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ILICA BAY (ÇEŞME-İZMİR) BENTHIC FORMINIFER-OSTRACOD ASSEMBLAGES AND PACIFIC OCEAN – RED SEA ORIGINATED FORAMINIFERA AND ABNORMAL INDIVIDUALS

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ABSTRACT.- In order to define contemporaneous benthic foraminifera series in surface sediments collected from the surroundings of hot spring locating at 2.50 m depth to the southeast of the Yıldız Cape, Ilıca Bay (Çeşme-İzmir), a total of 38 samples were collected from the three different transects. The Pacific Ocean and Red Sea originated benthic foraminifera species found in this study are; *Nodopthalmidium antillarum* (Cushman), *Spiroloculina antillarum* d'Orbigny, *Triloculina fichteliana* d'Orbigny, *Euthymonacha polita* (Chapman), *Coscinospira acicularis* (Batsch), *Peneroplis arietinus* (Batsch), *Amphisorus hemprichii* Ehrenberg, *Sorites orbiculus* Ehrenberg, *Cymbaloporetta plana* (Cushman). In addition to these species, *Peneroplis arietinus* (Batsch), *Spiroloculina antillarum* d'Orbigny, *Triloculina* cf. *fichteliana* d'Orbigny and *Cymbaloporetta plana* (Cushman) which were recorded on the southwest coasts of Antalya were also found in this region. *Euthymonacha polita* (Chapman) which was first recorded in Kuşadası Bay is also abundant in Ilıca Bay. This observation shows a northward distribution of this species. *Coscinospira acicularis* (Batsch) is a southwest Pacific originated species which is also found in Gulf of Aqaba, north of Red Sea. It is a typical alien species inhabiting the Ilıca Bay. This is the first record of this species both for the Mediterranean and Aegean Seas. *Amphistegina lobifera* Larsen was abundantly found around two submarine springs in Kuşadası Bay, situating at the south of Ilıca Bay. It was also recorded on the northwestern coasts of Karaburun Peninsula to the north of the study area. Meanwhile, the absence of *Amphistegina lobifera* Larsen in Ilıca Bay is the most striking feature of this study. Si, Mg and Mo concentrations of some of the colored *Peneroplis planatus* (Fichtel ve Moll) individuals are high but the concentration of rare earth elements, such as Tc, Pa, Ru and Mo were obtained from the shells in some of the sampling points.

Key words: Eastern Aegean Sea, Alien foraminifera, colored tests, Ilıca Bay, immigrant foraminifera, ostracod, thermal spring water.

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INTRODUCTION

Numerous thermal springs are located in submarine and on land regions along the coastal region of Aegean Sea of Turkey (Çağlar, 1946; Başkan and Canik, 1983). Ilıca Bay, situating at the western part of Karaburun Peninsula has a hot spring at a depth of 2.5 m beneath the sea level (Figure 1) (Çağlar, 1946; Başkan and Canik, 1983).

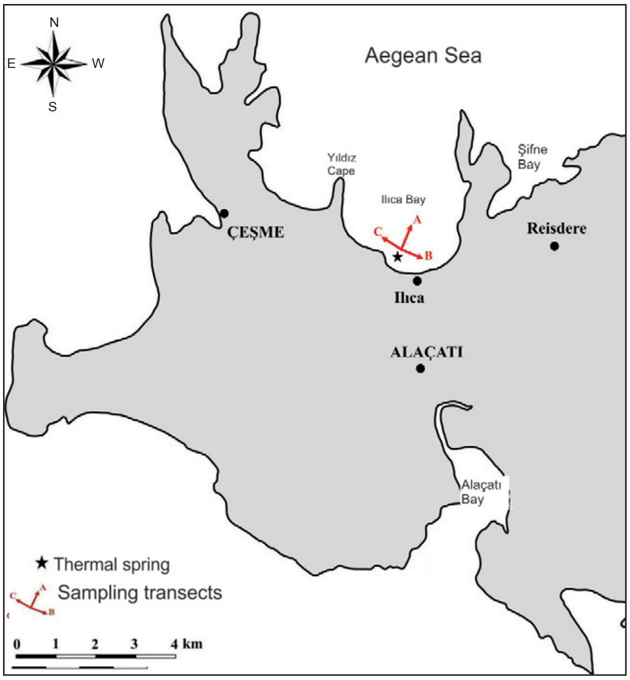


Figure 1- Location of the Çeşme-Ilıca submarine spring.

The aim of this study is to investigate the effect of this hot spring on the benthic foraminiferal assemblages. Results obtained have revealed the abundance of *Spiroloculina antillarum* d'Orbigny, *Peneroplis pertusus* (Forskal), *P. planatus* (Fichtel and Moll) and *Coscinospira hemprichii* (Ehrenberg) on the foraminiferal assemblage in this area. However, the most important coincidence is the presence of Pacific originated benthic foraminifera species (Loeblich and Tappan, 1994) which shows a distribution to the Red Sea (Hottinger et al., 1993), such as; *Nodopthalmidium antillarum* (Cushman), *Euthymonacha polita* (Chapman), *Coscinospira acicularis* (Batsch), *Peneroplis arietinus* (Batsch). Of these; *Euthymonacha polita* (Chapman), *Nodopthalmidium antillarum* (Cushman) and *Spiroloculina antillarum* d'Orbigny were found along Aegean coastal regions apart from Kuşadası Bay the second time; as for the *Peneroplis arietinus* (Batsch) was encountered for the first time again in this region after southwestern coasts of Antalya. Nonetheless; *Coscinospira acicularis* (Batsch) is the first defined genus and species on coasts of Turkey. Other than these; *Cymbaloporetta plana* (Cushman) was first found in this region after southwest Antalya coasts and Kuşadası Bay. Except the alien foraminifera known in Aegean Sea and in Mediterranean Sea (Zenatos et al., 2008), a strange foraminiferal assemblage was observed for the Mediterranean Sea and for the Aegean Sea around the spring in Ilıca Bay. Despite that; in recent years, there has not been any finding related to foraminifera mentioned on studies carried out in the region by Sözeri (1966), Sellier de Civrieux (1970), Meriç (1986), and by Avşar and Meriç (2001).

Thermal springs in submarine and on land exhibit remarkable features according to their radioactivity and their heavy metal and trace element contents (Erişen et al., 1996). Similarly, the samples from spring water in the study area are known to contain heavy metals such as; As, Fe, Mn, Cu, Co, Ni, Si, Cr, Al and Zn (Yenal et al., 1975). Accordingly, foraminiferal shells having various colors can be result from the metal content of the samples. For instance, peneroplis and hauerinids having yellow, orange, bluish green and black colored shells are the evidence of that. There are thermal spring waters originating from fault both in sea and on land due to fault lines in and around the study area cause on the east of the study area faults trending in NW-SE and NE-SW had developed as it was in Karaburun Peninsula (Çakmakoğlu and Bilgin, 2006).

MATERIAL AND METHOD

Total of 38 samples were collected on three transects in A (210°), B (120°) and C (290°) directions and at distances of 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90 and 100 meters in Ilıca Bay on November the 6th in 2008 and spring water temperature was measured as 28.4°C (Table 1). Sampling could not be made after 40 meter due to pier in transect A. UTM coordinates of the center point are 0444185E and 4240949N (Figure 1, Table 1). Foraminifer and ostracod analyses in sediment samples were made according to Babin (1980) and Bignot (1985). H_2O_2 with a concentration of 10% were added on 5 gr. wet samples, kept 24 hours then were washed under a pressured water on a 0.063 mm size sieve. After samples were then dried on oven at 50°C, they were sieved on 2.00, 1.00, 0.500, 0.250, 0.125 mm size sieves. These samples were then studied under binocular microscope and foraminifera they contain were determined.

According to elementary chemical analyses carried out in ÇNAEM, the measurements were made in ppm range by the Wavelength Dispersive X ray Fluorescence Analysis Spectrometer (WDXRF) for solid, liquid and gas samples, but were detected in ppb range after pre enrichment had been made. In the system which qualitative and quantitative analyses for the elements between Boron (B) and Uranium (U) were made; X0 ray tube, crystals (LiF220, PX10, GeIII-C, PE 202-C) in various features, 2 sensors, climators in various sizes and features, and a PC program was used to perform the analysis.

Table 1- Temperatures and depths measured for samples collected from the Çeşme-Ilıca submarine spring.

Çeşme (Ilıca)
UTM: 0444185 D 4240949 K
Temperature of submarine spring: 28.4 °C
Date: 06.11.2008

Horizontal distance (m)	Transect-A (210°)		Transect-B (120°)		Transect-C (290°)	
	Depth (m)	T °C	Depth (m)	T °C	Depth (m)	T °C
5	3.2	17.9	3.3	17.9	2.5	18.7
10	3.0	17.9	3.8	17.6	2.0	17.6
15	3.1	17.9	4.1	17.6	1.8	17.6
20	3.0	17.5	4.0	17.5	1.5	17.6
25	3.2	17.5	4.1	17.5	1.6	17.6
30	2.5	17.5	4.1	17.5	1.1	17.6
35	2.2	17.5	4.1	17.5	1.0	17.6
40	2.0	17.5	4.1	17.5	1.0	17.7
45			4.1	17.5	1.0	18.1
50			4.1	17.5	1.0	18.1
60			4.1	17.2	1.3	17.8
70	**PIER**		4.0	17.2	1.4	17.7
80			3.7	17.2	1.5	17.7
90			3.8	17.2	1.6	17.6
100			3.9	17.2	1.6	17.6

During the preparation of samples for counting, the material was first pulverized to be in 200 mesh size then were dried. The sample kept in desiccator was weighted in 12 gr., mixed with 3 gr. wax, then was placed into 40 mm. diameter mold and was turned into pellet exerting 35 tons of pressure. Electron microprobe quantitative analyses were carried out using computerized Jeol-733 electron microprobe device and online ZAFM quantitative analysis program.

Microprobe analyses of colored *Peneroplis planatus* (Fichtel ve Moll) shells were carried out using SEM (Jeol. JSM-6390) in TPAO Research Center.

ASSEMBLAGE OF BENTHIC FORAMINIFER

The samples collected around the spring Çeşme-Ilıca Bay contains 45 genera and 80 species of foraminifera, including 9 genera and 9 species originated from Pacific and Red Sea (Table 2, Plates 1-8; linear scale: 100 micron) (Meriç and Avşar, 2001; Meriç et al., 2002 *a* and *b*, 2003 *a* and *b*, 2004, 2008 *a* and *b*, 2009 *a*, *b* and *c*, 2010 *a* and *b*, 2011; Avşar et al., 2009). These are *Textularia bocki* Höglund, *Spirillina vivipara* Ehrenberg, *Vertebralina striata* d'Orbigny, *Nodopthalmidium antillarum* (Cushman), *Nubecularia lucifuga* Defrance, *Adelosina carinata-striata* Wiesner, *A. cliarensis* (Heron-Allen and Earland), *A. mediterranensis* (Le Calvez J. and Y.), *Spiroloculina angulosa* Terquem, *S. antillarum* d'Orbigny, *S. ornata* d'Orbigny, *Siphonaperta agglutinans* (d'Orbigny), *S. aspera* (d'Orbigny), *Cycloforina contorta* (d'Orbigny), *C. villafranca* (Le Calvez J. and Y.), *Lachlanella variolata* (d'Orbigny), *Massilina gualteriana* (d'Orbigny), *M. secans* (d'Orbigny), *Quinqueloculina berthelotiana* d'Orbigny, *Q. bidentata* d'Orbigny, *Q. jugosa* Cushman, *Q. laevigata* d'Orbigny, *Q. lamarckiana* d'Orbigny, *Q. seminula* (Linné), *Miliolinella elongata* Kruit, *M. labiosa* (d'Orbigny), *M. subrotunda* (Montagu), *M. webbiana* (d'Orbigny), *Pseudotriloculina laevigata* (d'Orbigny), *P. oblonga* (Montagu), *P. rotunda* (d'Orbigny), *P. sidebottomi* (Martinotti), *Triloculina bermudezi* Acosta, *T. fichteliana* d'Orbigny, *T. marioni* Schlumberger, *T. scheriberiana* d'Orbigny, *Sigmoilinita costata* (Schlumberger), *S. edwardsi* (Schlumberger), *Articulina carinata* Wiesner, *Parrina bradyi* (Millet), *Euthymonacha polita* (Chapman), *Coscinospira acicularis* (Batsch), *C. hemprichii* Ehrenberg, *Laevipeneroplis karreri* (Wiesner), *Peneroplis arietinus* (Batsch), *P. pertusus* (Forskal), *P. planatus* (Fichtel and Moll), *Amphisorus hemprichii* Ehrenberg, *Sorites orbiculus* Ehrenberg, *Polymorphina* sp.3, *Polymorphina* sp.5, *Polymorphina* sp.7, *Brizalina spatulata* (Williamson), *Reussella spinulosa* (Reuss), *Neoeponides bradyi* Le Calvez, *Gavelinopsis praegeri* (Heron-Allen and Earland), *Neoconorbina terquemi* (Rzehak), *Rosalina bradyi* Cushman, *R. globularis* d'Orbigny, *Pararosalina* cf. *dimorphiformis* McCulloch, *Planoglabratella opercularis* (d'Orbigny), *Cyclocibicides vermiculatus* (d'Orbigny), *Lobatula lobatula* (Walker ve Jacob), *Planorbulina mediterranensis* d'Orbigny, *Cibicidella variabilis* (d'Orbigny), *Cymbaloporetta plana* (Cushman), *C. squammosa* (d'Orbigny), *Miniacina miniacea* (Pallas), *Asterigerinata mamilla* (Williamson), *Nonion depressulum* (Walker and Jacob), *Ammonia compacta* Hofker, *A. parkinsoniana* (d'Orbigny), *A. tepida* Cushman, *Challengerella bradyi* Billman, Hottinger and Oesterle, *Cribroelphidium poeyanum* (d'Orbigny), *Porosononion subgranosum* (Egger), *Elphidium aculeatum* (d'Orbigny), *E. advenum* Cushman, *E. complanatum* (d'Orbigny), *E. crispum* (Linné) and *E. depressulum* (Cushman).

Table 2- Distribution of transects A, B and C from the Çeşme-Ilıca Bay, and genus and species of benthic foraminifera recorded at each station.

FORAMINIFER	TRANSECT-A								TRANSECT-B															TRANSECT-C														
	5	10	15	20	25	30	35	40	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100
Textularia bocki	*		*	*	*			*	*			*				*		*		*	*	*	*	*	*	*		*		*					*	*	*	*
Spirillina vivipara																	*																					
Vertebralina striata	*	*	*	*	*			*	*	*		*	*	*		*	*	*		*	*	*	*	*	*	*	*	*	*	*		*		*	*			*
Nodopthalmidium antillarum	*	*	*						*		*	*	*		*			*			*			*		*	*	*	*	*				*	*		*	*
Nubecularia lucifuga									*															*														
Adelosina carinata-striata					*																												*					
Adelosina cliarensis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*							*
Adelosina mediterranensis					*			*	*		*	*		*	*	*	*	*		*	*	*	*	*	*	*		*								*	*	
Spiroloculina angulosa	*	*	*	*			*	*	*	*		*		*		*			*		*		*		*	*	*		*					*	*		*	
Spiroloculina antillarum	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Spiroloculina depressa																							*															
Spiroloculina ornata	*	*	*	*	*	*		*	*	*	*	*	*		*	*		*	*	*		*	*	*		*	*	*		*	*	*		*	*	*		*
Siphonaperta agglutinans	*		*						*	*	*		*	*	*	*		*		*			*	*	*	*	*	*							*		*	*
Siphonaperta aspera	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Cycloforina contorta	*	*		*	*	*		*	*	*	*	*	*			*	*	*			*	*	*		*	*	*	*	*	*			*	*	*		*	*
Cycloforina villafranca						*										*				*	*		*							*			*					
Lachlanella variolata					*		*								*	*				*	*		*			*			*						*		*	*
Massilina gualteriana					*								*													*	*	*	*				*	*				
Massilina secans	*																								*													*
Quinqueloculina berthelotiana	*	*	*	*		*	*	*	*			*		*	*			*					*	*	*	*	*	*	*	*			*	*	*	*		*
Quinqueloculina bidentata	*	*	*		*		*		*			*	*	*		*	*		*						*	*	*	*	*	*		*		*	*	*	*	*
Quinqueloculina jugosa																						*	*			*												
Quinqueloculina laevigata					*				*				*	*	*	*			*			*		*			*							*				
Quinqueloculina lamarckiana	*					*				*				*				*							*	*		*		*		*			*	*	*	*
Quinqueloculina seminula	*								*										*		*		*	*		*		*	*			*	*		*	*	*	
Miliolinella elongata																	*																					
Miliolinella labiosa												*																										
Miliolinella subrotunda		*	*		*		*	*	*			*				*								*						*				*				
Miliolinella webbiana	*																																					
Pseudotriloculina laevigata	*		*	*										*																								
Pseudotriloculina oblonga	*	*	*		*	*			*		*		*	*	*	*						*		*		*	*	*	*					*	*			*
Pseudotriloculina rotunda									*	*						*			*							*	*		*					*				
Pseudotriloculina sidebottomi															*																							
Triloculina bermudezi		*	*		*				*																					*				*				
Triloculina cf. *fichteliana*																					*		*	*		*			*								*	
Triloculina marioni	*		*	*	*	*			*	*		*	*	*	*		*	*	*		*	*		*	*	*	*	*		*				*		*		
Triloculina scheriberiana	*	*	*												*					*	*		*			*												*
Sigmoilinita costata	*	*	*	*	*		*		*	*	*	*	*	*	*			*				*		*						*				*		*		
Sigmoilinita edwardsi						*			*	*				*										*														*
Articulina carinata	*	*		*								*		*	*	*						*																
Parrina bradyi	*					*									*	*						*		*		*			*			*			*			*
Euthymonacha polita	*								*	*			*					*																				
Coscinospira acicularis	*						*	*	*					*	*	*		*		*		*	*	*		*	*	*	*				*	*			*	

Table 2 (cont.).

FORAMINIFER	TRANSECT-A								TRANSECT-B															TRANSECT-C														
	5	10	15	20	25	30	35	40	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100
Coscinospira hemprichii	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Laevipeneroplis karreri		*	*		*	*		*										*						*		*		*				*		*				
Peneroplis arietinus	*			*	*		*	*			*			*	*	*		*			*	*			*	*	*		*							*	*	*
Peneroplis pertusus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Peneroplis planatus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Amphisorus hemprichii		*																		*			*	*		*												
Sorites orbiculus	*	*	*		*				*	*				*		*	*	*		*	*	*	*	*		*	*	*	*	*			*	*	*	*	*	*
Polymorphina sp.3	*	*	*																															*				
Polymorphina sp.5																					*					*	*			*				*				
Polymorphina sp.7														*				*		*	*																	
Brizalina spatulata																	*							*														*
Reussella spinulosa																								*														
Neoeponides bradyi	*		*			*					*				*		*					*	*					*										
Gavelinopsis praegeri		*	*																																			
Neoconorbina terquemi		*	*		*		*	*							*	*	*		*			*							*									
Rosalina bradyi	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*			*	*	*			*	*	*	*	*		*
Rosalina globularis														*			*						*			*			*									
Pararosalina cf. *dimorphiformis*	*				*		*	*	*				*							*		*	*		*	*	*					*		*	*		*	
Planoglabratella opercularis			*	*																																		
Cyclocibicides vermiculatus																										*												
Lobatula lobatula				*	*					*				*				*							*							*						
Planorbulina mediterranensis	*		*	*	*	*	*	*	*	*		*	*	*	*		*				*	*	*	*		*	*		*	*				*				
Cibicidella variabilis		*						*	*											*						*												
Cymbaloporetta plana		*	*		*					*	*			*	*					*	*	*		*				*	*					*				
Cymbaloporetta squammosa																														*								
Miniacina miniacea																																		*				
Asterigerinata mamilla					*					*		*	*	*			*																	*			*	
Nonion depressulum			*										*	*																								
Ammonia compacta						*						*	*			*	*	*				*				*					*							
Ammonia parkinsoniana		*	*	*		*	*	*	*	*	*		*	*				*		*	*	*	*		*	*	*	*	*	*	*	*	*		*		*	*
Ammonia tepida	*	*	*	*	*	*	*	*	*			*		*					*		*		*	*	*		*							*				
Challengerella bradyi			*			*	*	*	*			*					*	*		*	*	*	*	*	*					*						*		
Cribroelphidium poeyanum												*	*		*									*			*		*			*		*				
Porosononion subgranosum		*							*		*			*					*								*											
Elphidium aculeatum		*											*		*			*				*	*			*											*	
Elphidium advenum					*																																	
Elphidium complanatum											*																											
Elphidium crispum	*	*			*	*			*	*		*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*			*		*	*		*	*
Elphidium depressulum	*		*						*	*	*	*	*	*	*	*		*																				

ABNORMAL BENTHIC FORAMINIFERAL ASSEMBLAGE

Peneroplis' are dominant in benthic foraminiferal assemblage in the studied samples. Genera and species' belonging to the group showing morphological distortions form the great majority of the assemblage as illustrated on plates in appendix. *Vertebralina striata* d'Orbigny, *Spiroloculina angulosa* Terquem, *Coscinospira acicularis* (Batsch), *C. hemprichii* Ehrenberg, *Laevipeneroplis karreri* (Wiesner), *Peneroplis arietinus* (Batsch), *P. pertusus* (Forskal), *P. planatus* (Fichtel and Moll), *Sorites orbiculus* Ehrenberg, *Lobatula lobatula* (Walker and Jacob), *Cibicidella variabilis* (d'Orbigny) individuals collected from the three transects (A, B and C) in 38 samples around the spring are the examples of these forms. Although, there are 8 genera and 11 species, the dominant genus observed are *Coscinospira* and *Peneroplis,* the dominant species are *Coscinospira acicularis* (Batsch), *C. hemprichii* Ehrenberg and *Peneroplis arietinus* (Batsch), *P. pertusus* (Forskal), *P. planatus* (Fichtel and Moll).

The common morphological defection in these forms is interpreted as change in locular evolution and the irregularity in the sequence, resulting from evolution (Plate 1, figure 3; Plate 2, figures 15, 17-21; Plate 3, figures 9, 11, 12, 14-16 and 19-20; Plate 4, figures 4-5 and 7-8; Plate 5, figures 7-16; Plate 6, figures 1-13; Plate 7, figures 3-5, 8-12 and 15; Plate 8, figures 1, 3-5). Nevertheles, features such as the presence of two mouth (Plate 1, figures 4a, b and c, 14a and b; Plate 5, figure 12), changes in the form of mouth (Plate 7, figures 16, 17), collective species (Plate 6, figures 14a, b, c), abrupt changes around the shells (Plate 3, figures 8, 10, 13; Plate 4, figures 1-3) and the color of shells (Plate 9, figures 1-25; Plate 10, figures 1-28; Plate 11, figures 1-25) are the most remarkable irregularities for the study area as it is at the Alibey and Maden Islands and in Kuşadası Bay (Meriç et al., 2009 *a* and *b*).

OSTRACOD ASSEMBLAGES AND THEIR DISTRIBUTION

Van Morkhoven, 1963; Hartman and Puri, 1974; Breman, 1975; Yassinsi, 1979; Guillaume et al., 1985; Joachim and Langer, 2008 were used to describe 22 genera and 27 species of ostracodes. Defined ostracodes are; *Aurila convexa* (Sars), *Callistocythere intricatoides* (Ruggieri), *Carinocythereis carinata* (Roemer), *Costa batei* (Brady), *Cyprideis torosa* (Jones), *Cytherella alvearium* Bonaduce, Ciampo and Masoli, *Cytherelloidea sordida* (GW Müller), *Cytheretta judea* (Brady), *Hitermannicythere rubra* (Müller), *Hiltermannicythere turbida* (GW Müller), *Leptocythere* sp., *Loxoconcha rhomboidea* (Fischer), *Neocytherideis bradyi* Athersuch, *Neonesidea corpulenta* (Müller), *Neonesidea inflata* (Norman), *Paracytheridea depressa* Müller, *Pontocypris mytiloides* (Norman), *Pontocypris rara* (Müller), *Pontocythere turbida* (GW Müller), *Semicytherura inversa* (Seguenza), *Tenedocythere prava* (Baird), *Tribelina* sp., *Urocythereis crenulosa* (Terquem), *Urocythereis oblonga* (Brady), *Xestoleberis communis* Müller, *Xestoleberis dispar* Müler.

In transect A, a total of 14 genera and 16 species were described in 8 ostracod samples collected at distances varying between 5 to 40 meters (Table 3a). Of these species; *Xestoleberis communis* and *Urocythereis oblonga* were observed at 8 and (widely) 7 stations, respectively, whereas; *Tribelina* sp., *Cyprideis torosa*,

Table 3a- Distribution of the ostracod genus and species from the A transect in Çeşme-Ilıca Bay.

OSTRACOD	TRANSECT-A							
	5	10	15	20	25	30	35	40
Aurila convexa	*		*	*	*			*
Callistocythere intracatoides	*	*	*		*		*	*
Carinocythereis carinata	*		*	*	*		*	*
Cyprideis torosa		*						
Leptocythere sp.		*	*	*	*			
Loxoconcha rhomboidea	*		*			*	*	*
Neonesidea corpulenta				*	*			
Neonesidea inflata	*							
Paracytheridea depressa		*		*			*	
Pontocythere turbida	*							
Semicytherura inversa		*	*					
Tenedocythere prava	*		*		*			
Triebelina sp.		*						
Urocythereis oblonga	*	*	*		*	*	*	*
Xestoleberis communis	*	*	*	*	*	*	*	*
Xestoleberis dispar			*	*	*		*	

Pontocythere turbida and *Neonesidea inflata* were observed only at 1 station.

In transect B, a total of 19 genera and 23 species were identified in 15 ostracod samples collected at distances varying between 5 to 100 meters (Table 3b). In this transect; *Xestoleberis communis*, *Urocythereis oblonga*, *Loxoconcha rhomboidea*, *Callistcoythereis intracatoides*, *Aurila convexa* are abundantly observed species. In the same transect, *Eucytherura mistrettai*, *Pontocypris rara*, *Cytherella alvearium*, *Cyprideis torosa*, *Neocytherideis bradyi* were observed only at one station.

Table 3b- Distribution of the ostracod genus and species from the B transect in Çeşme-Ilıca Bay.

OSTRACOD	TRANSECT-B														
	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100
Aurila convexa	*		*	*	*	*	*	*	*	*		*		*	*
Callistocythere intracatoides	*	*	*		*	*	*	*	*			*		*	*
Carinocythereis carinata		*		*	*	*	*	*	*	*					
Cyprideis torosa		*													
Cytherella alvearium								*							
Cytherelloidea sordida						*									
Cytheretta judea					*					*	*	*			
Eucytherura mistrettai						*									
Hiltermannicythere rubra				*	*	*			*						
Hiltermannicythere turbida							*							*	*
Leptocythere sp.			*				*								
Loxoconcha rhomboidea	*	*		*	*	*	*	*	*	*	*	*	*	*	*
Neocytherideis bradyi							*								
Neonesidea corpulenta				*			*			*					
Paracytheridea depressa						*	*	*	*	*				*	
Pontocypris rara					*										
Pontocythere turbida				*	*				*				*	*	
Semicytherura inversa	*		*			*		*						*	*
Tenedocythere prava	*		*	*	*	*	*	*	*			*			*
Urocythereis crenulosa									*	*					
Urocythereis oblonga	*	*	*	*	*	*	*		*	*	*	*	*	*	*
Xestoleberis communis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Xestoleberis dispar	*	*					*	*	*	*		*	*	*	

In transect C, a total of 19 genera and 22 species were identified at distances varying between 5 to 100 meters (Table 3c). In this transect; *Aurila convexa, Xestoleberis communis*, *Urocythereis oblonga*, *Loxoconcha rhomboidea* are abundant species. *Pontocypris mytiloides*, *Urocythereis crenulosa*, *Hiltermannicythere rubra*, *Cytherella alvearium*, *Cytherelloidea sordida* and *Costa batei* were observed only at one station.

Table 3c- **Distribution of the ostracod genus and species from the C transect in Çeşme-Ilıca Bay.**

OSTRACOD	TRANSECT-C														
	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100
Aurila convexa	*	*		*	*	*	*		*		*	*		*	
Callistocythere intracatoides		*	*	*								*			
Carinocythereis carinata	*										*	*			
Costa batei												*			
Cytherella alvearium					*										
Cytherelloidea sordida			*												
Cytheretta judea	*		*												
Hiltermannicythere rubra			*												
Leptocythere sp.					*										
Loxoconcha rhomboidea		*	*		*	*	*		*		*	*		*	*
Neonesidea corpulenta	*						*				*				
Neonesidea inflata	*		*	*	*						*	*			
Paracytheridea depressa					*						*			*	
Pontocythere turbida									*					*	
Pontocypris mytiloides				*											
Semicytherura inversa	*		*								*				
Tenedocythere prava	*			*							*				
Triebelina sp.					*	*					*				
Urocythereis crenulosa					*										
Urocythereis oblonga	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Xestoleberis communis	*	*	*	*	*	*	*				*	*			*
Xestoleberis dispar		*		*	*	*					*	*		*	

HYDROGEOCHEMICAL AND RADIOACTIVITY CHARACTERISTICS OF ÇEŞME (ILICA) MINERALIZED WATERS

There are several submarine water springs along the southwestern coast of Karaburun, excluding the springs locating on land. Topan and Hamidiye are the most significant springs among them. It was determined that; Topan spring is chemically similar to that of onshore springs nearby. The water samples have thermal sodium chlorure, ranging between 42 - 55°C (Yenal et al., 1975; Barut et al., 2004). These mineralized waters are determined as saline waters since their salinity is close to that of sea water. However, they contain high sulphate and soil alkalinity with 27 gr. salt/lt (Yenal et al., 1975).

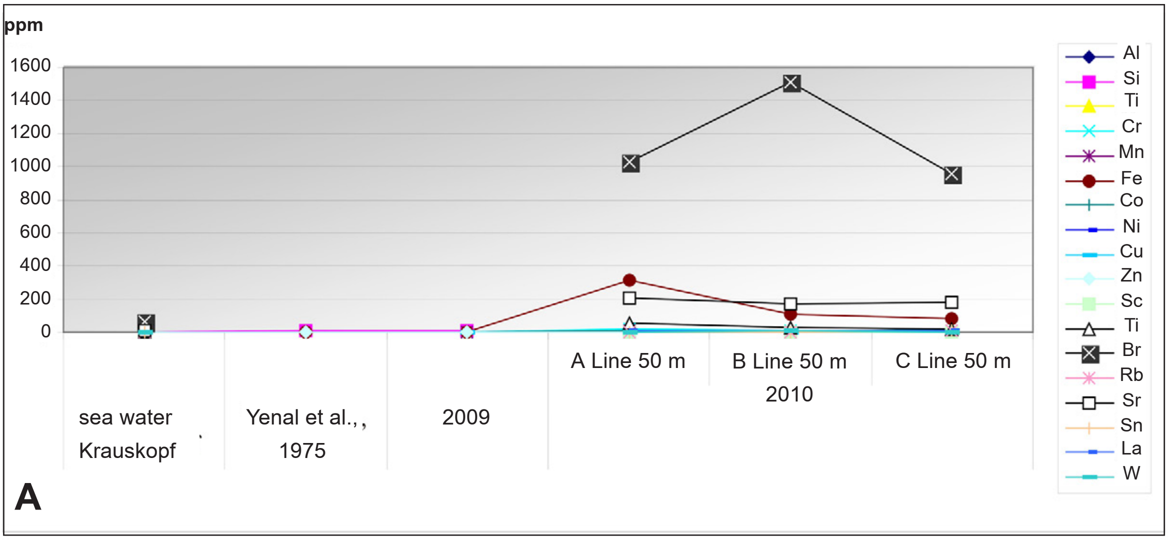
It is remarkable that; Fe, Br and Sr values are high and there is a good linearity between the concentrations of elements of Çeşme (Ilıca) spring (Table 4, figure 2 a and b). The amount of Br is higher than sea water (Krauskopf, 1979) and has the highest concentration in transect B.

In contrast, the concentration of Fe and Sr are highest in transect A. There was an increase in Si and Fe concentrations relative to the analyses carried out in 2009 in Ilıca spring. There are also differences in the compositions of water samples from transects A, B and C.

In our study, radioactive alpha and beta readings were recorded for the mineralized waters from Çeşme-Ilıca spring. According to these results, the distribution in transects A, B and C are close to each other. From radioactive determinations made in Çeşme Ilıca spring, which belongs to hyperthermal and hypertonic class, total alpha: 4.41188±19.6 Bq; total beta: 4.37081±9.21 Bq; Rn^{222} : 25.9 Bq; Ra ^{226}: 1.64428 Bq values were found based on the study of Yenal et al., (1975). When results of the study carried out in 1975 were compared with today's results, it has been seen that total alpha values had decreased a lot, while total beta values had increased as inversely proportional showing that characteristics of radioactivity had roughly changed (Table 4).

Table 4- Repeated chemical analyses of samples from the Çeşme-Ilıca Bay in 1975, 2009 and 2010, and total alpha and beta radioactive values of the sea water in A, B and C transects measured during 2010.

ÇEŞME-ILICA BAY						
	Submarine Spring			A (50 m)	B (50 m)	C (50m)
	Krauskopf (1979) Seawater	Yenal et al., 1975	2009	2010		
Al ppm	0.002	0.14	0.625			
Si ppm	2	5.41	6.25			
Ti ppm	0.001			31.5	17.9	10.5
Cr ppm	0.0003		0.1	19.3	11.1	7.8
Mn ppm	0.0002		0.067	4.8	3.4	1.3
Fe ppm	0.002	0.22	1	308.8	107.7	76.5
Co ppm	0.00005		0.364	7.8	1.9	15
Ni ppm	0.0017		0.75	1.3	0.8	2.9
Cu ppm	0.0005		0.075	3.8	1.3	2.6
Zn ppm	0.0049	0.83	0.047	1.5	0.4	0.5
As ppb	0.0000037		16.45			
Hg ppb	1x10-6		yok			
Pb ppm	3x10-5		eser			
CaO ppm				16400	7378.5	15289.2
Sc ppm	0.0000006			1.7	1.2	2.2
Br ppm	67	0.12		1026.5	1506.8	958.2
Rb ppm	0.12			3.3	2.8	5.3
Sr ppm	8			206.4	169.7	180
Sn ppm	0.00001			4.4	2.8	6.7
La ppm	0.000003			4.9	5.6	5.8
W ppm	0.0001			4.2	5.2	1
Total Alpha (Bq)		4.41188±19.6		0.207±0.013	0.227±0.013	0.225±0.013
Total Beta (Bq)		4.37081±9.21		19.589±1.047	18.727±1.03	18.782±1.03



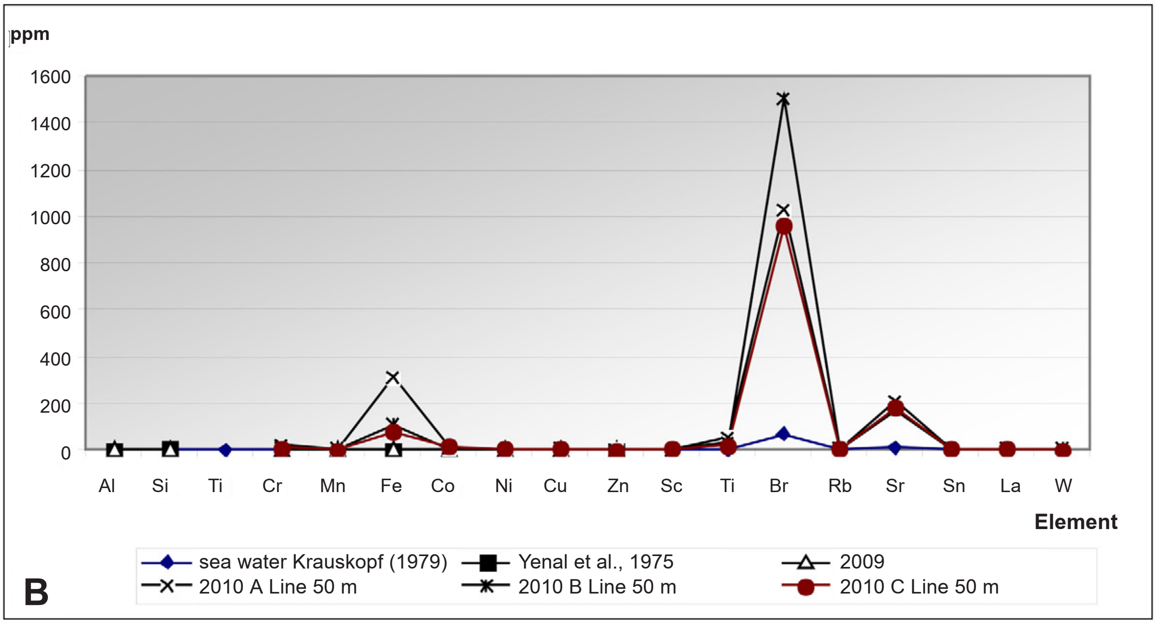


Figure 2- Geochemical samples from the Çeşme-Ilıca submarine spring.

GEOCHEMICAL CHARACTERISTICS of *Peneroplis Planatus* (FICHTEL AND MOLL) SHELLS

The microprobe analysis of *Peneroplis planatus* (Fichtel and Moll) shells in samples A5, A10, A15, A30, A40, B5, B20, B30 and C10 in Çeşme Ilıca (Table 5) indicate elevated Mg, Si, Fe, Zn, Rb, Y, Tc and Mo contents (Figure 3a). The concentration of Mg and Tc in A5 and B20; Si, Fe and Rb in A30, and Mo in A40 were found to be the highest values. Lowest elements, however; were detected in all shells except A30 (Al and Si) and B30 (K).

The distribution of heavy metal and trace elements of colored *Peneroplis planatus* (Fichtel and Moll) shells it was measured that the concentration of Ti, Cr, Te and Y in A10; Na, Al, Si, Fe, Fe, Rb and Pa in A30; Mo in A40; Ni and Y in B5; Mg and Tc in B20; K in B30, and Zn and Ru in C10 have highest values (Figure 3b). Ti, Cr and Fe concentrations are higher in the shells in comparison to those of water samples from Çeşme Ilıca. When these were compared with Krauskopf (1979) seawater reference values; Mg, Al, Si, (in A30), Ti, Cr, Fe, Ni, Zn, Rb and Y were remarkably found to be the high in concentration. When geochemical results of these shells were compared with shale reference values of Krauskopf (1979), Al, Si, Fe and Mo (A40) were found to be high i concentration (Table 5). Another important thing in shell analyses, the rare earth elements such as; Pa (A30), Mo (A40) and Ru (C10) were encountered only on shells in single sampling points.

Table 5- Results of geochemical analysis of purple shells of Peneroplis planatus (Fichtel ve Moll) in the Çeşme-Ilıca Bay samples.

ppm	*Peneroplis planatus* (Fichtel ve Moll) coloured shells										Shale Krauskopf (1979)	Sea water Krauskopf (1979)
	A5	A5	A10	A15	A30	A40	B5	B20	B30	C10		
Na	0.15	0.04	0.26	0.27	**0.76**	0.03	0.33	0.47	0.25	0.37	9000	10770
Mg	2.36	4.41	1.21	4.99	3.98	2.81	2.78	**5.09**	2.86	3.96	14000	1.29
Al	0.01	0.27	0.09	0.07	**3.05**	0	0	0	0.09	0.2	0.00092	0.002
Si	0	0	0	0	**5.83**	0	0	0	0	0	0.00238	2
K	0.15	0.04	0	0	0	0	0	0	**0.33**	0.1	25000	380
Ti	0.39	0.37	**0.49**	0.32	0.23	0.28	0.3	0.37	0.34	0.68	4500	0.001
Cr	0.53	0.5	**0.75**	0.44	0.54	0.39	0.57		0.41	0.29	100	0.0003
Fe	1.63	1.2	1.18	0.52	**3.1**	0.63	1.32	0.52	1.17	1.65	0.00047	0.002
Ni	0.94	0.88	1.39	0.51	0.9	0.94	**1.82**	0.86	1.3	0.54	80	0.0017
Zn	3.48	3.7	3.9	2.85	2.85	3.38	2.7	3.02	3.6	**3.95**	90	0.0049
Rb	3.52	2.85	3.49	1.91	**4.15**	2.8	3.07	2.13	2.99	3.27	140	0.12
Te	1.78	0.7	**3.25**	1.35	0.21	0	0	0	0	0		
Y	0	0	**1.99**	1.53	1.1	1.61	**1.99**	1.27	1.39	1.07	35	0.000001
Tc	0	0	0	2.15	0	0	0	**2.28**	1.69	0		
Pa	0	0	0	0	**0.37**	0	0	0	0	0		
Mo	0	0	0	0	0	**5.08**	0	0	0	0	2	0.01
Ru	0	0	0	0	0	0	0	0	0	**0.28**		

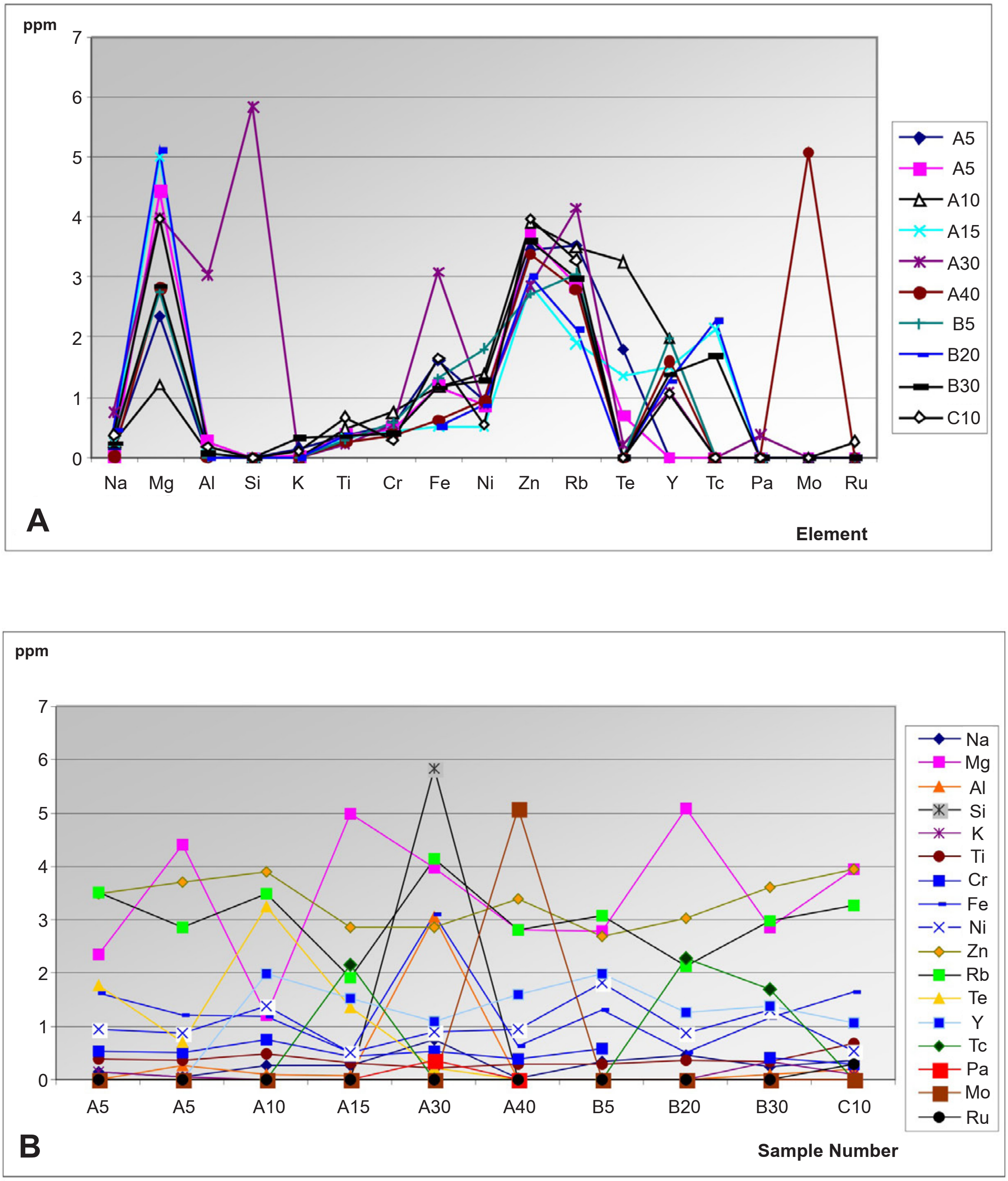


Figure 3- Geochemical analyses of coloured Peneroplis planatus (Fichtel ve Moll) shells.

DISCUSSIONS AND RESULTS

Apart from the İskenderun and Kuşadası Bays, a large number of *Nodopthalmidium antillarum* (Cushman) which is Pacific Ocean in origin have been found in the study area. However; *Spiroloculina antillarum* d'Orbigny and *Triloculina fichteliana* d'Orbigny have been identified in the Kuşadası and Çeşme Ilıca Bays. *Euthymonacha polita* (Chapman) was first observed around the springs in Kuşadasi Bay and Ilıca Bay along the Turkey coast. This species has also been found along the northwestern coasts of the Karaburun Peninsula. There is not any record whether this genus or species was present in the Red Sea. Despite that; *Coscinospira acicularis* (Batsch) was first observed along the Mediterranean and Aegean coasts. The number of individuals which were 9 in three samples around spring (A, B and C transects) exceeds 30 in total. This was defined as *Monalysium acicularis* (Batsch) in Gulf of Aqaba, north of the Red Sea (Hottinger et al., 1993). However; *Peneroplis arietinus* (Batsch) was largely observed around Kekova, on the coast of southwestern Antalya. However, although there had been no evidence for the presence of any genus or species along the coastline between Kalkan and Çeşme, these species were observed there in remarkable amounts. Ilıca Bay, though seldom, is the northernmost point where *Amphisorus hemprichii* Ehrenberg was encountered. *Cymbaloporetta plana* (Cushman) extends from the southwestern Antalya to the Kuşadası Bay and the northwestern coastal area of the Karaburun Peninsula. In addition to these characteristics, *Amphistegina lobifera* Larsen, which had been observed in minor amounts in Marmaris, Datça, Gökova Bays and southeast of Gökçeada is commonly present around the spring in Kuşadası Bay and on the northwestern coast of the Karaburun Peninsula. However; there is no evidence for the presence of this genus and species on the northern part of the Kuşadası Bay (Sözeri, 1966; Sellier de Civrieux, 1970; Meriç, 1986; Avşar and Meriç, 2001). It was also observed in only 1 of 16 samples studied in another investigation carried out at the southwestern part of the Dilek Peninsula located on the northern side of Kuşadası Bay (Avşar et al., 2009).

Koukousiora et al. (2010) have mentioned about the presence of alien foraminifera such as; *Triloculina fichteliana* d'Orbigny, *Coscinospira hemprichii* Ehrenberg, *Sorites orbiculus* Ehrenberg, *Planogypsina acervalis* Brady, *Cymbaloporetta plana* (Cushman) and *Amphistegina lobifera* Larsen in their study at the western coasts of the Aegean Sea and at different locations but, they do not mention the presence of submarine thermal springs in investigated areas.

In 28 of 38 studied samples, the abundance of *Peneroplis pertusus* (Forskal*), P. planatus* (Fichtel and Moll), *Coscinospira hemprichii* Ehrenberg and *Sorites orbiculus* Ehrenberg individuals having yellow, orange, bluish green and black colored shells reveals the effect of various heavy metal and trace elements in the composition of thermal water on the foraminiferal living around spring. Besides, the presence of shells having morphological defections in almost all samples indicates that various heavy metal, trace and radioactive elements were effective on the life around the spring. In a study carried out along the coast of Andros Island in western Aegean Sea (Triantaphyllou et al., 2005), some benthic foraminiferal shells have been observed that also have morphological defects. Besides; in some studies that was made on coasts of the western Aegean Sea, the presence of submarine thermal springs were also dealt with (Thierman et al., 1997; Varnavas et al., 1999).

Additionally, the observation of *Peneroplis planatus* (Fichtel and Moll), *Sorites orbiculus* Ehrenberg and *Ammonia compacta* Hofker individuals that are larger than 1 mm in 10 of the samples indicate the presence of $CaCO_3$ in this region. Moreover, the presence of *Euthymonacha polita* (Chapman) and *Coscinospira acicularis* (Batsch) in 18 of all samples are indicative for the diversity of the ecological conditions of the study area with compared to other locations of the Aegean Sea.

It was seen that ostracodes in the study area show similarity to those observed by other investigations carried out in Mediterranean and

Aegean Sea and there is no difference in communities belonging to 3 transects. The other important thing observed is that there was no coloring on the ostracod shells.

Consequently, due to diverse ecological features especially around submarine springs at some locations of the Aegean Sea, certain foraminiferal genera and species got the chance to survive. But, some foraminiferal species such as *Amphistegina lobifera* Larsen could not survive in these areas due to excess amount of radioactivity around high temperature thermal waters.

In our investigation, high values of Ca, Fe, Br and Sr in the Çeşme-Ilıca spring were detected and in geochemical assessment of colored *Peneroplis planatus* (Fichtel and Moll) shells encountered at some sampling points, shells at single sampling points like; Pa (A30), Mo (A40) and Ru (C10) among rare earth elements make us think that the source of these elements are orogenic and volcanic origin. Approximately 160000 years ago, volcanic materials such as ash, tuff and pumice spreaded to coastal areas of Turkey following the eruption of santorini Volcano on Thera Island. This was accompanied by changes in sea currents resulting in the formation of young surface terrains. Over 20 islands/islets were formed as called the “12 Islands”. The resultant permanent traces on peninsulas and bays along the coast also affect the human settlement of southwestern Anatolia (Aitken et al., 1988; Greaves, 2003; Piper et al., 2005).

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PLATES

PLATE - I

Ilıca Bay, Çeşme, İzmir.

1. *Vertebralina striata* d'Orbigny. Normal Individual, external view, B-10.00 m.
2. *Vertebralina striata* d'Orbigny. Abnormal Individual, external view, A-25.00 m.
3. *Vertebralina striata* d'Orbigny. Double mouth Individual, external view, B-35.00 m.
4. *Vertebralina striata* d'Orbigny. a. abnormally developed double mouth individual; b, detailed view of mouths and c, detailed view of second mouth, C-15.00 m.
5. *Vertebralina striata* d'Orbigny. a, external view of three mouth individual and b, detailed views of mouths, C-60.00 m.
6. *Nodopthalmidium antillarum* (Cushman). External view, A-5.00 m.
7. *Nodopthalmidium antillarum* (Cushman). External view, A-10.00 m.
8. *Nodopthalmidium antillarum* (Cushman). External view, B-35.00 m.
9. *Nodopthalmidium antillarum* (Cushman). External view, B-80.00 m.
10. *Nodopthalmidium antillarum* (Cushman). External view, C-20.00 m.
11. *Adelosina cliarensis* (Heron-Allen ve Earland). a and b, external views, A-5.00 m.
12. *Spiroloculina angulosa* Terquem. External view, A-15.00 m.
13. *Spiroloculina antillarum* d'Orbigny. a and b, External views, A-5.00 m.
14. *Spiroloculina ornata* d'Orbigny. a and b, abnormally developed double mouth individuals. a, B-40.00 m and b, C-60.00 m.
15. *Siphonaperta aspera* (d'Orbigny). a and b, external views, A-25.00 m.

Engir MERİÇ, Niyazi AVŞAR, Atike NAZİK, Baki YOKEŞ, İpek F. BARUT,
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Cüneyt BİRCAN and Aysun KAYGUN

PLATE - I

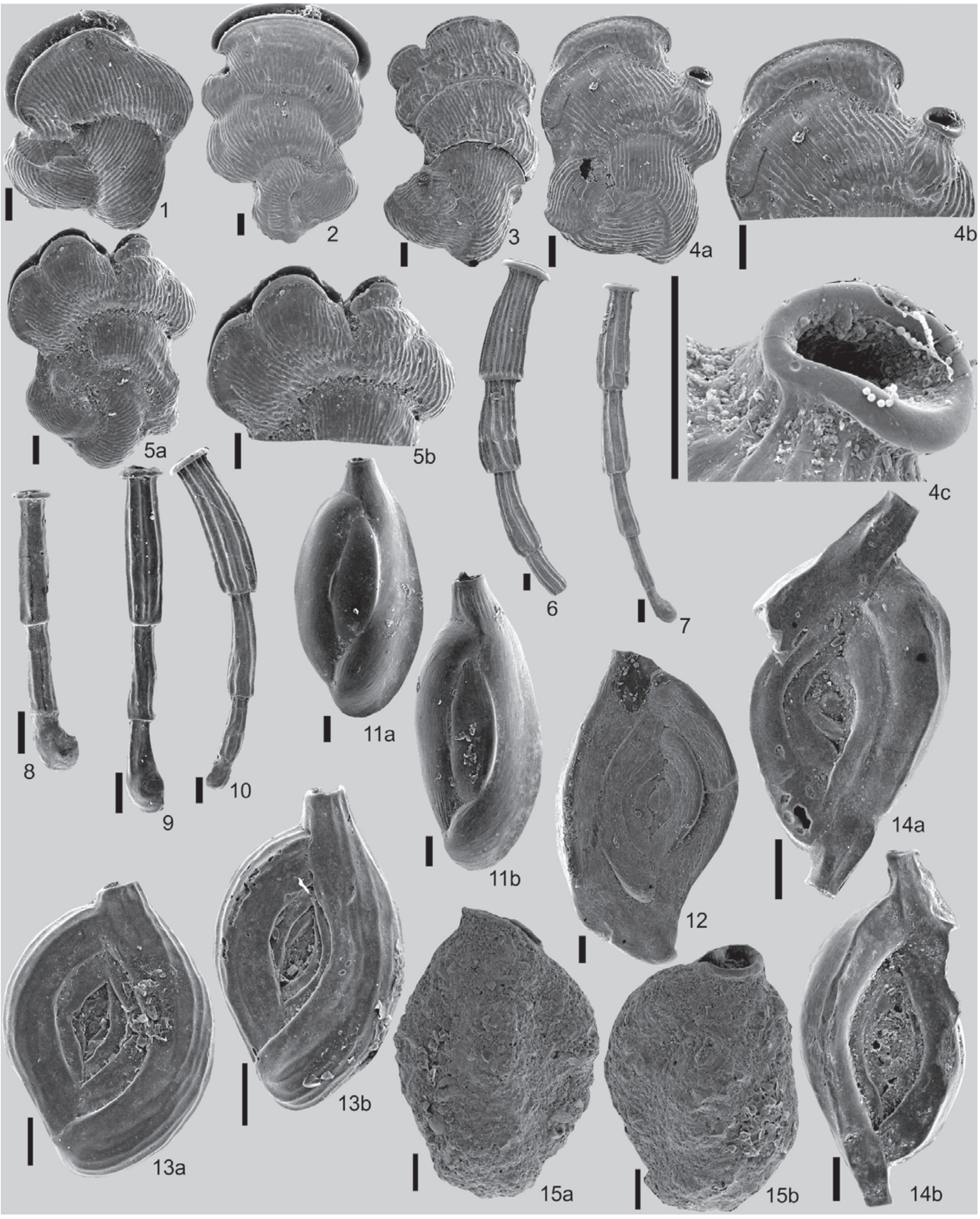

PLATE - II

Ilıca Bay, Çeşme, İzmir.

1. *Siphonaperta* cf. *aspera* (d'Orbigny). Abnormally developed twin individuals. B-80.00 m.
2. *Lachlanella variolata* (d'Orbigny). External view, A-35.00 m.
3. *Pseudotriloculina laevigata* (d'Orbigny). External view, A-5.00 m.
4. *Pseudotriloculina oblonga* (Montagu). a and b, External views, A-5.00 m.
1. *Articulina carinata* Wiesner. External view, A-10.00 m.
6. *Articulina carinata* Wiesner. External view, B-35.00 m.
7. *Articulina carinata* Wiesner. External view, B-35.00 m.
8. *Articulina carinata* Wiesner. External view, B-35.00 m.
9. *Articulina carinata* Wiesner. External view, B-40.00 m.
10. *Articulina carinata* Wiesner. External view, C-15.00 m.
11. *Parrina bradyi* (Millet). External view, A-5.00 m.
12. *Euthymonacha polita* (Chapman). a, detailed view of the mouth and b, External view, B-10.00 m.
13. *Euthymonacha polita* (Chapman). External view, B-10.00 m.
14. *Coscinospira acicularis* (Batsch). External view, C-15.00 m.
15. *Coscinospira acicularis* (Batsch). Abnormally developed individual, External view, A-35.00 m.
16. *Coscinospira acicularis* (Batsch). External view, B-30.00 m.
17. *Coscinospira acicularis* (Batsch). Abnormally developed individual, External view, B-90.00 m.
18. *Coscinospira acicularis* (Batsch). Abnormally developed individual, External view, B-10.00 m.
19. *Coscinospira acicularis* (Batsch). Abnormally developed individual, External view, C-20.00 m.
20. *Coscinospira acicularis* (Batsch). Abnormally developed individual, External view, C-60.00 m.
21. *Coscinospira acicularis* (Batsch). Abnormally developed individual, External view, C-90.00 m.
22. *Coscinospira hemprichii* Ehrenberg. External view, A-35.00 m.
23. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, External view, A-35.00 m.

Engir MERİÇ, Niyazi AVŞAR, Atike NAZİK, Baki YOKEŞ, İpek F. BARUT,
Mustafa ERYILMAZ, Erol KAM, Halim TAŞKIN, Asiye BAŞSARI, Feyza DİNÇER,
Cüneyt BİRCAN and Aysun KAYGUN

PLATE - II

PLATE - III

Ilıca Bay, Çeşme, İzmir.

1. *Coscinospira hemprichii* Ehrenberg. Young individual, external view, A-35.00 m.
2. *Coscinospira hemprichii* Ehrenberg. Mature individual, external view, A-5.00 m.
3. *Coscinospira hemprichii* Ehrenberg. Young individual, external view, A-10.00 m.
4. *Coscinospira hemprichii* Ehrenberg. Detailed view of the mouth, A-30.00 m.
5. *Coscinospira hemprichii* Ehrenberg. Young individual, external view, A-35.00 m.
6. *Coscinospira hemprichii* Ehrenberg. Young individual, external view, A-35.00 m.
7. *Coscinospira hemprichii* Ehrenberg. Young individual, external view, A-35.00 m.
8. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, external view, A-40.00.
9. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, external view, B-80.00 m.
10. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, external view, B-90.00 m.
11. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, external view, B-90.00 m.
12. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, external view, B-90.00 m.
13. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, External view, B-90.00 m.
14. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, External view, B-100.00 m.
15. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, External view, C-15.00 m.
16. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, External view, C-15.00 m.
17. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, External view, C-50.00 m.
18. *Coscinospira hemprichii* Ehrenberg. Detailed view of the mouth, C-25.00 m.
19. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, External view, C-30.00 m.
20. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, External view, C-35.00 m.

PLATE - III

PLATE - IV

Ilıca Bay, Çeşme, İzmir.

1. *Coscinospira hemprichii* Ehrenberg. Abnormal individual, external view, C-50.00 m.
2. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individual, external view, C-70.00 m.
3. *Coscinospira hemprichii* Ehrenberg. Abnormally developed individuals, external view, C-90.00 m.
4. *Laevipeneroplis karreri* (Wiesner). External view, A-25.00 m.
5. *Laevipeneroplis karreri* (Wiesner). Abnormal individual, external view, A-40.00 m.
6. *Laevipeneroplis karreri* (Wiesner). External view, B-10.00 m.
7. *Laevipeneroplis karreri* (Wiesner). Abnormal individual, external view, C-25.00 m.
8. *Laevipeneroplis karreri* (Wiesner). Abnormal individual, external view, C-80.00 m.
9. *Peneroplis arietinus* (Batsch). External view, C-30.00 m.
10. *Peneroplis arietinus* (Batsch). a, External view and b, detailed view of the mouth,C-30.00 m.
11. *Peneroplis arietinus* (Batsch). Abnormal individual, external view, C-60.00 m.
12. *Peneroplis arietinus* (Batsch). External view, A-20.00 m.
13. *Peneroplis arietinus* (Batsch). External view, C-35.00 m.
14. *Peneroplis arietinus* (Batsch). External view, A-40.00 m.
15. *Peneroplis arietinus* (Batsch). Young individual, external view, A-25.00 m.
16. *Peneroplis arietinus* (Batsch). Young individual, external view, A-25.00 m.
17. *Peneroplis arietinus* (Batsch). Young individual, external view, A-40.00 m.

PLATE - IV

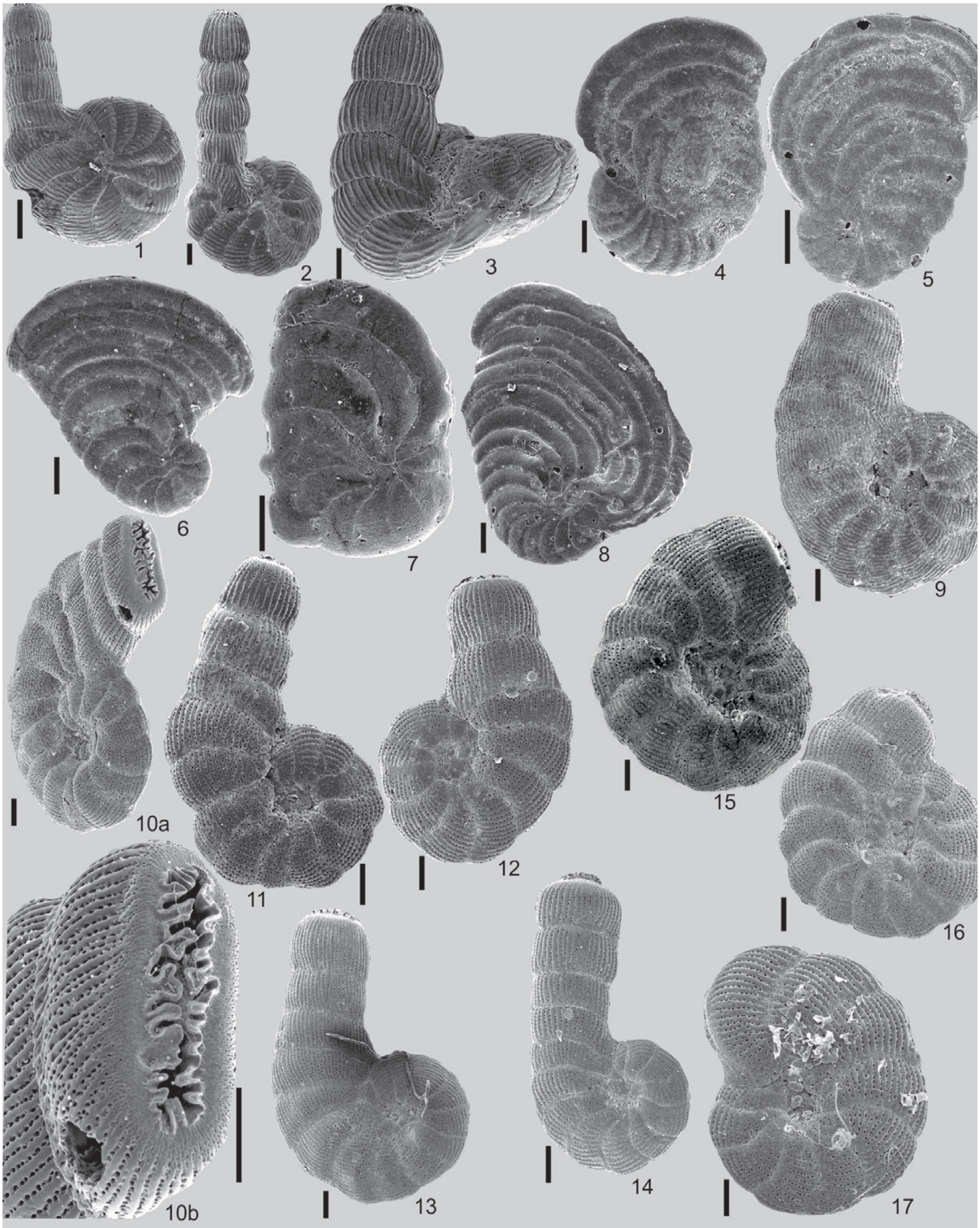

PLATE - V

Ilıca Bay, Çeşme, İzmir.

1. *Peneroplis arietinus* (Batsch). External view, B-35.00 m.
   Peneroplis arietinus (Batsch). Young individual, external view, B-50.00 m.
2. *Peneroplis arietinus* (Batsch). External view, B-50.00 m.
2. *Peneroplis arietinus* (Batsch). External view, C-30.00 m.
4. *Peneroplis pertusus* (Forskal). External view, A-5.00 m.
5. *Peneroplis pertusus* (Forskal). External view, A-5.00 m.
6. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, A-20.00 m.
7. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, A-30.00 m.
8. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, A-40.00 m.
9. *Peneroplis pertusus* (Forskal). Stuck twin, external view, B-35.00 m.
10. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, B-45.00 m.
11. *Peneroplis pertusus* (Forskal). Double mouth abnormal individual, external view, B-20.00 m.
12. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, B-50.00 m.
13. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, A-50.00 m.
14. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-15.00 m.
15. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-15.00 m.
16. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-15.00 m.

PLATE - V

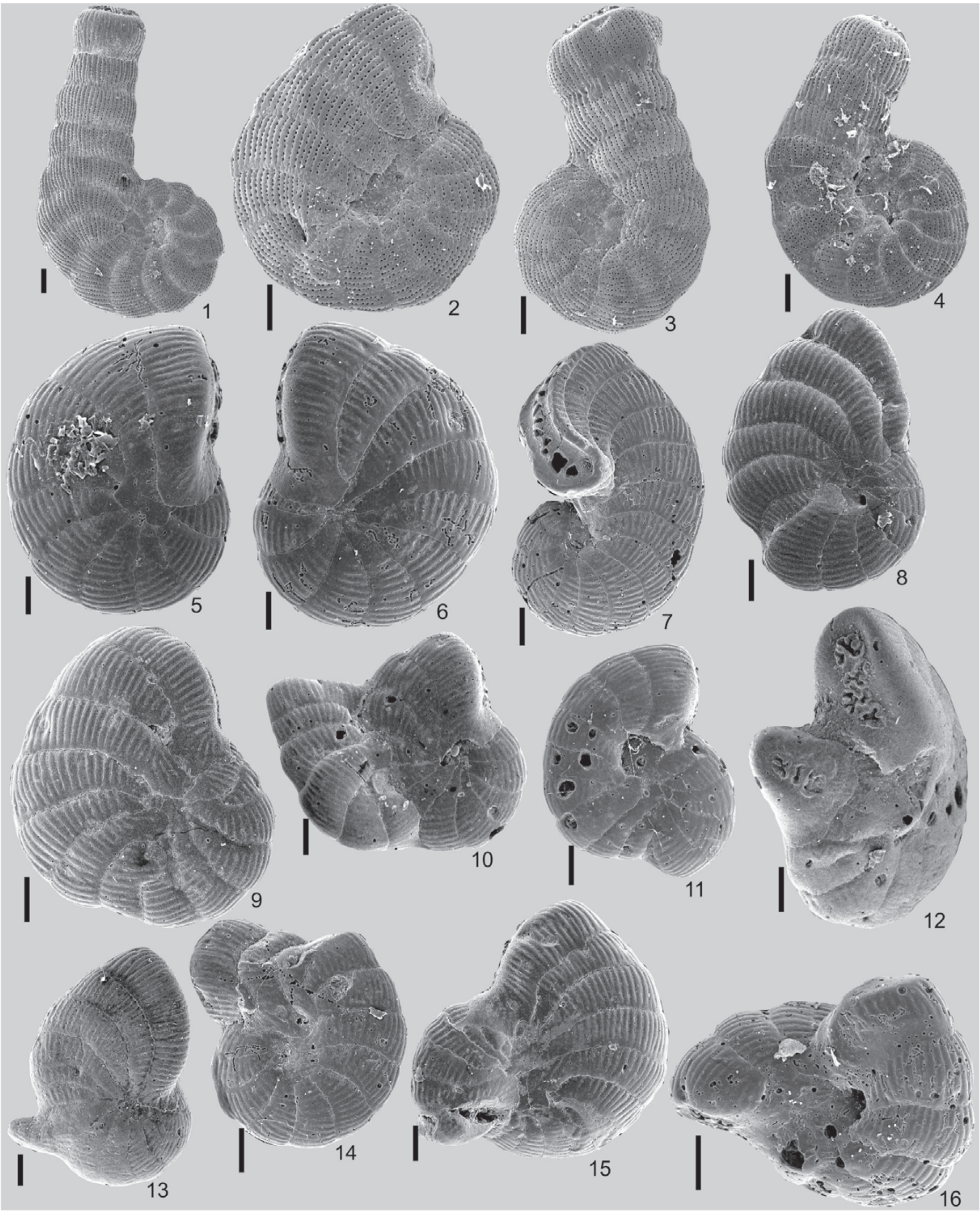

PLATE - VI

Ilıca Bay, Çeşme, İzmir.

1. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-15.00 m.
2. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-15.00 m.
3. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-25.00 m.
4. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-25.00 m.
5. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-25.00 m.
6. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-30.00 m.
7. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-30.00 m.
8. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-30.00 m.
9. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-50.00 m.
10. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-50.00 m.
11. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-60.00 m.
12. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-60.00 m.
13. *Peneroplis pertusus* (Forskal). Abnormal individual, external view, C-60.00 m.
14. Community of abnormal individuals, and the association of *Peneroplis pertusus* (Forskal) and *Peneroplis planatus* (Fichtel ve Moll). a, external view; b, *Peneroplis planatus* (Fichtel and Moll); c. *Peneroplis pertusus* (Forskal), C-90.00 m.

PLATE - VI

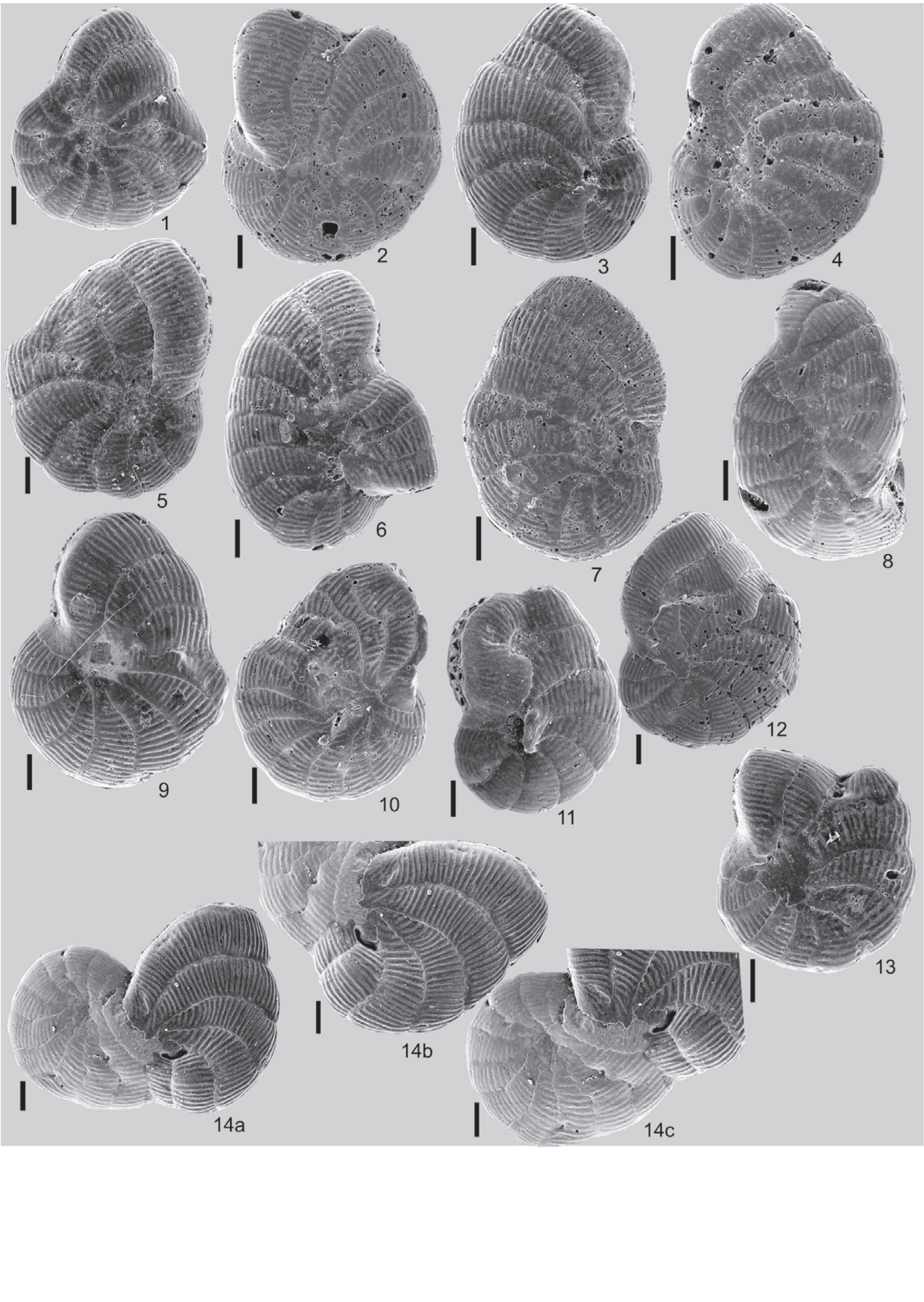

PLATE - VII

Ilıca Bay, Çeşme, İzmir.

1. *Peneroplis planatus* (Fichtel ve Moll). External view, C-80.00 m.
2. *Peneroplis planatus* (Fichtel ve Moll). External view, A-5.00 m.
3. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, B-10.00 m.
4. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, B-20.00 m.
5. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, B-90.00 m.
6. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, B-100.00 m.
7. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-25.00 m.
8. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, B-35.00 m.
9. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-25.00 m.
10. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-25.00 m.
11. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-25.00 m.
12. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-25.00 m.
13. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-35.00 m.
14. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-35.00 m.
15. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-35.00 m.
16. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, B-25.00 m.
17. *Peneroplis planatus* (Fichtel ve Moll). Abnormally developed mouth, C-35.00 m.

PLATE - VII

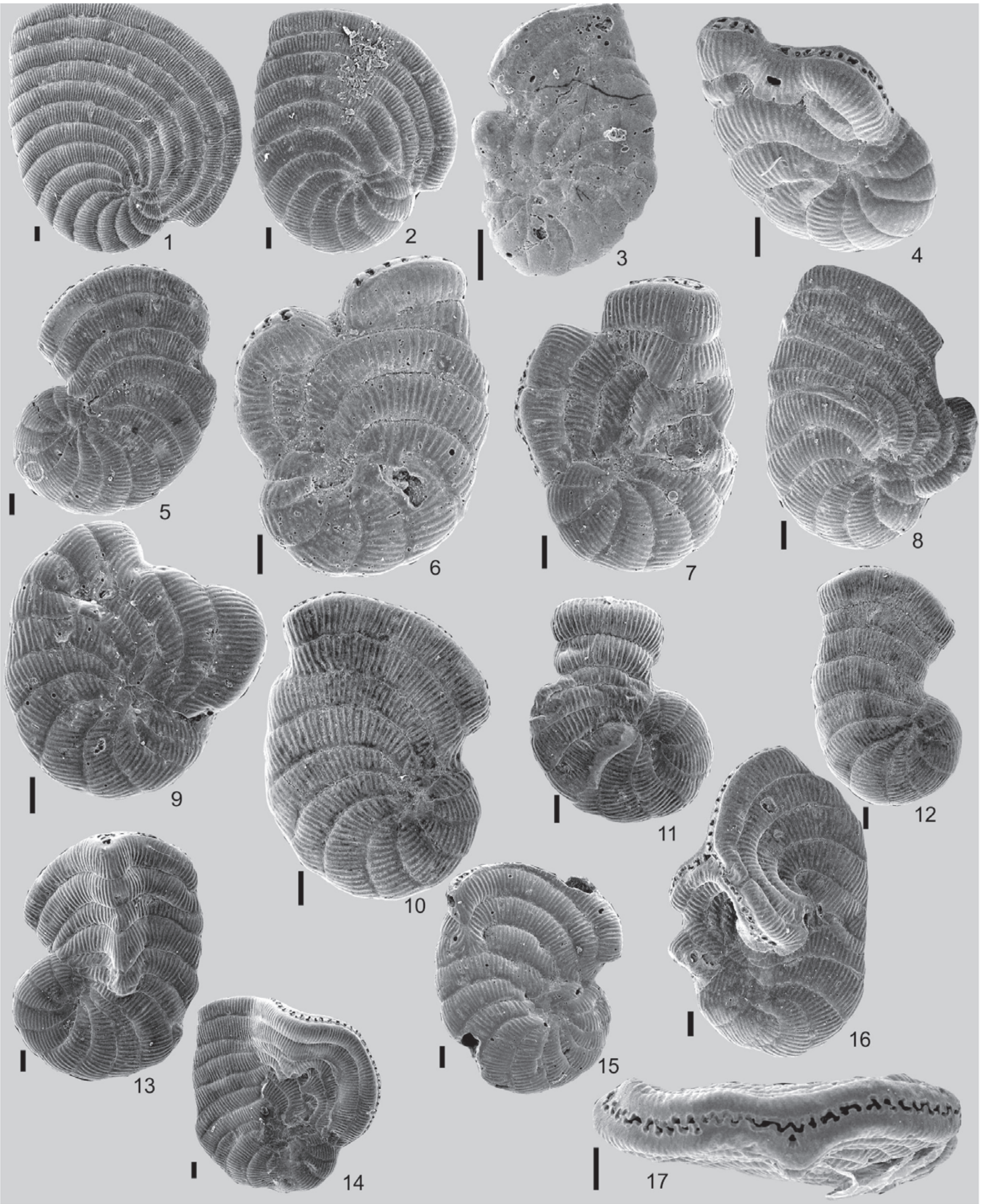

PLATE - VIII

Ilıca Bay, Çeşme, İzmir.

1. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-35.00 m.
2. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-35.00 m.
3. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-35.00 m.
4. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-35.00 m.
5. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-90.00 m.
6. *Peneroplis planatus* (Fichtel ve Moll). Abnormal individual, external view, C-70.00 m.
7. *Sorites orbiculus* Ehrenberg. External view, A-15.00 m.
8. *Sorites orbiculus* Ehrenberg. Abnormal individual, external view, B-10.00 m.
9. *Sorites orbiculus* Ehrenberg. Abnormal individual, external view, C-90.00 m.
10. *Planorbulina mediterranensis* d'Orbigny. External view, free surface, A-15.00 m,
11. *Cibicidella variabilis* (d'Orbigny). External view, spiral side, B-40.00 m.
12. *Cibicidella variabilis* (d'Orbigny). External view, spiral side, A-10.00 m.
13. *Cibicidella variabilis* (d'Orbigny). External view, spiral side, B-25.00 m.
14. *Cibicidella variabilis* (d'Orbigny). External view, umbilical side, B-35.00 m.
15. *Cymbaloporetta plana* (Cushman). External view, umbilical side, C-15.00 m.
16. *Cymbaloporetta plana* (Cushman). Side view with capsule, C-20.00 m.
17. *Cymbaloporetta plana* (Cushman). External view, spiral side, C-20.00 m.
18. *Cymbaloporetta plana* (Cushman). Side view with capsule, C-20.00 m.
19. *Cymbaloporetta plana* (Cushman). Side view, C-20.00 m.
20. *Ammonia parkinsoniana* (d'Orbigny). External view, umbilical side, A-30.00 m.
21. *Elphidium crispum* (Linne). External view, A-5.00 m.
22. *Elphidium* sp. External view, A-10.00 m.

PLATE - VIII

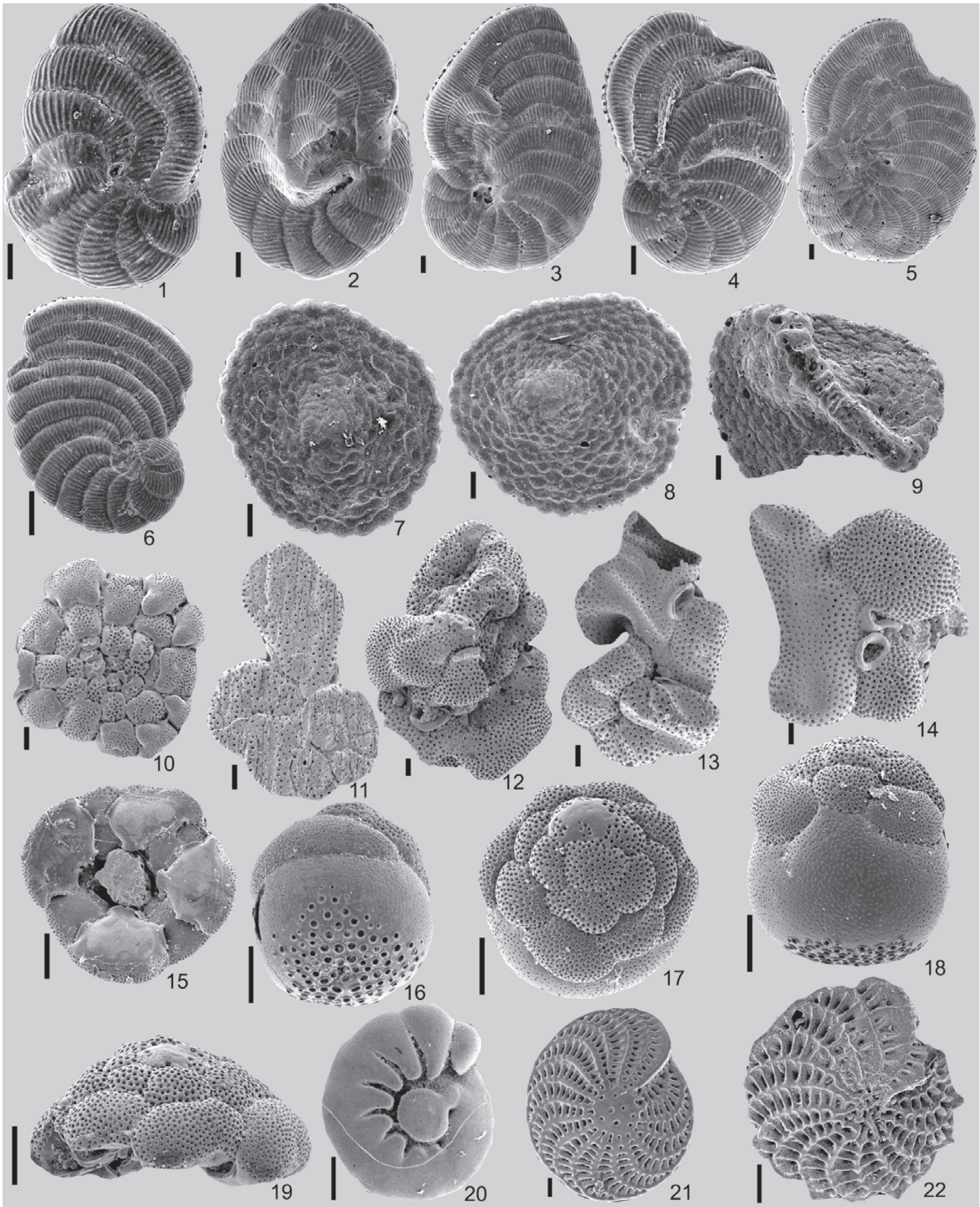

PLATE - IX

Ilıca Bay, Çeşme, İzmir.

1. *Textularia bocki* Höglund. External view, C-25.00 m.
2. *Vertebralina striata* d'Orbigny. External view, abnormally developed individual, C-20.00 m.
3. *Vertebralina striata* d'Orbigny. External view, abnormally developed individual, C-30.00 m.
4. *Adelosina cliarensis* (Heron-Allen ve Earland**).** External view, B-80.00 m.
5. *Adelosina mediterranensis* (Le Calvez J. ve Y.) External view, B-80.00 m.
6. *Spiroloculina angulosa* Terquem. External view, A-5.00 m.
7. *Spiroloculina angulosa* Terquem**.** External view, C-5.00 m.
8. *Spiroloculina angulosa* Terquem**.** External view, C-5.00 m.
9. *Spiroloculina angulosa* Terquem. External view, C-20.00 m.
10. *Spiroloculina antillarum* (d'Orbigny). External view, A-20.00 m.
11. *Spiroloculina antillarum* (d'Orbigny). External view, A-40.00 m.
12. *Siphonaperta aspera* (d'Orbigny). External view, C-80.00 m.
13. *Cycloforina rugosa* (d'Orbigny). External view, A-35.00 m.
14. *Cycloforina rugosa* (d'Orbigny). External view, C-20.00 m.
15. *Massilina secans* (d'Orbigny). External view, C-25.00 m.
16. *Quinqueloculina bidentata* d'Orbigny**.** External view, C-90.00 m.
17. *Triloculina marioni* Schlumberger. External view, A-15.00 m.
18. *Coscinospira acicularis* (Batsch). External view, C-15.00 m.
19. *Coscinospira acicularis* (Batsch). External view, C-25.00 m.
20. *Coscinospira hemprichii* Ehrenberg. External view, A-5.00 m.
21. *Coscinospira hemprichii* Ehrenberg. External view, young individual, A-15.00 m.
22. *Coscinospira hemprichii* Ehrenberg. External view, young individual, A-20.00 m.
23. *Coscinospira hemprichii* Ehrenberg. External view, A-35.00 m.
24. *Coscinospira hemprichii* Ehrenberg. External view, young individual, A-40.00 m.
25. *Coscinospira hemprichii* Ehrenberg. External view, B-10.00 m.

PLATE - IX

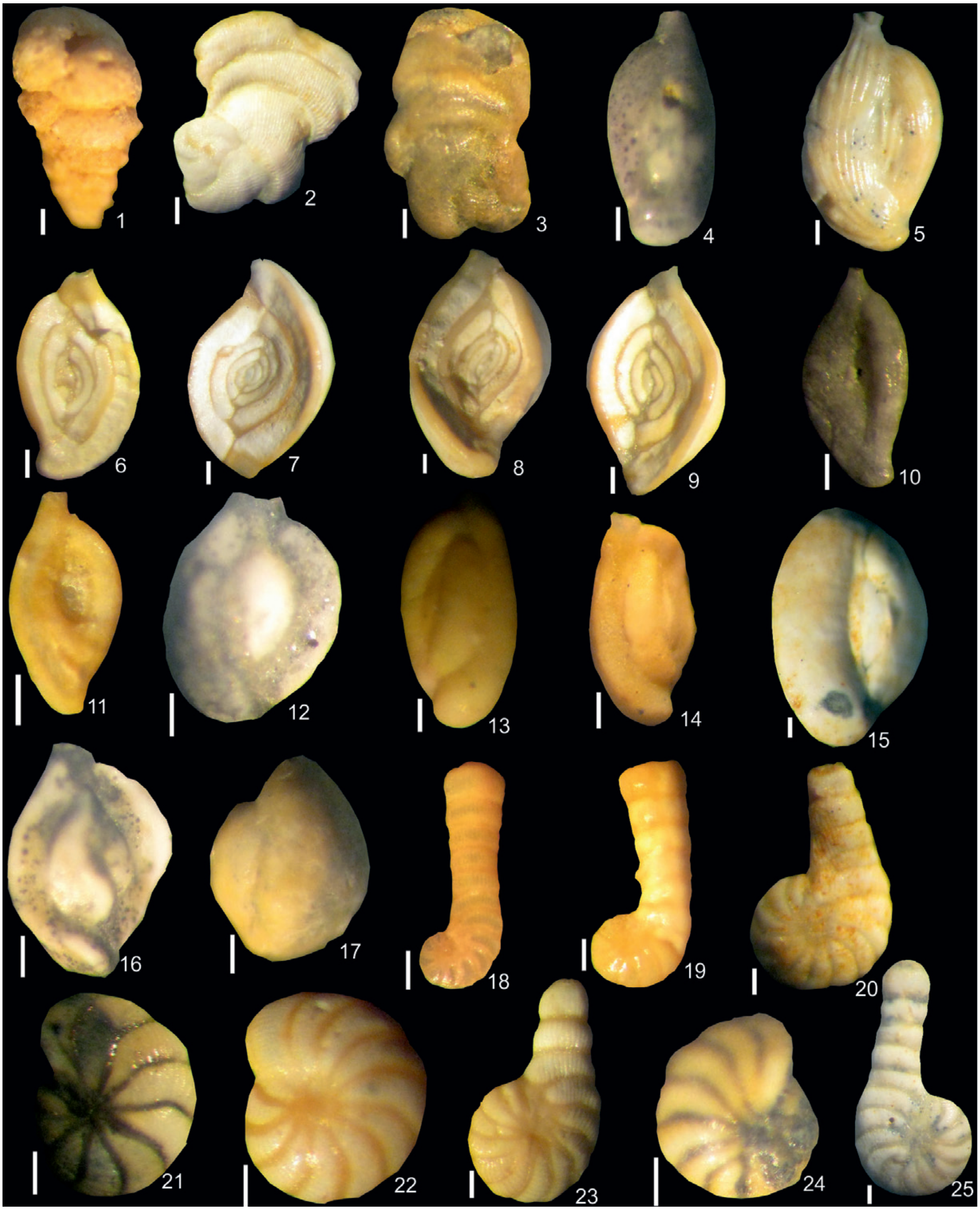

PLATE - X

Ilıca Bay, Çeşme, İzmir.

1. *Coscinospira hemprichii* Ehrenberg. External view, young individual, B-90.00 m.
2. *Coscinospira hemprichii* Ehrenberg. External view, C-25.00 m.
3. *Coscinospira hemprichii* Ehrenberg. External view, C-35.00 m.
4. *Coscinospira hemprichii* Ehrenberg. External view, young individual, C-70.00 m.
5. *Coscinospira hemprichii* Ehrenberg. External view, C-70.00 m.
6. *Coscinospira hemprichii* Ehrenberg. External view, young individual, C-80.00 m.
7. *Peneroplis pertusus* (Forskal). External view, A-5.00 m.
8. *Peneroplis pertusus* (Forskal). External view, A-10.00 m.
9. *Peneroplis pertusus* (Forskal). External view, abnormally developed individual, A-15.00 m.
10. *Peneroplis pertusus* (Forskal). External view, A-30.00 m.
11. *Peneroplis pertusus* (Forskal). External view, abnormally developed individual, A-35.00 m.
12. *Peneroplis pertusus* (Forskal). External view, A-40.00 m.
13. *Peneroplis pertusus* (Forskal). External view, A-40.00 m.
14. *Peneroplis pertusus* (Forskal). External view, B-10.00 m.
15. *Peneroplis pertusus (Forskal).* External view, C-5.00 m.
16. *Peneroplis pertusus* (Forskal). External view, C-5.00 m.
17. *Peneroplis pertusus* (Forskal). External view, abnormally developed individual, C-10.00 m.
18. *Peneroplis pertusus* (Forskal). External view, C-10.00 m.
19. *Peneroplis pertusus* (Forskal). External view, C-20.00 m.
20. *Peneroplis pertusus* (Forskal). External view, C-20.00 m.
21. *Peneroplis pertusus* (Forskal). External view, C-20.00 m.
22. *Peneroplis pertusus* (Forskal). External view, abnormally developed individual, C-20.00 m.
23. *Peneroplis pertusus* (Forskal). External view, C-25.00 m.
24. *Peneroplis pertusus* (Forskal). External view, C-30.00 m.
25. *Peneroplis pertusus* (Forskal). External view, C-30.00 m.

PLATE - X

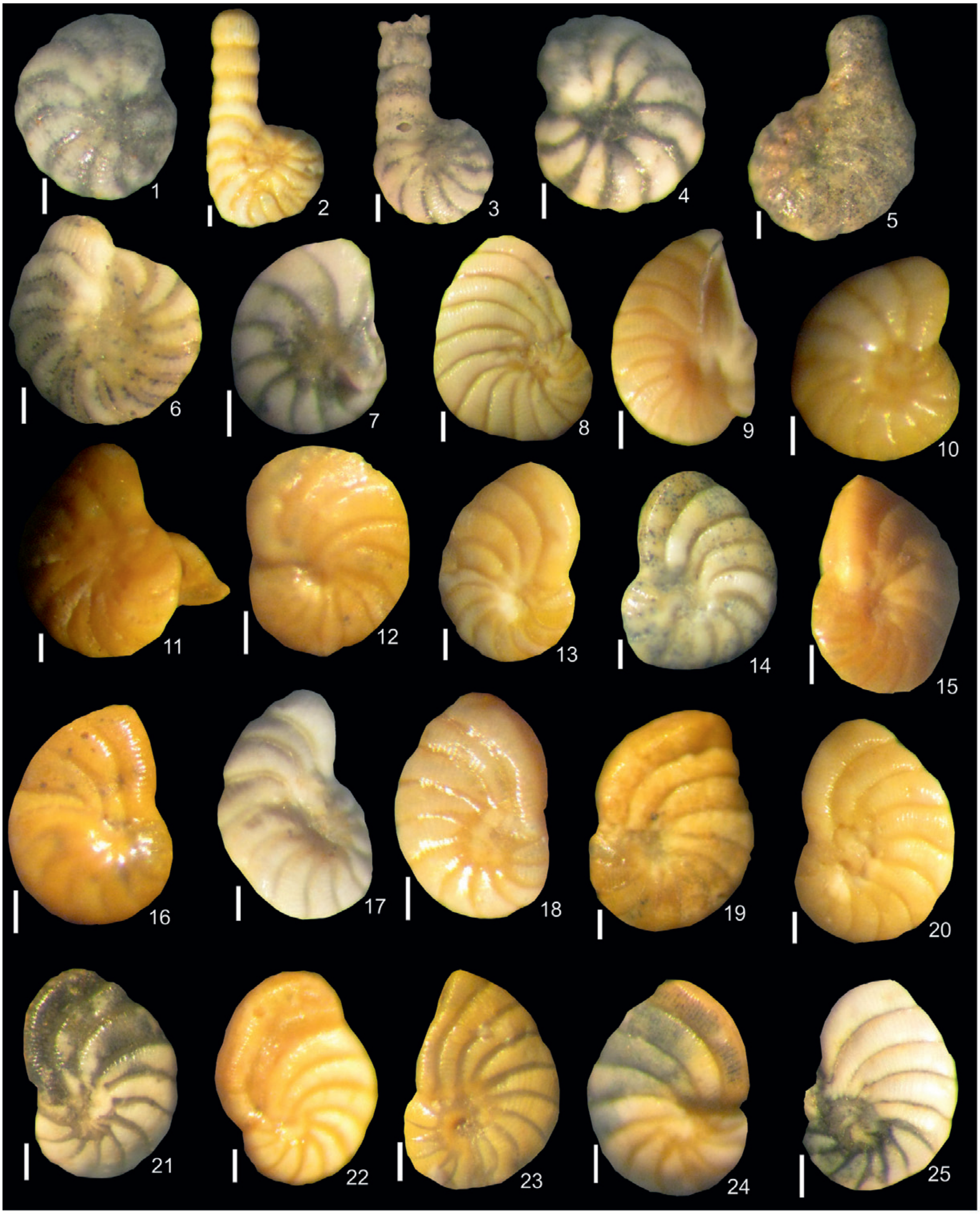

PLATE - XI

Ilıca Bay, Çeşme, İzmir.

1. *Peneroplis pertusus* (Forskal). External view, A-20.00 m.
2 *Peneroplis pertusus* (Forskal). External view, C-70.00 m.
3. *Peneroplis planatus* (Fichtel ve Moll). External view, A-5.00 m.
4. *Peneroplis planatus* (Fichtel ve Moll). External view, A-5.00 m.
5. *Peneroplis planatus* (Fichtel ve Moll). External view, A-5.00 m.
6. *Peneroplis planatus* (Fichtel ve Moll). External view, A-25.00 m.
7. *Peneroplis planatus* (Fichtel ve Moll). External view, A-35.00 m.
8. *Peneroplis planatus* (Fichtel ve Moll). External view, A-35.00 m.
9. *Peneroplis planatus* (Fichtel ve Moll). External view, A-40.00 m.
10. *Peneroplis planatus* (Fichtel ve Moll). External view, B-30.00 m.
11. *Peneroplis planatus* (Fichtel ve Moll). External view, B-50.00 m.
12. *Peneroplis planatus* (Fichtel ve Moll). External view, B-50.00 m.
13. *Peneroplis planatus* (Fichtel ve Moll). External view, C-80.00 m.
14. *Peneroplis planatus* (Fichtel ve Moll). External view, C-5.00 m.
15. *Peneroplis planatus* (Fichtel ve Moll). External view, C-10.00 m.
16. *Peneroplis planatus* (Fichtel ve Moll). External view, C-15.00 m.
17. *Peneroplis planatus* (Fichtel ve Moll). External view, C-30.00 m.
18. *Peneroplis planatus* (Fichtel ve Moll). External view, C-30.00 m.
19. *Peneroplis planatus* (Fichtel ve Moll). External view, C-35.00 m.
20. *Peneroplis planatus* (Fichtel ve Moll). External view, C-80.00 m.
21. *Peneroplis planatus* (Fichtel ve Moll). External view, C-80.00 m.
22. *Peneroplis planatus* (Fichtel ve Moll). External view, C-90.00 m.
23. *Ammonia compacta* Hofker. External view, spiral side, B-90.00 m.
24. *Ammonia compacta* Hofker. External view, umbilical side, A-35.00 m.
25. *Ammonia parkinsoniana* (d’Orbigny). External view, umbilical side, C-20.00 m.

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Cüneyt BİRCAN and Aysun KAYGUN

PLATE - XI