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Foraminiferal faunas in cores offshore from the Mississippi Delta*

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Summary—Study of Foraminifera from fifteen cores shows presence of cold-water faunas interpreted as representing glacial stages and/or substages, and of warm-water faunas interpreted as post-glacial and interglacial stages and/or substages. These sequences are similar to those previously reported from the northwestern Gulf of Mexico.

The amount of post-glacial deposition is greater on the lower continental shelf and upper continental slope than on the lower slope and basin. Variations in amount of post-glacial sedimentation within these topographic provinces are demonstrated.

Two cores located in the bottom of Mississippi Canyon contain faunas and sediments which have been displaced downslope, presumably by turbidity currents. It is suggested that the turbidity current was confined to Mississippi Canyon, and that submarine canyons generally tend to localize many turbidity currents.

INTRODUCTION

Members of the Woods Hole Oceanographic Institution have pioneered in studies of the offshore sediments in the northern Gulf of Mexico. Extensive collections of surface sediments and longer cores were taken along 2,500 miles of traverses in the northwestern Gulf of Mexico in 1947, using the research vessel *Atlantis*. The physical parameters of these sediments were reported and interpreted by Stetson (1953), chemical studies of the materials are discussed by Trask (1953), and the foraminiferal faunas are described and interpreted by Phleger (1951) and Phleger and Parker (1951). In 1951 Stetson made extensive collections aboard the *Atlantis* in the northeastern area, from the Mississippi Delta to Florida, collecting surface sediment samples and long cores along several hundred miles of traverses. The foraminiferal facies in the surface sediments along these traverses have been interpreted by Parker (1954), and study of the sediments is being undertaken by Stetson.

The present paper is a study of the vertical sequences of foraminiferal faunas in fifteen of these cores in a traverse extending southward from the Mississippi Delta. The purposes of this study are:

(1) To discover whether there is a vertical sequence of cold- and warm-water faunas as reported from the western Gulf of Mexico and elsewhere;

(2) To attempt to discover relative rates of deposition off a large delta;

(3) To evaluate the role of turbidity currents in deposition in the area covered by the cores.

The cores were studied at the suggestion of Henry C. Stetson of the Woods Hole Oceanographic Institution, who furnished them to the writer. The assistance of Jean F. Peirson in this study is gratefully acknowledged. Dr. Rufus J. LeBlanc, of the Shell Development Company, kindly arranged to have several of the cores sampled. The laboratory work was supported by the Office of Naval Research (Project NR 081–050, Contract Nonr–233, Task 1).

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LOCATIONS OF STATIONS AND DESCRIPTION OF THE AREA

The cores were collected along a traverse (Table I, Fig. 1) extending from the deep Gulf of Mexico basin at 3,017 m to the lower continental shelf at 88 m. The near-shore, shallow end of the traverse is only a short distance off Southwest Pass, one of the main distributaries of the Mississippi Delta.

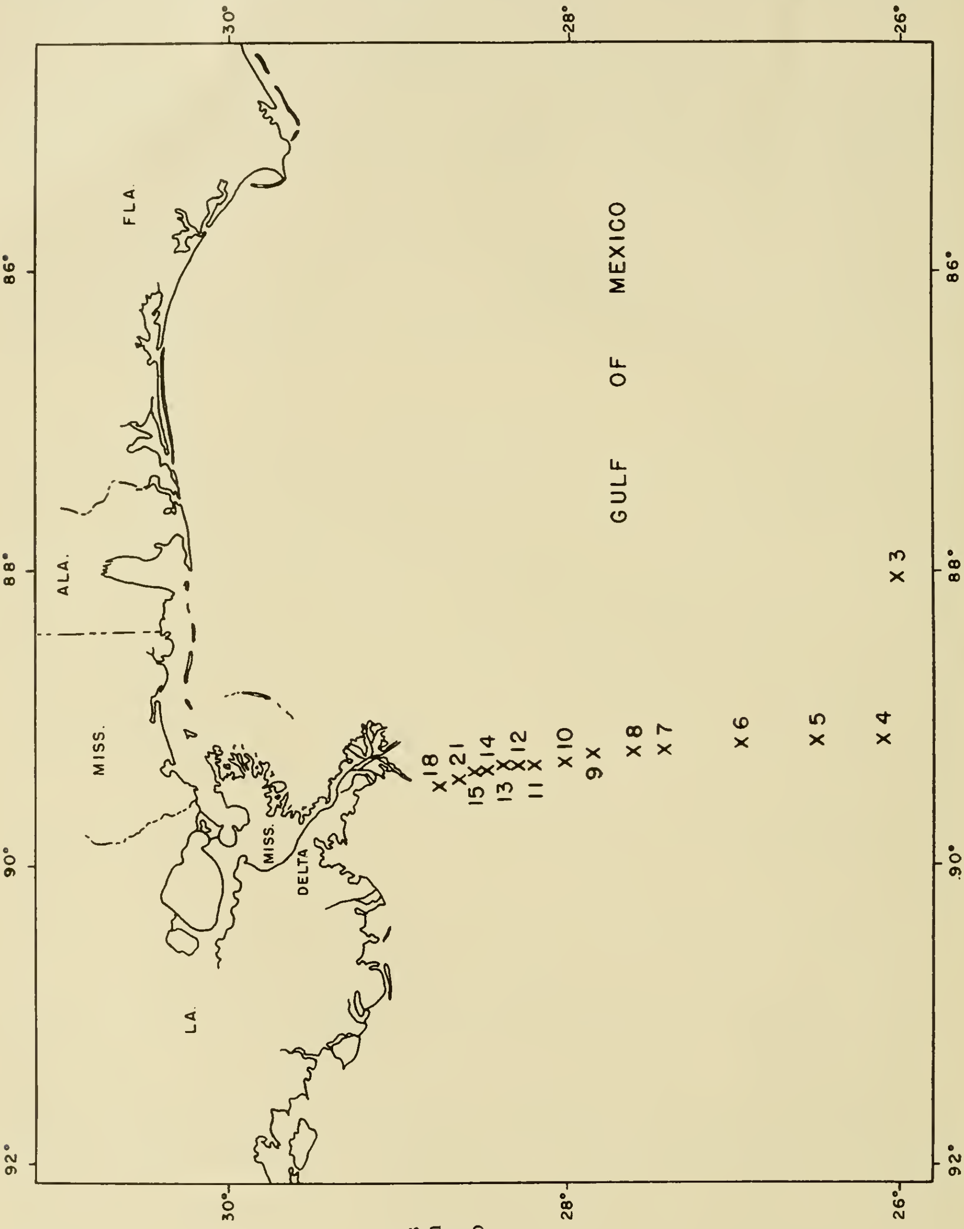

Fig. 1. Locations of cores in the Gulf of Mexico off the Mississippi River.

Table I—Locations and depths of cores

Core	*Depth in m*	*N. Lat.*	*W. Long.*
3	3017	26 01′	88 03′
4	2972	26 07′	89 09′
5	2788	26 31′	89 09·5′
6	2468	26 58·5′	89 12′
7	1875	27 26′	89 14′
8	1417	27 37·5′	89 14·5′
9	1372	27 51′	89 15′
10	1298	28 01·5′	89 19′
11	914	28 12′	89 20′
12	732	28 18′	89 20′
13	631	28 23·5′	89 20′
14	471	28 29′	89 22′
15	298	28 33·5′	89 22′
21	142	28 39′	89 25′
18	88	28 45·5′	89 27′

The topographic charts of the northwestern Gulf of Mexico, constructed by Gealy (1955), end at the approximate position of the Mississippi Delta, and all of the present core stations are off her chart except cores 7–12 (Fig. 2). Core 18 was taken at a depth of 88 m on the lower part of the narrow continental shelf. Most of the other cores came from the continental slope, except those at the outer end of the traverse which are in or on the edge of the Gulf of Mexico basin. The continental slope in this area appears to be quite rugged, and is cut by the Mississippi Canyon. The Sigsbee Deep Scarp described by Gealy may not be present in the area traversed by the cores.

This is an area of high runoff from the Mississippi River and is presumed to have a rather high rate of sedimentation. It has been shown by Scruton (MS.) that the highest sedimentation rate is close to the delta distributaries and decreases rapidly offshore. There appears to be rather rapid sedimentation for approximately 60 miles offshore, according to analyses by Phleger (MS.). It seems likely that sedimentation is more rapid farther offshore in this area than in any other part of the northern Gulf of Mexico.

The physical oceanography of the area is not well-known. Offshore surface temperatures vary from a mean minimum of 20° C in February to a mean maximum of 29° C in August, according to Fuglister (1947). It thus has the surface-water temperatures of North Atlantic mid-latitudes in winter and of low latitudes in summer. A considerable amount of low-latitude water enters the Strait of Yucatan, and while much or most of this flows out the Florida Strait, its effect may be pronounced in the area of the outer part of the present traverse. Offshore salinities in the Gulf of Mexico are approximately $36^{\circ}/_{\circ\circ}$. A near-shore wedge of lower-salinity water is expected in this high runoff area. Parr (1935) shows salinities of approximately $24^{\circ}/_{\circ\circ}$ in the upper 50 m a few miles to the east of the present traverse.

METHOD OF STUDY

The cores were collected with a coring tube described by Hvorslev and Stetson (1946). The samples used in the present study were one-fourth of each core cut into sections approximately 5 cm in length, so that the entire core was sampled. Each sample was trimmed of approximately 1/8 inch of sediment to prevent contamination between samples and was washed free of fine sediment over a brass sieve having an average opening of 0·074 mm.

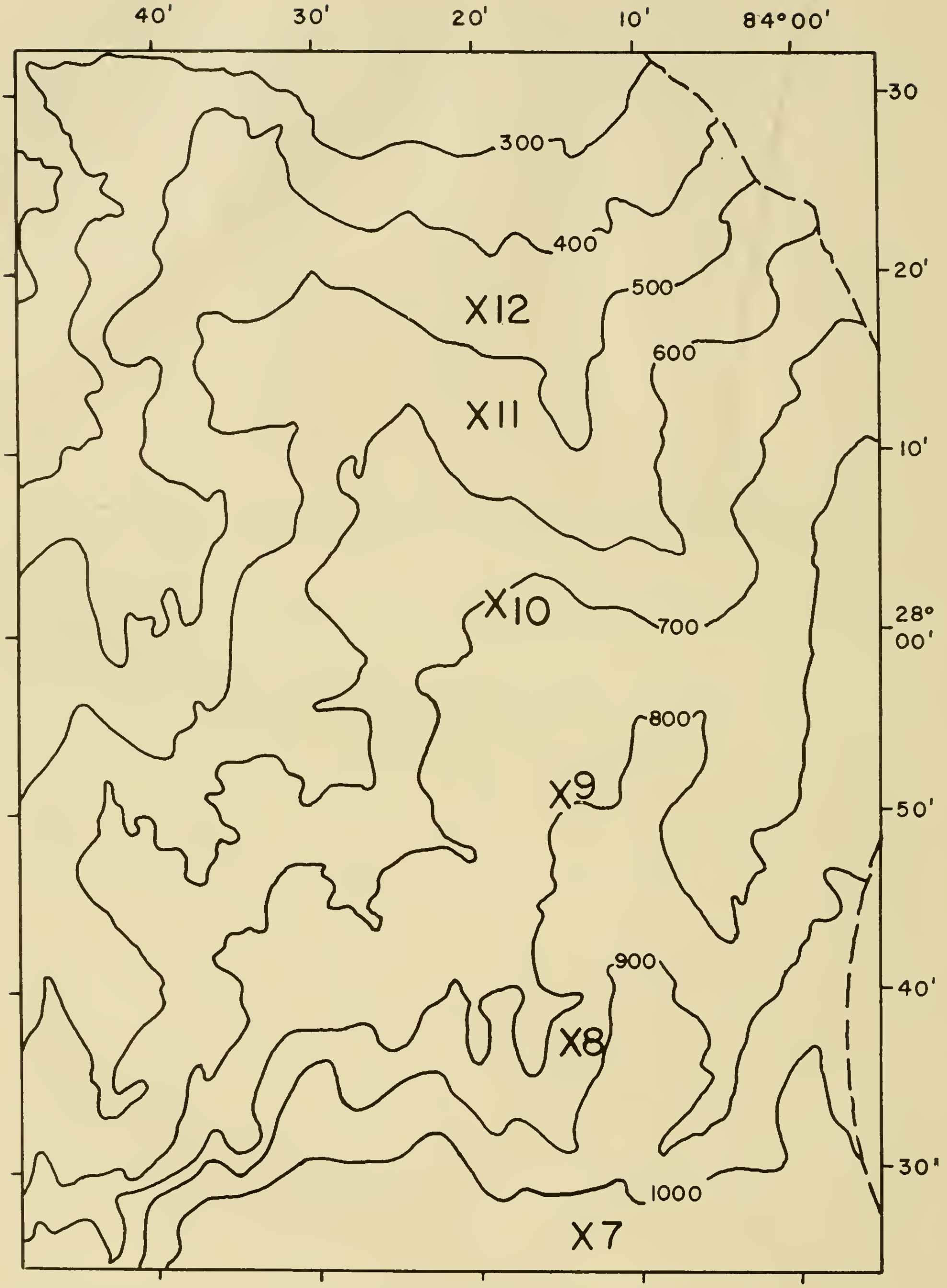

Fig. 2. Locations of cores 7–12 in relation to topography. Topography modified after Gealy (1955). Depths in fathoms

The foraminiferal faunas were analyzed quantitatively. Only a fraction of the population was counted in samples having very large populations; quartering was done by a method described previously (PHLEGER, 1951, 7). Occurrences of species are listed in percent of the total; benthonic and

Table II—Occurrences of Foraminifera in cores 3–6, in percent of total population. Planktonic and benthonic populations computed separately

CORE	6																		
DEPTH IN METERS	2468																		
DEPTH IN CORE IN CM. FROM TOP	TOP	4-8.5	12.5-17.5	20-25.5	27.7-32.5	32.5-37.5	42-47	54-59	75-80	90-95	98.5-104	110-115	131-136	148-153	170-175	178-183	190-195	202.5-207.5	207.5-213.5
TOTAL PLANKTONIC POPULATION	52,000	98,000					140,000		1,700		16,000	2,800	510		90		12		
Globigerina bulloides	4	.8					1		.2		10	4	2		8		8		
G. digitata																			
G. eggeri	7	12					12		14		9	9	14		2		8		
G inflata																			
G pachyderma													.4						
Globigerinella aequilateralis	5	4					4		1		2	.6	.4		1				
Globigerinita glutinata	3	1					3		2		6	3	8		6				
Globigerinoides conglobata	.5	.3					.5		.7		.6	.8							
G. rubra	45	23					23		29		51	43	55		49		43		
G sacculifera	17	31					40		31		5	27	4		26		25		
Globorotalia hirsuta																			
G menardii	5	8					3		5		.3	3					8		
G punctulata	1	4					1		1		7	3	3		2		8		
G scitula	1										.9		1						
G truncatulinoides	3	4					1		3			3	8		2				
G tumida	1	3					1		2			.3	.4		1				
Orbulina universa	3	3					7		6		2	.6	3						
Pulleniatina obliquiloculata	3	5					3		4		6	2	.8		3				
Sphaeroidinella dehiscens	.1	.5					.3		.2			.3							
TOTAL BENTHONIC POPULATION	550	1,000	1,700	1,700	2,500	1,800	1,100	56		17	530		76	210		14		7	5
Amphistegina (juvenile)																			
Angulogerina bella																			
Bolivina alata					.6	.9													
B albatrossi				.5		.4		2											
B lowmani		.8		.5	1	2	2				.2								
B paula		.8					2												
B pulchella primitiva	.4				.6														
B striatula spinata								2											
B subaenariensis mexicana	.4					.4							1						
B subspinescens	.4				.3		.8				1								
Bulimina spicata			.2	.5				4		6									
B striata mexicana	1	.8	1	.9	.6						.2								
Buliminella cf bassendorfensis				.5															
Cancris oblonga																			
Cassidulina subglobosa	6	5	4	5	2		2						1	.5					
Cassidulinoides tenuis	.4				1	.4							3			7			
Cibicides kullenbergi		1	1	1	3	2	2				2								
C robertsonianus	4	[illegible]	7	3	3	4	2	2		6	7			.5					
C wuellerstorfi	18	12	18	13	10	12	13	11		6	2		4	13		7		14	[illegible]
Eggerella bradyi	1	.4	1	.5	2	1	2			6	2								
Elphidium spp																			
Epistominella decorata	4	4	2	2	1	4	3	4		11	19		1	.5					
E exigua	.4	.4	.2								.8								
Eponides polius	3	1	2	.5		.4					1			.5					
E tumidulus	.4	.8	1							19	.9		1	3					
E turgidus	4	2	3	1	2	.9	2	4			13		7	27					
Globobulimina affinis & vars	5	12	8	11	1	15	15	9		6	18		48	44		7			
Gyroidina neosoldanii			2	.9	.6	.9					1								
G orbicularis	3		.5	.5	1	1					1			.5					
Haplophragmoides bradyi	3		2																
Haglundina elegans	4	14	14	[illegible]	28	25	14	8		11	10			1					
Karreriella bradyi																			
Lagenidae	6	8	5	6	7	7	4	4		6	2		5	1					
Miliolidae	.4	2	.2	2	[illegible]	2	.8												
Nonion pompilioides	2	1	2	3	3	2	2	2			2		3	.5					
Nonionella atlantica																			
N opima							2												
Plectina apicularis	.7																		
Pseudoeponides umbonatus	3	3	3	3	3	3	3	2		11	1		8	2					
Pullenia spp	9	3	5	2	2	5	7	8			3			1					
Pyrgo murrhina		.4	.5	.9	.6	.9	.8				3		3	1					
Quinqueloculina sp		.8		.5	1	.9	.8	2			.9								
Robulus spp			.2			.4	.8				.2		1						
"Rotalia" beccarii vars			.2			.4													
"R" translucens			.2				2							.5					
Sigmoilina distorta																			
S schlumbergeri	.4	2	1	2	.3	1		2			2			.5				29	
Siphonina bradyana																			
S pulchra																			
Siphotextularia rolshauseni																			
Triloculina tricarinata					.6		2												
Uvigerina peregrina	4	8	3	2	3	2	9			6	1		1	.5					
Valvulineria mexicana	2	1	.7		2	2		4			3		8	2					
Virgulina advena		.4		.9															
V complanata	.4				.3						.6		4						
V mexicana																			
V pontoni								2											
Laticarinina pauperata	3	1	2	.5	3	1	.8	2			.6								
Other species	11	5	8	5	2	2	5	6		6	3		1						

CORE	5						
DEPTH IN METERS	2788						
DEPTH IN CORE IN CM. FROM TOP	TOP	8.5-14.5	44-49	71-76	109-114	134-139	167-172
TOTAL PLANKTONIC POPULATION	14,000	70,000	45,000	1,300	2,700	51,000	2,700
Globigerina bulloides	5	2	5	1	.9	4	.9
G. digitata	.2						
G. eggeri	5	7	9	12	11	11	11
G inflata							
G pachyderma							
Globigerinella aequilateralis	5	2	4	3	2	4	4
Globigerinita glutinata	12	17	15	11	8	24	17
Globigerinoides conglobata	.1	.4	.3	.3	.3		
G. rubra	46	36	27	34	37	32	44
G sacculifera	7	9	16	22	20	9	7
Globorotalia hirsuta							
G menardii	3	8	8	4	5	3	
G punctulata	.5	.7	1			2	5
G scitula	7		.3			.6	1
G truncatulinoides	2	4	3	2	2	2	2
G tumida	.2	4	3	2	1	2	2
Orbulina universa	1	7	3	3	9	3	3
Pulleniatina obliquiloculata	2	2	4	4	3	3	4
Sphaeroidinella dehiscens			7	.6	.3		
TOTAL BENTHONIC POPULATION	700	1,100	1,000	240	100	1,500	360
Amphistegina (juvenile)							
Angulogerina bella							
Bolivina alata		.7	.8		1	4	.3
B albatrossi							.3
B lowmani	2	3	5	6	2	2	.8
B paula			2		1	1	
B pulchella primitiva	.6					.5	
B striatula spinata			.4	.4			
B subaenariensis mexicana		.4	.8			.5	
B subspinescens	1	1	1		1	2	.3
Bulimina spicata							
B striata mexicana	.6						.3
Buliminella cf bassendorfensis			.4	.4	1	.3	.5
Cancris oblonga							
Cassidulina subglobosa	4	4	.4	.8	2	2	2
Cassidulinoides tenuis		.4	.8				.5
Cibicides kullenbergi			1			.3	
C robertsonianus	3	4	3	.4	1	3	.5
C wuellerstorfi	3	5	12	2	8	10	7
Eggerella bradyi		2	.4		1		.3
Elphidium spp		.7					
Epistominella decorata	20	9	8	2		14	11
E exigua		1	.8			.3	1
Eponides polius	8	6	2	.4		.8	
E tumidulus	3	5	2	.8		2	.8
E turgidus	12	8	7	9	18	9	14
Globobulimina affinis & vars	1	4	4	50	5	9	36
Gyroidina neosoldanii		.4	.4			.3	
G orbicularis	1	2					.3
Haplophragmoides bradyi		2					
Haglundina elegans	.6	4	13	6	31	4	6
Karreriella bradyi							
Lagenidae	10	11	12	9	15	12	4
Miliolidae	1		.4	2		.5	1
Nonion pompilioides	.6	2	5	.8	3	2	3
Nonionella atlantica			.4				
N opima							
Plectina apicularis							
Pseudoeponides umbonatus	1	2	.4	4		2	3
Pullenia spp	4	7	2	1	1	3	2
Pyrgo murrhina							1
Quinqueloculina sp	.6		.8			1	.5
Robulus spp							
"Rotalia" beccarii vars							
"R" translucens						.3	
Sigmoilina distorta							
S schlumbergeri		.7		.8		.3	.3
Siphonina bradyana				.4			
S pulchra							
Siphotextularia rolshauseni			.4	.4		1	.5
Triloculina tricarinata	1		4	1		2	
Uvigerina peregrina		1				.3	
Valvulineria mexicana	2	1	2	.4		4	1
Virgulina advena	.6	2				.5	
V complanata	6	2	.8	.8	3	1	1
V mexicana	.6						
V pontoni			.4				
Laticarinina pauperata	.6	.4	.4				
Other species	15	1	7	4	6	5	2

CORE	4														
DEPTH IN METERS	2972														
DEPTH IN CORE IN CM. FROM TOP	TOP	0-5	5-15.5	23.5-28.5	31.5-36.5	47.5-52.5	57.5-62.5	82-87	110-115	120-125	148-153	160-165	165-170	170-175	181.5-186.5
TOTAL PLANKTONIC POPULATION	27,000	8,900		48,000		5,000	3,600	990	250						37
Globigerina bulloides	8					.8	1	2	.4						
G. digitata	1														
G. eggeri	10	7		12		11	7	4	20		X	X	X	X	8
G inflata		.3													
G pachyderma						.6	.3	.4	.4						
Globigerinella aequilateralis	5	3		1		.8	3	4	2						3
Globigerinita glutinata	9	10		10		10	8	3	6						
Globigerinoides conglobata	1	.3		.7			2	.4	.8						
G. rubra	36	37		41		55	56	38	41		X	X	X	X	62
G sacculifera	9	16		18			8	38	10		X	X	X	X	8
Globorotalia hirsuta															
G menardii	4	4		4					.8		X	X			
G punctulata	.2	.6				2	7	.8	7		X	X	X	X	8
G scitula	4			.2			.3								
G truncatulinoides	2	7		2		.6	1	2	8		X	X			8
G tumida	2	6		2		3									3
Orbulina universa	5	4		5		4	4	.8	3		X	X			
Pulleniatina obliquiloculata	3	5		4		2	2	6	.4			X			
Sphaeroidinella dehiscens	.2					.6	.3								
TOTAL BENTHONIC POPULATION	510		570	1,000	600	400	140	150		220	40				23
Amphistegina (juvenile)															
Angulogerina bella															
Bolivina alata	.8				.3										
B albatrossi					.3										
B lowmani	.4		1	1	1	.2									
B paula	.4		1	.8	.3										
B pulchella primitiva	.4			.4											
B striatula spinata															
B subaenariensis mexicana				.4	1										
B subspinescens	1			.8											
Bulimina spicata															
B striata mexicana										.3					
Buliminella cf bassendorfensis					.3										
Cancris oblonga															
Cassidulina subglobosa	3		2	3	.7	.5	.7	.7		.5	2				
Cassidulinoides tenuis															
Cibicides kullenbergi	.4		.7	.8		.2									
C robertsonianus	6		3	2	1	1	.7	1							
C wuellerstorfi	20		24	18	24	21	21	5		10	20				4
Eggerella bradyi	1		.7	.8	.3	2	3			.5					
Elphidium spp			3	.4											
Epistominella decorata	8		8	4	10	2	6	.7		.5	2				
E exigua			.3												
Eponides polius	4		9		4	.2									
E tumidulus	6		5	9	3	3	1	4		2					
E turgidus	4		9	9	18	33	36	24		7	7				4
Globobulimina affinis & vars			10	3	.7	12	5	50		5	35				9
Gyroidina neosoldanii			.3	.4		.2	1	.7		.5					
G orbicularis				.8	1	.5									
Haplophragmoides bradyi	2														
Haglundina elegans	2		4	6	1	2		1							
Karreriella bradyi															
Lagenidae	2		7	7	6	2	4	2		3					
Miliolidae	.8		1	1	.3										
Nonion pompilioides	2		3	4	4	2	1	3		.5					
Nonionella atlantica															
N opima															
Plectina apicularis	3			1											
Pseudoeponides umbonatus	.4		2	.8	2	5	9			3					
Pullenia spp	2		2	5	3	2	3	.7		.5					
Pyrgo murrhina			.3	2		.5	.7	2							
Quinqueloculina sp					.3		3								
Robulus spp				.4											
"Rotalia" beccarii vars															
"R" translucens	.8														
Sigmoilina distorta															
S schlumbergeri			.7	2	2	1	.7								4
Siphonina bradyana															
S pulchra															
Siphotextularia rolshauseni	1					.5	.7								
Triloculina tricarinata	.4														
Uvigerina peregrina	1					.2									
Valvulineria mexicana				.8	2	.5				13	13				4
Virgulina advena	.4		.7		.7	2	1								
V complanata	.4		.3		.3	2	.7	1		1					13
V mexicana															
V pontoni															
Laticarinina pauperata				.4		.5									
Other species			4	8	3		2	2		1					

CORE	3										
DEPTH IN METERS	3017										
DEPTH IN CORE IN CM. FROM TOP	TOP	5-10.5	10.5-15.5	31.5-38.5	38.5-43.5	57-62	76-81.5	85-90	102.5-107.5	130.5-135.5	167-172
TOTAL PLANKTONIC POPULATION	63,000	56,000		68,000		32,000	3,000	1,400	2,100	960	
Globigerina bulloides	3	2		2		5	7	10	5	9	R
G. digitata	.1										
G. eggeri	6	7		8		10	11	11	9	10	
G inflata						.2		.3		.9	
G pachyderma						.4	4	1		4	
Globigerinella aequilateralis	4	6		5		2	6	6	3	1	
Globigerinita glutinata	13	5		4		12	8	7	13	8	A
Globigerinoides conglobata	.2	.9		.4			.9	1	.7	2	
G. rubra	42	42		40		38	44	34	[illegible]	43	A
G sacculifera	9	15		26		16	7	9	.7	6	A
Globorotalia hirsuta		.2				.2	.2	1	.4	.3	
G menardii	4	6		4		1			1		[illegible]
G punctulata	.1	.3		.2		3	3	8	.7	4	
G scitula	3	.6		.2		1		2		.3	
G truncatulinoides	2	2		.8		2	1		1	7	R
G tumida	.3	2		3		3	.2		.6		R
Orbulina universa	1	6		3		4	6	3	4	4	
Pulleniatina obliquiloculata	1	2		3		2	1	5	3	.9	
Sphaeroidinella dehiscens											
TOTAL BENTHONIC POPULATION	1,200		1,600	600	310	650	210		170	170	22
Amphistegina (juvenile)			.5		.6				.6		
Angulogerina bella				.7							
Bolivina alata	.3			.7							
B albatrossi											
B lowmani	4		2	12	3	1	.5		1		
B paula	1		1	.7	1	.6					
B pulchella primitiva	2		.5		1						
B striatula spinata											
B subaenariensis mexicana			.5	.7							
B subspinescens	1		.5	.7							
Bulimina spicata											
B striata mexicana	.3										
Buliminella cf bassendorfensis	.7					.3					
Cancris oblonga				.7							
Cassidulina subglobosa	2		2	5	5	2	1		.6	.6	10
Cassidulinoides tenuis	.5		.5			.3					
Cibicides kullenbergi				1							
C robertsonianus	.7			.7	.6	.9	.5		.6		
C wuellerstorfi	13		20	16	23	21	21		5	24	35
Eggerella bradyi	.3		.5	1	1	.3	1		2	.6	
Elphidium spp					.6	.6			1		
Epistominella decorata	21		20	9	4	14	3		5	2	5
E exigua	1					1					
Eponides polius	6		4	1	.6		1		.6		
E tumidulus	3		2	13	7	9	2			5	9
E turgidus	6		7		4	15	31			15	9
Globobulimina affinis & vars			2		.6	4	11		5		5
Gyroidina neosoldanii			.5		3	.9	1		1		
G orbicularis											
Haplophragmoides bradyi	2		.5	.7							
Haglundina elegans	3		8		9	5			2		
Karreriella bradyi											
Lagenidae			7	7	11	4			4		
Miliolidae	6				1	1	2			1	
Nonion pompilioides	1		2	7	7	6	1		2	4	
Nonionella atlantica	.7					.3					
N opima											
Plectina apicularis	1										
Pseudoeponides umbonatus	1		2	.7	.6	2	7				
Pullenia spp	.6		4	3	4	2	2		5	3	
Pyrgo murrhina	3		1		2	.9	2		6	.6	
Quinqueloculina sp					.6	.9					
Robulus spp										.6	
"Rotalia" beccarii vars											5
"R" translucens	3		1				.5				
Sigmoilina distorta									.6		
S schlumbergeri	1		1	.7	.6	3			1		
Siphonina bradyana											
S pulchra	.3										
Siphotextularia rolshauseni	1		.5				.5				
Triloculina tricarinata	.7		5	.7	.6	.6					
Uvigerina peregrina											
Valvulineria mexicana	.7				.6				8	4	2
Virgulina advena			.6				.5		1		
V complanata	1		.5			.6	5		1	2	
V mexicana	.7			1		.3					
V pontoni											
Laticarinina pauperata	.3		.5			.3			1		
Other species	6		7	6	5		5		5	2	

Table III—Occurrences of Foraminifera in cores 7–11, in percent of total population. Planktonic and benthonic populations computed separately

CORE	11								10						9									8										7							
DEPTH IN METERS	914								1298						1372									1417										1875							
DEPTH IN CORE IN CM. FROM TOP	TOP	5-105	62-675	133-1385	170-1755	190-195	203-209	2215-227	TOP	2.5-7	235-285	565-615	105-110	144-155	TOP	3-8	95-145	145-195	36-41	545-595	735-785	119-124	158-163	TOP	9-14	35-40	55-60	84-89	89-94	1035-1085	1115-1155	1155-1195	1385-144	TOP	0-5	115-17	15.5-25.5	30-35	52-57	95-100	120-125
TOTAL PLANKTONIC POPULATION		3,700	2,700	12,000	9,500	5,200	2,100		1,700	2,300	4,000	900	600		5,300	3,100			6,700		3,200	97	31	7,000	170	180	120	120			2,600			100,000	57,000			28,000	3,400	65	9,200
Globigerina bulloides			4	4	8	4	6		6	2	.4	.9	2		9	1			.5		2	1	13	6		2		.8			2			3	1			4	3	3	5
G eggeri		14	8	19	16	19	11		14	13	14	8	16		10	12			14		11	4	6	18	10	10	8	14			20			8	10			11	9	15	9
G pachyderma							1																																		
Globigerinella aequilateralis			1	2	.7				4	.3	.8		1		6				2		.7		3	3	2	3	.8	2			1			7	2			4	5	6	1
Globigerinita glutinata		3	6	7	5	2	7		3	4	4	6	3		5	3			4		5	10	10	1	.6	3		6			2			2	2			6	6	8	8
Globigerinoides conglobata		.4	.3			.5	.6		2	.3	2	.4				3			2		.2			3	.6									.5				.3			.3
G rubra		33	37	35	45	48	41		25	25	27	39	31		32	27			33		35	51	33	23	29	22	43	35			33			32	41			35	38	24	36
G sacculifera		17	12	13	8	8	8		6	10	14	13	19		5	13			12		12	8	10	6	36	35	25	6			14			15	17			11	20	24	17
Globorotalia menardii		11	8	.6	X	X	X		9	13	13	8	8		3	13			9		11	7	6	9	7	9	3	7			.3			11	8			9	4	2	.3
G punctulata		2	5	4	6	11	10		1	2	.4				.6	2					2	1	3	.7							13			.4	1			1	.3		14
G scitula			.3				.6		2						2						.2													.5							.8
G truncatulinoides		6	8	4	2	4	5		13	11	12	9	7		7	12			9		10	6	3	12	5	5	4	4			3			5	5			7	2	6	3
G tumida		2	1	2	3	.5	4		3	3	3	5	2		2	4			2		1	1		4	.6	1	3				3			2	2			2	.9	5	2
Orbulina universa		.9	.9	3	1	1	2		3	4	.8	3	2		8	2			1		3	7		2	7	5	5	10			3			8	4			5	6	2	2
Pulleniatina obliquiloculata		10	8	5	5	2	4		9	12	9	7	8		10	8			11		7	4	13	12	2	5	7	11			5			4	7			4	5	2	2
Sphaeroidinella dehiscens		.4	.3																								.8	2						.2					.3	3	
TOTAL BENTHONIC POPULATION	160	2,100	1,200	2,800	3,700		3,200	530	320	390	830	280		120	380	460	370	780	860	340	410	30	160	430	82		170	200	170	160	250	400	290	180		200	42		280		
Angulogerina bella																							.6																		
Anomalinoides mexicana			.3	.1	.3		.1				.2	.7			.3		.5	.1	.2									1	.6		.4	.2									
Bolivina alata							.1			4		.4		.9		.7	2	.1		3	17		3	2	50		63	12	17	42	30	33	45				32		46		
B albatrossi	3	12	10	.7	1		1		8	11	10	7		.9	.8	4	8	2	5	5	6	3	1	3	2		1	1	2	7			.3	4		1	2		2		
B barbata														3									4																		
B lowmani		1	2	2	.1		.1		2	2	3	.7		7	1	1	2	2	1	.9	1		2	.2	1					1	.4								.7		
B ordinaria		2	2	7	6		12	5		.5	.7					.2			2	1					1			.5		.6									.4		
B pulchella primitiva														.9																			.3								
B striatula spinata														5		.4				.3	.5		4									.2									
B subaenariensis mexicana		.2					2	.4						2									4	.2	6		.6	1		.6		.2	.7				2		2		
Bulimina aculeata	4	3	1	6	21		16	8	11	15	18	10			13	21	15	10	21	23	16	14	1	2							1	1	1	7		9					
B. alazonensis		6	5	1	2		3		5	4	3	3			1	1	1	2	2	3	2			2					1		2	3				.5					
B. marginata														5									2																		
B spicata		2	2	.9					4	.8	2	3			1	.7	.3	.4	.9	.3	2	3	.6	2				.5						2							
B striata mexicana		.2	.5		2		2	3	.6	2	.4					.7		.8	.5	1				.9	1			4	4		.8	2	.3	.6		1			.7		
Buliminella cf. bassendorfensis										1		2		13		.2				.3	1	7	5										1			.5			.4		
Cassidulina carinata		.6	.3	1	4		20	73						.9		.2	.3		.2		.5	20	20				2	.5		1	1	1	.7				2		1		
C subglobosa		9	4	10	5		5		2	9	11	13			4	5	4	6	5	6	4	3		4	1		.6	1	.6	2	3	7	1	11		3			.4		
Chilostomella oolina		.2		.1			.1		.9	.3						.4					1	7	1				22	.5		4	1	.5	16						.4		
Cibicides aff floridanus	.6	2	5	4	3		.8	.2	4	5	5	5			3	3	2	2	3	3	1	3		4							.4										
C robertsonianus			2	.1			.1		2	.5	1	2			.8	1	2	2	3	.6	1			.2				.5	.6		2	3		5		3					
C. wuellerstorfi		.2	.2	.1	.3				.9	1	2	1			.8	5	4	2	2	4	3			2	1			1	3		2	2	.7	3		7					
Cibicidina strattoni														2																											
Elphidium spp														4									1										.3								
Epistominella decorata									.3						3	1	2	3	1	.6				2	4			1	4	2	8	5	3	18		1			10		
E exigua		4	5	12	11		3	.2	4	2	4	4		2	1	1	3	2	3	2	2	7		.5	2		.6	3	1	6	.8	.2	2	3		.5			1		
E rugosa		2	.8	.9	1		.5					.4					.5	.1		.6	.5																				
E vitrea														27									19																		
Eponides polius		.4	.2	.7						.8	1	1		.9	.3		2	.5	1	.3	1									.6	.8	.2									
E. tumidulus											.8				.3	.9	.3	2	.2		.2								.6					2		1					
E turgidus		8	5	4	2		5		.6	3	5	3			6	7	8	10	21	12	3			.9				1	2	.6	3	1	.7	.6		3	10		5		
Globobulimina affinis & vars	.6	.6	2	.4	.9		.5		3	2	.5	1		2		4	.8	.1	1	2	2				23		2	30	35	11	10	8	2	2		15	34		14		
G mississippiensis																							2																		
Gyroidina orbicularis		3	.8	.6	1		1		2	1	2	4			2	3	4	5	4	2	3			4				2	.6		1	1	.7	5		3					
Haplophragmoides bradyi	7								1	.3					.5	2		2						.9										3		.5					
Hoglundina elegans		.7	.2	.3	.2		.1			.8	.7	.4				3	4	2	1	2	.7										4	2		6		11	5				
Lagenidae		2	2	4	3		.3	1	.3	5	4	9			3	4	4	6	4	3	6	7		.7	2			4	1	4	3	2	3	3		4			3		
Laticarinina pauperata		2	.6	1	1		.3		.9	2	2	2			1	2	2	2	1	2	2			.9							2	3		1		2	2				
Miliolidae		.8	2	.6	.5		.2		2	.9	2	.4		5	1	1	1	1	.4	1	1	3	1	.9					.6	1	2	4	3	1					.4		
Nonionella atlantica																																		.6							
N opima														6							.2		1										.7								
Osangularia cultur	.6	7	13	.7					2	3	2	6			.8	3	1	2	3	2	3			3	1		1	5	4	3	1	2	.3	2		3	2		.7		
Pseudoeponides umbonatus			.5	.1	.3		.1		.3	.5	.2	.4			.5	1	1	.3	.5	.3	.5							3	4	1	.4	.7		.6		1			.4		
Pullenia spp.	.6	2	1	1	1		.2		4	2	3	2			1	3	5	3	4	5	2			.9				2	3	.6	2	1	.3	1		4			.4		
Rectobolivina advena																							.6																		
Robulus spp.		.2			.3				.3		.6			2		.2	1	.5	.9		.2		2	.7				1	2	1	.4	.2	.7	.6		.5					
"Rotalia" beccarii vars.														4									4																		
"R". translucens		1	3	3	13		12	.2	.3	5	1	5			.3	.9	2	.6	.2	2	3	3	.6							1				.6							
Uvigerina parvula														3									8																		
U. peregrina	1	14	21	22	10		5	.2	6	7	8	5			6	8	8	4	5	4	6			15	2			17	8	5	5	6	3	5		15	.2		6		
Virgulina mexicana					.1		.5	7								.2					3	20	3				2	.5	1		.4	.7	6						.4		
V pontoni														2									2																		
V. tessellata		.2	.6		.1		.3		3	.5	.4	.7				.2	.3		.2	.3	.2																				
Other species	82	3	8	16	10		9	2	29	8	6	8		2	48	10	9	24	4	10	4		8	47	3		5	7	4	5	12	10	7	12		10	7		5		

Table IV—Occurrences of Foraminifera in cores 12–15, 18 and 21, in percent of total population. Planktonic and benthonic populations computed separately

CORE	18						21						15								14						13						12							
DEPTH IN METERS	88						142						298								471						631						732							
DEPTH IN CORE IN CM. FROM TOP	TOP	4-9	45-50	99-104	124-129	162-168	TOP	15-20	44-49.5	74.5-80.5	120-125	192-198.5	TOP	13-19	42-47	55-60	86-91.5	117-122.5	163.5-170	192-197	TOP	4.5-10	48.5-53.5	90-95	124-129.5	180-185	TOP	7.5-13	45-50	86-91	134-139	174-180	TOP	15-20	67-72	85-90	109-114	153-155	170-175	200-205
TOTAL PLANKTONIC POPULATION	3	6	18	8	1	10	0	97	300	140	280	12,000	300	1,700	2,300	24,000	900	170	23		2	9,200	270	16,000	26,000	19,000	7	150	200	850	1,100	5,000	75	250	500	500	2,200	2,500	3,600	1,500
Globigerina bulloides	67							8	4	6	1	1	3	4	3	4	3	3	13			6	3	6	6	16		.7	2	5	4	7	4	5	7	3	1	6	2	7
G eggeri			22	12				14	15	13	11	10	27	10	12	12	12	12	4			11	15	11	12	11		13	7	7	14	9	30	14	11	9	13	14	17	20
G pachyderma																										2														2
Globigerinella aequilateralis						10		1	2			2	.4	1		1	.4	2				1	3	.6	.6	.8		1	.5	1	.7	2		.4	.4	.4	.7		1	.6
Globigerinita glutinata			11		100			6	3	2	7	6	5	2	3	1	3	1				2	2		8	7		5	3	1	4	6	3	.8	2	3	3	3	.9	2
Globigerinoides conglobata								3		2	.7	.6	.7	2		1	.9					.3	2	2	3	.8		1	.5	2	.4	1		1	.8	.4	.4		.4	
G rubra	33	50	27	40		20		44	28	43	35	42	12	38	42	51	40	54	62		100	44	28	39	37	48		27	30	34	29	38		36	35	30	28	41	38	32
G sacculifera		33	6	12		10		4	10	8	12	6	4	16	13	13	18	16	13			8	5	9	17	3		9	12	11	7	10		6	4	10	11	14	21	9
Globorotalia hirsuta													.4	3	2	3	.7	2												.4										
G menardii		17		12				1	7	3	14	10	13	3	2	4	5	3				6	9	8	6		14	11	12	16	12	9		5	3	11	14	4	5	.3
G punctulata								1	.7				.7		.7	1	.4	.6				.7	.7	.6	.3	5	14	3				.3	3	.4			5		.2	10
G scitula																									.3	2														
G truncatulinoides			22			30		9	8	3	4	7	12	10	11	3	6	3				10	11	7	4	.5	29	15	18	9	9	7	43	9	7	8	8	4	4	4
G tumida									3	2	1	1	6	6	4	1	1	1				3	4	2	1			.7	4	3	7	3	4	3	6		5	5	2	6
Orbulina universa			6	12				3	5	5	3	3	1		.4	.7	2		4			2	7	3	1	3		1	1	.7	4	.6	3	3	5	7	2	3	2	1
Pulleniatina obliquiloculata			6	12		30		6	14	13	11	11	14	5	7	4	8	2	4			6	10	12	3	1	43	12	10	10	13	6	20	14	19	17	9	6	6	6
Sphaeroidinella dehiscens																							.4		.6					.4						.4			.2	.3
TOTAL BENTHONIC POPULATION	250	1,200	2,800	1,400	1,100	950	120	4,600	3,900	5,600	4,200	15,000	800	3,500	2,800		1,300	1,300	1,300	1,100	36	5,200	1,800	6,700	6,400	10,000	250	750	800	1,400	1,900	3,400	410	1,000	1,000		1,300			7,100
Ammoscalaria pseudospiralis	.4	3	.6	2	1	2	8																																	
Bolivina albatrossi									.4	.6		1	9	11	14		12	2				6	2	4	9	11	3	5	4	7	7	8	6	5	10		10			1
B barbata		13	3	3	3	3		15	12	15	8	.9	1	2	.9		.6	4	2	6								.5												
B lowmani	.4	.3	.3	.3	.4			1	2	8	2	1	.7	1	2		.6	.5		.4			.9	.5	1	.3		2	.5	.6	1	2	1	.8	.4		.9			
B ordinaria								2	1	3	3	3	3	3	5		4	1	2	.7		13	14	8	9	11	11	10	6	13	18	15	7	3	4		10			14
B striatula spinata		4	2		.4	2		.3		.3												.6																		
B subaenariensis mexicana		1	.9	.6	1	2		40	21	15	13	6	.7	11	5		9	13	13	9		.6		1	1	5				1		.5		.2	.8		.3			
B subspinescens									.8		.4	3	1	1	.3				.3			.6			1	3	.4		1	1	.8	.9	1	.4	.2		.6			.6
Bulimina aculeata																						.6					14	5	2	.6			2	4	.4		.5			12
B alazanensis																						3	.9	2				3	1	4	3	4		4	5		9			3
B marginata		15	8	4	9	5		20	15	6	8	12	13	3	4		10	23	22	31		.6		2	2	1														
B spicata													1											1	.3	.3	4						.7	1	1		1			.1
B striata mexicana									1	.3	.4	.4	12	5	4		2	1	1	.7		3	6	4	.5	.3	13	4	5	4	2	2	5	6	3		1			.7
Buliminella cf bossendorfensis		32	17	30	22	34			.2	3																		1												
Cassidulina carinata								.2	1					3	3		3	1		.7		4	30	10	5	2		17	49	6	3	2		13	2		.9			9
C curvata								.5	2	3	2	2	2	2	2		3	.5	2			7		2	1	2	.4				.4									
C neocarinata								.5	1	4	6	6	.7	3	4		2	1	2				3	1	2	2	.8	.5			.4		.2							1
C subglobosa			.6					.3	.4	3	3	1		3	1		.9	.3	1	.4		2	.4	5	1	1		8	3	6	9	8	.2	4	8		11			17
Cibicides aff floridanus		.3						2	15	9	16	9	4	11	9		11	3				.6	3	2	1	2	4	2	1	3	3	4	3	5	8		5			2
Elphidium spp		.3											.7				.3																							
Epistominella exigua														.2								1		1			7	7	4	12	15	19	4	5	5		6			2
E rugosa														.2			.3						.4	2	3	5						.9		2	1		.9			.5
E vitrea	.4	16	31	30	42	23		.3	.4	3	1								.3			.6																		
Eponides regularis								6	8	6	6	1	2	4	.9		7	37	34	36		.6	.9	1	.7	1	2													.1
E turgidus																						2		.5			4	3	2	6	2	.9	.5	.6	5		3			8
Globobulimina affinis											3	.4	.2														.4	.5			2		2	1	1		1			.2
G mississippiensis		.7	.3	1	2	.4		2	1										.3																					
Gyroidina orbicularis													.2				.3					.6	2			.3					2	.5		.4	2		2			.6
Gyroidinoides altiformis									.6		.8			.5	.9		.3	2	2			.6	.9	.5	.5	2			.5	.6	.4	.9		.2	.4		.2			1
Goesella mississippiensis	3						53														3																			
Lagenidae		.2	.3					1	1		2	2	2	1	.9		.9		2	2		2	1	1	2	2	.4	2	2	1	1	3	1	1	1		1			1
Miliolidae			1	.6		.9		.4	1	2	1	1													2	.9		.5			.8	.5		.2						.2
Nonionella atlantica		.7		.3																							.4													
N. opima			.3	.3	.4			1	1		.4		.2				.6																							
Osangularia cultur																											.4	2		4	2		5	6	6		3			
Planulina ariminensis															.3							1		3	3	.3						2		.2			.3			.6
P foveolata									1	.6	3	3	.2	.5	2		2	.6				1																		
Pullenia spp									.6		1	.4	.7	1	.9		1	.2				3	1	2	1	.6	.4	2		.6	1	1		.2	.4		.3			.8
Rectobolivina dimorpha																								.5								.5								
Robulus spp		4	.6	.8	.4			.3	1	1	3	3	3	3	4		3	.6					1	1	1	.9			.5	.6					.2		.3			.3
"Rotalia" translucens													.2	3	4		2	5	11	7		14	17	14	21	27		6	4	10	8	7		10	11					12
Rotamorphina laevigata								.2				2														.6	.4	1			2	.9	.2	1	.8		1			1
Sigmoilina distorta								.7	.8	.3	.8	2		.2										.5	.3															
Siphonina pulchra									.2	.3		3					.3							1	1															
Sphaeroidina bulloides								.2	1	.6	1	2	8	4	3		2	.3	.9	1		6	4	5	7	3	8	2	2	3	5	2	8	6	4		5			.8
Textularia earlandi	61						.9														11						2						9							
Trifarina bradyi																						.6		1	.7						.4				.6		.2			.2
Uvigerina laevis								.7	2	3	3	9			.3		.6		.9					.5		.9														
U parvula		6	33	27	18	26		2	4	3	8	7		.9			12	2	.3																					
U peregrina													16	18	25		5	.3				17	1	14	11	7	6	7	7	8	5	6	12	12	13		16			4
Valvulineria mexicana		.3	.3					.2	.2	.9	1	.4	4	.9	.6			.3	.6	.4		.6	2				2		1				.2	.2	.4					
Virgulina mexicana														.5	.3									.5			.4	.5	.5	.6	.8	.5		.2	.2		.2			
V tessellata																									.3							.9	2		.2					.3
Other species	35	3	1			2	38	3	3	8	3	19	13	3	3		4	1	3	5	86	8	9	9	12	8	16	9	4	8	5	7	30	7	5		8			6

planktonic forms are treated as separate populations, with each constituting 100%. Total populations are estimated for each sample, since they all contained approximately the same amount of sediment, with a few exceptions. Results of the faunal analyses are on Tables II–IV. Only the more common and/or important species are included in these lists; detailed analyses are on file at the Marine Foraminifera Laboratory.

Detailed faunal analyses were made on only a few samples from each core, but each sample was examined to ascertain whether or not there was a faunal change. Faunas in surface sediment samples from the stations along this traverse, collected with a small coring tube, have been analyzed by PARKER (1954). Population data from some of these samples are included for comparative purposes, since the top sample from a long core may not represent the actual surface sediment due to methods of collecting and processing.

The following should be consulted for illustrations, descriptions, and additional distributions of the species listed in the present report: PHLEGER and PARKER (1951), PARKER (1954), PHLEGER, PARKER and PEIRSON (1953), and PHLEGER (1954).

CORE FAUNAS

In a previous study of core faunas from the northwestern Gulf of Mexico (PHLEGER, 1951) it was possible to differentiate an " upper " and " lower " core fauna based on the assemblages of planktonic Foraminifera. The upper planktonic fauna is the modern one and has the following general composition:

30–70%
- *Globigerinoides rubra* (d'Orbigny)

10–20%
- *Globigerina bulloides* d'Orbigny
- *G. eggeri* Rhumbler
- *Globorotalia truncatulinoides* (d'Orbigny)
- *Pulleniatina obliquiloculata* (Parker and Jones)

5–10%
- *Globigerinoides sacculifera* (H. B. Brady)
- *Globorotalia menardii* (d'Orbigny)

<1–5%
- *Globigerinella aequilateralis* (H. B. Brady)
- *Globigerinoides conglobata* (H. B. Brady)
- *Globorotalia tumida* (H. B. Brady)
- *Orbulina universa* d'Orbigny

The planktonic fauna which is widespread in lower sections of most northwestern Gulf of Mexico cores differs in having many or all of the following species absent or lower in frequency:

- *Globigerina eggeri* Rhumbler
- *Globigerinella aequilateralis* (H. B. Brady)
- *Globigerinoides conglobata* (H. B. Brady)
- *Globorotalia menardii* (d'Orbigny)
- *G. truncatulinoides* (d'Orbigny)
- *G. tumida* (H. B. Brady)
- *Orbulina universa* d'Orbigny
- *Pulleniatina obliquiloculata* (Parker and Jones)

In addition, the following occur in the lower fauna:

Globigerina inflata d'Orbigny
G. pachyderma (Ehrenberg)
Globorotalia punctulata (d'Orbigny)
G. scitula (H. B. Brady)

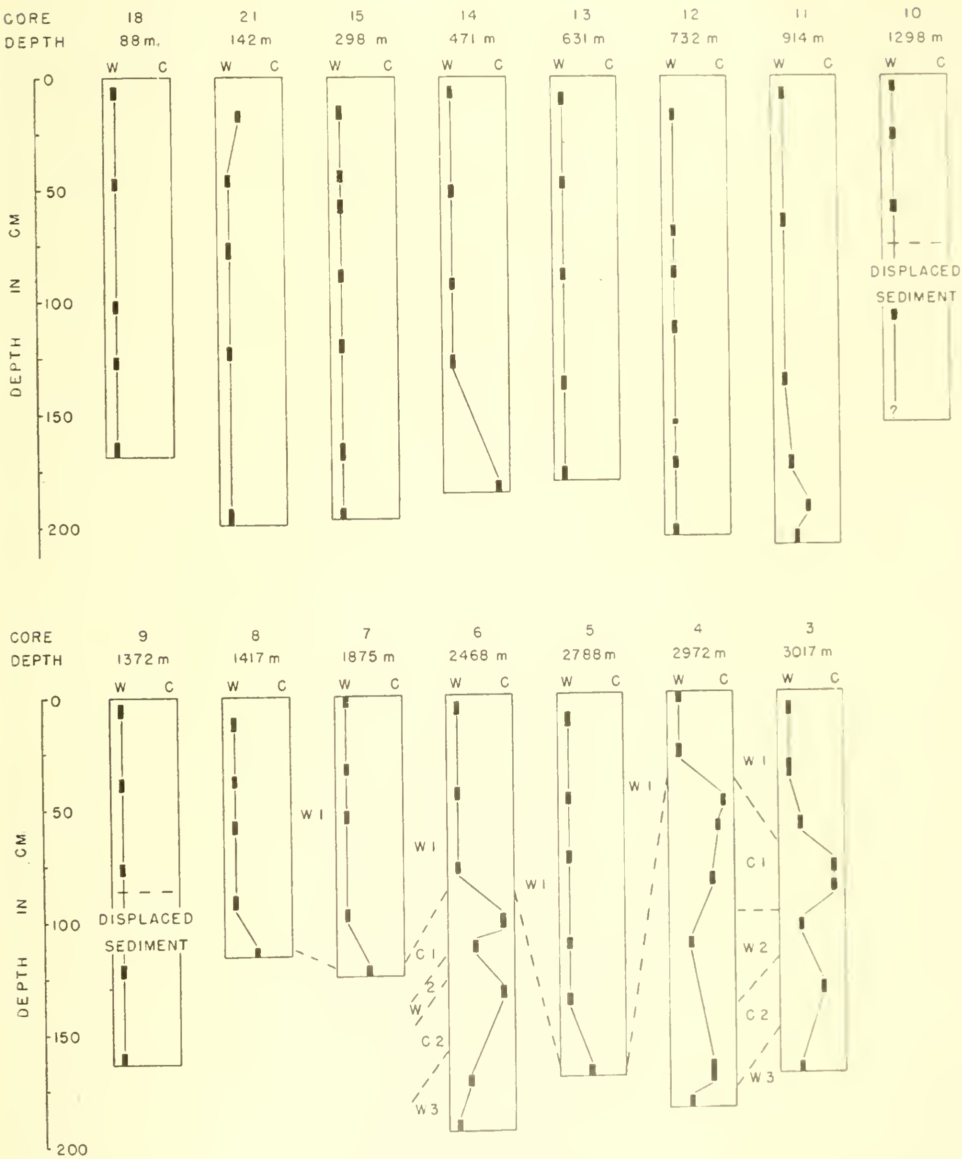

Fig. 3. Relative temperatures indicated by Foraminifera in the cores. W, relatively warm surface water. C, relatively cold surface water

The present cores contain " upper " and " lower " faunas which are comparable in species composition to those previously reported, with the following exceptions: in the upper, modern assemblage *Globigerinoides sacculifera* generally is more abundant especially in the area farthest off shore, *Globorotalia truncatulinoides* may be less abundant, and *Globigerina eggeri* may be more abundant; in the lower fauna, *G. inflata* and *G. pachyderma* are less common, being recorded in very low frequencies from only occasional samples.

The " upper " planktonic core fauna contains the modern assemblage and is assumed to represent conditions similar to those obtaining today, and may be considered to represent relatively warm surface water. The " lower " fauna contains fewer North Atlantic low-latitude planktonic specimens and consequently more mid-latitude forms, and is considered to represent a time of cooler surface water. Interpretation of these distributions may be clarified by examination of the data and discussion in PHLEGER *et al.* (1953) on distributions of North Atlantic planktonic Foraminifera.

Lower, colder-water faunas were present in eight of the fifteen cores examined. The interpretations of the faunas are summarized in Fig. 3, and the faunas on which these interpretations are based are listed in Tables II–IV. Cores 3, 4 and 6 contain two cold-water faunas separated by a warm-water fauna and their lower sections contain an additional warm-water fauna. Cores 5, 7, 8, 11 and 14 contain a cold-water fauna in their lowermost sections. The other cores contain the modern Gulf of Mexico planktonic fauna throughout their entire lengths. Core 18, on the lower continental shelf at a depth of 88 m, contains few planktonic specimens.

The benthonic Foraminifera in most of the core samples are normal for the water depths at which the cores were collected (see PHLEGER, 1951, Figs. 22–25; PARKER, 1954, Figs. 3–9). Striking exceptions occur in cores 9 and 10. In core 9, from 1372 m depth, the bottom sample at 158–163 cm contains the following shallow-water (continental shelf) species in significant frequencies:

Angulogerina bella Phleger and Parker
Bolivina barbata Phleger and Parker
B. striatula spinata Cushman
Bulimina marginata d'Orbigny
Buliminella cf. *bassendorfensis* Cushman and Parker
Elphidium spp.
Globobulimina mississippiensis F. L. Parker
Nonionella opima Cushman
Rectobolivina advena (Cushman)
" *Rotalia* " *beccarii* (Linné) variants
Virgulina pontoni Cushman

A few of these species occur in lower frequencies from 145–158 cm, and single specimens of *Bolivina striatula spinata*, *Buliminella* cf. *bassendorfensis* and *Liebusella* sp. occur at 3–8 cm in the core. Most of the benthonic Foraminifera in this core are normal for the depth at which the core was collected. Quartz grains of fine sand size and wood fibres which are coloured dark brown occur from 85 cm to the bottom of the core.

In core 10 from a depth of 1,298 m the following shallow-water species are important constituents of the bottom core section at 144–155 cm:

Bolivina pulchella primitiva Cushman
B. striatula spinata Cushman
Bulimina marginata d'Orbigny
Buliminella cf. *bassendorfensis* Cushman and Parker
Cibicidina strattoni (Applin)
Elphidium spp.
Nonionella opima Cushman
" *Rotalia* " *beccarii* (Linné) variants
Virgulina pontoni Cushman

A few specimens of *Buliminella* cf. *bassendorfensis* also occur at 56·5–61·5 cm and 2·5–7 cm. Plant fibres and fine quartz sand occur in the samples from 75 cm to 155 cm. The major part of the benthonic fauna consists of species normal for the depth of the core.

Twenty-six specimens of *Gümbelina* are recorded from the lowermost section of core 10.

Occasional shallow-water benthonic Foraminifera are recorded from the following additional deep-water cores of this series: 3, 4, 5, 6, 7, 8, 13 and 14. These are single specimens and no sample contains more than four specimens, while many contain none. No other evidence of displacement of sediment was observed.

DISCUSSION

Interpretations of the core planktonic Foraminifera in terms of " warm " (like the present) and " cold " (colder than present) surface water temperatures are given on Fig. 3. In this figure, " W 1 " refers to the modern warm-water fauna, " C 1 " to the last cold-water fauna, " W 2 " to the preceding warm-water fauna, etc. It is suggested that these stages can be correlated in the present cores, as shown on Fig. 3, especially where a succession of such faunal variations occurs and where there is no indication of displaced sediment. This is especially striking in comparing cores 3, 4 and 6. These cores came from the same relatively small area and from similar depths in the eastern Gulf of Mexico basin. Each of them has three warm-water faunas separated by two cold-water ones, and these occur within approximately the same thickness of sediment.

It is suggested that these warm and cold faunas also are to be correlated with similar successions described previously from northwestern Gulf of Mexico cores (PHLEGER, 1951, Figs. 29–33). The cold-water faunas have been interpreted elsewhere as representing Pleistocene glacial stages and/or substages and the warm-water faunas are thus possible interglacial stages and/or substages. The widespread occurrence of a cold-water fauna beneath the modern fauna in this region suggests a general cooling of Gulf of Mexico surface water during the last glacial or stadial stage.

Correlation of the planktonic faunas makes it possible to estimate the amount of post-glacial sedimentation along this traverse. This is based on the assumption that the upper, warm-water fauna represents post-glacial deposition. The amounts of deposition appear to be approximately as follows:

Core	*Water depth in m*	*Estimated post-glacial deposition in cm*
3	3017	65
4	2972	40
5	2788	170
6	2468	90
7	1875	120
8	1417	115
9	1372	>150
10	1298	>150
11	914	>210
12	732	>205
13	631	>180
14	471	155
15	298	>195
21	142	>195
18	88	>165

Some useful generalizations may be made from these data. The amount of post-glacial deposition is smallest away from the major source of supply, the Mississippi River, and near the centre of the basin; there is a general increase in amount of deposition closer to the source, as expected. In all but one core shoaler than 1,400 m the coring tube did not penetrate through post-glacial sediment. There is considerable local variation in the amount of post-glacial deposition. For example, in core 5 in the basin there is two to four times as much post-glacial deposition as in nearby cores from similar depths. Core 14 on the upper part of the continental slope has considerably less post-glacial sedimentation than nearby cores at similar depths and position. The amount of post-glacial deposition in the cores from the basin and lower continental slope in the present cores is comparable to that shown in cores from the basin and lower slope reported previously from the northwestern area (see PHLEGER, 1951, Figs. 29–33). The amount of such deposition on the upper slope appears to be larger than in the western area, although there are exceptions.

Cores 9 and 10 contain sediments and faunas in their lower sections which appear to have been displaced downslope from shoaler depths, presumably in the form of turbidity currents. The presence of abundant sand, wood fibres and abundant shallow-water benthonic Foraminifera at water depths of 1,298 m and 1,372 m appears to be conclusive evidence for such displacement. Most of the benthonic Foraminifera are species normal for the depth at which the core was taken; this demonstrates that the displaced material was deposited at the present water depths at those stations. The age of the displacement is post-glacial (W 1), as shown on Fig. 3.

Cores 9 and 10 occur in the bottom of Mississippi Canyon (Fig. 2). Other cores in this traverse do not have displaced sediment, at least in significant amounts, and these are located on topography other than the canyon floor. This suggests that the turbidity flow was localized in the canyon. Studies by SHEPARD (1951) and LUDWICK (1950) in the San Diego area have shown that displacement of sediment from shallow to deep water appears to be funnelled down the canyons in that area, and it seems probable that much displaced sediment flows down the channels of submarine canyons in other areas of the world. The restriction of displaced sediment to the Mississippi Canyon floor in the present cores is evidence in this connection.

The lower section of core 15, below approximately 165 cm, contains abundant sand grains and plant fibres; this sediment contains no benthonic Foraminifera which are characteristic of water shoaler than that at which the core was collected (298 m). It is possible that this sediment was displaced from shallow water, but the absence of displaced Foraminifera suggests that a turbidity current was not the mechanism of deposition. It appears more likely that this material may be river sediment which was carried offshore (approximately 20 miles) during flood stages of the Mississippi River. Shallow-water Foraminifera would not be expected under these conditions.

It is suggested that the occasional specimens of shallow-water Foraminifera found in cores 3–8 and 13–14 do not indicate the presence of appreciable amounts of displaced sediment in these cores. These specimens may have been deposited by one or more of the following mechanisms:

(1) They may have been carried somewhat beyond the limit of turbidity flows because of slow settling velocity or low effective specific gravity. If the specimens contained protoplasm this mechanism would be aided.
(2) They may have been put in suspension by wave action when they contained protoplasm, and were carried to their present positions by currents. A few specimens of living, shallow-water benthonic Foraminifera have been reported in offshore plankton tows in the northwestern Gulf of Mexico (Phleger, 1951, p. 36).
(3) They may have been deposited by several very small-scale turbidity currents which transported small amounts of sedimentary materials.

The presence of specimens of *Gümbelina* in core 10 is difficult to explain. These may have been carried out by the river and deposited at their present position, or they may possibly be contaminated by a salt plug bringing early Tertiary or Cretaceous sediments to the surface.

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