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Article

Ostracod Assemblages in the East Siberian Sea: A Comparative Study of River-Influenced and River-Isolated Shelf Ecosystems

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Abstract: The East Siberian Sea (ESS) is one of the least studied seas in terms of ostracod fauna. Ostracods are sensitive organisms to environmental changes, and detailed information on their ecology is still required. To fill this knowledge gap, we studied 33 meiobenthic dredge samples collected from the western part of the ESS and the Chaun Bay together with 17 grab samples taken from the eastern part of the sea. Quantitative analyses of the ostracod assemblages demonstrate that the river-influenced western part of the ESS is inhabited by low diverse and impoverished fauna consisting of the taxa which are able to adapt to different environmental conditions. In the isolated Chaun Bay sheltered from significant riverine influence, the ostracod assemblages contain species that prefer more stable conditions. The predominance of living specimens over dead ones and individual valves points to strong carbonate dissolution that is more pronounced in the western ESS than in the Chaun Bay. The formation of such conditions might be related to the high content of dissolved carbon dioxide resulting from bacterial remineralization of in situ produced and land-derived organic matter in the bottom sediments and low pH near the seabed. Numerous ferromanganese crusts were found on the ostracod valve surfaces and inside the shells from the Chaun Bay.

Keywords: distribution; salinity; temperature; Chaun Bay; Indigirka River; Arctic Ocean; migration; Holocene; dissolution

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1. Introduction

Up to now, the ostracod fauna of the East Siberian Sea (ESS) are very poorly studied in comparison with the other Arctic marginal seas and little is known about the ecological preferences of different species and the patterns of their distribution. One of the important problems in ostracod studies is an accurate taxonomic identification, and this depends on high specimen abundances. However, in the ESS, the material is limited and makes species-level identification more challenging [1].

Since the 1960s, the cold-water arctic–boreal ostracods have actively been investigated by paleoceanographers and paleontologists as important indicators of glacial–interglacial climatic variability and reliable tracers of bottom currents and riverine influence. However, only the morphology of the ostracod valves was superficially studied whereas the soft body of the organisms was not analyzed. In particular, T.M. Cronin and H.J. Dowsett [2] suggested a quantitative micropaleontological method using ostracod taxa identified to the genus level as the reliable indicators of paleoceanographic conditions. The authors proposed that as ostracods are sensitive organisms to environmental changes, it is not necessary to accurately identify them to the species level [2]. Later studies demonstrate that this approach is suitable to global-scale environmental reconstructions and insufficient for regional studies. Thus, more recent works show that many species, which have been previously described as widespread taxa, actually consist of morphologically similar but distinct species that are characterized by the narrower range of their distribution [1,3,4]. Thus, detailed knowledge of species ecology and their systematics is required for the further improvement of paleoecologic and paleoceanographic reconstructions in Arctic Ocean environments.

Almost up to the first half of the twentieth century, knowledge about the ostracod fauna in the ESS was scarce. O. Elofson reported that ostracod species *Heterocyprideis sorbyana* (Jones, 1857), *Paracyprideis pseudopunctillata* (Swain, 1963), and *Sarsicytheridea bradii* (Norman, 1865) were found in the ESS [5]. Much more data on the distribution of the ostracod species in the Eastern Arctic were obtained by N.A. Akatova based on the samples collected during the drifting expedition on the R/V "Sedov" in 1937–1940 [6,7]. She identified 26 species from the Laptev and East Siberian Seas. V.G. Chavtur and E. I. Schornikov reported about 16 species of benthic ostracods from the ESS in the book *The species list of free-living invertebrates of the Eurasian Arctic Seas* [8]. Six species of ostracods from the ESS were listed in the database of the Arctic ostracods [9–11]. Thus, for the ESS there have been described 15 species of benthic ostracods with the exception of synonyms and unidentified taxa. In 2006, E.I. Schornikov and M.A. Zenina reported about 32 species from the Chaun Bay and 35 species from the East Siberian Sea [1]. Recent ostracod fauna have been studied in the Kara [1,12,13], Laptev [1,12,14,15], and Chukchi [16,17] seas.

This study is based on the surface meiobenthic samples taken from the muddy sediments in the coastal area of the East Siberian Sea. This paper aims to accomplish the following: (1) study modern ostracod distribution across the shelf; (2) compare the ostracod assemblages from the Chaun Bay with those from the Indigirka River mouth and the adjacent area; (3) analyze the ecological preferences of the ostracod species; and (4) reveal the influence of the environmental parameters, including the riverine discharge, on the distribution of the ostracod species.

2. Regional Setting

The ESS is located between the Laptev and Chukchi Sea and bordered by the northern coast of Eastern Siberia to the south (Figure 1). The northern limit of the ESS coincides with the end of the continental shelf. The ESS is known as the shallowest sea among the Arctic seas with a mean depth of 52 m [18]. The seabed is flattened without any significant troughs, depressions, or submarine rises, and is sloped from the southwest to the northeast.

The ESS is characterized by strong environmental variability due to winter sea ice cover, seasonal riverine input [19], thermoabrasion of coastal permafrost sequences [20], and highly variable atmospheric circulation [21,22]. The sea surface is covered by sea ice during ~10 months per year, and during summer it may be partially or completely ice-free depending on the position of the atmospheric pressure cells that control the wind direction over the sea surface, e.g., [23]. Sea ice forms within polynyas and flaw leads developing above 20 and 30 m isobaths, e.g., [24], and then moves northward as drifted ice. In the ESS, the area of polynyas and flaw lead development extends from the northeast to the southwest marking the northern boundary of the fast ice (i.e., ice attached to the coast) area (Figure 1) [25].

The hydrological setting of the ESS is characterized by the two contrasting areas: the western part and the eastern part, including the Chaun Bay [22]. The western part of the basin is occupied by a pronounced freshened surface mixed layer that persists in the upper 10–25 m in summer [26]. This layer is mainly maintained by fresh water from the Lena River, which enters the western ESS through the Dmitrii Laptev and Sannikov Straits. Two major rivers, the Indigirka and the Kolyma, contribute to the formation of the freshened surface mixed layer and annually supply 61 and 132 km^3 of fresh water, respectively [19]. These freshened waters are relatively warm and nutrient-depleted in contrast to the cold, nutrient-rich, and saline waters from the eastern part of the ESS which penetrate to the basin from the Chukchi Sea [22]. The eastward transport of the freshened waters forms the Siberian Coastal Current; its strength is influenced by wind direction [27].

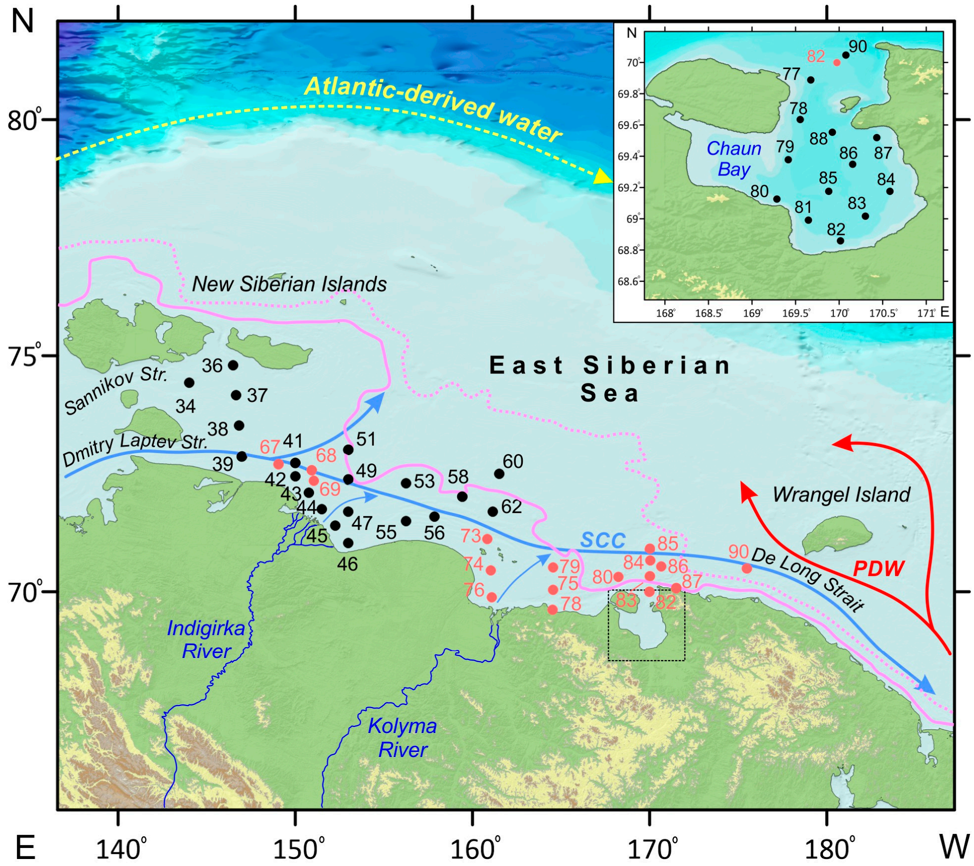

Figure 1. Map of the study area in the East Siberian Sea. Stations in black color are samples collected during the expedition of the R/V "Ivan Kireev" in 2004 while stations in red are ones from the expedition of the R/V "Ivan Kolomeytsev" in 2000. SCC—Siberian Coastal Current; PDW—Pacific-derived water. The enlarged square illustrates the Chaun Bay. Purple lines mark the northern boundaries of fast ice (solid) and flaw polynya (dashed) distribution [25].

The sequences of the coastal permafrost exposed along the seacoast in the East Siberian lowlands are subjected to thermoabrasion which is most intensive in summer, e.g., [28,29]. Erosion of these sequences causes the significant input of fine-grained material including highly reactive organic carbon into the ESS [20]. The bacterial degradation of organic matter that is delivered to the coastal waters results in acidification, which causes the development of a carbonate-corrosive environment [30,31]. The high amount of nutrients delivered by the rivers creates favorable conditions for in situ marine organic matter formation by phytoplankton, the degradation of which contributes to the acidification [32,33].

Due to the lack of long-term observations, data on temperature and salinity are limited. During the studied season, the bottom-water temperature ranges between −1.07 and 4.5 °C, and the bottom-water salinities range between 10.1 and 28‰ at water depths between 7 and 23 m in the western ESS (Appendix A, Table A1). In the Chaun Bay, temperature and salinity vary within 1.1–8.5 °C and 19.5–25.5‰, respectively, at a water depth range between 10 and 16 m. TOC content in the surface sediments is low and does not exceed 2% [34].

There are several bays along the Eastern Siberian coast: the Chaun Bay, the Kolyma Bay, the Omulyakh Bay, and the Khromskaya Bays. The Chaun Bay located in the southeastern part of the ESS is the largest bay among all ESS bays. It is a semi-enclosed estuary which is connected with the open sea via three narrow passages separated by two islands. The

Chaun Bay's maximal width from north to south is about 100 km; the maximal length is ~150 km and a square is about 9180 km^2 [35]. Several small rivers enter the Chaun Bay supplying in total around 9 km^3 per year [36]. This volume is significantly smaller than the riverine input derived from the Indigirka, Kolyma, and Lena Rivers; therefore, river-related seasonal variations in fresh water content in the sea surface are negligible. The mean depth of the Chaun Bay is 15 m.

According to Golikov and co-authors [36], the average bottom-water temperature in the Chaun Bay is 1.9 °C across the seafloor. Other researchers report a near-bottom temperature range of −0.11–3.27 °C and a salinity range between 24.1 and 31.8‰ in October 2020 [36]. During the studied season, the bottom-water temperature varies between 1.1 and 8.6 °C, whereas the salinity ranges between 19.5 and 25.5‰ (Appendix A, Table A1).

3. Materials and Methods

In the framework of this study, quantitative analyses of ostracod assemblages were carried out in 33 meiobenthos samples collected from the East Siberian Sea (ESS) during the expedition of the R/V "Ivan Kireev" in 2004 and 17 samples from R/V "Ivan Kolomeytsev" in 2000 (Appendix A, Tables A1–A4). Twenty samples were taken in the western part of the sea including the Indigirka fore-delta area, whereas thirteen samples were retrieved in the Chaun Bay (Figure 1).

The material from the expedition of the R/V "Ivan Kireev" was collected by the light dredge of 36 cm width combined with a net of 100 micron mesh screen. The dredge allows for taking the upper 5 cm of the bottom sediments. The approximate amount of retrieved sample is about 15 L. Samples collected during the expedition of R/V "Ivan Kolomeytsev" were taken by grab. The collected material was thoroughly washed onboard, placed into 96% ethanol in glass containers to preserve the soft bodies of meiofauna, and, after the expedition, stored as a museum collection at A.V. Zhirmunsky National Scientific Center of Marine Biology, Far Eastern Branch, Russian Academy of Sciences, Vladivostok, Russia, between 2004 and 2022. The temperature in the storage room does not exceed 16 °C. Ethanol was periodically added to the samples to reach an ethanol-to-sediment ratio of 2:1. Four samples were dried up during storage but included in this study as well. Four weeks before the study, most of the samples were treated by a solution of 2 g Rose Bengal l^{-1} in 96% ethanol and stored at room temperature, according to FOBIMO protocol [37]. Dry samples were not treated by Rose Bengal. The containers with wet samples were repeatedly shaken in order to disintegrate clumps and enhance the diffusion of the dye into the soft bodies of the organisms. After four weeks of staining, the samples were washed again through the 100 µm mesh-size sieve. The fraction > 100 µm was used for the ostracod study. Fractions rich in ostracods were split in suitable aliquots under wet conditions to obtain 250–300 specimens in each portion. All ostracods including individual valves were hand-picked from the aliquots and identified to the species level where possible. Seventeen samples collected by grab during the cruise of the R/V "Nikolay Kolomeytsev" in 2000 and also treated by Rose Bengal were included in this study as well (Appendix A, Table A1).

Rose Bengal treatment is a technique that allows for not only staining living specimens but also for coloring recently alive individuals with organic test lining inside the valves. As the samples were collected by dredge, there are no data about the strict amount of analyzed sediments; thus, only the relative abundances of species (percentage of each species from the total number of individuals) were calculated. The statistical operations (diversity index calculations and the performing of cluster analysis) were carried out using the PAleontological STatistics (PAST) version 4.11 software [38]. Assemblage similarity indices were calculated using the SIMPER program in Plymouth Routines In Multivariate Ecological Research (PRIMER v6) software package.

The temperature and salinity were measured in situ with a SeaBird 19. To determine the pH values of the water, the technique of potentiometry with a cell with a liquid-free junction was used [39].

4. Results

In our materials from the ESS, 32 species of ostracods were found (Table 1). The fauna of the Chaun Bay are characterized by the greatest ostracod diversity with two clearly distinct ostracod assemblages. The area near the Indigirka River is inhabited by less diverse ostracod fauna.

Table 1. List of the ostracod species from the Eastern Siberian Sea and studied areas.

Taxa	Mention for the ESS	Western Part of the ESS	Chaun Bay *
Philomedes brenda (Baird, 1850)	[1,6,8,40]		
Scleroconcha ruffi Kornicker, 1988	[40]		
Polycope sp. s. Akatova, 1946	[40]		
Pseudopolycope sp. B Schornikov and Zenina, 2006	[1]	■	
Argilloecia sp. s. Schornikov, 2001	[1,40]		
Jonesia acuminata (Sars, 1866)	[1,40,41]		
Jonesia arctica Schornikov, 1980	[1,40]		■
Jonesia sp.1 s. Schornikov, 2001	[1,40]		
Sclerochilus (S.) jurasovi Schornikov, 2004	[1,40]		■
S. (*S.*) *laptevensis* Schornikov, 2004	[1,40]	■	
S. (S.) semiletovi Schornikov and Zenina, 2006	[1,40]		■
Microcytherura nealei Schornikov and Zenina, 2006	[1,40]		■
Palmenella dentatomarginata Akatova, 1946	[1,40]	■	■
Cluthia cluthae (Brady, Crosskey and Robertson, 1874)	[1,40]	■	■
C. horni Schornikov and Zenina, 2006	[1,40]	■	■
Eucythere sp. 1. s. Schornikov, 2004	[1,40]		■
Heterocyprideis fascis (Brady and Norman, 1889)	[1,40]	■	■
H. sorbyana (Jones, 1856)	[1,6,9,40,41]	■	■
Paracyprideis sp.	[1,3,6,9,40,41]	■	■
Sarsicytheridea bradii (Norman in Brady, 1865)	[1,6,9,40,41]	■	■
S. macrolaminata (Elofson, 1939)	[1,40]		
S. parapapillosa (Swain, 1963)	[1,40]	■	■
S. punctillata (Brady, 1865)	[6,9,40]		
Pontocythere sp. s. Schornikov, 2004	[1,40]	■	■
Krithe glacialis Brady, Crosskey and Robertson, 1874	[1,6,9,40]		
Acanthocythereis horrida (Sars, 1866)	[1,40]		■
A. dunelmensis (Norman, 1865)	[1], [3]?, [6]?, [9]?, [40]		■
Robertsonites tuberculatus (Sars, 1866)	[1,6,40]		■
Cytheretta teshekpukensis Swain, 1963	[1,40]		■
Finmarchinella (*Barentsovia*) *barenzovoensis* (Mandelstam, 1957)	[6,36,40]		
F. (*B.*) *logani* (Brady and Crosskey, 1871)	[1,40]		■
Elofsonella pinegensis (Lev, 1983)	[1,40,41]		

Table 1. *Cont.*

Taxa	Mention for the ESS	Western Part of the ESS	Chaun Bay *
Rabilimis mirabilis (Brady, 1868)	[1,6,40,41]		
R. septentrionalis (Brady, 1866)	[1,40]	■	■
Kuiperiana venepidermoidea (Swain, 1963)	[1,40]		■
Pteroloxa chaunensis Schornikov and Zenina, 2006	[1,40]	■	■
Roundstonia globulifera (Brady, 1868)	[1,40]	■	■
Semicytherura complanata (Brady, Crosskey and Robertson, 1874)	[1,40]		■
Semicytherura sp. 2 s. Schornikov, 2001	[1,40]		■
Semicytherura sp. 3 s. Schornikov and Zenina, 2006	[1,40]	■	■
Kotoracythere arctoborealis Schornikov and Zenina, 2006	[1,40]		■
Munseyella kiklukhensis (Brouwers, 1990)	[40]		■
Cytheropteron arcuatum Brady, Crosskey and Robertson, 1874	[1,9,40]		
C. champlainum Cronin, 1981	[1,40]		
C. cf. *elaeni* Cronin, 1989 s. Schornikov, 2004	[1,40]		■
C. montrosiense Brady, Crosskey and Robertson, 1874	[1,9,40,41]	■	
C. occulatum Whatley and Masson, 1979	[1,40]	■	
?C. paralatissimum Swain, 1963	[6,40,41]		
C. pseudomontrosiense Whatley and Masson, 1979	[1,9,40]		
C. pyramidale Brady, 1868	[1,40]		■
C. sibiricum Schornikov and Zenina, 2006	[1,40]		■
C. sulense Lev, 1972	[1,40]	■	
C. suzdalskyi Lev, 1972	[1,40]		
Cytheropteron sp. s. Schornikov and Zenina, 2006	[1,40]		■
Arctostoma dudarevi Schornikov and Zenina, 2006	[1,40]	■	□

Note. The second column contains literature mentioning the ostracod species for fauna of the East Siberian Sea; ■—ostracods with soft bodies; □—only ostracod valves and shells. *—modified list of ostracod species from Schornikov and Zenina, 2006 [1], the question mark (?) indicated for the cited references to "A. dunelmensis (Norman, 1865)" and for "C. paralatis-simum Swain, 1963" denotes questionable taxonomic identification status for these species, which was used in the previous work for taxonomic investigation. In this paper, it was improved, ostracod abundance was counted, and ostracod distribution was analyzed.

The results of cluster analysis applied to the percentages of living ostracod database from the western part of the ESS and the Chaun Bay demonstrate that the study region is subdivided into four zones based on the differences in hydrology (salinity, temperature, and currents), types of sediments (biotope), and ostracod species composition (Figure 2).

Zones 1 and 2 are located in the western part of the ESS near the Indigirka River mouth at different distances from the river discharge area while Zones 3 and 4 are within the Chaun Bay (Figure 3).

4.1. *The Area of the Indigirka River Mouth*

In this area, ostracod assemblages are characterized by low diversity. In total, 18 species were found there (Appendix A, Table A2). This is almost two times less than in the Chaun Bay which is another study area. The predominant species in the region of the Indigirka River mouth are the most eurybiont species capable of withstanding highly variable salinity. The predominant species in this area are *Heterocyprideis sorbyana*, *Paracyprideis* sp., *Cytheropteron sulense*, *Pseudopolycope* sp., and *Pteroloxa chaunensis* (Appendix B, Figures A1 and A2).

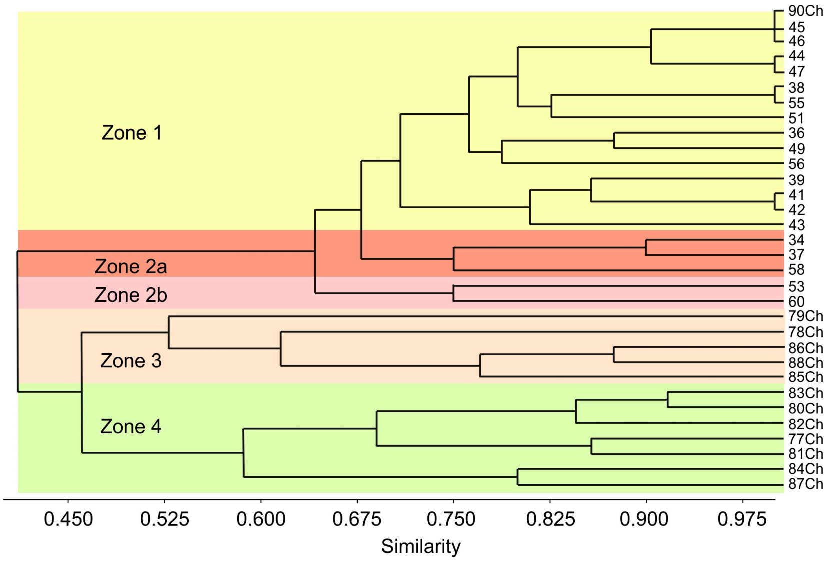

Figure 2. The results of cluster analysis applied to the percentages of living ostracod database in the studied area. Bands of different color marks stations belonging to different zones: Zone 1 (yellow), Zone 2a (brown), Zone 2b (rose), Zone 3 (orange), Zone 4 (green).

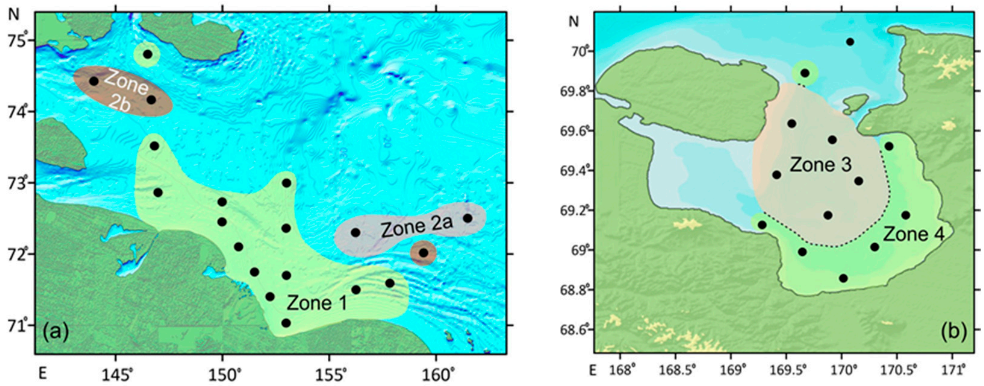

Figure 3. Zonal ostracod distribution in (**a**) the western part of the ESS and (**b**) the Chaun Bay. Colored areas include stations belonging to different zones: Zone 1 (yellow), Zone 2a (brown), Zone 2b (rose), Zone 3 (orange), Zone 4 (green).

A large number of living specimens were encountered in this area, whereas only a few valves were found here. This may indicate strong dissolution in this area.

The application of cluster analysis demonstrates that two zones with distinct ostracod assemblages persist in this area. Zone 1 is adjacent directly to the mouth of the Indigirka River whereas Zone 2 occurs at some distance from the river discharge area.

Most of the samples belong to Zone 1, so it appears to be the most studied area while as for Zone 2, which is located far from the Indigirka mouth, we have a smaller amount of data that indicates a gradual change in the ostracod assemblages with increasing distance from the river. Zone 1 is characterized by a change in the dominant species from sample to sample, which means unstable conditions. In most samples, the dominant species are *Heterocyprideis sorbyana*, *Paracyprideis* sp., and *Cytheropteron sulense*. Sample 38 is dominated by *Pseudopolycope* sp.

With increasing distance from the river, the proportion of other species increases. In Zones 2A and 2B, *Sarsicytheridea bradii* and *Pteroloxa chaunensis* begin to increase in their percentages while *Heterocyprideis sorbyana* and *Paracyprideis* sp. become less abundant. The average dissimilarity between Zones 2A and 2B, according to Simper analysis, is 83.71%.

However, visually that difference is not very noticeable, since the change in assemblages occurs gradually and the boundaries between them are blurred.

The number of species varies from 5 to 14 per sample with a minimum at station 45 which is located close to the river mouth (Figure 4). The Shannon index ranges between 0.9 and 1.8 with maxima at the remote locations from the river discharge area. The evenness index changes significantly and does not show any distinct patterns. The dominance index shows maximal values at stations 41 and 49 caused by a strong prevalence of *Paracyprideis* sp.

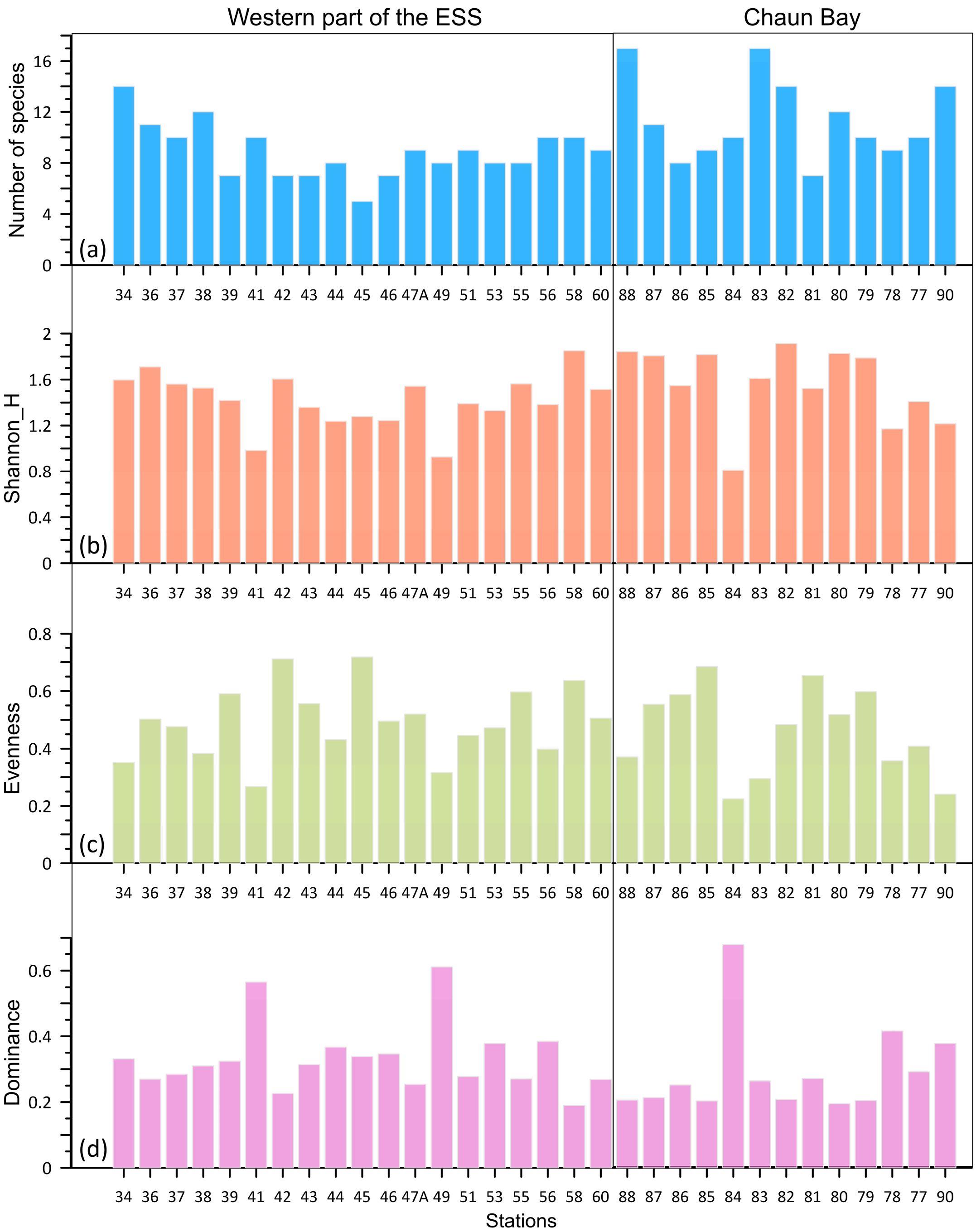

Figure 4. Ostracod distribution on the studied stations: (**a**)—number of species; (**b**)—Shannon diversity index; (**c**)—evenness index; (**d**)—dominance index.

4.2. The Chaun Bay

The ostracod fauna are rather diverse and abundant in this area (Appendix A, Table A3). In total, thirty-two species were identified, of which thirty-one species were found with soft bodies, whereas one species was represented only by valves. Most of them are known to live within muddy sediments. However, some species, *Sclerochilus* spp., *Arctostoma dudarevi*, and *Finmarchinella (B.) logani*, which were also found in the studied samples, prefer hard substrates. The species are grouped by their biotope preference, where they can be found alive and abundant. The number of living ostracod specimens varies from 194 to 9182 specimens per sample. Ostracod fauna are unevenly distributed in the samples and the dominant species are different from sample to sample. Despite the fact that samples were collected by dredge, i.e., it is not possible to calculate species abundance per unit of sediment volume, the uniform sampling technique allows us to suggest higher absolute abundance in the Chaun Bay compared to the Indigirka river mouth area.

In the Chaun Bay, two zones (Zone 3 and 4) of different ostracod assemblages are distinguished by cluster analysis (Figure 3). These zones are characterized by specific ostracod distribution, the different sediment types, and hydrological conditions. There are twenty-four species in each zone, including fifteen general common species and nine species which are typical of each zone.

The most common species, which characterize the entire water area of the Chaun Bay, are *Sarsicytheridea bradii*, *Cluthia horni*, *Semicytherura complanata*, *Paracyprideis* sp., *Kotoracythere arctoborealis*, *Pteroloxa chaunensis*, and others.

Zone 3, associated with the central part of the Chaun Bay, is inhabited mainly by muddy dwellers. *Jonesia arctica*, *Munseyella kiklukhensis*, *Rabilimis septentrionalis*, *Sclerochilus (S.) jurasovi*, *Heterocyprideis macrotuberculata*, *Finmarchinella (B.) logani*, *Arctostoma dudarevi*, and *Pseudopolycope* sp. characterize this zone.

Zone 4 is a coastal zone which is affected by the riverine influence. It is characterized by the presence of *Munseyella kiklukhensis*, *Roundstonia globulifera*, *Kuiperiana venepidermoidea*, *Cytheretta teshekpukensis*, *Microcytherura nealei*, *Semicytherura* sp. 2, and the more rare *Sclerochilus semiletovi*, *Cytheropteron* sp., and *Pontocythere* sp.

The comparison of the two Chaun Bay assemblages by Simper analysis demonstrates significant differences between them. According to the applied analysis, the average dissimilarity between Zones 3 and 4 is 76.36%. The main differences are achieved due to *Sarsicytheridea bradii*, *Kotoracythere arctoborealis*, and *Paracyprideis* sp. The number of species per sample changes from nine to seventeen per sample. The Shannon index generally varies between 1.2 and 1.9 with a distinct minimum (0.8) at station 84. The dominance is relatively low (~0.2); however, two maxima were found at stations 84 (0.6) and 78 (0.4). The evenness index changes within the interval of 0.2–0.6 (Figure 4).

One of the main features of the ostracod individuals from the Chaun Bay is the presence of brown crusts and spots of various types on the valve surfaces. This was first mentioned in Schornikov and Zenina [1]. The largest rusty ferromanganese nodules are found on the massive thick "old" valves of *A. horrida* (Station IK 88). The crusts cover not only the upper part of the valves but also the upper lip. In total, 28*8vf, 16*1sm (*—living stained specimens, v—valves, s—unstained shells without soft parts, f—female, m—male), and 85* juvenile instars (A-1–A-5) are identified in this sample. Nearly half of all the valves from adult specimens (14*f and 9*m) are covered by rusty crusts. Two female specimens of *Heterocyprideis sorbyana* (among 32*f, 4*m, and 52 juvenile instars of A-1–A-3) and several individuals (from more than 1000 organisms) of *Kotoracythere arctoborealis* with ferromanganese crusts in the lower and back part of the valve are found in the same sample (Station IK 88). Some specimens (from more than 1500 individuals) of *Munseyella kiklukhensis* with ferromanganese crusts in the back part of the valve are determined in the sample from Station IK 86. Black crusts are also noted on the surface of valves. Usually, black crusts are represented by small spots or even dots, whereas sometimes they reach significant size. Along with rusty crusts, black spots are found on the valves of *A. horrida* and *H. sorbyana*, on many valves of *Cluthia cluthae* and *Cluthia horni*, and on several valves of *K. arctoborealis* from the same sample. Black spots are found on the valves of *P. dentatomarginata* from Stations IK 82, 87, 88.

5. Discussion

5.1. A Comparison of the Ostracod Assemblages from the Western Part of the ESS and the Chaun Bay

The ESS is characterized by a complicated hydrological regime and changeable environmental conditions; therefore, the faunal composition varies greatly in the different areas. The western part of the ESS is strongly influenced by the simultaneous fresh water flow from the Indigirka River and the influx of the low-saline waters from the Laptev Sea. In addition, tidal currents also affect the salinity and temperature regime of the area [42,43]. In such conditions, only certain species are able to survive, so this aquatic area has low ostracod diversity. The most abundant species inhabiting this area are widespread taxa which are able to adapt to different and unstable environmental conditions. *Sarsicytheridea bradii*, *Heterocyprideis sorbyana*, *Roundstonia globulifera*, and *Paracyprideis* sp. are typical of the high-latitude and severe environment in the Kara [1,12,13], Laptev [1,12–15], East Siberian [1,41], Chukchi, Beaufort, and Bering [16,17] Seas. The species composition of the assemblages from the western part of the ESS is very close to that from the Laptev Sea [1,12–14].

Pseudopolycope sp. shows high relative abundances and may even be a dominant species in the assemblages from the western part of the ESS, whereas few specimens of these taxa were found in the Chaun Bay. It seems that the changeable volume of the river input and unstable wind direction influencing the strength of the Siberian Coastal Current in the western ESS represent more favorable conditions for the survival of this species.

River runoff apparently has the greatest influence on the ostracod fauna from Zone 1. With increasing distance from the river mouth, species composition changes occur in the ostracod assemblages, but they are gradual, so there are no clear visual boundaries between the obtained zones. However, these zones are obviously determined statistically and, based on Simper analysis, the obtained zones are reliable with differences of more than 70%. On the remote stations, in Zones 2A and 2B, the faunal assemblages differ from the communities from Zone 1, since the influence of the river input weakens and the ostracod compositions are affected by the water influx from the Laptev Sea and the Siberian Coastal Current. Another explanation for the observed differences between the zones is the possible influence of cold and saline subsurface waters from the north on the remote and deeper Zones 2a and 2b. According to the hydrological data, the freshened layer occupies the upper 20–30 m; thus, it can be possible that Arctic subsurface waters may penetrate to our deepest stations which are located at 20–23 m below sea level.

The Chaun Bay has more favorable environmental conditions for the ostracod fauna, so quite diverse sets of species have been found there. In this area, rare species for the ESS and other Arctic seas are found, which indicates specific environmental conditions. The examples of such species are *Munseyella kiklukhensis*, *Kotoracythere arctoborealis*, *Arctostoma dudarevi*, *Finmarchinella (B.) logani*, *Semicytherura* sp. 3, *Semicytherura* sp. 2, and others. The hydrological regime is quite complicated, but less aggressive than in the western ESS. Most likely, the high diversity is related to low-amplitude salinity fluctuations and the warmer temperature regime compared to the mouth of the Indigirka River. Despite the small area of the Chaun Bay, two distinct ostracod assemblages were found. Zone 3 occupies the central area with more stable and calm conditions. Zone 4 is under the influence of the desalinated waters of the Kolyma River, which flow into the bay along the western sea coast, as well as the runoff of small rivers on the south. Pacific-derived waters which penetrated to the eastern ESS from the Chukchi Sea also affect the hydrology of the Chaun Bay [22,36]. The strong differences in the ostracod assemblages in Zones 3 and 4 are also due to the different types of sediment in these areas. The central part of the Chaun Bay is characterized by mud [36,43], while in the coastal part the sediments contain higher sand content and even stones [36]. In the eastern part of the EES adjacent to the Chaun Bay, ostracod fauna are more diverse than in the area of the Indigirka river mouth and less varied compared to the Chaun Bay (Appendix A, Table A4).

5.2. Implications of Carbonate-Corrosive Environment

The very high abundance of living ostracod specimens together with scarce dead forms and individual valves indicate intensive dissolution of calcareous microfossils in the western part of the ESS. Moreover, the absence of dead thin-walled ostracod species seems to reflect unfavorable conditions for calcium carbonate burial. The majority of living individuals are characterized by the opaque surfaces of the valves indicating enhanced dissolution processes. Partly dissolved valves and their remainders further point to a carbonate-aggressive environment in the western ESS. The prevalence of living specimens over dead ones together with the findings of numerous signs of corrosion were previously obtained in benthic foraminiferal assemblages from the same samples [44]. Thus, our results are in line with the previous conclusions.

The development of a carbonate-corrosive environment might be caused by several processes. First, erosion of the Late Pleistocene Ice Complex deposits, which are exposed along the seacoast in the Siberian lowland [29], leads to the supply of a high amount of old and bioavailable organic matter [31,45,46]. Bacterial degradation of the organic components contributes to an enhancement of the aggressive environment. Second, a high amount of nutrients delivered by the river induces phytoplankton growth, i.e., producing in situ marine organic matter at the sea surface [32,33]. The export production sinks and remineralizes on the seafloor further enhancing the acidification [32]. Third, the riverine waters, entering the western ESS, are also acidic with high concentrations of dissolved CO_2 and low pH [45,46]. Finally, methane flux derived from subsea permafrost actively releases from the water column to the atmosphere in the western part of the basin and enhances unfavorable conditions for calcium carbonate preservation [47].

In contrast to the western ESS, the ostracod assemblages from the Chaun Bay are characterized by a higher amount of dead specimens in most samples with an average content of nearly 50%. Such a living-to-dead ratio indicates less corrosive conditions in this area isolated from the significant riverine influence. Indeed, the Chaun Bay is a large estuary with an annual freshwater flux of 9 km^3 which is considerably lower than the flux delivered by both the Indigirka (61 km^3) and Kolyma (132 km^3) rivers [19,36]. As the carbon dioxide input from the rivers seems to be lower in this area, the bottom-water environment appears to be less carbonate-aggressive. Furthermore, the coastal permafrost deposits exposed only on the west coast of the Chaun Bay [48] apparently supply a lower amount of labile organic matter to the sea. Finally, the isolated position of the bay restricts the wave-related erosion of the coasts surrounding the Chaun Bay.

5.3. Brown Crusts and Spots on the Ostracod Valves from the Chaun Bay

One of the main features of the ostracod individuals from the Chaun Bay is the presence of brown crusts and spots of various types. Boomer and others [49] have investigated such crusts on the valve surfaces of the species *Cyprideis torosa*, euryhaline taxa which sometimes live in strongly eutrophic and anaerobic environments. It has been revealed that these crusts are mainly composed of iron and manganese compounds with the association of bacteria and various diatom species. The iron compounds dominate in the red-brown crusts; the joint occurrence of iron and manganese is found in dark-brown crusts whereas the manganese oxides are the major component of the black nodules [49]. It seems the rusty crusts from our ostracod individuals consist of iron compounds whereas the black spots and crusts contain the manganese oxides. Possibly they form near the sediment–water interface during the bacterial processes, similarly to the formation of the ferromanganese nodule field, which is widely distributed in the Arctic, e.g., [50,51]. The presence of diatom communities on the surface valves is typical of the shallow-water ostracods [52]. According to our observations, the diatoms may occur not only on the surface but also on the inner side of the valves of the stained ostracods with soft parts.

6. Conclusions

Quantitative analyses of the ostracod assemblages together with the statistical treatment of the obtained dataset demonstrate that four distinct zones characterized by a certain species composition are present in the western ESS and the Chaun Bay. Widespread high-latitude species *Sarsicytheridea bradii*, *Heterocyprideis sorbyana*, *Roundstonia globulifera*, and *Paracyprideis* sp., which are able to adapt to different and variable low-saline environmental conditions, dominate in the western part of the ESS. The assemblage composition of Zones 1 and 2 obtained in this area is strongly controlled by the distance from the river mouth; however, the boundaries between the zones are blurred. In the isolated Chaun Bay, *Munseyella kiklukhensis*, *Kotoracythere arctoborealis*, *Arctostoma dudarevi*, *Finmarchinella (B.) logani*, *Semicytherura* sp. 3, *Semicytherura* sp. 2, and others are the typical species. These assemblages prefer more stable and saline conditions. Ostracod assemblages from Zones 3 and 4 obtained in the Chaun Bay presumably consist of muddy dwellers and coarse substrate inhabitants, respectively.

The predominance of living ostracod specimens together with scarce dead forms and individual valves indicate a carbonate-corrosive environment in the western part of the ESS which is in line with previous studies. The carbonate-aggressive conditions might be related to low pH and to the high amount of dissolved carbon dioxide which is derived from the atmosphere and by the riverine flux. The bacterial degradation of labile organic matter originating from eroded coastal permafrost as well as an oxidation of methane might contribute to the enhancement of the carbonate-corrosive environment.

Numerous ferromanganese crusts and spots have been found on the ostracod valve surfaces and inside the shells from the Chaun Bay. The species containing these signs are *A. horrida*, *H. sorbyana*, *M. kiklukhensis*, *C. cluthae*, *C. horni*, and *K. arctoborealis.* Possibly these crusts and spots form near the sediment–water interface during the bacterial processes similarly to the formation of the ferromanganese nodule field, which is widely distributed in the Arctic.

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Appendix A

Table A1. List of stations collected in the study area.

№	Coordinates: N; E	Data	Depth (m)	Sediments	t °C	S‰	O_2, mL/L	O_2%	pH
R/V «Nikolay Kolomeytsev» (NK), East Siberian Sea, 2000									
67	72°42.165′; 149°02.917′	06. 09.	10	sm, d	2.9	21.98	7.95	97.6	7.78
68	72°34.1′; 150°56.8′	06. 09.	15	sm	2.36	22.78	7.98	97.2	7.73
69	72°20.8′; 151°03.41′	06. 09.	13	sm	2.68	22.58	7.96	97.6	7.74
73	71°07.218′; 160°49.803′	07. 09.	9	sm	2.53	24.01	7.91	97.5	7.8
74	70°26.837′; 161°01.477′	08. 09.	7	sm	2.87	25.25	7.76	97.4	7.81
75	70°02.397′; 164°33.753′	08. 09.	20	sm	2.65	29.72	7.51	95.4	7.82
76	69°52.623′; 161°05.953′	08. 09.	8	sm, d	2.46	26.69	7.83	98	7.76
78	69°37.105′; 164°31.745′	08. 09.	10	sm	0.42°	30.97	6.73	82.3	7.55
79	70°30.827′; 164°32.441′	09. 09.	16	sm	1.89	28.97	7.73	96.9	7.9
80	70°18.99′; 168°14.125′	09. 09.	34	sm	0.21°	31.47	6.82	82.6	7.64
82	69°59.894′; 169°58.481′	09. 09.	15	ms	0.37	31.69	6.98	85.6	7.66
83	70°19.583′; 170°00.134′	09. 09.	27	m, s	0.47	31.23	7.42	90.9	7.85
84	70°39.842′; 170°01.530′	09. 09.	25	sm	0.7	31.46	7.48	92.5	7.82
85	70°53.9′; 170°00.684′	09. 09.	27	sm	0.33	31.89	6.71	80.9	7.73
86	70°32.310′; 170°39.587′	10. 09.	27	m, sm	−0.77	32.08	6.85	81.8	7.72
87	70°04.133′; 171°30.533′	10. 09.	24	st, s, m	0.3	31.64	7.08	86.7	7.72
90	70°29.647′; 175°29.117′	10. 09.	41	m, sm	−1.76	33.36	5.96	69.9	7.58
R/V "Ivan Kireev" (IK), the western part of the ESS, 2004									
34	74°25′50″; 144°00′08″	02.09.	18	m	1.27	18.62	8.59	98.85	7.75
36	74°48′12″; 146°29′83″	02.09.	14	m	1.46	19.23	8.62	100	7.79
37	74°09′83″; 146°40′25″	02.09.	15	ms	0.89	17.98	8.79	99.73	7.76
38	73°30′98″; 146°50′23″	02.09.	12	ms	1.90	17.63	8.54	99.25	7.76

Table A1. *Cont.*

№	Coordinates: N; E	Data	Depth (m)	Sediments	t °C	S‰	O_2, mL/L	O_2%	pH
39	72°51′78″; 146°59′85″	02.09.	9	m	2.95	14.74	8.41	98.51	7.71
41	72°44.01′; 150°00.02′	02.09.	15	m	1.8	16.69	8.48	97.70	7.67
42	72°27′01″; 149°59′94″	03.09.	9	m	3.02	13.12	8.38	97.30	7.66
43	72°06′02″; 150°45′70″	03.09.	7	m	3.17	12.84	8.29	96.41	7.64
44	71°45′01″; 151°30′61″	03.09.	11	m	3.07	14.84	8.21	96.52	7,61
45	71°24′02″; 152°14′71″	03.09.	11	m	3.58	12.45	7.99	93.69	7.47
46	71°02′01″; 152°59′98″	03.09.	9	m	4.54	10.11	8.15	96.36	7.58
47	71°41′99″; 153°00′01″	03.09.	15	m	0.99	17,88	8.34	94.89	7.40
49	72°22′00″; 152°59′84″	04.09.	19	m	−0.73	26.13	5.66	65.14	7.39
51	73°00′01″; 153°00′04″	04.09.	22	m	−1.07	29.41	3.13	36.56	7.23
53	72°18′02″; 156°15′44″	04.09.	20	m	−0.51	23.77	8.14	92.59	7.62
55	71°30′01″; 156°15′77″	04.09.	12.5	m	2.89	16.80	8.20	97.24	7.68
56	71°35′38″; 157°50′68″	05.09.	15.4	m	1.81	18.11	8.43	98.08	7.66
58	72°00′97″; 159°25′45″	05.09.	21	m	−0,41	22.82	8.42	95.45	7.62
60	72°30′08″; 161°30′09′	05.09.	23	m	−0,62	25.00	8.42	96.44	7,63
90	70°02.81′; 170°04.62′	08. 09.	18	m	−0.76	27.959	7.33	85.36	7.65
R/V "Ivan Kireev" (IK), East Siberian Sea, Chaun Bay, 2004									
77	69°53.28′; 169°40.43′	07. 09.	13	sm	3.89	20.458	7.88		7.74
78	69°38.06′; 169°33.13′	07. 09.	15	sm	3.89	20.019	7.69	95.64	7.73
79	69°22.69′; 169°24.95′	07. 09.	14	sm	6.68	19.872	7.53	100.19	7.79
80	69°07.57′; 169°17.11′	07. 09.	10	s	7.66	20.386	7.19	98.24	7.77
81	68°59.43′; 169°38.77′	07. 09.	13	sm, s, st, imn	7.99	20.812	7.23	99.89	7.79
82	68°51.52′; 170°00.96′	07. 09.	10.4	s, st, c, imn	8.56	19.56	7.26	100.77	7.79
83	69°01.02′; 170°18.06′	07. 09.	13	ms	5.63	23.949	7.19	95.80	7.80
84	69°10.52′; 170°35.02′	07. 09.	11	m	8.34	19.453	7.18	99.03	7.79
85	69°10.50′; 169°52.87′	07. 09.	15	sm	1.52	25.047	7.56	91.56	7.44
86	69°20.90′; 170°09.37′	07. 09.	15.4	sm	1.18	25.587	7.43	89.52	7.45
87	69°31.17′; 170°25.97′	07. 09.	11	m	8.33	19.642	7.20	99.44	7.77
88	69°33.18′; 169°55.27′	08. 09.	16	m	2.54	25.325	6.89	85.80	7.48

Note: sm—sandy mud, d—detritus, m—mud, s—send, st—stone, ms—muddy sand, imn—iron-manganese nodules, c—clay.

Table A2. Counts of the living ostracod species and their valves at the stations from the western part of the East Siberian Sea.

Taxa	**Station**									
	34	**36**	**37**	**38**	**39**	**41**	**42**	**43**	**44**	**45**
Sarsicytheridea bradii	182 17	- -	108 18	39 -	- -	3 -	2 -	48 -	- -	- -
Semicytherura sp. 3	15 5	25 3	- -	- -	- -	- -	- -	- -	- -	- -
Cluthia cluthae	22 -	5 -	3 -	- -	- -	- -	- -	- -	- -	- -
Cluthia horni	5 -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Pteroloxa chaunensis	13 4	31 8	1 -	1 -	2 -	31 -	37 -	5 -	85 12	- 2
Palmenella dentatomarginata	1 2	21 4	29 2	9 2	1 -	- -	- -	- -	- -	- -
Cytheropteron occulatum	2 2	- 9	10 6	- -	- -	1 -	- -	- -	2 -	7 10
Sclerochilus (*S.*) *laptevensis*	2 2	- -	- -	- -	- -	1 1	- -	- -	2 -	- -
Pseudopolycope sp.	11 -	- -	- -	164 -	12 -	14 1	76 2	23 -	12 -	- -
Roundstonia globulifera	1 -	39 2	5 -	14 -	- -	4 -	- -	- -	- -	3 -
Eucythere sp.	14 1	2 -	21 2	1 -	- -	- -	- -	2 -	- -	- -
Pontocythere sp.	1 -	- -	2 -	1 -	- -	- -	- -	- -	- -	- -
Heterocyprideis sorbyana	66 15	11 16	60 20	84 -	8 -	73 -	88 2	153 -	8 -	7 38
Paracyprideis sp.	6 -	225 31	- -	14 -	2 -	499 -	66 -	155 -	231 1	25 24
Cytheropteron sulense	- -	82 56	2 -	9 3	27 2	41 8	8 1	- -	91 6	40 67
Cytheropteron montrosiense	- -	38 12	- -	3 6	- -	- -	- -	- -	2 -	- 2
Arctostoma dudarevi	- -	- -	- -	1 -	- -	- -	- -	- -	- -	- -
Rabilimis septentrionalis	- -	1 -	- -	- -	1 -	7 -	15 -	14 -	- -	- -
Total number: **Living specimens** **Valves**	 341 48	 480 141	 241 48	 340 11	 53 2	 674 10	 292 5	 400 -	 433 -	 82 143
Taxa	**Station**									
	46	**47A**	**47B**	**49**	**51**	**53**	**55**	**56**	**58**	**60**
Sarsicytheridea bradii	- -	- -	- -	- -	314 -	- 2	7 -	2 -	34 2	54 2
Semicytherura sp. 3	- -	- -	- -	- -	- -	- -	- -	1 -	- -	1 -

Table A2. *Cont.*

Taxa	**Station**									
Cluthia cluthae	- -	- -	- -	18 -	120 -	- -	- -	21 -	21 -	- -
Cluthia horni	- -	- -	- -	- -	- -	- -	- -	9 -	2 -	- -
Pteroloxa chaunensis	10 -	105 7	59 8	11 -	2 -	41 -	18 1	18 1	- -	91 5
Palmenella dentatomarginata	- -	- -	- -	- -	- -	- -	- -	- -	1 -	- -
Cytheropteron occulatum	1 -	3 -	- 2	- -	1 -	7 -	- -	- -	- -	10 -
Sclerochilus (*S.*) *laptevensis*	- -	1 -	- -	- -	- -	4 -	- -	- -	- -	6 2
Pseudopolycope sp.	- -	8 -	- -	18 6	4 -	4 3	25 -	55 1	8 -	18 -
Roundstonia globulifera	4 2	20 -	- 1	6 -	5 -	2 -	1 -	- -	33 6	1 -
Eucythere sp.	- -	- -	- -	- -	- -	- -	- -	- -	3 -	- -
Heterocyprideis sorbyana	113 3	46 3	46 12	17 3	177 8	- -	5 -	13 2	18 5	- -
Paracyprideis sp.	101 -	174 -	181 36	260 4	326 33	96 12	67 3	178 3	1 -	- -
Cytheropteron sulense	32 3	109 16	10 6	1 2	- -	13 1	26 -	4 2	- -	105 36
Cytheropteron montrosiense	2 -	1 -	- -	4 -	1 -	- 2	1 -	3 -	5 6	3 -
Arctostoma dudarevi	- -	- -	- -	- -	- -	4 -	- -	- -	- -	- -
Total number: **Living specimens** **Valves**	 263 8	 467 26	 296 65	 335 15	 950 41	 171 20	 150 4	 304 9	 126 19	 289 45

Note: First line for each species is counts of the living specimens, second line is number of valves (one shell = 2 valves).

Table A3. Counts of the living ostracod species and their valves at the stations from the Chaun Bay.

Taxa	**Station**									
	88	**87**	**86**	**85**	**84**	**83**	**82**	**81**	**80**	**79**
Sarsicytheridea bradii	3264 176	- -	2516 335	24 6	4 -	216 6	32 4	84 10	- -	107 4
Semicytherura sp. 3	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 -
Cluthia cluthae	678 -	5 -	- -	- -	- -	13 6	- -	- -	- -	- -

Table A3. *Cont.*

Taxa	**Station**									
Cluthia horni	1424	224	1	36	-	236	4	-	18	5
	-	-	-	-	-	33	-	-	-	-
Pteroloxa chaunensis	400	200	13	3	15	-	-	-	-	-
	48	-	-	-	1	-	-	-	-	-
Palmenella dentatomarginata	2	89	-	-	4	9	1	-	1	-
	-	-	-	-	-	1	1	-	1	-
Roundstonia globulifera	-	2	-	-	-	5	67	10	138	-
	-	-	-	-	-	-	-	-	-	-
Eucythere sp.	-	-	-	-	5	18	6	-	12	14
	-	-	-	-	-	-	-	-	5	-
Pontocythere sp.	-	-	-	-	-	1	10	-	-	-
	-	-	-	-	-	-	-	-	-	-
Heterocyprideis sorbyana	112	-	636	83	-	4	6	7	4	-
	2	-	216	33	-	3	-	-	1	6
Paracyprideis sp.	1216	1054	826	-	16	13	1	40	-	146
	-	-	418	-	-	-	1	48	-	3
Arctostoma dudarevi	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	2	-	-
Rabilimis septentrionalis	1	-	91	26	-	-	-	-	-	-
	-	-	1106	13	-	-	-	-	-	-
Acanthocythereis horrida	94	-	-	-	-	3	-	-	-	-
	50	-	38	-	-	-	-	-	-	-
Semicytherura complanata	120	513	-	-	528	9	-	-	1	2
	-	22	-	-	-	-	-	-	-	-
Munseyella kiklukhensis	240	-	1087	26	-	-	-	-	-	68
	-	-	48	-	-	-	-	-	-	-
Cytheropteron sp. cf. *eleani*	41	88	-	-	42	283	-	-	-	-
	5	6	-	-	5	-	-	-	-	-
Sarsicytheridea parapapillosa	-	-	1008	7	-	6	-	36	116	29
	-	-	133	2	-	-	-	6	20	3
Robertsonites tuberculatus	1	-	-	-	-	-	-	-	-	54
	-	-	-	-	-	-	-	-	-	-
Kuiperiana venepidermoidea	-	154	-	-	6	3	54	-	21	-
	-	-	-	-	-	-	4	-	-	-
Semicytherura sp. 2.	-	220	-	-	20	10	11	16	77	-
	-	-	-	-	-	4	-	-	16	-
Kotoracythere arctoborealis	1584	1273	-	-	4	-	-	-	-	-
	32	-	-	-	-	-	-	-	-	-
Jonesia arctica	-	-	-	-	-	-	-	-	-	25
	-	-	-	-	-	-	-	-	-	-
Microcytherura nealei	-	-	-	-	-	1	136	-	13	-
	-	-	-	-	-	-	88	-	-	-
Cytheropteron sibiricum	-	-	-	1	-	-	29	-	1	-
	-	-	-	-	-	-	8	-	-	-
Cytheretta teshekpukensis	-	-	-	-	-	2	8	-	94	-
	-	-	-	-	-	-	-	-	-	-
Sclerochilus semiletovi	-	-	-	-	-	-	-	1	-	-
	-	-	-	-	-	-	-	-	-	-

Table A3. *Cont.*

Taxa	**Station**									
Cytheropteron sp.	- -	- -	- -	- -	- -	- -	1 -	- -	- -	- -
Finmarchinella (B.) logani	- -	- -	- -	20 2	- -	- -	- -	- -	- -	- -
Sclerochilus (S.) jurasovi	1 -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Heterocyprideis macrotuberculata	3 -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Cytheropteron pyramidale	1 -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Total number: **Living specimens** **Valves**	 9182 313	 3862 28	 6178 2294	 226 56	 644 6	 832 53	 366 106	 194 67	 496 43	 451 16

Taxa	**Station**		
	78	**77**	**90**
Sarsicytheridea bradii	253 220	196 -	1536 -
Cluthia cluthae	4 8	- -	16 -
Cluthia horni	64 224	- 6	- -
Pteroloxa chaunensis	24 32	1676 -	232 -
Cytheropteron occulatum	- -	- -	3 1
Sclerochilus (S.) laptevensis	- -	- -	5 1
Pseudopolycope sp.	8 -	- -	- -
Roundstonia globulifera	- -	32 -	18 -
Heterocyprideis sorbyana	- 16	2930 -	6 -
Paracyprideis sp.	848 176	2084 -	1552 -
Cytheropteron sulense	- -	- -	51 5
Cytheropteron montrosiense	- -	- -	1 -
Argilloecia sp.	- -	- -	- 2
Acanthocythereis horrida	- -	- -	64 16
Semicytherura complanata	- 352	304 -	86 8

Table A3. *Cont.*

Taxa	Station		
Munseyella kiklukhensis	- -	- -	2 0
Cytheropteron sp. cf. *eleani*	32 120	- -	3 2
Sarsicytheridea parapapillosa	127 68	110 -	- -
Robertsonites tuberculatus	- -	1 -	- -
Kuiperiana venepidermoidea	- -	8 -	- -
Semicytherura sp. 2.	- -	32 -	- -
Kotoracythere arctoborealis	1908 264	- -	- -
Total number: **Living specimens** **Valves**	 3268 1480	 7373 6	 3575 34

Note: First line for each species is counts of the living specimens, second line is number of valves (one shell = 2 valves).

Table A4. Counts of the living ostracod species at the stations from the eastern and western parts of the East Siberian Sea collected during the R/V «Nikolay Kolomeytsev».

Taxa	**Station**									
	90	**87**	**86**	**85**	**84**	**83**	**82**	**80**	**79**	**78**
Sarsicytheridea bradii	- -	1 4	- -	- -	- -	7 -	- -	4 16	- -	- -
Semicytherura sp. 3	- -	- -	- -	- -	- -	- -	- -	1 -	- -	- -
Cluthia cluthae	- -	1 1	- -	- -	- -	- -	- -	1 -	- -	- -
Cluthia horni	- -	2 4	- -	- -	- -	- -	- -	3 1	- -	- -
Pteroloxa chaunensis	- -	2 -	- -	18 15	- -	- -	- 1	- -	- -	- -
Pontocythere sp.	- -	3 4	- -	2 1	- -	- -	- -	- -	- 1	- -
Heterocyprideis sorbyana	- -	- -	3 -	- -	- -	- 4	- -	3 3	- -	1 -
Paracyprideis sp.	- -	5 6	2 1	2 1	1 -	- -	5 -	3 2	- -	12 22
Cytheropteron sulense	- -	- -	- -	- -	- -	- -	1 -	- -	- -	- -
Acanthocythereis horrida	- -	3 3	- 1	- -	- -	- -	- -	- -	- -	- -
Cytheropteron sp. cf. *eleani*	- -	- -	- -	- 1	- -	- -	- -	2 -	- -	- -

Table A4. *Cont.*

Taxa	**Station**									
Sarsicytheridea parapapillosa	- -	- 1	7 4	- 3	- -	- -	- -	- -	- 1	- -
Robertsonites tuberculatus	1 1	- -	- -	- -	- -	- -	- -	- -	- -	- -
Heterocyprideis macrotuberculata	- -	- 4	- -	- -	- -	1 -	- -	3 3	- -	- -
Elofsonella neoconcinna	- -	- -	- -	- -	- -	- -	- -	5 4	- -	- -
Normanicythere leioderma	- -	- -	- -	- -	- -	- -	- -	7 1	- -	- -
Cytheropteron champlainum	- -	- 1	- -	- -	- -	- -	- -	- -	- -	- -
Cytheropteron arcuatum	- -	- -	- -	- -	- -	- -	- -	1 -	- -	- -
Jonesia sp. 1	2 -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Cytheropteron suzdalskyi	2 2	- -	- -	- -	- -	- -	- -	- -	- -	- -
Total number:			-							
Living specimens	5	17	12	22	1	8	6	33	-	13
Valve	3	28	6	21	0	4	1	30	2	22

Taxa	**Station**						
	76	**75**	**74**	**73**	**69**	**68**	**67**
Sarsicytheridea bradii	- -	- -	14 10	- -	- -	1 1	- -
Cluthia horni	- -	1 -	- -	- -	- -	- -	- -
Pteroloxa chaunensis	- -	2 10	- -	- -	1 -	1 -	3 -
Palmenella dentatomarginata	- 1	1 -	- -	- -	- -	- -	- -
Heterocyprideis sorbyana	- -	- -	24 19	- -	2 -	4 5	- -
Paracyprideis sp.	7 3	1 -	- -	- -	24 14	13 15	3 -
Sarsicytheridea parapapillosa	- -	- 2	- -	- -	3 -	- -	- -
Sarsicytheridea macrolaminata	- -	- -	- -	- 1	- -	- -	- -
Cytheropteron sulense	- -	- -	1 1	- -	3 -	- -	1 -
Total number:							
Living specimens	7	5	39	-			
Valve	4	12	30	1	33	19	7
					14	21	-

Note: First line for each species is counts of the living specimens, second line is number of valves (one shell = 2 valves).

Appendix B

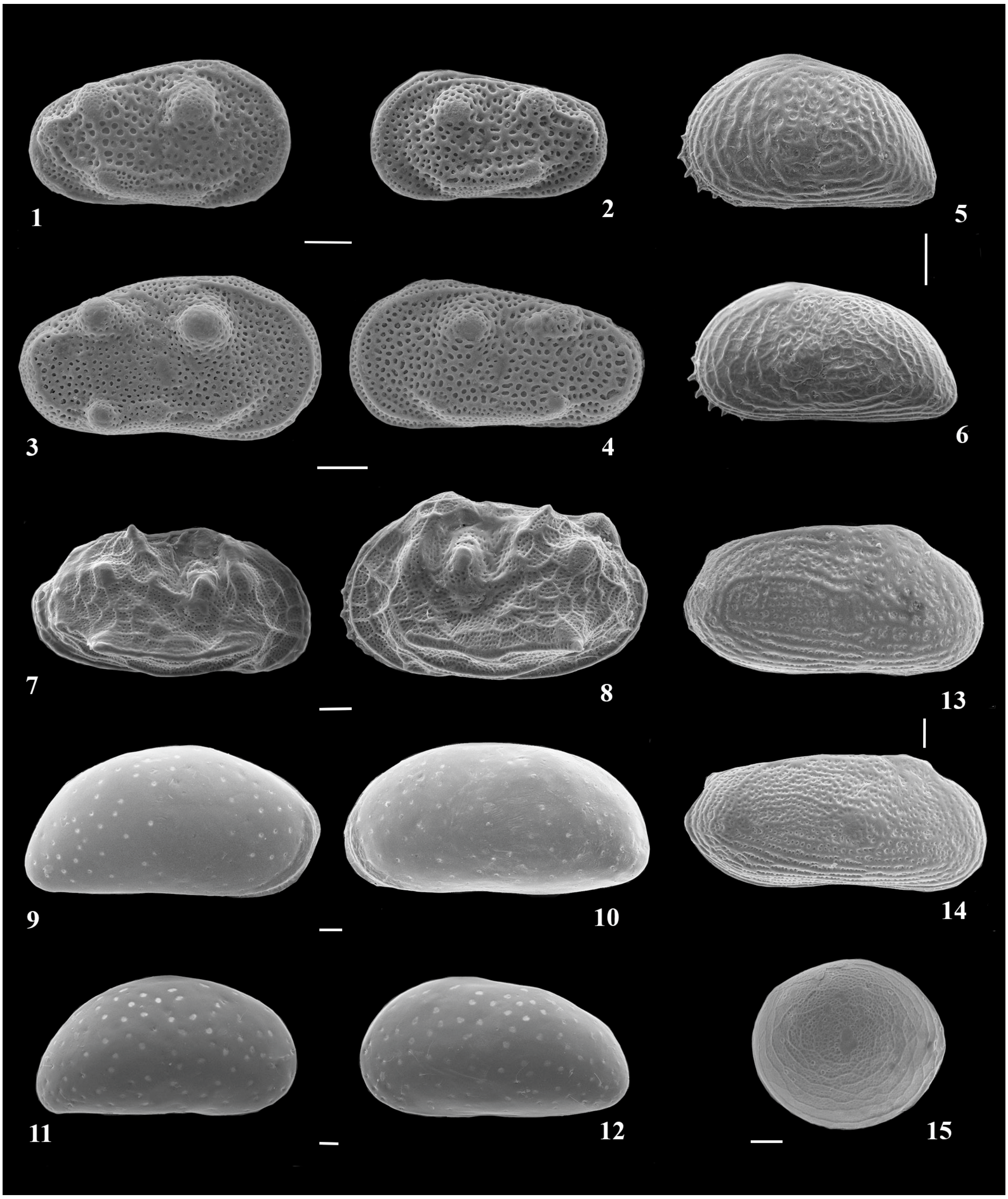

Figure A1. 1-2 *Cluthia cluthae* (Brady, Crosskey and Robertson, 1874), Chaun Bay, st. 88, 1—female RV (right valve), 2—male LV (left valve); 3-4 *Cluthia horni* Schornikov and Zenina, 2006, Chaun Bay, st. 88, 3—female RV, 4—male LV; 5-6 *Heterocyprideis sorbyana* (Jones, 1856), Chaun Bay, st. 86, 5—female LV, 6—male LV; 7-8 *Palmenella dentatomarginata* Akatova, 1946, Chaun Bay, st. 87, 7—male RV, 8—female LV; 9-10 *Sarsicytheridea bradii* (Norman in Brady, 1865), Chaun Bay, st. 86, 9—female RV, 10—male LV; 11-12 *Paracyprideis* sp., Chaun Bay, st. 86, 11—female RV, 12—male LV; 13-14 *Cytheretta teshekpukensis* Swain, 1963, Chaun Bay, st. 80, 13—female RV, 14—male RV; 15—*Pseudopolycope* sp. B Schornikov and Zenina, 2006, western part of the EES, st. 38. Bar 1-4, 7-12, 15—60 μm, 5-6, 13-14—100 μm.

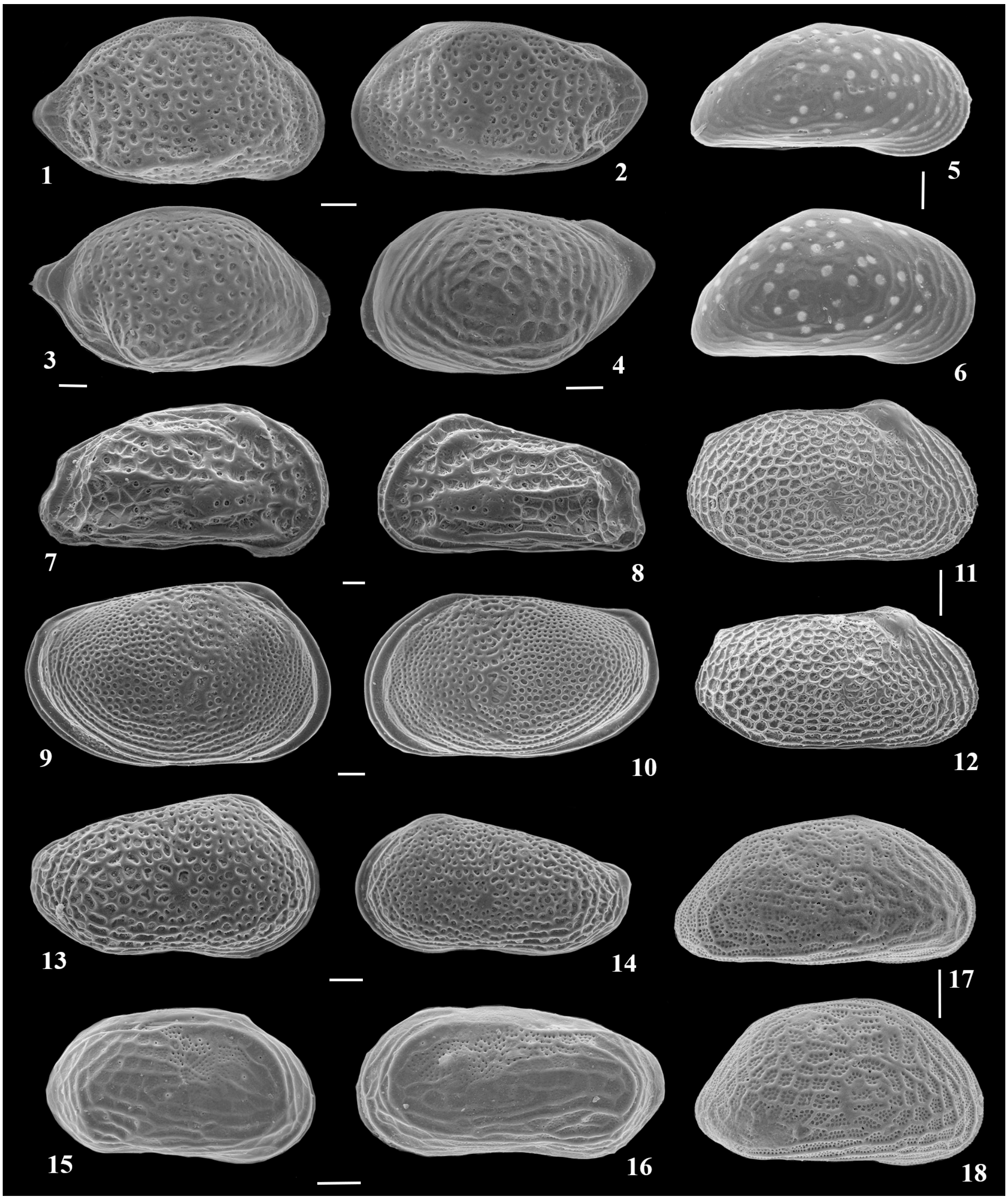

Figure A2. 1-2 *Cytheropteron sibiricum* Schornikov and Zenina, 2006, Chaun Bay, st. 82, 1—female RV (right valve), 2—male LV (left valve); 3 *Cytheropteron occulatum* Whatley and Masson, 1979, the western part of the EES, st. 38, female RV; 4 *Cytheropteron sulense* Lev, 1972, the western part of the EES, st. 38, female LV; 5-6 *Eucythere* sp. 1., Chaun Bay, st. 80, 5—male RV, 6—female RV; 7-8 *Finmarchinella (B.) logani* (Brady and Crosskey, 1871), Chaun Bay, st. 85, 7—female RV, 8—male LV; 9-10 *Kuiperiana venepidermoidea* (Swain, 1963), Chaun Bay, st. 82, 9—female RV, 10—male LV; 11-12 *Rabilimis septentrionalis* (Brady, 1866), Chaun Bay, st. 86, 11—female RV, 12—male RV; 13-14 *Pteroloxa chaunensis* Schornikov and Zenina, 2006, Chaun Bay, st. 86, 11—female RV, 12—male LV; 15-16 *Semicytherura* sp. 2, Chaun Bay, st. 87, 15—female RV, 16—male LV; 17-18 *Microcytherura nealei* Schornikov and Zenina, 2006, Chaun Bay, st. 82, 17—male RV, 18—female RV. Bar—1-10, 13-18—60 µm, 11-12—100 µm.

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