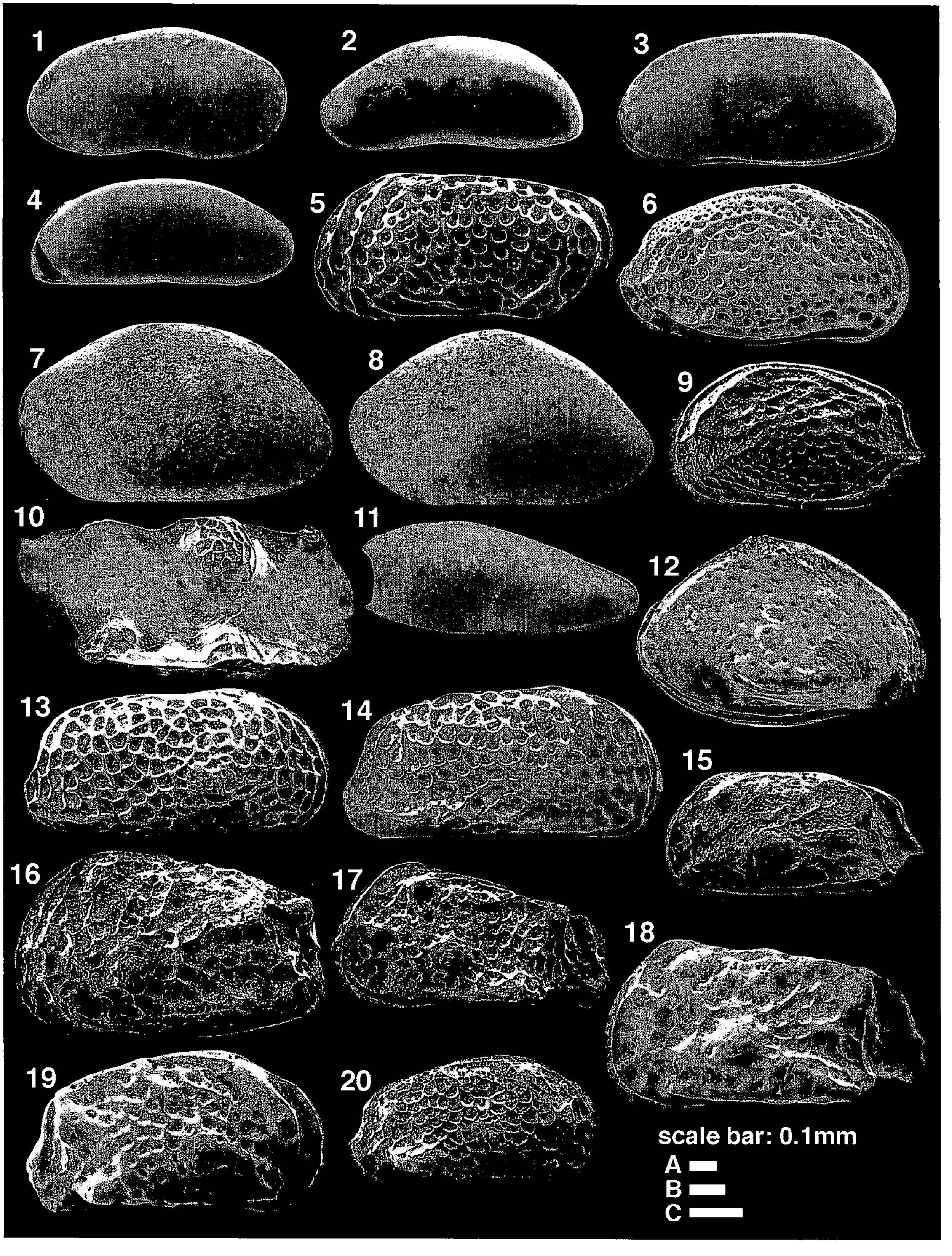
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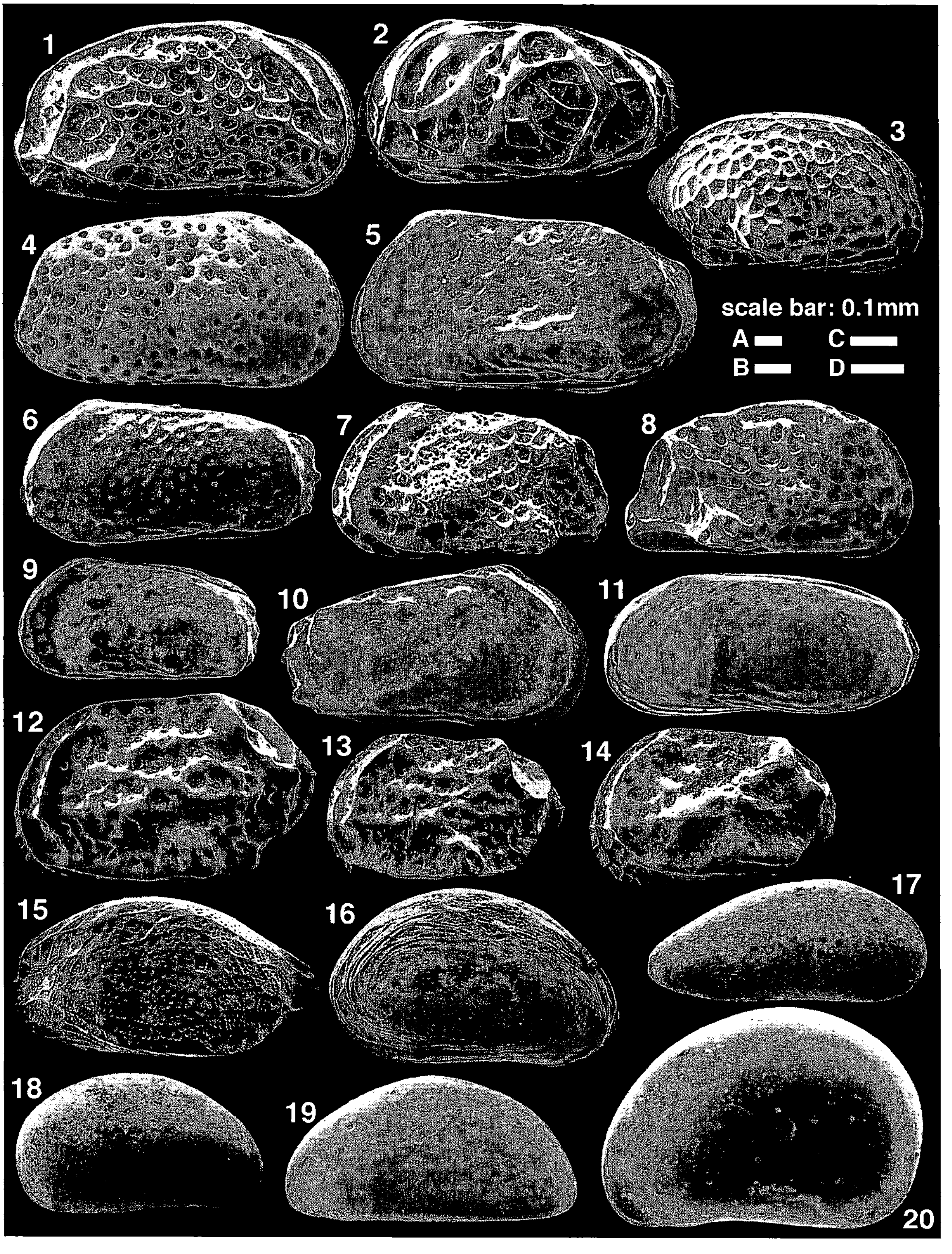
Plate 2: Ostracods in sample from KT04-20 Cruise. Specimens of 2–6, 9, 11, 14, 16, 18 and 20 are from off Shiretoko Peninsula in the southwestern Okhotsk Sea, and those of 1, 7, 8, 10, 12, 13, 15, 17 and 19 are from off Okushiri Island in the northeastern Japan Sea. Scale bars are 0.1 mm: A for 7, 8, 17; B for 4, 9, 12–14, 18; C for 3; D for 1, 2, 5, 6, 10, 11, 15, 16, 19, 20. RV: right valve, LV: left valve, CR: carapace, RS: right side, LS: left side

1. *Hemicythere orientalis*: RV, sample G-38
2. *Howeina leptocytheroidea*: LV, sample G-4
3. *Howeina*? sp.: RV, sample G-2
4. *Johnnealella nopporensis*: RV, sample G-2
5. *Kotoracythere* sp.: LS, sample G-4
6. *Munseyella hatatatensis*: LV, sample G-3
7. *Laperousecythere robusta*: LV, sample G-38
8. *Laperousecythere* sp.: RV, sample G-38
9. *Munseyella* sp. 2: LS, sample G-4
10. *Munseyella* sp. 3: RS, sample G-30
11. *Munseyella* sp. 1: LS, sample G-6
12. *Schizocythere okhotskensis*: LV, sample G-38
13. *Schizocythere okhotskensis*: LV (A-1 juvenile), sample G-38
14. *Schizocythere ikeyai*: LS, sample G-4
15. *Semicytherura* sp. cf. *miurensis*: LV, sample G-25
16. *Semicytherura hiberna*: RV, sample G-2
17. *Propontocypris*? sp. 2: RV, sample G-27
18. *Xestoleberis hanaii*: RV, sample G-3
19. *Xestoleberis setouchiensis*: LV, sample G-27
20. *Xestoleberis iturupica*: LV, sample G-3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北海道沖オホーツク海南西部・日本海北東部海域における現生介形虫類の分布に関する予察的成果－淡青丸 KT04-20 次航海で採取された表層堆積物試料について

小 沢 広 和[1]・塚 脇 真 二[2]

要　旨

2004 年 9 月 13–18 日に、オホーツク海南西部知床半島沖・北見大和堆付近および日本海北東部奥尻島沖海域において、海洋研究船淡青丸の研究航海 KT04-20 により、計 45 の海底表層堆積物試料が採取された。本研究では、知床半島沖および奥尻島沖海域の計 28 試料について、現生介形虫類の分布を検討した。その結果、以下の予察的成果が得られた。

2 海域の計 28 試料のうち、25 試料から、計 62 属 136 種の介形虫類が同定された。そのうち、知床半島沖オホーツク海域では、水深 76–1,234m で得られた 9 試料より 37 属 75 種が見出され、分布する全種のリストおよび多産種の電子顕微鏡写真が示された。本研究は、オホーツク海沿岸の介形虫類相の分布に関する、2 例目の詳細なデータ報告である。これらは、日本海沿岸にも共通して分布する種を、多く含む。

奥尻島沖日本海域では、水深 65–375m で得られた計 16 試料から、56 属 115 種が見出された。これらは、日本海冷水系中層水および日本海中間水–固有水域に、特徴的に分布する種を多く含む。

本研究の種分布データは、海洋環境変動が地球上で最も激しい中緯度域について、地質時代の新生代後期や、現在および近未来の温暖化・寒冷化等の海洋環境変動と、好冷性生物種の移動・絶滅・生存パターンとの関連を考える上で、重要な基礎情報である。

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