ISSN: 0001-5113
AADRAY

ACTA ADRIAT.,
42 (1): 125-150, 2001

UDC: 593.12 : 591.15 (262.4-17)
Original scientific paper

Benthic foraminiferal fauna of Gökçeada Island (Northern Aegean Sea) and its local variations

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This study has been carried out around Gökçeada with the samples taken from 34 different points, depths of 0.50 - 68 m. 58 genera and 104 species have been determined. The faunal associations show differences between the east and west coast of the island. Especially to the east of the island, on the Aydıncık Cape, there is an abundance of Peneroplis planatus (*FICHTEL* and *MOLL*) *and* Peneroplis pertusus (*FORSKAL*). *Also, to the south-east of Gökçeada, the typical Foraminifera of the eastern Mediterranean* Amphistegina lobifera *LARSEN and Sorites* orbiculus *EHRENBERG have been observed. Besides, a foraminiferal assemblage rich in number and high in diversity has been identified in 4 stations to the east and 3 stations to the west of the island.*

During another study area between Gökçeada-Bozcaada-Çanakkale, the genus Peneroplis, Laevipeneroplis, Amphistegina *and* Sorites *have not been found.*

For this reason, the east and southeast of Gökçeada and on the west fields in different sites there was life as a result of geothermal effect.

Keywords: Benthic Foraminifera, Gökçeada, northern Aegean Sea

INTRODUCTION

The study area, Gökçeada, is located in the north-eastern part of the Aegean Sea. Gökçeada island is a continental shelf environment. This island is bordered by the Gulf of Saroz to the north-east, the Gelibolu Peninsula and Dardanelles to the east, the Limnos Island to the southwest and by the Bozcaada to the south.

34 samples were collected using VAN VEEN grab sampler from the sea bottom around Gökçeada island (Fig. 1) during the 1998 summer season.

Previously, it has been reported that AVŞAR and ERGIN (1998) carried out on 31 dry sediment samples and described 84 genera and 160 benthic foraminiferal species from the various depths and locations at the Gökçeada-Bozcaada-Çanakkale triangle.

The objective of this study is to indicate the existance of the some peneroplids and describe the benthic foraminiferal taxa of the region.

MATERIAL AND METHODS

10 grams dry sediments from each of the 34 surface sediments samples were soaked with 17% H_2O_2 and left 24 hours within it. After drying and sieving of the residues bigger than 0.063-mm mesh, the foraminifers were picked

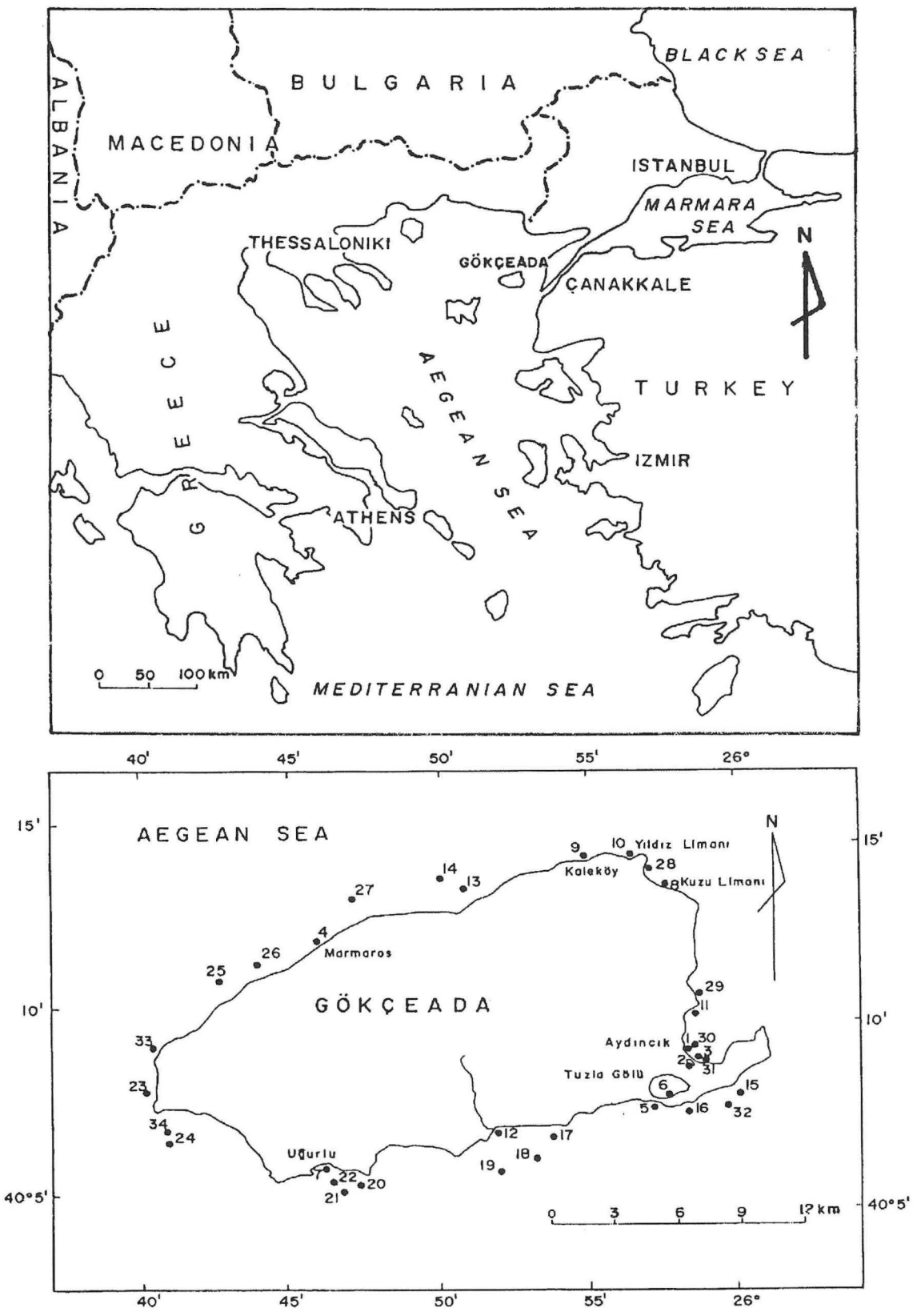

Fig. 1. Location map of the study area and sampled localities

up and examined under a binocular microscope. The following symbols in Table 2 show number of individuals in the samples, O 1-2, 3-5, ? 6-15, 16-25, more than 25.

The studies of YANKO and TROITSKAJA, 1987; LOEBLICH and TAPPAN, 1988; MERIÇ AND SAKINÇ, 1990; CIMERMAN and LANGER, 1991; HOTTINGER *et al.*, 1993; SGARRELLA and MONCHARMONT-ZEI, 1993; MERIÇ *et al.*, 1995; MERIÇ and AVŞAR, 1997 were used for the identification of the foraminiferal taxa.

LIST OF TAXA IDENTIFIED

(Classification according to LOEBLICH and TAPPAN, 1988).

Family Haplophragmoididae MAYNC, 1952
Haplophragmoides CUSHMAN, 1910
Haplophragmoides canariensis (d'ORBIGNY, 1839)
Family Spiroplectamminidae CUSHMAN, 1927
Subfamily Spiroplectammininae CUSHMAN, 1927
Spiroplectinella KISEL'MAN, 1972
Spiroplectinella sagittula (d'ORBIGNY, 1839)
Family Eggerellidae CUSHMAN, 1937
Subfamily Eggerellinae CUSHMAN, 1937
Eggerelloides HAYNES, 1973
Eggerelloides scabrus (WILLIAMSON, 1858)
Family Textulariidae EHRENBERG, 1838
Subfamily Textulariinae EHRENBERG, 1838
Textularia DEFRANCE, 1824
Textularia bocki HÖGLUND, 1947
Textularia truncata HÖGLUND, 1947
Subfamily Siphotextulariinae LOEBLICH and TAPPAN, 1985
Siphotextularia FINLAY, 1939
Siphotextularia concava (KARRER, 1868)
Family Spirillinidae REUSS and FRITSCH, 1861
Spirillina EHRENBERG, 1843
Spirillina vivipara EHRENBERG, 1843
Family Patellinidae RHUMBLER, 1906
Subfamily Patellininae RHUMBLER, 1906
Patellina WILLIAMSON, 1858
Patellina corrugata WILLIAMSON, 1858
Family Ficherinidae MILLET, 1898
Subfamily Ficherininae MILLET, 1898
Trisegmentina WIESNER, 1920
Trisegmentina compressa WIESNER, 1931
Subfamily Nodobacullariellinae BOGDANOVICH, 1981
Vertebralina d'ORBIGNY, 1826
Vertebralina striata d'ORBIGNY, 1826
Wiesnerella CUSHMAN, 1933
Wiesnerella auriculata (EGGER, 1893)
Family Spiroloculinidae WIESENER, 1920
Adelosina d'ORBIGNY, 1826
Adelosina cliarensis (HERON-ALLEN and EARLAND, 1930)
Adelosina mediterranensis (Le CALVEZ J. and Y., 1958)
Adelosina partschi (d'ORBIGNY, 1846)
Adelosina pulchella d'ORBIGNY, 1846
Spiroloculina d'ORBIGNY, 1826
Spiroloculina angulata d'ORBIGNY, 1826
Spiroloculina angulosa TERQUEM, 1878
Spiroloculina depressa d'ORBIGNY, 1826
Spiroloculina ornata d'ORBIGNY, 1839
Spiroloculina pellucida SAID, 1950
Family Hauerinidae SCHWAGER, 1876
Subfamily Siphonapertinae SAIDOVA, 1975
Siphonaperta VELLA, 1957
Siphonaperta aglutinans (d'ORBIGNY, 1839)
Siphonaperta aspera (d'ORBIGNY, 1826)
Siphonaperta dilatata (Le CALVEZ J. and Y., 1958)
Siphonaperta irregularis (d'ORBIGNY, 1826)
Subfamily Hauerininae SCHWAGER, 1876
Cycloforina LUCZKOWSKA, 1972
Cycloforina contorta (d'ORBIGNY, 1846)
Cycloforina rugosa (d'ORBIGNY, 1826)
Cycloforina tenuicollis (WIESNER, 1923)
Cycloforina villafranca (Le CALVEZ, J. and Y., 1958)
Lachlanella VELLA, 1957
Lachlanella undulata (d'ORBIGNY, 1826)
Lachlanella variolata (d'ORBIGNY, 1826)
Massilina SCHLUMBERGER, 1893
Massilina gualteriana (d'ORBIGNY, 1839)
Massilina secans (d'ORBIGNY, 1826)
Quinqueloculina d'ORBIGNY, 1826

Quinqueloculina berthelotiana d'ORBIGNY, 1839
Quinqueloculina bidentata d'ORBIGNY, 1839
Quinqueloculina disparilis d'ORBIGNY, 1826
Quinqueloculina eburnea (d'ORBIGNY, 1839)
Quinqueloculina jugosa CUSHMAN, 1944
Quinqueloculina laevigata d'ORBIGNY, 1839
Quinqueloculina lamarckiana d'ORBIGNY, 1839
Quinqueloculina seminula (LINNÉ, 1758)
Quinqueloculina stalkeri LOEBLICH and TAPPAN, 1953
Quinqueloculina viennensis Le CALVEZ J. and Y., 1958
Subfamily Miliolinellinae VELLA, 1957
Miliolinella WIESNER, 1931
Miliolinella elongata KRUIT, 1955
Miliolinella semicostata (WIESNER, 1923)
Miliolinella subrotunda (MONTAGU, 1803)
Miliolinella webbiana (d'ORBIGNY, 1839)
Pseudotriloculina CHERIF, 1970
Pseudotriloculina laevigata (d'ORBIGNY, 1826)
Pseudotriloculina oblonga (MONTAGU, 1803)
Pseudotriloculina rotunda (d'ORBIGNY, 1826)
Pseudotriloculina sidebottomi (MARTINOTTI, 1920)
Pyrgo DEFRANCE, 1824
Pyrgo anomala (SCHLUMBERGER, 1891)
Pyrgo elongata (d'ORBIGNY, 1826)
Triloculina d'ORBIGNY, 1826
Triloculina marioni SCHLUMBERGER, 1893
Triloculina plicata TERQUEM, 1878
Triloculina schreiberiana d'ORBIGNY, 1839
Triloculina tricarinata d'ORBIGNY, 1826
Wellmanellinella CHERIF, 1970
Wellmanellinella striata (SIDEBOTTOM, 1904)
Subfamily Sigmoilinitinae LUCZKOWSKA, 1974
Sigmoilinita SEIGLIE, 1965
Sigmoilinita costata (WIESNER, 1893)
Sigmoilinita edwardsi (SCHLUMBERGER, 1887)
Subfamily Tubinellinae RHUMBLER, 1906
Articulina D'ORBIGNY 1826
Articulina carinata WIESNER, 1923
Parrina CUSHMAN, 1931
Parrina bradyi (MILLETT, 1898)
Family Peneroplidae SCHULTZE, 1854
Laevipeneroplis SULC, 1936
Laevipeneroplis karreri (WIESNER, 1923)
Peneroplis de MONTFORT, 1803
Peneroplis pertusus (FORSKAL, 1775)
Peneroplis planatus (FICHTEL and MOLL, 1798)
Family Soritidae EHRENBERG, 1839
Subfamily Soritinae EHRENBERG, 1839
Sorites EHRENBERG, 1839
Sorites orbiculus EHRENBERG, 1839
Family Nodosariidae EHRENBERG, 1839
Subfamily Lenticulininae CHAPMAN, PARR and COLLINS, 1934
Lenticulina LAMARCK, 1804
Lenticulina gibba (d'ORBIGNY, 1826)
Subfamily Marginulininae WEDEKIND, 1936
Amphicoryna SCHLUMBERGER, 1881
Amphicoryna scalaris (BATSCH, 1791)
Family Polymorphinidae d'ORBIGNY**, 1839**
Subfamily Polymorphininae d'ORBIGNY, 1839
Globulina d'ORBIGNY, 1839
Globulina punctata d'ORBIGNY, 1846
Globulina sp.
Polymorphina d'ORBIGNY, 1826
Polymorphina sp. 2
Polymorphina sp. 3
Polymorphina sp. 5
Family Buliminidae JONES, 1875
Bulimina d'ORBIGNY, 1826
Bulimina elongata d'ORBIGNY, 1846
Family Reussellidae CUSHMAN, 1933
Reussella GALLOWAY, 1933
Reussella spinulosa (REUSS, 1850)
Family Bagginidae CUSHMAN, 1927
Subfamily Baggininae CUSHMAN, 1927
Valvulineria CUSHMAN, 1926
Valvulineria bradyana (FORNASINI, 1900)
Family Eponididae HOFKER, 1951
Subfamily Eponininae HOFKER, 1951
Eponides de MONTFORT, 1808

Eponides concameratus (WILLIAMSON, 1858)
Family Mississippinidae SAIDOVA, 1981
Subfamily Stomatorbinae SAIDOVA, 1981
Stomatorbina DOREEN, 1948
Stomatorbina concentrica (PARKER and JONES, 1864)
Family Discorbidae EHRENBERG, 1838
Neoeponides REISS, 1960
Neoeponides bradyi (Le CALVEZ, 1974)
Family Rosalinidae REISS, 1963
Neoconorbina HOFKER, 1951
Neoconorbina terquemi (RZEHAK, 1888)
Rosalina d'ORBIGNY, 1826
Rosalina bradyi CUSHMAN, 1915
Rosalina floridensis (CUSHMAN, 1922)
Rosalina globulosa d'ORBIGNY, 1826
Tretomphalus MÖBIUS, 1880
Tretomphalus bulloides (d'ORBIGNY, 1829)
Family Glabratellidae LOEBLICH and TAPPAN, 1964
Conorbella HOFKER, 1951
Conorbella imperatoria (d'ORBIGNY, 1846)
Family Discorbinellidae SIGAL, 1952
Subfamily Discorbinellinae SIGAL, 1952
Discorbinella CUSHMAN and MARTIN, 1935
Discorbinella bertheloti (d'ORBIGNY, 1839)
Family Cibicididae CUSHMAN, 1927
Subfamily Cibicidinae CUSHMAN, 1927
Cibicides de MONTFORT, 1808
Cibicides advenum (d'ORBIGNY, 1839)
Lobatula FLEMING, 1828
Lobatula lobatula (WALKER and JACOB, 1798)
Subfamily Annulocibicidinae SAIDOVA, 1981
Cyclocibicides CUSHMAN, 1927
Cyclocibicides vermiculatus (d'ORBIGNY, 1826)
Family Planorbulinidae SCHWAGER, 1877
Subfamily Planorbulininae SCHWAGER, 1877
Planorbulina d'ORBIGNY, 1826
Planorbulina mediterranenesis d'ORBIGNY, 1826
Cibicidella CUSHMAN, 1927
Cibicidella variabilis (d'ORBIGNY, 1839)
Family Acervulinidae SCHULTZE, 1854
Sphaerogypsina GALLOWAY, 1933
Sphaerogypsina globula (REUSS, 1848)
Family Asterigerinatidae REISS, 1963
Asterigerinata BERMUDEZ, 1949
Asterigerinata mamilla (WILLIAMSON, 1858)
Family Amphisteginidae CUSHMAN, 1927
Amphistegina d'ORBIGNY, 1826
Amphistegina lobifera LARSEN, 1976
Family Nonionidae SCHULTZE, 1854
Subfamily Nonioninae SCHULTZE, 1854
Nonion de MONTFORT, 1808
Nonion depressulum (WALKER and JACOB, 1798)
Subfamily Astrononioninae SAIDOVA, 1981
Astrononion CUSHMAN and EDWARDS, 1937
Astrononion stelligerum (d'ORBIGNY, 1839)
Family Rotaliidae EHRENBERG, 1839
Subfamily Ammoniidae SAIDOVA, 1981
Ammonia BRÜNNICH, 1772
Ammonia compacta HOFKER, 1969
Ammonia parkinsoniana (d'ORBIGNY, 1839)
Ammonia tepida CUSHMAN, 1926
Challengerella BILLMAN, HOTTINGER and OESTERLE, 1980
Challengerella bradyi BILLMAN, HOTTINGER and OESTERLE, 1980
Family Elphidiidae GALLOWAY, 1933
Subfamily Elphidiinae GALLOWAY, 1933
Cribroelphidium CUSHMAN, 1948
Cribroelphidium poeyanum (d'ORBIGNY, 1839)
Porosononion PUTRYA, 1956
Porosononion subgranosum (EGGER, 1857)
Elphidium de MONTFORT, 1808
Elphidium aculeatum (d'ORBIGNY, 1846)
Elphidium advenum (CUSHMAN, 1922)
Elphidium complanatum (d'ORBIGNY, 1839)
Elphidium crispum (LINNÉ, 1758)
Elphidium depressulum CUSHMAN, 1933
Elphidium macellum (FICHTEL and MOLL, 1798)
Elphidium cf. *pulvereum* TODD, 1958

DISCUSSION AND RESULTS

Temperature changes between 15° and 26°C in water depths from 0.50 to 68.00 meters. Salinity is 22.3 –38.4 psu, pH 7.55-8.13 and dissolved oxygen 2.90-8.62 mgl-1 (Table 1). Out of 34 investigated sites, the 12th and 31st did not include foraminiferal fauna. There were 104 species of 58 genera related to 30 families and 26 subfamilies identified from 32 locations (Table 2).

The evaluation of species, genus features and quantitative data were obtained from foraminiferal assemblages in the examined samples. A numerous individuals were noted at some stations such as 16, 24 and 29. The occurrences of *Peneroplis, Laevipeneroplis, Sorites* and *Amphistegina* genera, which have not been

Table 1. Depth, temperature, oxygen, pH and salinity values of bottom water

Station No	Depth (m)	Oxygen (mg/l)	Temp. (°C)	pH	Salinity (*psu*)
1	0.50	5.03	25.0	8.03	27.1
2					
3	0.50	5.03	25.0	8.03	27.3
4	0.50	7.84	24.5	8.12	27.5
5	0.50	8.17	25.0	8.05	29.6
6					
7	0.50	5.63	26.0	8.13	22.9
8	0.50	8.35	24.5	8.03	29.7
9	0.50	8.56	25.0	8.02	28.9
10	0.50	8.41	26.0	8.11	29.5
11	0.50	5.02	25.0	8.03	27.9
12	0.50	8.62	25.0	8.08	22.3
13	13.00	6.80	23.0	7.85	34.4
14	55.00	5.00	17.0	7.80	37.4
15	3.00	4.90	22.0	7.68	33.4
16	4.00	4.70	22.0	7.65	33.4
17	4.00	4.70	22.0	7.70	33.4
18	30.00	4.30	19.0	7.72	37.3
19	40.00	4.20	22.0	7.71	33.5
20	3.00	5.20	22.0	7.71	33.4
21	15.00	4.70	22.0	7.69	33.4
22	3.00	4.90	22.0	7.70	33.4
23	10.00	5.90	22.0	7.63	33.5
24	68.00	5.60	16.5	7.58	38.0
25	25.00	4.90	21.0	7.83	34.1
26	9.00	4.90	22.0	7.81	33.6
27	9.00	5.90	22.0	7.65	33.4
28	10.00	2.90	22.0	7.55	33.4
29	11.00	4.60	19.0	8.02	38.3
30	3.00	6.51	19.0	7.75	37.4
31	13.00	6.55	18.0	8.08	38.4
32	16.00	4.31	18.0	7.99	38.4
33	28.00	5.49	15.0	7.92	36.6
34	41.00	4.40	16.0	7.86	38.3

Table 2. Distribution of species of Foraminifera according to site numbers

FORAMINIFERA	STATIONS																																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Haplophragmoides canariensis																									○									
Spiroplectinella sagittula																■									▲							▲		
Eggerelloides scabrus																												●						
Textularia bocki													●			*								*	●	○			▲			●		
Textularia truncata																●								*	●	○			▲			▲		
Siphotextularia concava																									▲							○		
Spirillina vivipara																													○					
Patellina corrugata																													○					
Trisegmentina compressa																													●					
Vertebralina striata															○	▲							●	*	○	*			*	○		○		
Wiesnerella auriculata																									○									
Adelosina cliarensis											○		○	○	○	*					○				○	○		●	●	▲		●		
Adelosina mediterranensis																								*	▲	○	○	○	■			●		
Adelosina partschi														○											○							○		
Adelosina pulchella																										○								
Spiroloculina angulata													○		○				●		○				○			○		●		○		
Spiroloculina angulosa																▲									●			○		○		○		
Spiroloculina depressa																									○									
Spiroloculina ornata															●	●							●	*	▲	▲			■	●		●		
Spiroloculina pellucida																													○					
Siphonaperta agglutinans			●																															
Siphonaperta aspera	○		■	▲	○				●		○		▲	○	▲	*	●		●	●			▲	*	●	○	○	▲	*	*		■		
Siphonaperta dilatata																												●				○		
Siphonaperta irregularis			▲																															
Cycloforina contorta															○									*	▲			○	▲	●		*		
Cycloforina rugosa														○				○																
Cycloforina tenuicollis																									○									
Cycloforina villafranca																																○		
Lachlanella undulata																								*	▲				○					
Lachlanella variolata																							▲			▲			●	●				
Massilina gualteriana			●	○											○				●				■						▲			○		
Massilina secans																			○						▲									○
Quinqueloculina berthelotiana			▲								○		○		○	*				○					●	*			*	●		▲		
Quinqueloculina bidentata	○															▲							●			▲		▲	▲	●				
Quinqueloculina disparilis			○													▲									▲	▲			▲			●		
Quinqueloculina eburnea		○	○										○		○	●	○												○	○				
Quinqueloculina jugosa														○	○	*									▲				▲			▲		
Quinqueloculina laevigata	○		▲												○	*										▲			▲	○				
Quinqueloculina lamarckiana	▲	○	■	○				▲	○		○		▲		○	■		○	●		○	○			■	*		●	*	▲		■		
Quinqueloculina seminula		●	▲					○			●			●	▲	*		○		○					▲				▲	*		▲	○	
Quinqueloculina stalkeri																												○						
Quinqueloculina viennensis																													*	●				
Miliolinella elongata																	○												○					
Miliolinella semicostata															○										●	○			▲					
Miliolinella subrotunda	○		○	○	○			○								▲	○							*	▲			○		●		▲		
Miliolinella webbiana			○													■	○							*	▲	●			▲			●		
Pseudotriloculina laevigata			●																						●				○	○				
Pseudotriloculina oblonga								○									○				○		●		○			●						
Pseudotriloculina rotunda					●	○			○				○		○	*									▲	▲	○		▲			▲		
Pseudotriloculina sidebottomi																													▲					
Pyrgo anomala																●																		
Pyrgo elongata																												○						
Triloculina marioni			▲												○	■	○	○	○					*	▲	○		▲	*	◐		▲		
Triloculina plicata								○																	●	●			■					
Triloculina schreiberiana																*									○			●	○	○				

Table 2. cont'd

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Triloculina schreiberiana																*									○			●	○	○				
Triloculina tricarinata			○																						●	○								
Wellmanellinella striata																													▲					
Sigmoilinita costata							○								○	■									▲	▲			*			○		
Sigmoilinita edwardsi				○																										○				
Articulina carinata																									▲				○	○				
Parrina bradyi																										○			●	○		●		
Laevipeneroplis karreri																										▲			○					
Peneroplis pertusus	■	■	*	○					○	○	*		○	○	○	●	○	○	○	○	▲	○			●	●	○	○	■	■		▲		
Peneroplis planatus	▲	▲	■	○						○	○				●		○				○					○		○	▲	■		○		
Sorites orbiculus																														●				
Lenticulina gibba																																○		
Amphicoryna scalaris																									○				○					
Globulina punctata																													○					
Globulina sp.																●																○		
Polymorphina sp. 2																													○					
Polymorphina sp. 3			○										○	○		▲		○					▲		○				○			○		
Polymorphina sp. 5																●									○				○			○		
Bulimina elongata																									○									
Reussella spinulosa																													○					
Valvulineria bradyana																									○									
Eponides concameratus																									●							○		
Stomatorbina concentrica																	○												○					
Neoeponides bradyi		○	○											○	○	▲				○				*	●			○	■	○		▲		
Neoconorbina terquemi																								*	▲				*	*		▲		
Rosalina bradyi	●	●	▲	○					○		▲			○	○	▲	○		○		○	●	▲	*	■	*		■	*	*		*		
Rosalina floridensis															●	*								*	*	▲			■			*		
Rosalina globularis	●	○	●								●									○	○	○	▲							●				
Tretomphalus bulloides					○		○		○												●		▲	*	▲	○			*					
Conorbella imperatoria											○					●													▲					
Discorbinella bertheloti																▲									▲				●			▲		
Cibicides advenum	▲	▲		○							■		○								○			*	▲				▲	■		▲		
Lobatula lobatula	●	▲	▲						○		●				▲	*		○		●	▲		*	*	*	*	○	■	*	▲		*		
Cyclocibicides vermiculatus																									▲				○					
Planorbulina mediterranenesis															●	■	○		○		●		▲	*	*	▲		○	*	○		*		
Cibicidella variabilis																	○								●									
Sphaerogypsina globula			○													●																		
Asterigerinata mamilla		○	○								○					*							●		*				*	*		■		
Amphistegina lobifera																														■				
Nonion depressulum		○	○		○																						○					●		
Astrononion stelligerum																									●				■	○		●		
Ammonia compacta			○													*	●		■		○				▲	○						●		
Ammonia parkinsoniana	○	■	▲		○	○		▲			○		○	▲	▲	▲	○	▲	●	○	●	●		*	○		▲	●	*			●	○	▲
Ammonia tepida							▲									▲												▲		*				
Challengerella bradyi	●	▲				○													○											○				
Cribroelphidium poeyanum																▲														○				
Porosononion subgranosum								○								■												○						
Elphidium aculeatum	●		○	*	○		●			○	▲				●	*		●		○	▲	▲	●		○	●		○	*	●		▲		
Elphidium advenum		○	○													*									●	●		●	■	▲		■		
Elphidium complanatum																*												○	*	●				
Elphidium crispum	*	*	*	▲	●	●		▲	●	▲	▲		▲	▲	▲	*	○	●	●	▲	●	▲	▲	*	*	■	○	▲	*	*		*		
Elphidium depressulum		●	▲				●		○	○															▲	●	○	▲	*	*		○		
Elphidium macellum		○	●					○			○															○			▲			○		
Elphidium cf. pulvereum																												○						
TOTAL NUMBER OF SPECIMENS PER 10 gr SEDIMENT	180	160	330	58	13	8	17	44	16	13	138	0	35	32	92	1374	26	22	50	24	44	33	190	1048	604	343	16	144	1900	729	0	587	3	12

reported among 84 genera and 160 species in another recent study (AVŞAR and ERGİN, 1998) are carried out on 31 samples from the various depths and locations at the Gökçeada-Bozcaada-Çanakkale, which are important and interesting subjects to study (Table 2).

Observation of the indicated 4 genera, which are mostly typical Mediterranean foraminifers (CIMERMAN and LANGER, 1991), and their occurrences around Gökçeada point to the existence of different ecological conditions around the island, particularly towards the eastern part. The following explains better the subject: *Amphistegina lobifera* LARSEN was found at the stations 30 and 32 located at the southeast part of the island. At the station 30 there were not seen too many of *Sorites orbiculus* EHRENBERG. *Laevipeneroplis karreri* (WIESNER) was recorded at stations 29 and 26 situated at the east and northwest of the area. Many individuals of *Peneroplis pertusus* (FORSKAL) and *Peneroplis planatus* (FICHTEL and MOLL) were observed at stations 1, 2, 3, 11, 29 and 30 in the east part of the island (Table 2).

Also, in the Karaburun Peninsula on the east of Çeşme (İzmir) in the Ilıca Bay, there is a geothermal source with the temperature 55-58°C in the depth of 2.50 m. Around this source there is enrichment of peneroplids. In a near past, in the İzmit Gulf, the researches made in two different points and around the geothermal sources related to the faults, which disappeared lately, there is an extraordinary number of foraminiferal development.

Besides, little amount of *Peneroplis* individuals was seen at 4, 25, 26, 27 at northwest; 9, 10, 13, 14, 28 at northeast; 20, 21, 22 at southwest and 15, 16, 17, 18, 19 called stations at southeast. At evaluation of quantitative data, the number of the *Peneroplis* individuals is observed only at 17 stations (Table 2). These forms are thought to be reworked individuals by currents from the east part of the island.

Furthermore, an extreme abundance of peneroplids around a thermal water, at heat of 55-58°C and 2.50 m of depth, from the gulf was also reported in the previous studies (SÖZERI, 1966; MERİÇ, 1986) carried out around the Ilıca Gulf at the east of Çeşme (İzmir), the Karaburun Peninsula. This kind of hot water sources is also known from the various parts and depths of the Aegean Sea (BAŞKAN and CANIK, 1983). More recently, another study at the İzmit Gulf explains numerous foraminifer occurrences around the thermal waters related to the fault systems (MERİÇ and SUNER, 1995).

Number of foraminifer individuals living near to a thermal water source is too many such as S-3 and S-2 drillings at the İzmit Gulf. The reason is probably water temperature and sulfur contents. Because the sulfur having (-2) value is mostly an important food source for protista (MERİÇ, 1983). Temperature changes also effect the life of an organism. Besides, CO_2 and H_2S contents of hot waters around Çeşme (İzmir) and its surrounding were also examined (BAŞKAN and CANIK, 1983).

Sampling examination in detail indicates that abundance of *Peneroplis planatus* (FICHTEL and MOLL) and *Peneroplis pertusus* (FORSKAL) particularly at the east part of Gökçeada is an interesting point to be taken into consideration. It is found that the indicated species are wide spread at the Mersin Gulf and the İskenderun Gulf at the Mediterranean shores (AVŞAR and MERİÇ, 1996; AVŞAR, 1997) and prefer warm water conditions such as the Ilıca Gulf at the eastern Çeşme. However, very shallow water depths such as sampling locations also support sun shine effects in this kind of areas. Apart from the mentioned data, recent biological studies also show that temperature in very deep and dark environments effects the life of organisms. Abnormal occurrences of organisms around the hot water sources were recorded at Galapagos Islands and surroundings (at 2500 meters of depth and temperature of 35.0°C) as well as in the Atlantic type ridge which is 2900 km far from Miami, 3670 meters deep and at temperature of 36.5°C (BALLARD, 1976; CORLISS and BALLARD, 1977; BALLARD and GRASSE, 1979; ENRIGHT *et al.*, 1981, LUTZ and HAYMON, 1994, MERİÇ, 1983, 1994; LUTZ, 2000).

On the other hand, in spite of existing of *Posidonia* grasses in most of sampling areas,

sometimes disappearing of Foraminifera at the mentioned areas (31), occurrences of less amount of Foraminifera at some of them (13, 14, 22, 27, 33, 34), and being observed of a large number of Foraminifera in the called areas of 16, 25, 30 and 32 make us think that vegetable life abundance is not the main reason of increase in specimens. Besides, 1900 Foraminifera were found at the sample 29 including small pebbles. The Foraminifera obtained from the points 15 (92), 24 (10.485), 26 (343), and 28 (144) exhibit an important change (Table 2) because of the *Posidonia* grasses.

Consequently, it is found that hot water sources which are still active or have stopped their functions at near past exist at different points around the Gökçeada Island.

The Foramininfera identified in this area are demonstrated on Plates 1-7.

ACKNOWLEDGEMENTS

The authors thank to Dr. Cüneyt KUBANÇ and Dr. Serhat ALBAYRAK (İ.Ü. Science Faculty, Biology Department) for providing the samples, ARÇELİK A.Ş. Research and Technology Development Center for taking photographs on the scanning electron microscope (Jeol JSM-6400 Scanning Microscope), Turgay GÖNÜL (ARÇELIK A.Ş.) for helping in SEM photography and N. Bora ÜLTER (İ.Ü. Engineering Faculty) for preparing the tables carefully by computer.

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Bentoska fauna foraminifera otoka Gökçeada (sjeverno Egejsko more) i njezine lokalne varijacije

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SAŽETAK

Tijekom istraživanja oko otoka Gökçeada uzeti su uzorci sa 34 različite točke na dubini od 0.50 do 68 m. Određeno je 58 rodova i 104 vrste. Ustanovljene su razlike u fauni istočnog i zapadnog dijela otoka, a posebito istočno od otoka, na rtu Aydıncık gdje su rasprostranjene vrste *Peneroplis planatus* (FICHTEL & MOLL) i *Peneroplis pertusus* (FORSKAL). Također su proučavane na sjeveroistoku otoka Gökçeada tipične foraminifere istočnog Mediterana kao što su *Amphistegina lobifera* LARSEN i *Sorites orbiculus* EHRENBERG. Pored toga, zajednica foraminifera brojno dobro zastupljena i vrlo različita, identificirana je na četiri postaje istočno i tri zapadno od otoka. Prilikom istraživanja provedenog u području između otoka Gökçeada, Bozcaada i Çanakkale, rodovi *Peneroplis, Laevipeneroplis, Amphistegina* i *Sorites* nisu pronađeni. Stoga je istočno i sjeveroistočno od otoka Gökçeada, te na zapadnim dijelovima različitih postaja postojao život kao rezultat geotermalnih utjecaja.

PLATES 1-7 FORAMINIFERIDA FROM GÖKÇEADA ISLAND, NORTHERN AEGEAN SEA

PLATE 1

1-2. *Spiroplectinella sagittula* (d'ORBIGNY). External views; Station 32, x 75.
3-4. *EGGERelloides scabrus* (WILLIAMSON). External views; Station 28, 3- x 120; 4- x 85.
5-6. *Textularia bocki* HÖGLUND. External views; Station 29, x 90.
7-9. *Textularia truncata* HÖGLUND. External views; Station 32, 7 ve 8, x 110; 9, x 145.
10-11. *Siphotextularia concava* (KARRER). External views; Station 25, 10, x 95; 11, x 85.
12-13. *Trisegmentina compressa* WIESNER. External views; Station 29, x 140.
14-15. *Vertebrellina striata* d'ORBIGNY. External views; Station 26, x 70.
16. *WIESNERella auriculata* (EGGER). External view; Station 25, x 150.
17-18. *Adelosina cliarensis* (HERON-ALLENand EARLAND). External views; Station 16, x 85.
19-20. *Adelosina mediterranensis* (Le CALVEZ J. and Y.). External views; Station 25; 19, x 75; 20, young individual, x 95.
21. *Adelosina* cf. *partschi* (d'ORBIGNY). External view; İstaasyon 25, x 50.

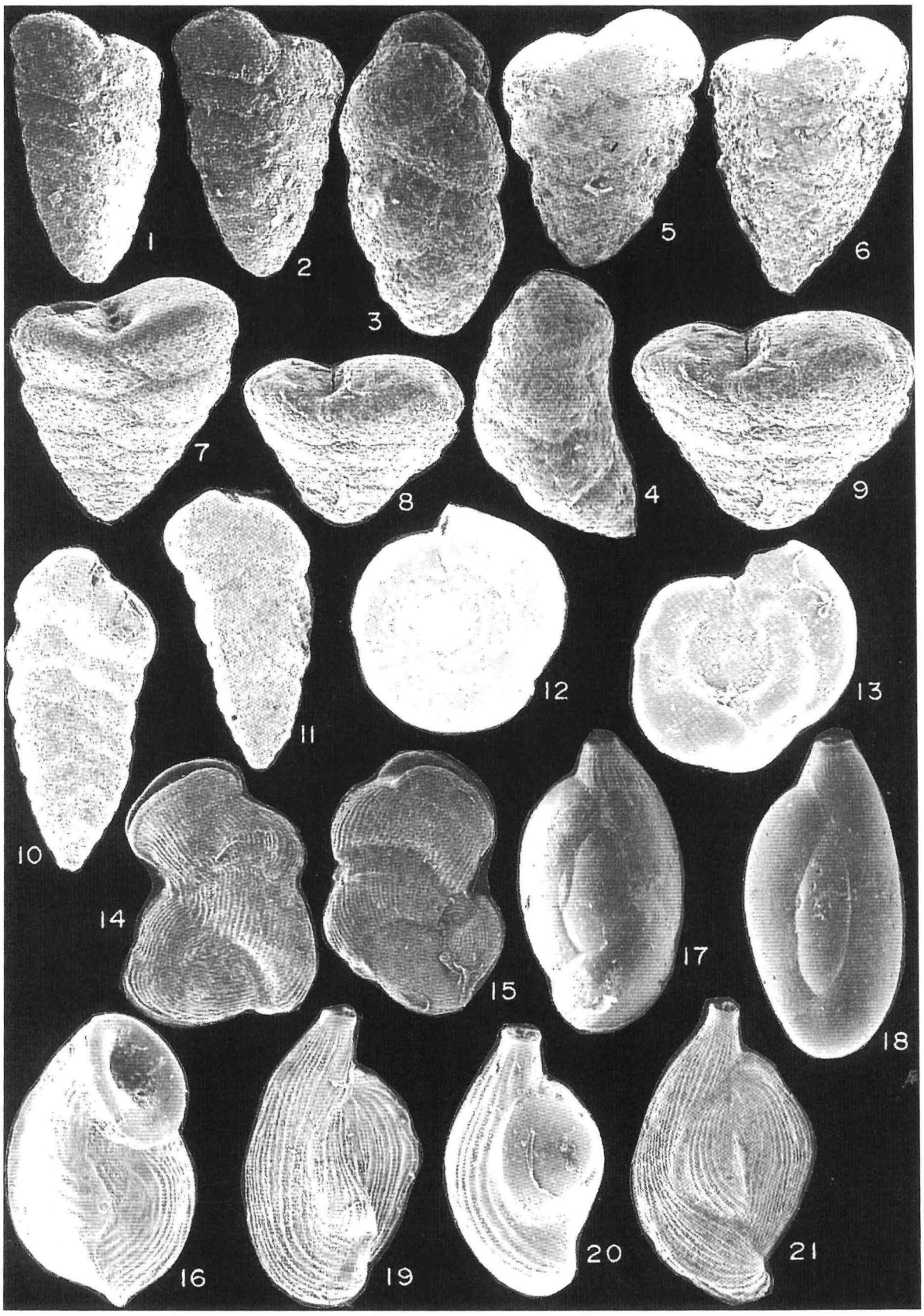
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PLATE 2

1. *Spiroloculina angulosa* TERQUEM. External view; Station 32, x 90.
2-3. *Siphonaperta aspera* (d'ORBIGNY). External views; Station 32, x 95.
4-5. *Cycloforina contorta* (d'ORBIGNY). External views; Station 32, x 105.
6-8. *Lachlanella undulata* (d'ORBIGNY). External views, Station 25; 6, x 90; 7-8, x 70.
9-10. *Lachlanella variolata* (d'ORBIGNY). External views; Station 26, x 70.
11. *Massilina secans* (d'ORBIGNY). External view; Station 25, x 30.
12-13. *Quinqueloculina berthelotiana* d'ORBIGNY. External views; Station 32, x 75.
14-15. *Quinqueloculina bidentata* d'ORBIGNY. External views; Station 29, x 110.
16-17. *Quinqueloculina disparilis* d'ORBIGNY. External views; Station 25, x 60.
18-19. *Quinqueloculina eburnea* (d'ORBIGNY). External views; Station 13; 18, x 100; 19, x 160.
20-21. *Quinqueloculina jugosa* CUSHMAN. External views; Station 32, x 90.

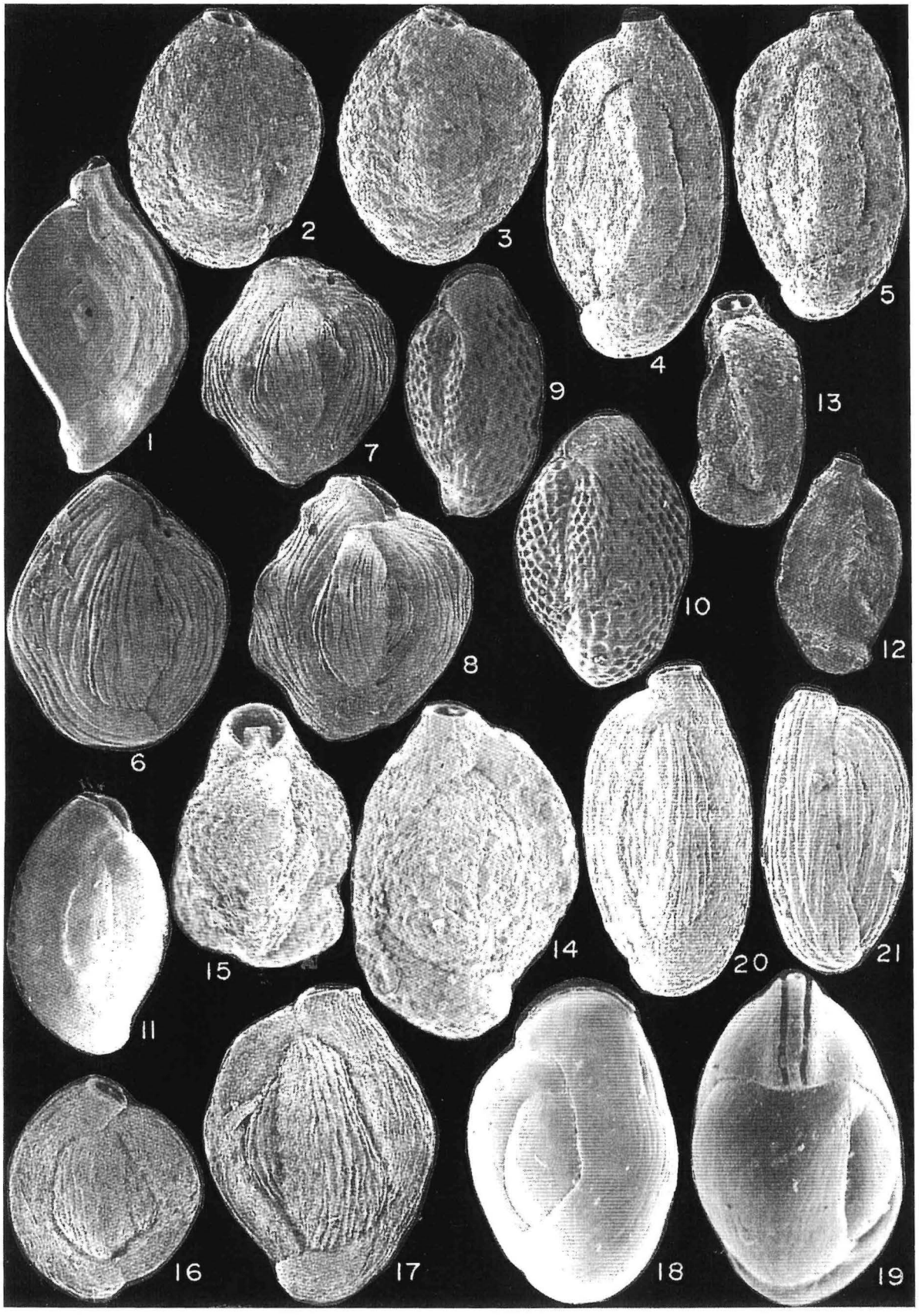
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PLATE 3

1-2. *Quinqueloculina laevigata* d'ORBIGNY. External views; Station 26, x 100.
3-4. *Quinqueloculina lamarckiana* d'ORBIGNY. External views; Station 32, x 80.
5. *Quinqueloculina seminula* (LINNÉ). External view; Station 25, x 70.
6-7. *Quinqueloculina viennensis* Le CALVEZ J. and Y. External views; Station 29, x 110.
8. *Miliolinella elongata* KRUIT. External view, Station 29 x 100.
9 -10. *Miliolinella semicostata* (WIESNER). External views; Station 29, x 140.
11-12. *Miliolinella subrotunda* (MONTAGU). External views; Station 32, x 120.
13-14. *Miliolinella webbiana* (d'ORBIGNY). External views; Station 32, x 145.
15-16. *Pseudotriloculina laevigata* (d'ORBIGNY). External views; Station, 29, x 80.
17-18. *Pseudotriloculina oblonga* (MONTAGU). External views; Station 28, x 95.
19-20. *Pseudotriloculina rotunda* (d'ORBIGNY). External views;Station 26; 19, x 75; 20,x 95.


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PLATE 4

1-2. *Pseudotriloculina sidebottomi* (MARTINOTTI). 1, External view; Station 29, x 95; 2, aperture, x 130.
3. *Pyrgo elongata* (d'ORBIGNY). External view; Station 28, x 150.
4-5. *Triloculina marioni* SCHLUMBERGER. External views; Station 29, x 120.
6-7. *Triloculina plicata* TERQUEM. External views; İstaasyon 26, x 100.
8-9. *Triloculina schreiberiana* d'ORBIGNY. External views; Station 28, x 130.
10-11. *Wellmanellinella striata* (SIDEBOTTOM). External views; Station 29, x 80.
12-13. *Sigmoilinita costata* (SCHLUMBERGER). External views; Station 25; 12, x 150; 13, x 160.
14-16. *Articulina carinata* WIESNER. External views; Station 25; l4, x 170; 15, x 140; 16, x 110.
17-18. *Laevipeneroplis karreri* (WIESNER). External views; Station 26, x 120.
19-20. *Peneroplis pertusus* (FORSKAL). External views; Station 3, x 120.
21. *Peneroplis planatus* (FICHTEL and MOLL). External view; Station 3, x 120.

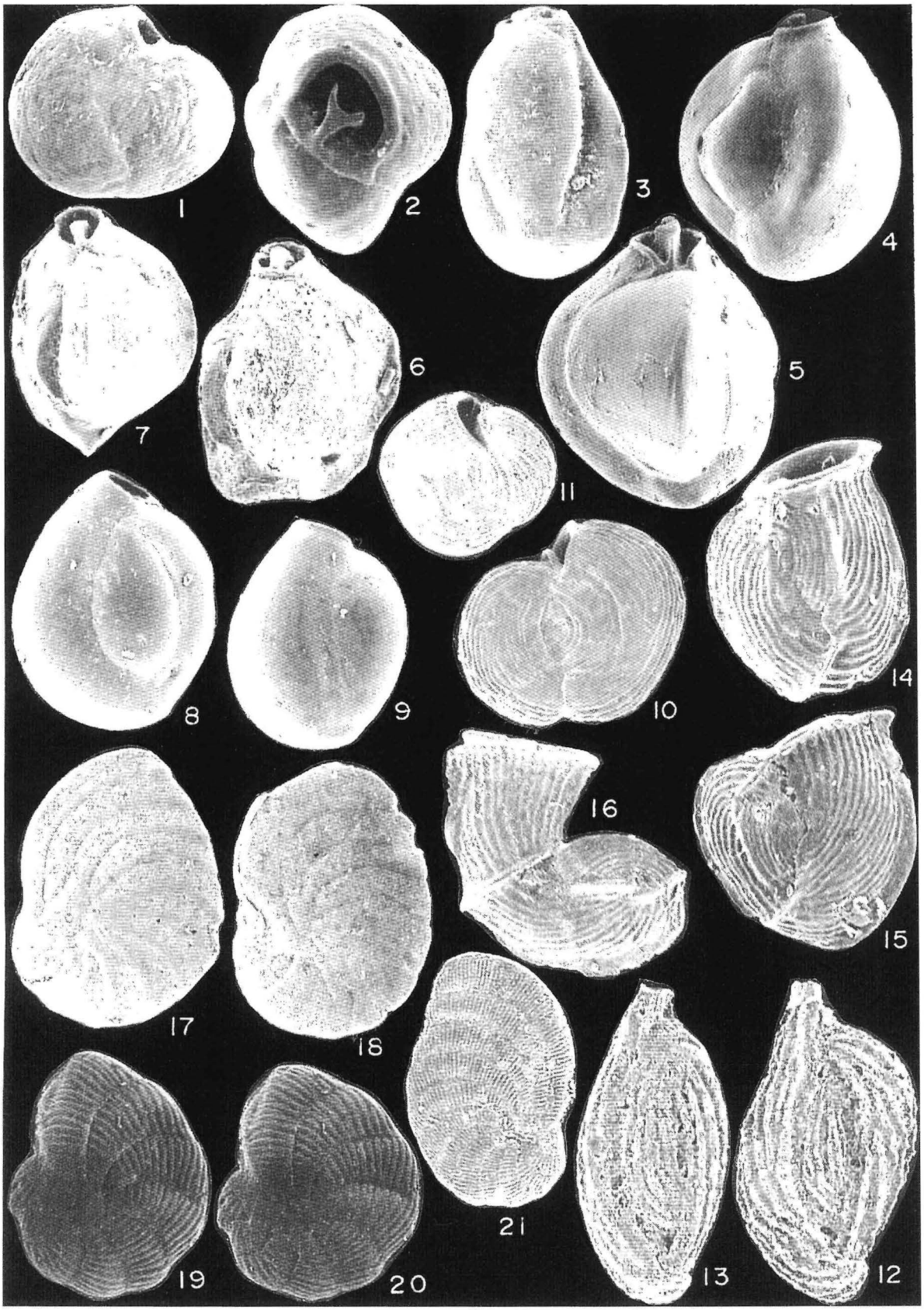
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PLATE 5

1-2. *Reussella spinulosa* (REUSS). External views; Station 29; 1, x 170; 2, x 200.
3. *Stomatorbina concentrica* (PARKER and JONES). External view, spiral side; Station 17, x 85.
4-5. *Neoeponides bradyi* (Le CALVEZ). External views; 4, spiral side; 5, umbilical side, Station 32, x 120.
6-7 *Neoconorbina terquemi* (RZEHAK). External views; 6, spiral side; 7, umbilical side, Station 32; x 120.
8-9. *Rosalina bradyi* CUSHMAN. External views; 8, spiral side; 9, umbilical side, Station 32 x 80.
10-11. *Rosalina floridenesis* (CUSHMAN). External views; 10, spiral side; 11, umbilical side, Station 32; x 80.
12. *Rosalina globulosa* d'ORBIGNY. External view, spiral side; Station 30, x 190.
13-15. *Trethomphalus bulloides* (d'ORBIGNY). External views; 13, spiral side; 14 and
15, edge views; Station 21; x 200.
16-17. *Conorbella imperatoria* (d'ORBIGNY). External views; 16, spiral side; 17, umbilical side, Station 29; x 160.
18-19. *Discorbinella bertheloti* (d'ORBIGNY). External views; 18, spiral side; 19, umbilical side, Station 32; x 110.

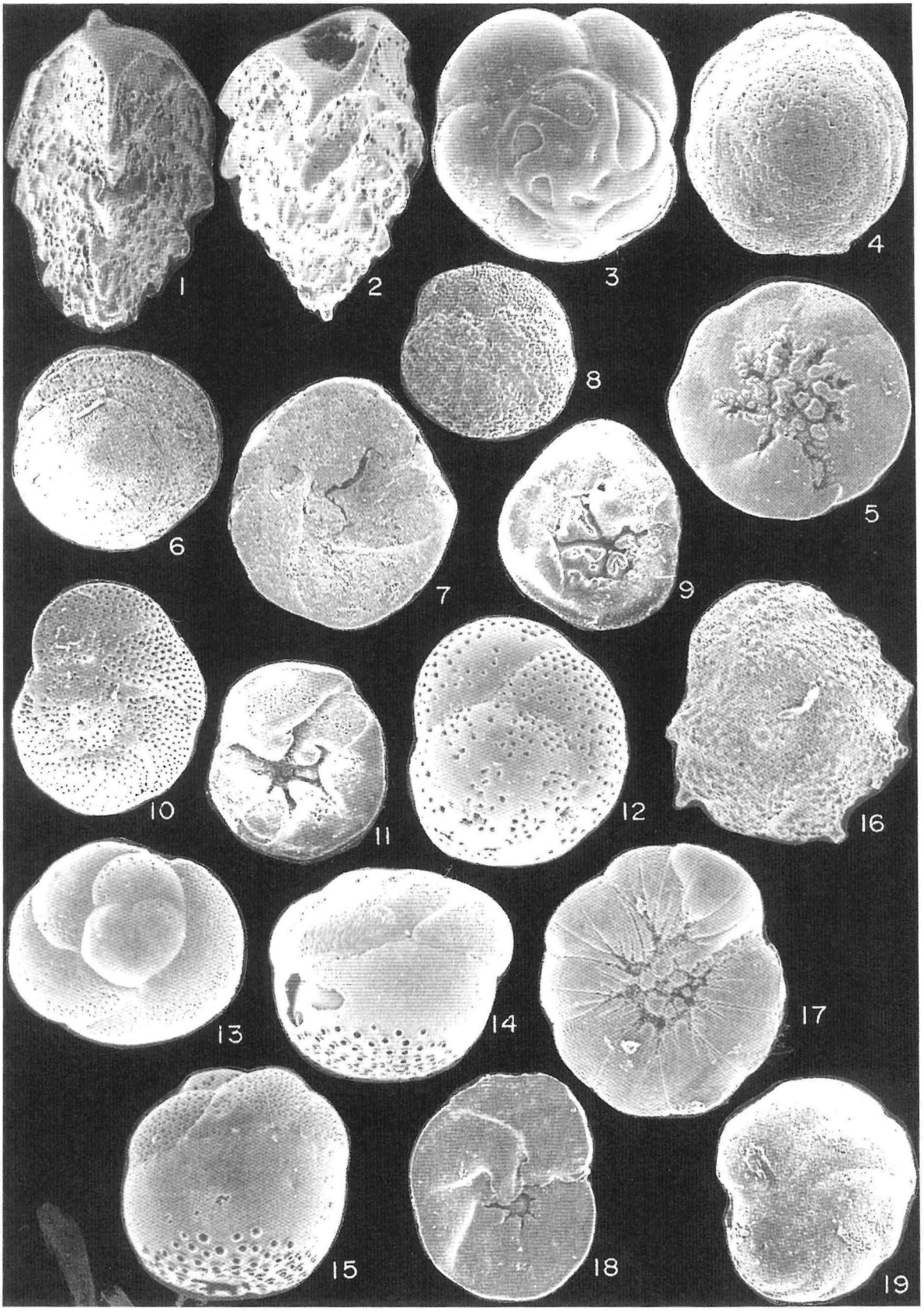
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PLATE 6

1-2. *Cibicides advenum* (d'ORBIGNY). External views; 1, spiral side; 2, umbilical side, Station 32, x 135.
3-4. *Lobatula lobatula* (WALKER and JACOB). External views; 3, spiral side; 4, umbilical side, Station 32, x 70.
5-6. *Cyclocibicides vermiculatus* (d'ORBIGNY). External views; Station 255, x 50; 6, x 43.
7-9. *Planorbulina mediterranesis* d'ORBIGNY. External views; 7, Unattached side; Station 32, x 80; 8, Unattached side and 9, Attached side; x 105.
10-12. *Cibicidella variabilis* (d'ORBIGNY). External views; Station 25; 10, spiral side, x 50, 11, umbilical side, x 60; 12, detail view of the apertures, x 150.
13-14. *Asterigerinata mamilla* (WILLIAMSON). External views; Station 32; 13, spiral side and 14, umbilical side, x 150.
15-16. *Amphistegina lobifera* LARSEN. External views; Station 32, x 45.

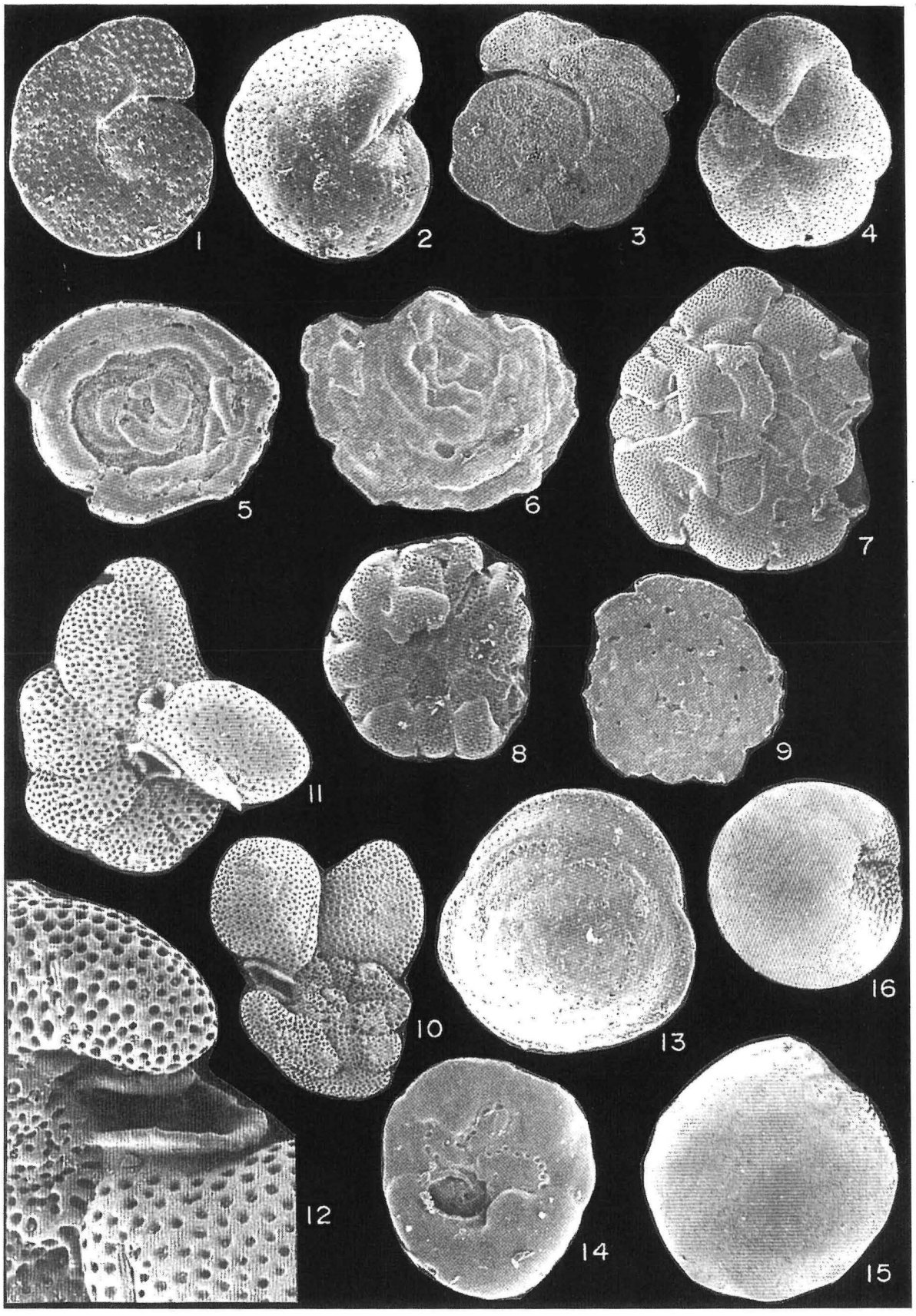
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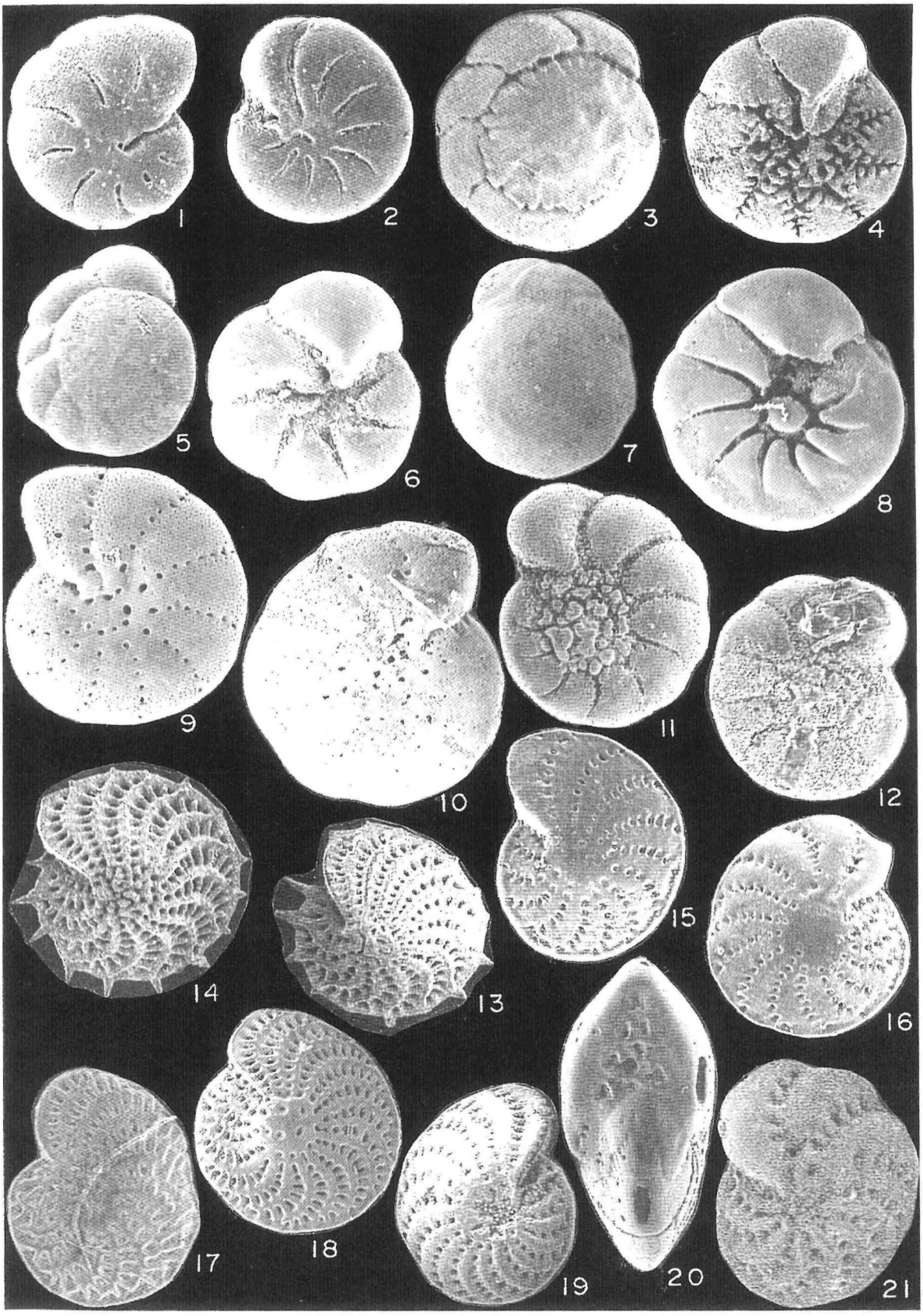
PLATE 7

1-2. *Astrononion stelligerum* (d'ORBIGNY). External views; Station 32, x 120.
3-4. *Ammonia compacta* HOFKER. External views, 3, spiral side; 4, umbilical side, Station 25, x 70.
5-6. *Ammonia tepida* CUSHMAN. External views; Station 28; 5, spiral side, x 100; 6, umbilical side,, x 140.
7-8. *Ammonia parkinsoniana* (d'ORBIGNY). External views; Station 29; 7, spiral side, x 100; 8, umbilical side,, x 110.
9-10. *Cribroelphidium poeyanum* (d'ORBIGNY). External views, Station 16, x 180.
11-12. *Porosononion subgranosum* (EGGER). External views; Station 16; 11, x 95; 12, x 120.
13-14. *Elphidium aculeatum* (d'ORBIGNY). External views, Station 4, x 80.
15-16. *Elphidium advenum* (CUSHMAN). External views; Station 32, x 95.
17. *Elphidium complanatum* (d'ORBIGNY). External view; Station 28, x 90.
18. *Elphidium crispum* (LINNÉ). External view; Station 32, x 70.
19-20. *Elphidium depressulum* CUSHMAN. External views; Station 3; 19, overview, x 95; 20, edge view and aperture, x 130.
21. *Elphidium* cf. *pulvereum* TODD. External view; Station 28, x 130.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