LATE HOLOCENE MICROFAUNAL AND NANNOFLORAL ASSEMBLAGES OF THE NW BLACK SEA

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Abstract. This study describes the fluctuation pattern in Late Holocene microfaunal (i.e. foraminifera and ostracods) and nannofloral assemblages of two cores collected from the Romanian Black Sea shelf, at a water depth of 28 and 66 m, respectively. The lithology of the cores is mainly characterised by blackish muds, alternating with thin, centimetres-thick sand and coquina layers. The microfaunas are dominated by brackish foraminiferal and ostracod assemblages that are still common in the actual Black Sea communities, living nowadays at water salinity lower than 18 ‰. In the shallower water Site EF 08-01, the abundance ratio between Caspian and Mediterranean ostracods is 0.7, while in the deeper water Site BS 08-055, the abundance ratio between Caspian and Mediterranean ostracods is 0.01. These data argue for the dominance of Mediterranean ostracod fauna with lower abundance in shallower environments of the Black Sea and with a very high abundance in the deeper parts of the internal shelf, i.e., at a water depth of 66 m. Based on the calcareous nannoplankton fluctuation, four Nannofloral Intervals were identified, which indicate a gradual salinity increase of the surface waters during the deposition of the Late Holocene Shallow Unit. In the same interval, the benthic microfaunas (ostracods and foraminifers) argue for a more stable salinity environment in the two studied cores from the Black Sea inner shelf.

Key words: microfaunas and nannofloras, Upper Holocene, Romanian Black Sea inner shelf.

1. INTRODUCTION

The Holocene evolution of the Black Sea encountered several major climatic and sea-level changes (Yanko-Hombach *et al*., 2007). During the youngest Quaternary glaciations, the salinity dropped significant and the Black Sea became an almost freshwater basin (Fedorov, 1971; Ostrovsky *et al*., 1977; Hay, 1988; Yanko, 1990; Ryan *et al*., 1997; Aksu *et al*., 2002). Moreover, it is assumed that the Black Sea level had dropped more than 100 m below its outlet (Lancelot *et al*., 2002). These changes are reflected in the lithology modification, as well as in the microfaunal and nannofloral fluctuation pattern (Hiscott *et al*., 2007; Issar, 2007; Lericolais *et al*., 2007).

Former investigations (Yanko 1989, 1990; Yanko & Vorob'eva, 1990) revealed that benthic foraminifera live on the shelf to a maximum depth of 220 m in the Black Sea. They are represented by 101 species, from which 19 are endemic in the Black Sea, 5 are Paratethyan relics, 5 are Caspian taxa, and the most numerous (72) are Mediterranean immigrant species. In general, the number of foraminiferal species and their abundance diminished progressively with decreasing salinity, especially in the NW part of the Black Sea basin, where the salinity is lower due to the significant fresh water influx of Danube, Dniester and Dnieper rivers.

In the Holocene sediments of the Black Sea, ostracod faunas are found from the top of the Unit 1 (Laminated coccolith mud) downward to Unit 3 (Lacustrine lutite) of Ross & Degens (1974). The ostracod communities have changed from a Caspian (brackish/lacustrine) assemblage that implied salinity around 5‰, to a Mediterranean assemblage in the youngest Holocene Unit 1 (Evans, 2004; Hiscott *et al*., 2007). The time interval for changes in ostracod assemblages was around 1300 years, from ~7300 to 6000 yr BP (Hiscott *et al*., 2007).

So far, there are only few published papers focused on Holocene ostracod faunas from the Black Sea basin (Schornikov, 1964, 1966, 2011; Caraion, 1967; Opreanu, 2006; Boomer *et al*., 2010; Briceag, 2012; Ivanova *et al*., 2012). The ostracods that are living today in the Black Sea and appeared also in Holocene assemblages are represented by a mixture of brackish Caspian species, endemic marine species and Mediterranean and Atlantic immigrants (Opreanu, 2005; Ivanova *et al*., 2012). In general, the study of the ostracod communities is very useful to reveal palaeoenvironmental changes in the Holocene sediments of the Black Sea, especially in those deposited during low salinity intervals, which are lacking foraminifera.

The foraminifers and ostracods are known as reliable palaeoenvironmental indicators. Their huge taxonomic diversity, especially during Tertiary times, allows for a wide range of biological reactions to varied environmental factors, including many species-specific responses to ecological conditions (Fursenko, 1978). Both foraminifera and ostracods have very short reproductive cycles, from six months to one year (Boltovskoy, 1964), and a rapid growth (Walton, 1964), making even their community structure particularly responsive to environmental changes. For these reasons, these taxonomic groups have a significant potential in monitoring the sea-level and salinity fluctuations.

The three lithological units described by Ross & Degens (1974) can be found only in the deeper part of the Black Sea basin, at water depths below 200 m. In the shallow setting of the Black Sea, such as that studied by us, Giunta *et al*. (2007) and Oaie & Melinte-Dobrinescu (2012) identified only two lithological units: the oldest Unit 3 (Lacustrine lutite) of Ross and Degens (1974) and the Shallow Unit (Giunta *et al.*, 2007; Oaie & Melinte-Dobrinescu, 2012), which corresponds to Unit 1 and Unit 2 deposited in the basinal setting (Fig. 5). All over the Black Sea basin, between the Shallow Unit and Unit 3, there is a hash layer that contains a mix of brackish and fresh water mollusc fauna (Major *et al*., 2006).

This study is focused on the foraminiferal and ostracod fluctuations in diversity and abundance from the Holocene deposits of the Romanian Black Sea inner shelf. The paper presents also quantitative studies on the calcareous nannoplankton assemblages from two cores. All the acquired data have been used for palaeoenvironmental reconstructions of NW Black Sea inner shelf during Late Holocene times.

2. MATERIAL AND METHODS

This investigation is focused on the Holocene sediments recovered from two cores that are placed on the Romanian Black Sea Shelf: (1) EF 08-01 (at 44º01’99”N Longitude and 28º42’62” E Latitude), at around 28 m water depth, with a total length of 200 cm, and (2) BS 08-055 (at 43º54’35”N Longitude and 29º21’20” E Latitude), at 66.80 m water depth, with a total length of 43 cm (Fig. 1). The two cores were acquired using a gravity corer during scientific cruises with the Romanian research vessel *Mare Nigrum* (owner the National Research and Development Institute for Marine Geology and Geoecology – GeoEcoMar, Bucharest).

The Site EF 08-01 is located in offshore of the town of Eforie (Fig. 1), at the water depth of 28.15 m, and covers 200 cm of Upper Holocene sediments. The lithology mainly consists of alternating blackish muds and fine silty sands, interbedded with coquina layers and, rarely, very thin grey fine-grained silty clayey laminae. The coquina layers mainly contain marine bivalve molluscs belonging to *Modiolus* and *Mytilus* genera, but also microgastropod taxa.

The Site BS 08-055 is situated SE offshore of the town of Constanţa (Fig. 1). Lithologically, it is made by blackish soft mud containing bivalve shells (*Modiolus phaseolinus, Mytilus galloprovincialis, Cardium* spp. and microgastropods), which is overlaying a 1 cm coquina layer, with very fragile shells fragments (*Mytilus galloprovincialis, Cardium* spp., *Dreissena* sp., *Monodacna* sp. and microgastropods) in a sandy silty matrix, and a layer of compact, massive and sticky grey silty clay, at the bottom.

Fig. 1 Location of the investigated cores (EF 08-01 and BS 08-055) from the Romanian Black Sea shelf.

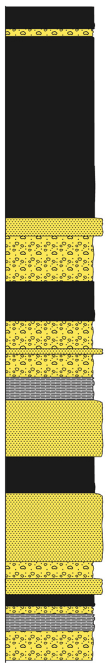
Detailed micropalaeontological analysis had been carried out on 42 samples from the mentioned gravity cores. The micropalaeontological samples were taken at 5 cm intervals. For each sample, 20 g have been washed and boiled with Na_2CO_3, and passed through 63 μm sieve. Quantitative studies on foraminifers and ostracods have been achieved, by counting the total number of specimens in the whole resulted material from each sample,

EF 08-01

Lat. 44° 01' 99" N
Long. 28° 42' 62" E

Water depth 28,15 m

Lithology



Sample	*Pseudocandona* sp.	*Candona scweyeri*	*Candona fabaeformis*	*Leptocythere multipunctata*	*Leptocythere gracilloides*	*Leptocythere devexa*	*Semicytherura* sp.	*Cyprideis torosa littoralis*	*Cyprideis* sp.	*Palmoconcha granulata*	*Loxoconcha gibboides*	*Loxoconcha* sp.	*Pontocythere bacescoi*	*Pontocythere* sp.	*Cytheroma variabilis*	*Callistocythere* sp.	*Callistocythere diffusa*	*Limnocythere inopinata*	*Xestoleberis cornelii*	*Xestoleberis* sp.	*Tyrrhenocythere donetziensis*	*Amnicythere bendovanica*	*Amnicythere cymbula*	*Amnicythere quinquetuberculata*	*Amnicythere striatocostata*	*Eucypris* sp.	*Cythereis rubra pontica*	*Darwinula stevensoni*	*Bythocythere turgida*	*Ammonia* spp.	*Cribroelphidium poeyanum*	*Textularia cushmani*	*Globigerinidae* sp.
	Ostracods																													**Foraminifers**			
0 - 1 cm						2																								16	10		
4 - 5 cm	1					4	1		1	1																				32	3		
5 - 10 cm						1	1		4																								
10 - 15 cm						2	1		1					1																45	9		
15 - 20 cm							1		1		2				1		1	1												144	16		
20 - 25 cm						3			1	1				2	2			1	1											142	22		
25 - 30 cm						3			1	2																					13		
30 - 35 cm						4			1					2	1															75	9		
35 - 40 cm						5	1		2					3	1			1												142	5		
40 - 45 cm	2	1				4	1		2					4							1	1								94	11		
45 - 50 cm	1					6				2				4							2				2					85	14		
50 - 55 cm									3																					140			
55 - 60 cm	4				2				6	1	1			4								1	1			2				192			
60 - 65 cm	2					8	1		2	1				2			2	1						2			1			228	12		
70 - 75 cm						3	2		2	1		3		5												1		1		111	4		
80 - 85 cm	1			1		22	2		2	1				4									1							142	16		
85 - 90 cm			1			8	1		1	2			1		1					1							1			308	48	1	
95 - 100 cm	2					5			2				1									1								361	71		
100 - 105 cm	3					2			5	1								2									1			291	58		
105 - 110 cm						4						1				1		1											1	130	24		
110 - 115 cm	2					2			3				3			1														42	5		
115 - 120 cm	2			5		2		1	2				1			2														91	6		
120 - 125 cm				4					4				1																	308	17		
125 - 128 cm	1			7		5			4				3																	159	5		
149 - 179 cm	4			4		11	3		2	1			4		1							2								292	16		3
179 - 180 cm									4																					165	17		
184 - 185 cm						2			9				1																	315	5		
185 - 191 cm			2	10		2			2	1	1		4		1													1		185	16		
191 - 200 cm			1			3			4																					200	19		

Legend: Blackish mud; Coquina layer; Grey silty clay; Silty sand; Shell fragments

Fig. 2 Lithology and microfaunal (ostracods and foraminifers) distribution and abundance in the EF 08-01 core. Abundance is given in adult specimens/sample.

using a binocular microscope. For the ostracod quantitative analyses, we have taken into consideration only the adult specimens due to the possibility of successive moult of taxa.

Calcareous nannoplankton investigations were carried out on the LM (Light microscope), by using an Olympus microscope, with 1600 x magnification. Smear slides were prepared directly from the untreated sediment, in order to preserve the original composition. For the calcareous nannoplankton both qualitative and quantitative studies were performed.

The relative abundance of *Emiliania huxleyi* (expressed as percent values) was determined on a total sum of at least 350 specimens. For *Braarudosphaera bigelowii* that is the subdominant species in nannofloral assemblages, counting was continued until a total of 350 specimens were reached.

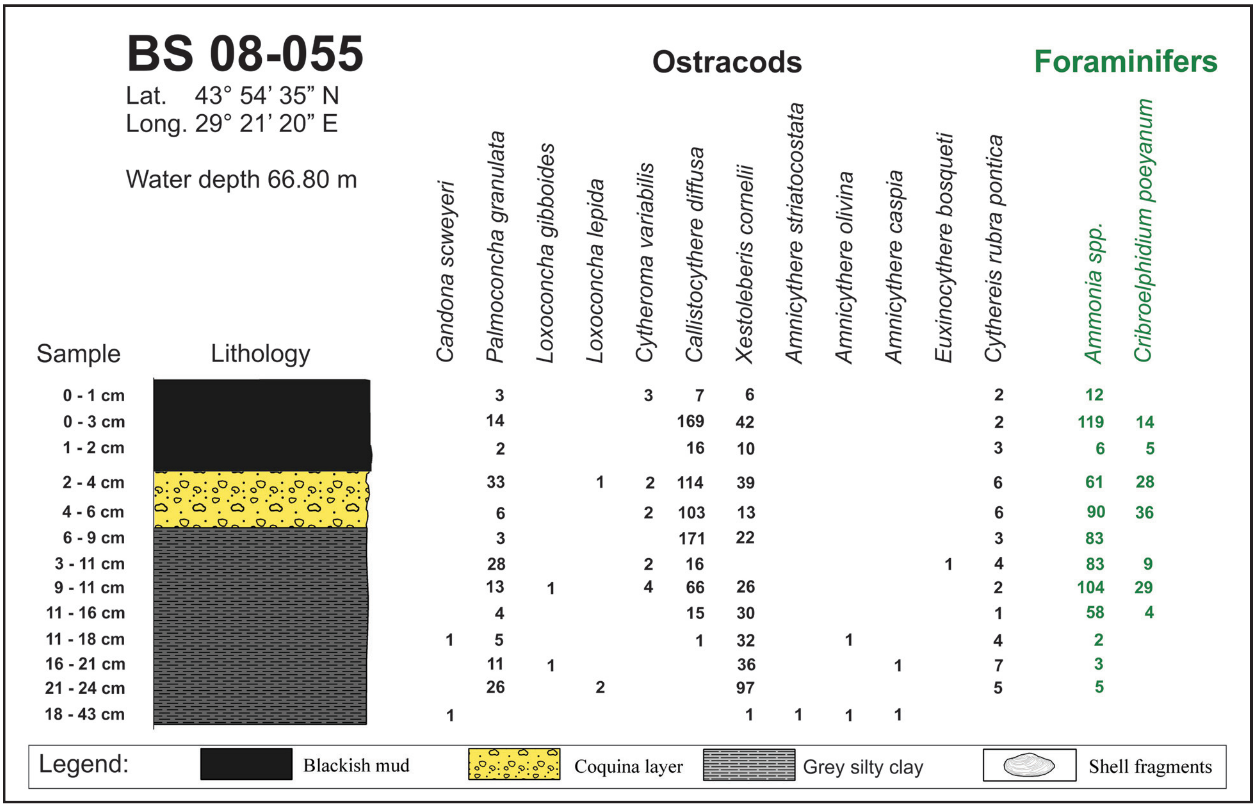
Additionally, counting in a fixed area corresponding to 75.5 fields of view was performed. The results were converted into population density (number/mm^2) by using the formula given by Giunta *et al*. (2007) for calcareous nannoplankton studies of the Black Sea Holocene deposits: number of individuals observed/field of view number*field of view area.

3. RESULTS

3.1 Lithostratigraphy

The upper part of the Site EF 08-01 (between 0-65 cm) is characterised by the presence of a blackish mud, soft in the upper part and more compact and massive at the base, with a cm thick coquina layer near the top (Fig. 2). The lower part of the core (65-183 cm) is composed by alternating fine silty sands, coquina layers which contains taxa of *Modiolus* and *Mytilus* in a sandy matrix, blackish muds and compact fine grey silty sands. At the base of the core, between the depths of 183-200 cm, the lithology is represented by the deposition of a coquina layer with a coarse sandy matrix. In this interval the macrofauna is represented by mollusc shells belonging to *Dreissena* spp. and microgastropods.

The upper part (11 cm) of the Core BS 08-055 is characterised by the presence of a blackish mud (Fig. 3), very rich in fragments of mollusc shells dominated by *Modiolus phaseolinus*. The next 6 cm of the core are represented by a coquina layer, which contains marine mollusc shells, such as *Mytilus galloprovincialis* and *Cardium* spp., as well as fresh water mollusc shells, i.e., *Dreissena* and *Monodacna*, in a sandy matrix. Beneath this interval (between 19-43 cm), down to the core base, the lithology consists of a compact grey silty clay. In this interval, the macrofauna is represented by few fragments of mollusc shells belonging to *Dreissena* and *Monodacna* genera, and by a microgastropods assemblage.



Sample	*Candona scweyeri*	*Palmoconcha granulata*	*Loxoconcha gibboides*	*Loxoconcha lepida*	*Cytheroma variabilis*	*Callistocythere diffusa*	*Xestoleberis cornelii*	*Amnicythere striatocostata*	*Amnicythere olivina*	*Amnicythere caspia*	*Euxinocythere bosqueti*	*Cythereis rubra pontica*	*Ammonia spp.*	*Cribroelphidium poeyanum*
0 - 1 cm		3			3	7	6					2	12	
0 - 3 cm		14				169	42					2	119	14
1 - 2 cm		2				16	10					3	6	5
2 - 4 cm		33		1	2	114	39					6	61	28
4 - 6 cm		6			2	103	13					6	90	36
6 - 9 cm		3				171	22					3	83	
3 - 11 cm		28			2	16					1	4	83	9
9 - 11 cm		13	1		4	66	26					2	104	29
11 - 16 cm		4				15	30					1	58	4
11 - 18 cm	1	5				1	32		1			4	2	
16 - 21 cm		11	1				36			1		7	3	
21 - 24 cm		26		2			97					5	5	
18 - 43 cm	1						1	1	1	1				

Fig. 3 Lithology and microfaunal (ostracods and foraminifers) distribution and abundance in the BS 08-055 core. Abundance is given in adult specimens/sample.

3.2 Ostracod assemblages

In the core EF 08-01, we identified 29 species of ostracods belonging to 17 genera (Fig. 2). The highest diversity is recorded by the *Leptocytheridae* taxonomic group that contains 12 species (Fig. 4). Most of them are ostracods Caspian in origin, such as: *Amnicythere cymbula* (Livental), *Amnicythere striatocostata* (Schweyer), *Amnicythere bendovanica* (Livental), *Amnicythere quinquetuberculata* (Schweyer), *Amnicythere gracilloides* (Schornikov), *Candona schweyeri* Schornikov, *Candona fabaeformis* (Fischer), *Pseudocandona* sp., *Cyprideis torosa (Jones)*, *Cyprideis* sp., *Loxoconcha gibboides* Livental, *Loxoconcha* sp., *Limnocythere inopinata* (Baird), *Tyrrhenocythere donetziensis* (Dubowsky) and *Darwinula stevensoni* (Brady & Robertson). The rest of the ostracods encountered in this core are represented by the Mediterranean species: *Leptocythere multipunctata* (Sequenza), *Leptocythere devexa* Schornikov, *Callistocythere diffusa* (Müller), *Callistocythere* sp., *Semicytherura* sp., *Palmoconcha granulata* (Sars), *Pontocythere bacescoi* (Caraion), *Pontocythere* sp., *Cytheroma variabilis* Müller, *Xestoleberis cornelii* Caraion, *Xestoleberis* sp., *Eucypris* sp., *Cythereis rubra pontica* Dubovski and *Bythocythere turgida* Sars.

The uppermost part (1 cm) of the EF 08-01 core contains only one ostracod species, *Leptocythere devexa*, which prefers muddy substratum and a brackish environment (Opreanu, 2006). The highest diversity, i.e., 10 species (Fig. 4), is recorded within the sampled interval 60-65 cm in which prevail the Mediterranean taxa represented by: *Cyprideis torosa littoralis*, *Pontocythere bacescoi*, *Leptocythere devexa*, *Callistocythere diffusa*, *Palmoconcha granulata* and *Cythereis rubra pontica*.

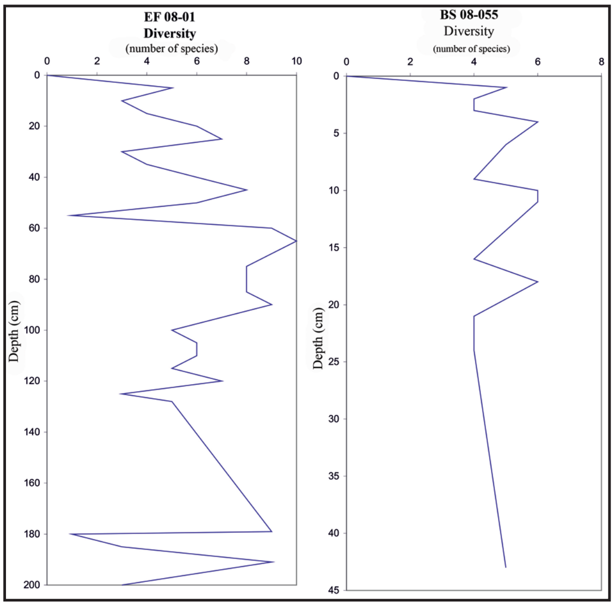


Fig. 4 Fluctuation in diversity (number of species) of ostracod taxa in the studied cores (EF 08-01 and BS 08-055) from the NW Black Sea shelf.

The BS 08-055 core contains only 12 species of ostracods belonging to 8 genera (Fig. 3). The highest abundance is recorded by the Mediterranean species represented by *Palmoconcha granulata* (Sars), *Cytheroma variabilis* Müller, *Callistocythere diffusa* (Müller), *Xestoleberis cornelii* Caraion and *Cythereis rubra pontica* Dubovski. With a lower abundance were encountered Caspian species, such as *Candona schweyeri* Schornikov, *Loxoconcha gibboides* Livental, *Loxoconcha lepida* Stepanaitys, *Amnicythere striatocostata* (Schweyer), *Amnicythere olivia* (Livental), *Amnicythere caspia* (Livental) and *Euxinocythere bosqueti* (Livental). The Mediterranean species are dominating the upper part of the core (0-24 cm), while the Caspian species are dominating the lower part (24-43 cm).

3.3 Foraminiferal assemblages

In the EF 08-01 core, the foraminiferal assemblage is represented by *in situ* species *Ammonia beccarii* (Linné), *Ammonia tepida* (Cushman), *Cribroelphidium poeyanum* (d'Orbigny) and *Textularia cushmani* (Said) and by reworked planktonic taxa *Globoquadrina* sp. and *Globigerina* sp. The taxa belonging to *Ammonia* group and *Cribroelphidium poeyanum* species are very abundant in the studied core, reaching values of 315 specimens in the sampled interval 184-185 cm (Fig. 2). Their presence with such a high abundance indicates a stable brackish shallow water environment.

In the BS 08-055 core, the foraminiferal assemblage is represented only by the taxa belonging to the *Ammonia* group and *Cribroelphidium poeyanum* species. In this core, between 11 and 24 cm, *Cribroelphidium poeyanum* is missing and the abundance of *Ammonia* spp. is decreasing (Fig. 3). In the lower part of the core, there are no foraminifers *in situ* or reworked.

3.4 Calcareous nannoplankton

In the EF 08-01 core, the youngest 5 cm contain a monospecific calcareous nannoplankton assemblage with *Emiliania huxleyi*. In the depth interval 5-100 cm, no calcareous nannoplankton *in situ* was found, only reworked Tertiary taxa was observed. Between 100 cm and 170 cm, the calcareous nannoplankton *in situ* contains mainly *Emiliania huxleyi*, 95-98 % that is about 750 specimens/mm^2, respectively. In the same interval, *Braarudosphaera bigelowii* was recorded with a very low occurrence, between 2-5 % and around 14 specimens/mm^2, respectively. In the 180-185 cm interval, a monospecific assemblage with *Braarudosphaera bigelowii*, reaching 22.4 specimens/mm^2, was observed. The deepest cored interval of EF 08-01 (185-200 cm) contains no nannofloras, either *in situ* or reworked.

In the uppermost 15 cm of BS 08-055 core, the calcareous nannoplankton assemblages are represented by the dominance of *Emiliania huxleyi* (over 95 %), while the remainder is *Braarudosphaera bigelowii*. The uppermost 10 cm of the core contain a very high abundance of *Emiliania huxleyi*, more than 1450 specimens/mm^2. At the 20 cm sampled interval, *Emiliania huxleyi* is no longer found, and the calcareous nannoplankton assemblages contain only *Braarudosphaera bigelowii*. Below 25 cm, no nannofloras was found, either *in situ* or reworked. In both EF 08-01 and BS 08-055 cores a negative correlation could be observed between *Emiliania huxleyi* and *Braarudosphaera bigelowii*.

Quantitative studies of the calcareous nannoplankton assemblages from the two cores allow us to recognize four nannofloral intervals (described in detail by Melinte-Dobrinescu & Briceag, 2011), that are from younger to older: (1) Nannofloral Interval I is characterised by a very high abundance in *Emiliania huxleyi*, between 1450 and 1650 specimens/mm^2, and by a very low abundance (up to 2 specimens/mm^2) or even by the absence of *Braarudosphaera bigelowii*; (2) Nannofloral Interval II is characterised by the presence of *Emiliania huxleyi* with a relatively high abundance (less than 950 specimens/mm^2), as well as by the continuous presence of *Braarudosphaera bigelowii*, but with a low abundance, up to 16 speciments/mm^2; (3) Nannofloral Interval III is characterised by a monospecific assemblage with *Braarudosphaera bigelowii* that reaches values as high as 22 specimens/mm^2; (4) Nannofloral Interval IV is present towards the base of the studied sites. No calcareous nannoplankton, either *in situ* or reworked, was remarked.

4. DISCUSSION

Although there are many ostracod species (high diversity) in the encountered microfaunal assemblages, their abundance is very low in the samples, whereas the foraminiferal diversity is very low, but the abundance is very high (Figs. 2 and 3). This type of microfaunal association is common in the present-day Black Sea benthic communities, at water salinity below 18 ‰.

As we expected, in a shallower environment, with low salinity values, as for the Site EF 08-01, the Caspian ostracod species prevailed over the Mediterranean in origin ones, while in the deeper parts of the inner shelf, i.e., Site BS 08-055, the ostracod assemblages are dominated by the Mediterranean taxa, and the Caspian ones could be found in low number and with a low frequency. Therefore, an increase in the Mediterranean microfaunal abundance is present from the coastal marine environments towards the open settings in the NW Black Sea basin.

In the Site EF 08-01, the microfaunal fluctuation indicates no significant changes from the base to the top of the studied core. The abundance ratio Caspian taxa/Mediterranean taxa are always around 0.7. By contrast, in the youngest sediments of the Site BS 08-055, the Mediterranean taxa are clearly dominating, and the Caspian taxa/Mediterranean taxa reached values up to 0.01. The base of this cored interval (below 24 cm of sediment) in the Site BS 08-055 is characterised by the prevalence of Caspian taxa, while the ratio between the abundance of the Caspian /Mediterranean ostracods is 4.

The sediments from the 24-43 cm cored interval are barren of foraminiferal and calcareous nannoplankton. Additionally, the low salinity mollusc *Dreissena* (Hiscott *et al*., 2007) was identified in the Site BS 08-055, beneath the depth of 11 cm. This depth is also coincident with the significant decrease in the calcareous nannoplankton species *Emiliania huxleyi*, from over 1500 at the top of the site towards around 850-900 specimens/mm^2. Taking into account the above-described fluctuation pattern of the calcareous nannoplankton assemblages, a gradual increase in salinity could be supposed for the surface waters (Fig. 5). By contrast, the benthic microfaunas (ostracods and foraminifers) argue for a more stable salinity environment in the two studied cores from the Black Sea shelf.

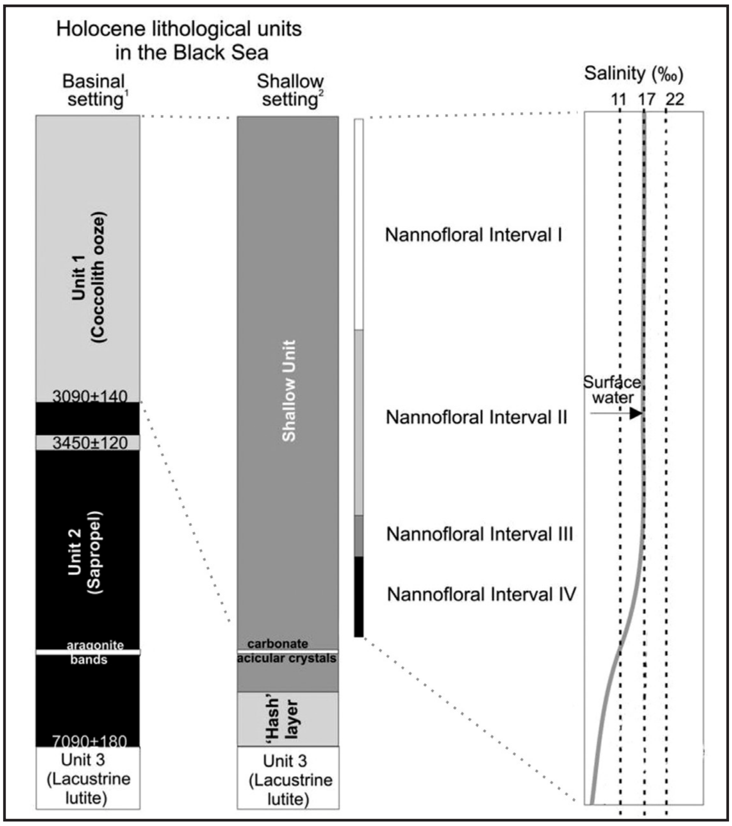


Fig. 5 Holocene lithological units and identified calcareous nannoplankton intervals in the Black Sea. (1) Basinal setting: lithological units after Ross and Degens (1974); absolute age after Jones and Gagnon (1994). (2) Shallow setting of the Romanian inner shelf: lithological units after Oaie and Melinte-Dobrinescu (2012); Nannofloral Intervals described in this study; surface water salinity according to data in this paper.

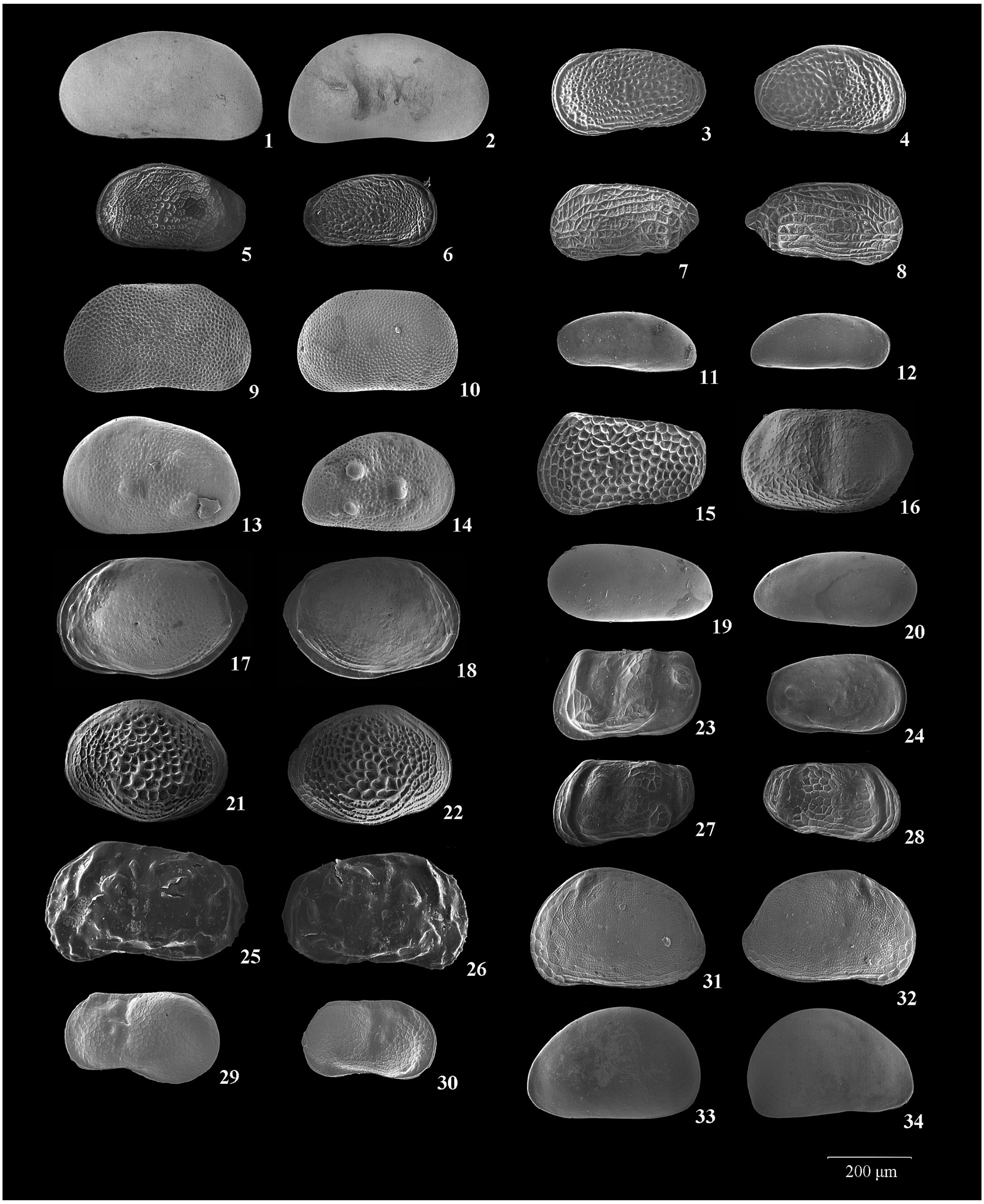


Plate 1 Ostracods from the studied cores, all valves of ostracods belong to adult individuals, external lateral views; LV = left valve, RV = right valve; **1**, **2** *Candona schweyeri* Schornikov, BS 08-055 (11-18 cm, 18-43 cm): 1 - LV; 2 - RV; **3**, **4** *Leptocythere devexa* Schornikov, EF 08-01 (80-85 cm): 3 - LV; 4 - RV; **5**, **6** *Leptocythere multipunctata* (Sequenza), EF 08-01 (185-191 cm): 5 - LV; 6 - RV; **7**, **8** *Semicytherura* sp., EF 08-01 (149-179 cm): **7** - LV; 8 - RV; **9**, **10** *Pseudocandona* sp., EF 08-01 (55-60 cm): 9 - LV; 10 - RV; **11**, **12** *Cytheroma variabilis* Müller, EF 08-01 (20-25 cm): 11 - LV; 12 - RV; **13**, **14** *Cyprideis torosa* (Jones), EF 08-01 (115-120 cm): 13 - LV; 14 - RV; **15** *Amnicythere olivia* (Livental), BS 08-055 (18-43 cm), LV; **16** *Bythocythere turgida* Sars, EF 08-01 (105-110 cm), LV; **17**, **18** *Palmoconcha granulata* (Sars), BS 08-055 (2-4 cm): 17 - LV; 18 - RV; **19**, **20** *Darwinula stevensoni* (Brady & Robertson), EF 08-01 (70-75 cm, 185-191 cm): 19 - RV; 20 - LV; **21**, **22** *Loxoconcha gibboides* Livental, BS 08-055 (9-11 cm), EF 08-01 (15-20 cm): 21 - LV; 22 - RV; **23** *Amnicythere quinquetuberculata* (Schweyer), EF 08-01 (60-65 cm), LV; **24** *Amnicythere cymbula* (Livental), EF 08-01 (55-60 cm), RV; **25**, **26** *Callistocythere diffusa* (Müller), BS 08-055 (0-3 cm): 25 - LV; 26 - RV; **27**, **28** *Amnicythere bendovanica* (Livental), EF 08-01 (149-179 cm): 27 - LV; 28 - RV; **29**, **30** *Limnocythere inopinata* (Baird), EF 08-01 (100-105 cm): 29 - LV; 30 - RV; **31**, **32** *Tyrrhenocythere donetziensis* (Dubowsky), EF 08-01 (45-50 cm): 31 - LV; 32 - RV; **33**, **34** *Xestoleberis cornelii* Caraion, BS 08-055 (21-24 cm): 33 - LV; 34 - RV.

5. CONCLUSIONS

This study was focused on two gravity cores collected from the NW part of the Black Sea basin, EF 08-01 from a shallow environment (28.15 m) and BS 08-055 from the inner/outer shelf area (66.80 m). The modifications in nannoplankton composition and abundance suggest a gradual salinity change of surface waters, while the benthic microfaunas argues for a more stable salinity in deeper parts of the basin, in the benthic zone. Once the salinity increased to values close to the nowadays, stable marine conditions have been established, fact argued by little fluctuation in nannofloral assemblages during latest Holocene times.

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