AN APPLICATION OF FORAMINIFERAL ECOLOGY

Vicinity of Horn Island, Mississippi

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by

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ABSTRACT

Foraminifera were examined in 159 samples cut from 23 piston cores collected in the vicinity of Horn Island, Mississippi. The age of the oldest marine sediment cored is approximately 5000 years. The following data on depositional surface Foraminifera were determined and compared with those data from reports on similar areas: (a) specific composition, (b) percentage of arenaceous Foraminifera, (c) numbers of species, (d) specific dominance, and (e) numbers of specimens. These data show that environments of core samples can be determined by their foraminiferal content and such interpretation utilized to reconstruct the depositional history of an area.

A non-marine clay and sand existed in the area at a time when sea level was lower. As sea level rose, nearshore marine deposition occurred in the present open-gulf area. Alternating brackish and near-marine conditions existed in the present Sound area. A barrier island system, established early in the period of core sediment deposition, offered varying degrees of resistance to the invasion of marine waters. As deposition continued, a "near-delta" influence was impressed upon the area. This influence existed throughout most of the depositional period. At present, a brackish environment exists north of Horn Island and a marine environment occurs south of the island. Mixing of these environments occurs in the passes on each end of Horn Island. The island acts as a barrier to marine water, and brackish water from the Sound now dilutes the open gulf to a greater extent than in the past. The "near-delta" influence is now negligible.

INTRODUCTION

In recent years, many workers have reported statistical foraminiferal data and much has been written which correlates Foraminifera with environment. Application of ecologic principles to fossil assemblages is a logical approach to paleoecology. Foraminifera are increasing in value as additional ecologic data become available. Paleoecology contributes to geology by improving interpretations of paleogeography. Stratigraphic correlation is refined when fossil assemblages can be recognized as specific environmental indicators. A further contribution of paleoecology is that it provides a means of recognizing, in the subsurface, proximity to such features as sand bodies, reefs, and shorelines.

This study is an application of criteria obtained from depositional surface foraminiferal studies to older assemblages. The object of this application is to interpret the depositional environment of each core sample, and to combine these interpretations into a history of the area during core sediment deposition. The older assemblages of this study are geologically recent (approximately 5000 years and less), but environments changed within this period and these changes are indicated by the Foraminifera.

Dr. William R. Walton guided the initial efforts of this study. The samples, laboratory, and library facilities were furnished by Gulf Research and Development Company. The writer gratefully acknowledges the help of Mrs. Helen Hensenne who typed the thesis, and Mr. Paul Fiehler and Miss Theresa Provenzo who drafted the figures and tables. The suggestions of Dr. Raymond E. Peck, Dr. M. G. Mehl and Mr. John Wall, who read the manuscript, are also appreciated.

DESCRIPTION OF THE AREA

The area extending from $30^{\circ}09'$ to $30^{\circ}20'$ N. latitude and $88^{\circ}28'$ to $88^{\circ}48'$ W. longitude includes the eastern one-third of Dog Keys Pass, Horn Island, Horn Island Pass, the western end of Petit Bois Island, and the interval from one-half mile off the Mississippi coast to approximately 5 miles south of Horn Island, Mississippi (Figure 1). The area is approximately 220 square miles.

Hydrography

Horn Island, one of a series of sand islands extending from Mobile Point to the St. Bernard subdelta, is an effective barrier to the invasion of marine water into Mississippi Sound. The Pascagoula River drains into the northern part of the area. The principal environments in the area are Mississippi Sound, Horn Island, the two passes, and the open gulf. The maximum water depth sampled is 44 feet. Comparison of modern charts with those of 1860 indicates very little change in water depths. A few current measurements in the Sound have been recorded (John C. Ludwick, personal communication) and these currents were negligible. This suggests very little transportation of sediment in the Sound. Currents are considerably stronger in the passes and sediment is transported in this area.

Air temperatures, measured in September (John C. Ludwick, personal communication), are approximately 28° C. The Mississippi Sound and open-gulf waters are isothermal, and the temperature is approximately 28° C. Salinity, measured in April and May (John C. Ludwick, Personal communication), varies from 24 to 30 parts per thousand in Mississippi Sound. Measurements in September average 26 parts per thousand for bottom waters

in Mississippi Sound and 30 parts per thousand for bottom waters in the open gulf.

Sediment

The dominant sediment in Mississippi Sound is black, fetid mud (C. S. Wimberley, personal communication). Sand is common as discontinuous units but silt is lacking in the Sound. Horn Island is composed of well-sorted, fine to medium-grained quartz sand. A long narrow trough, parallel to Horn Island and immediately north, contains fine-grained mud. Sediment in the open gulf consists of both sand and mud but the amount of mud decreases rapidly offshore.

PREVIOUS STUDIES

Foraminiferal data from this area have been published by Phleger (1954). Additional data from related areas are reported by Parker et al. (1953), Walton (1954), and Phleger (1955). The environmental significance of the common Foraminifera can be determined from these data. Specific distributions are well defined in the above reports. Phleger (1954, p. 603) recognizes a distinct calcareous-arenaceous foraminiferal boundary. In the same report (p. 591), Phleger establishes that numbers of species are larger in the open gulf than in Mississippi Sound. Walton (1956, unpublished data) characterizes the Foraminifera near Horn Island in terms of numbers of species, percentage occurrence of the dominant species, percentage of arenaceous Foraminifera, numbers of specimens, and sharpness of faunal boundaries.

Data from the above reports indicate that, for this area: (a) generic distributions are environmentally controlled; (b) numbers of species and numbers of specimens increase with distance from shore; (c) percentage of arenaceous Foraminifera and specific dominance decreases with distance from shore; and, (d) foraminiferal boundaries become sharper with proximity to shore.

The quantity of data available and the number of environments included in the previous studies, combined with data herein presented, permit rather accurate interpretation of the environments indicated by the core Foraminifera.

METHODS

Twenty-three cores were collected in the vicinity of Horn Island, Mississippi (Figure 2). They were collected in 1955 aboard the GRADCO Pioneer with a piston-type coring device. This device obtains a maximum core of 26 feet. It operates with a system of gears that permits a 4 to 1 recovery of sediment with drop of the weight pan. Aluminum tubes, lining the core barrel, were removed aboard ship and cut into sections approximately 4 feet long.

Sediment in the core sections was extruded in the laboratory by means of a winch and a wooden plunger equipped with a rubber stopper. Some sections had to be milled open when the winch and plunger were unsuccessful. Foraminiferal samples were cut at intervals of approximately 20 inches and each conspicuous lithologic unit was sampled. The samples are uniform in volume, one inch in length and one-half the core diameter in width. Sediment from the exterior of each sample was removed to avoid contamination. The resulting volume of each sample is approximately 23 cc. A total of 159 samples were washed over a 230 mesh screen, examined wet for fecal, vegetative and chitinous matter, and allowed to dry. The Foraminifera in the dried samples were concentrated by floating in carbon tetrachloride, and the residue of each sample was examined for non-floating organisms. Samples containing large numbers of specimens were split, prior to concentrating the Foraminifera, with an Otto microsplitter (Otto, 1933) and a minimum of 300 specimens per sample was counted (Dryden, 1931). Species populations were counted in 95 samples (Tables IA,B; IIA,B; III) and Foraminifera in the remainder of the samples were visually estimated.

The estimates consist of counts of numbers of species, estimates of percentage occurrence of each species, and estimates of total numbers of specimens.

Portions of the Mississippi Sound, open gulf, and mixed environments are included in this study. The dominant genus and average value per sample of numbers of species, numbers of specimens, percentages of arenaceous Foraminifera, and percentage occurrence of the dominant species can be determined for each environment (Figure 2). These averages, obtained from core-surface data, are in agreement with data of Phleger (1954) and Walton (1956, unpublished data). Generic dominance can be determined by combining these data (Figure 3).

FORAMINIFERA IN THE SURFACE SEDIMENT

Ammobaculites spp. (chiefly A. salsus Cushman and Bronnimann) and Streblus beccarii (Linné) are, by far, the most common species in the surface sediment of this area. Ammobaculites, essentially restricted to Mississippi Sound, constitutes more than one-half the fauna in the majority of Sound samples. The rapid decrease in percentage occurrence of this genus near areas of open-gulf influence is striking (Figure 4). Streblus beccarii dominates the fauna of the majority of open-gulf and mixed environment samples (Figure 5). Elphidium (Figure 6) commonly is associated with Streblus and occasionally dominates the fauna of samples within the Streblus "zone". Hanzawaia strattoni (Applin) and the Miliolidae are essentially restricted to the open gulf. These forms occasionally dominate the fauna of a few, sparsely populated, beach or nearshore samples (Figure 3). Buliminella spp. (chiefly B. elegantissima (d'Orbigny)) and Nonionella spp. (chiefly N. atlantica Cushman and N. opima Cushman) are not abundant in the surface sediment of this area. These species are abundant within the cores, however, and their surface distribution deserves mention. Buliminella seldom constitutes greater than 5 percent of the fauna landward from a distance of 2 miles south of Horn Island. Nonionella usually comprises less than 15 percent of the fauna in the open gulf and generally less than 2 percent in the Sound and mixed environments.

A distinct arenaceous-calcareous foraminiferal boundary occurs in the area (Figure 4). Ammobaculites constitutes the major element of the Sound arenaceous Foraminifera; therefore, the distribution of this genus

defines the arenaceous-calcareous boundary. The 50 percent contour is indented shoreward in areas of marine influence but extends to the barrier island in the central part of the area. The percentage of arenaceous Foraminifera is markedly decreased in areas of intensive marine influence. In the open gulf, arenaceous Foraminifera usually constitute less than 10 percent of the fauna.

Numbers of species per sample and specific dominance (expressed as the percentage occurrence of the dominant species) are, in general, inversely proportional. In the Sound, samples contain an average of 18 species and the dominant species constitutes an average per sample of 49 percent of the Fauna. The mixed environment surface samples contain intermediate values for these two faunal characters. The average number of species per sample is 36 and the average specific dominance value is 27 percent. In contrast to the Sound, the open-gulf samples contain an average of 43 species and a specific dominance value of 17 percent.

The density of the foraminiferal population can be determined by combining and adjusting data to represent a uniform volume of approximately 23 cc. Data from core surface samples, grab samples, and PBS samples were used. Two areas of large populations occur in the Horn Island vicinity. The area of largest population, greater than 25,000 specimens per sample, occurs at a distance of approximately $1\frac{1}{2}$ miles south of Horn Island. Numbers of specimens decrease rapidly in the direction of the island where, on the beaches or very near shore, there are less than 1000 specimens per sample. The area of large numbers of specimens in the Sound, approximately 5000 specimens per sample, occurs

at a distance of about one mile north of Horn Island. Numbers of specimens per sample decrease shoreward toward Horn Island and the Mississippi coast.

Core surface foraminiferal characters, excluding generic and specific composition, can be plotted as in Figure 7. Each point, representing a core surface sample, is plotted on a number of species - specific dominance scale. The broken lines group the samples. The brackets within each group contain the average values per sample of percentage of arenaceous Foraminifera and number of specimens. The crossmark represents the "average" sample on the number of species - specific dominance scale. Numbers of species and numbers of specimens decrease as Sound conditions are obtained. The percentage of arenaceous Foraminifera and the specific dominance increase as Sound conditions are obtained.

FIGURE 7
CORE SURFACE FAUNAL CHARACTERISTICS

Averages for area

% arenaceous
+ Spp. vs. dominance
Benthonic population

• = SURFACE SAMPLE

FORAMINIFERA IN THE CORES

The twenty-three core locations are distributed so that nine occur in the Sound environment, four occur in the mixed environment, and ten occur in the open gulf. Seventy-six samples were cut from the Sound cores and sixty-six of these samples contained Foraminifera. Of the twenty-eight samples cut from the mixed environment cores, twenty-five contain Foraminifera. Fifty-five open-gulf core samples were examined and fifty were found to contain Foraminifera.

Ammobaculites, Elphidium, Streblus, and Buliminella dominate the Sound cores fauna. Ammobaculites is dominant in more than half the samples. Elphidium is commonly dominant and, in some samples, it co-dominates with Streblus. Buliminella, rare or absent at the surface, dominates the fauna of about 10 percent of the Sound core samples. In the mixed environment cores, Elphidium and Streblus are, by far, the most common genera. Ammobaculites and Trochammina dominate the fauna of a few mixed environment core samples. In the open-gulf cores, in contrast to the Streblus-dominant surface fauna, Buliminella and Elphidium dominate the fauna of more than three-fourths of the samples. Nonionella is dominant in about 10 percent of these samples, and Streblus, Hanzawaia, or Rosalina dominate the fauna of the remaining samples.

In practically all of the Sound core samples, Ammobaculites, Elphidium and Streblus are abundant or very common. Buliminella, Bolivina and Miliolidae are less common, but they are significant at the 20-60 inch level and restricted to it in most samples. In the majority of the mixed environment core samples, Streblus and Elphidium are abundant or very common. Ammobaculites and Trochammina are rather common in the low parts

of these cores. In the open-gulf cores, Elphidium is abundant. Buliminella is consistently abundant within the cores but only in core 7425-H is it abundant at the surface. Streblus is rather common in most of the samples but it is abundant only in the surface and near-surface samples. Rosalina, Nonionella, Hanzawaia, Bolivina, and the Miliolidae are often more common than Streblus.

The surface relationship of arenaceous and calcareous Foraminifera is maintained within the cores. The average percent per sample of arenaceous Foraminifera is largest in the Sound cores, intermediate in the mixed environment cores, and smallest in the open-gulf cores. The percentage of arenaceous Foraminifera in Sound cores is highly variable (Figure 8) and is cyclic in occurrence. Fauna of the Sound core samples contains an average of about 50 percent arenaceous Foraminifera. In the mixed environment cores, the percentage of arenaceous Foraminifera does not vary so consistently (Figures 9, 10). Fauna of the mixed environment core samples contains an average of 16 percent arenaceous Foraminifera. The open-gulf core samples contain an average of 2 percent arenaceous Foraminifera. This sparse, arenaceous fauna is dominated by Bigenerina irregularis Phleger and Parker, typically an open-gulf species.

The surface relationships of numbers of species between Sound, mixed, and open-gulf environments is maintained within the cores. The average value of numbers of species per sample is smallest in the Sound cores, intermediate in the mixed environment cores, and largest in the open-gulf cores. The Sound core samples contain an average of 16 species. Indicative of the rapid rate of change in the nearshore brackish environment, some of the longer Sound cores contain evidence of two complete

FIGURE 8

FAUNAL LOG CORE 7419-H

FIGURE 10
FAUNAL LOG CORE 7408-H

cycles in the number of species character (not well-developed in Figure 8). The mixed environment core samples contain an average of 27 species. Numbers of species generally decrease with depth in these cores. The open-gulf core samples contain an average of 36 species. Numbers of species in these samples are relatively uniform and decrease only in the lower parts of the longer cores (Figure 11).

The surface relationship of specific dominance is maintained within the cores. The Sound core samples contain dominant species which constitute about 34 percent of the fauna. Cyclic occurrences of specific dominance are conspicuous in some of the longer Sound cores (Figure 8). The mixed environment core samples contain average specific dominance values of 28 percent. The open-gulf core samples contain average specific dominance values of 20 percent. A slight increase in this character can be noted at depth within the open-gulf cores.

Values for number of specimens per sample maintain the same relationship within the cores as at the surface. Average values of numbers of specimens per sample are smallest in the Sound cores, intermediate in the mixed environment cores, and largest in the open-gulf cores. Most core samples contain fewer specimens than those samples taken at the depositional interface. Numbers of specimens are cyclic in some of the Sound cores.

In comparing the various faunal characteristics of all the cores, several significant features become apparent. The average values for the faunal characteristics of each group of cores are smaller in most samples, but remain within the ranges established from the surface faunal data. The relationships of faunal characteristics from core group to core group

are the same as at the surface; for example, numbers of species per sample are smaller in the Sound cores than in the open-gulf cores and values of dominance in the Sound cores are larger than in the open-gulf cores. In addition to relationships of faunal characteristics, another feature is emphasized by the core faunal data. The abrupt changes present in the Sound surface characteristics are reflected in the Sound cores. This rapid rate of change emphasizes the relative instability of environments in the Sound. The cyclic occurrences in numbers of species, percentage arenaceous Foraminifera, specific dominance, and numbers of specimens are characteristic of the Sound cores.

The changes in faunal characteristics with depth in the cores can be illustrated with faunal logs (Figures 8-11). The ranges are based on data obtained from surface samples. Four of the five faunal characteristics are applicable to older sediment where recent genera may not exist. The rapid faunal changes characteristic of nearshore, brackish environments can be illustrated with the Sound core faunal log (Figure 8). Large values of dominance and percentage arenaceous Foraminifera, and small values of numbers of species and numbers of specimens are illustrated with this log. In contrast, the relatively uniform environment persisting throughout most of the open-gulf section is illustrated with Figure 11. The dissimilarity in faunal characteristics of Figures 8 and 11 is striking. In Figure 11, numbers of species and numbers of specimens are large while percentage arenaceous Foraminifera and specific dominance are small. Figures 9 and 10 are logs of two mixed environment cores. Intermediate values for most of the faunal characteristics are

illustrated with these logs. In addition, the rate of change in faunal characteristics of these logs is intermediate between that of Figures 8 and 11.

Eighteen of the samples contain few or no Foraminifera. The faunas in these samples are so inconsistent in number of specimens, specific composition, or environmental significance that contamination undoubtedly is responsible. The sediment in most of these barren samples is a stiff, gray, or mottled dark green and reddish-yellow clay. A gray wood-imbedded clay directly overlies this varicolored clay in some cores. Carbon 14 dating of wood from the same horizon near Point Aux Chenes, Mississippi, indicates an age of approximately 5000 years (John C. Ludwick, personal communication).

DISCUSSION

Values for most faunal characters, when averaged for the various cores, are within the ranges of those existing at the surface. The similarity of these values aids in environmental interpretation, but similarity is not necessary. Trends of faunal characters are more applicable than fixed values; for example, increasing specific dominance and percentage of arenaceous Foraminifera combined with decreasing numbers of species and numbers of specimens indicate proximity to nearshore, brackish environs. The combination of the various faunal characters is important. Values for any one character may not be sufficient for accurate interpretation, but complementary indications from several characters increase the accuracy considerably.

Rates of sedimentation and removal are factors which seldom remain constant. These factors, combined with post-depositional destruction of tests, should influence the resultant faunal characteristics. A consideration of the effects of these factors brings to mind several questions. Are marine transporting agents selective to a point of distinguishing between various species? Undoubtedly they are to a certain extent. Large chambered, thin-walled, unfilled specimens will be removed more readily than thick, small chambered or filled specimens of similar size. It is questionable, however, that similar-sized, equally preserved specimens of an area would offer varying resistance to transportation. Another question concerns the strength of the foraminiferal tests. Considerable force may be necessary to destroy a specimen when that specimen is cushioned by water, or by saturated unconsolidated sediment.

Post-depositional destruction of foraminiferal tests does occur. Probably enough difference exists in the strength of various specific tests such that, over a period of time, most specimens of a fragile species will be destroyed while specimens of other more durable species are spared. Little correction can be made for this other than noting the amount of fragmental specimens and considering this in the interpretation. Familiarity with faunal assemblages and specific characteristics enable one to recognize, from fragments, most genera and some species, at least in recent faunas. In consideration of the physical factors acting on the foraminiferal faunas, it becomes necessary to record variations in properties which offer varying degrees of resistance to transportation. The amount of fragmental shell in a sample should also be noted.

If it is assumed that the species are not differentially affected by transportation and sedimentation, then specific dominance will not be appreciably influenced by changes in the rates of these factors. The percentage of arenaceous Foraminifera will not be affected by these changes except in the event that physical action destroys the fragile tests. Numbers of species and numbers of specimens, however, are strongly influenced by variations in these factors. Increased terrigenous deposition decreases the number of specimens by diluting the benthonic population of a given sample. Numbers of species are affected in a similar manner by the masking of "rare" species. Increased transportation indiscriminately removes large numbers of specimens, and thus the benthonic population of a local area is decreased. Numbers of species would also decrease since the fewer specimens of the "rare" species would soon be removed completely.

In this area the similar size, preservation, type of chambers, thickness of walls, and shape of the various species preclude selective removal. Fragments of arenaceous Foraminifera are very common in the Sound core samples. These fragments are the coiled portions of specimens of the genus Ammobaculites. A. salsus is, by far, the most common and A. exiguus constitutes the remainder of the fragmental specimens. Fragmentation occurred possibly before the samples were collected or, more likely, during the laboratory washing process when a fine spray of water disaggregated the sample over a screen. Since fragmentation did not prevent specific identification it is believed that the faunal analysis is unappreciably affected.

Surface values determined for this area are sufficiently applicable to the core fauna to enable interpretation of the fauna in each sample. Although the core faunal values, when averaged, are within the ranges of the surface values, enough differences exist in this relatively short section to emphasize the need for determination of trends of faunal characters rather than fixed values. Faunal characteristic values must be determined for each section in question and these values must be based on the known ranges in the section.

Environmental Interpretation of Core Foraminifera

On the basis of the faunal characters (specific composition, specific dominance, numbers of species, numbers of specimens and percentage of arenaceous Foraminifera), the fauna of each sample is interpreted as indicative of either a brackish depositional environment (Sound type), an open-marine environment, a mixed environment (Pass type), or a marsh environment (Figure 12). Those samples which are barren are interpreted as non-marine.

The open-gulf cores contain an open-marine fauna which varies only near the bottom as in cores 7424-H and 7432-H. A significant decrease in numbers of specimens and an increase in specific dominance indicate that nearshore, open-marine conditions existed during deposition of these lower samples. The distinction between the nearshore brackish and the nearshore marine fauna is based on the difference in arenaceous faunal content. A non-marine clay occurs below the nearshore marine level. Core 7425-H does not penetrate the nearshore and non-marine horizons. This suggests the presence of a depression in the non-marine clay near core 7425-H. Core 7417-H, located in Dog Keys Pass, is composed almost entirely of a mixed environment fauna. Most of these samples contain a near open-marine fauna. The nearshore open-marine and the non-marine horizons can be recognized in this core. Nearshore brackish horizons can be recognized in most of the remaining cores.

In the Sound cores, the depositional environments are generally cyclic and change rather rapidly. Brackish and mixed environment indications alternate in most cores. This character of frequent change is significant. A marsh fauna is found in two cores, and the non-marine horizon is recognized in several. The non-marine samples in 7421-H and 7408-H differ from other non-marine samples in that the former are composed of clean quartz sand.

Marine influence was more extensive in the past over most of the present Sound area. More than one-third of the Sound cores fauna indicate brackish-marine mixing. Although a few samples contain a fauna indicative of near-marine environments, no open-marine fauna occurs in the Sound core samples. This indicates that a barrier existed early in

the deposition of the Sound cores sediment. Possibly cores 7414-H and 7415-H would penetrate a very thin, nearshore, open-marine horizon if extended. The occasional occurrences of "near-marine" faunas, and the common occurrences of mixed environment faunas in the Sound cores indicate that the early barrier was not as continuous or as effective as it is at present.

The preceding interpretation does not require a knowledge of generic environmental significance. More detailed interpretation can be made by applying what is known of the environmental significance of the various genera. The surface fauna of the Sound is replaced, or appreciably supplemented, by Streblus and Elphidium. Nonionella and Buliminella are more abundant in the cores than they are at the surface. The open-gulf core fauna is supplemented by Hanzawaia and Rosalina. Recent studies (Parker, 1954) establish that, in the northeastern Gulf of Mexico, distributions of empty tests closely approximate distributions of living Foraminifera. Streblus and Elphidium are most abundant in a narrow zone about 5 to 15 miles off shore in water depths of about 10 fathoms or less. Salinity measurements vary from 26 to 30 parts per thousand in this zone. Nonionella and Buliminella are abundant in a broad belt extending from southeast of the present Mississippi Delta to an area east of the north end of the Chandeleur Islands. Phleger (1955) reports abundant living specimens in this area. Nonionella and Buliminella seem dependent on some factor of a "near-delta" environment. The alignment of these genera with the Mississippi Delta system is unlikely coincidental. The favorable factors of this environment are not known but, apparently, these genera require a less dilute marine environment than do Streblus and Elphidium.

which occur landward of the Nonionella-Buliminella zone. Hanzawaia and Rosalina are abundant over an extensive area on the continental shelf. In this area, water depths are approximately 10 to 30 fathoms and salinity is about 30 to 32 parts per thousand.

The increase in specimens of Streblus and Elphidium in the Sound cores and the increase in Hanzawaia and Rosalina in the open-gulf cores are correlated. Both increases are indicative of more marine conditions existing in the past. The increase in specimens of Nonionella and Buliminella within the cores indicates greater deltaic influence in the past.

Brief speculation on the history of core sediment deposition results in the following interpretation of the sequence of events in the area. At a time when sea level was lower, this area existed as an exposed clay surface. A sand body of minor areal extent existed in the northeast quarter of the area. As sea level rose, open-marine deposition occurred in the present open-gulf area. Horn Island was formed soon after the shoreline transgressed the present site of the island. Near-shore, brackish deposition occurred in the present Sound area. The fluctuation from brackish to mixed environments, indicated by the Sound cores fauna, illustrates the variable character of this restricted area. The open-gulf environment was more uniform. A "near-delta" influence existed in the area early in the period of core sediment deposition. This influence is recorded in the lower sections of cores in the three environments. Late in the period, the environment became less marine and the deltaic influence diminished. Horn Island is now exerting its maximum effect as a barrier to marine invasion. Some explanation can be

advanced for the various environmental changes. An increase in run-off from the Mississippi coast could dilute the marine water and thus extend brackish conditions seaward. The deltaic influence is thought to have been supplied by the St. Bernard subdelta and possibly its precursors. This subdelta is relatively inactive at present and has not discharged significant quantities of water for approximately 500 years (H. N. Fisk, 1955).

Points Worthy of Future Examination

A few ideas that have come to mind, but that have not been examined sufficiently, are worthy of mention. Thickness and ornamentation of calcareous tests are probable indicators of environment. It was noticed that size and thickness of calcareous tests were less in the brackish environment. The most ornate and thick-walled specimens of Streblus were found in a lake on Horn Island. The salinity was not measured but the water is salty to the taste. Chitinous linings occur in most of the calcareous specimens of the brackish environment. In contrast, no chitinous linings were observed in specimens from the continental shelf. Natural decalcification occurs to some extent in the Sound.

Fecal pellets of a small worm are very abundant in the Sound. In some samples, these pellets are the dominant constituent of the sediment. Vegetative matter does not appear to be significant except in some of the barren clay samples where pieces of wood are rather common. Wood also occurs in the marsh sample of core 7408-H. Diatoms are occasionally very abundant but no significance could be attached to their distributions. Pyrite, pyritized wood fibre, and pyrite-filled Foraminifera are rather common in the area.

An interesting study could be directed toward the examination of morphology as related to environment. Perhaps coiling and mode of test development is related to environment.

CONCLUSIONS

1. Characteristics of modern foraminiferal distributions can be established such that ecologic application can be made to fossil assemblages. These characteristics are: specific composition, percentage of arenaceous Foraminifera, number of species, specific dominance, and numbers of specimens. Genera and species are environmentally controlled. Numbers of species and numbers of specimens decrease in nearshore brackish and/or restricted areas. The percentage of arenaceous Foraminifera and the percentage occurrence of the dominant species increase in nearshore brackish and/or restricted areas.

2. The depositional environment of each core sample can be interpreted and the sequence of events in core sediment deposition concluded to be: lowering of sea level with non-marine clay and sand exposed; rise in sea level resulting in nearshore marine deposition in the present open-gulf area, nearshore brackish deposition in the present Sound area, and the formation of a barrier island in essentially the same position as that now occupied by Horn Island; continued open-marine deposition in the present open-gulf area and alternating brackish and mixed environment deposition in the present Sound area; the existence of a "near-delta" influence upon the area throughout most of the depositional period; and, at present, the occurrence of a brackish Sound area, an effective barrier island, a dilute marine open-gulf area, and a negligible "deltaic influence upon the area.

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APPENDIX

Identification of the Foraminifera is based largely on comparisons with topotypes and homeotypes furnished by Frances L. Parker and Fred B. Phleger. The remaining species were identified by comparison with figured and described hypotypes. All figured specimens are filed in the foraminiferal collection of the Geology and Geochemistry Division of Gulf Research and Development Company. The following is an alphabetically arranged list of the most common species. Only original references, references to name changes, and references to reports on related areas are included.

Ammobaculites exiguus Cushman and Bronnimann

Plate 1, Figures 1A,B

1948. Ammobaculites exiguus Cushman and Bronnimann, Cushman Lab. Foram. Research Contr., vol. 24, pt. 2, p. 38, pl. 7, figs. 7, 8.
1953. Ammobaculites exiguus Cushman and Bronnimann. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 5, pl. 1, fig. 16. Recent Foram., Southwest Texas.
1954. Ammobaculites exiguus Cushman and Bronnimann. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 633, pl. 1, fig. 5. Recent Foram., Mississippi Sound.
1956. Ammobaculites exiguus Cushman and Bronnimann. Bandy, U. S. Geol. Survey Prof. Paper 274-G, p. 192, pl. 30, fig. 2. Recent Foram., Gulf of Mexico.

Ammobaculites exiguus is usually less than 10 percent of the Sound fauna but occasionally constitutes 22 percent of the fauna. It is usually less than 1 percent in the open gulf. It is less than 5 percent and essentially restricted to the Sound near Breton Sound (Phleger, 1955).

Ammobaculites salsus Cushman and Bronnimann

Plate 1, Figures 2A,B

1948. Ammobaculites salsus Cushman and Bronnimann, Cushman Lab. Foram. Research Contr., vol. 24, pt. 1, p. 16, pl. 3, figs. 7-9. Arenaceous Foram., Trinidad.

1953. Ammobaculites salsus Cushman and Bronnimann. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 5, pl. 1, figs. 17-25. Recent Foram., Southwest Texas.
1954. Ammobaculites salsus Cushman and Bronnimann. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 635, pl. 1, figs. 7, 8. Recent Foram., Mississippi Sound.
1956. Ammobaculites salsus Cushman and Bronnimann. Bandy, U. S. Geol. Survey Prof. Paper 274-G, p. 192, pl. 30, fig. 4. Recent Foram., Gulf of Mexico.

Ammobaculites salsus is very abundant in the Mississippi Sound and essentially restricted to it. It is rare in the open gulf and abundant in the bays behind barrier islands off Texas (Parker, 1953). It is abundant in the bays and Breton Sound, and common in the marshes of the southeast Mississippi Delta (Phleger, 1955).

Bigenerina irregularis Phleger and Parker
Plate 1, Figures 3A,B

1951. Bigenerina irregularis Phleger and Parker, Geol. Soc. America Mem., vol. 46, pt. 2, pl. 1, figs. 16-21. Recent Foram., Northwest Gulf of Mexico.
1954. Bigenerina irregularis Phleger and Parker. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 636, pl. 1, figs. 16, 17. Recent Foram., Mississippi Sound.
1954. Bigenerina irregularis Phleger and Parker. Parker, Harvard Coll. Mus. Comp. Zoology Bull., v. III, no. 10, p. 492, pl. 3, figs. 1-3. Recent Foram., Northeastern Gulf of Mexico.
1954. Bigenerina irregularis Phleger and Parker. Bandy, U. S. Geol. Survey Prof. Paper 254-F, p. 135, pl. 29, figs. 8, 9. Recent Foram., Gulf of Mexico.

Bigenerina irregularis is essentially restricted to the open gulf according to results of this study and usually comprises less than 10 percent of the fauna. It usually constitutes 5 to 10 percent of the fauna off the Texas bays (Parker, et al., 1953). It is essentially restricted to the offshore, open-gulf area near the southeast Mississippi Delta area (Phleger, 1955).

Bolivina lowmani Phleger and Parker
Plate 1, Figures 4A,B

1951. Bolivina lowmani Phleger and Parker, Geol. Soc. America Mem., vol. 46, pt. 2, p. 13, pl. 6, figs. 20A,B, 21. Recent Foram., Northwestern Gulf of Mexico.

1953. Bolivina lowmani Phleger and Parker. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 6, pl. 4, fig. 1. Recent Foram., Southwest Texas.
1954. Bolivina lowmani Phleger and Parker. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 637, pl. 1, figs. 18, 19. Recent Foram., Mississippi Sound.
1954. Bolivina lowmani Phleger and Parker. Parker, Harvard Coll. Mus. Comp. Zoology Bull., v. III, no. 10, p. 515, pl. 7, fig. 21. Recent Foram., Northeastern Gulf of Mexico.

Bolivina lowmani occurs mostly in the open gulf according to this study and usually constitutes a small percentage of the fauna.

Bolivina pulchella primitiva Cushman
Plate 1, Figures 5A,B

1930. Bolivina pulchella (d'Orbigny) var. primitiva Cushman, [fide Florida State Geol. Survey Bull., vol. 4, p. 47, pl. 8, figs. 12A,B.]
1953. Bolivina pulchella primitiva Cushman. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 6, pl. 4, figs. 4, 5. Recent Foram., Southwest Texas.
1954. Bolivina pulchella (d'Orbigny) var. primitiva Cushman. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 637, pl. 1, fig. 20. Recent Foram., Mississippi Sound.
1954. Bolivina pulchella primitiva Cushman. Parker, Harvard Coll. Mus. Comp. Zoology Bull., v. III, no. 10, p. 516, pl. 7, fig. 36. Recent Foram., Northeastern Gulf of Mexico.

Bolivina striatula Cushman
Plate 1, Figures 6A,B

1922. Bolivina striatula Cushman, Carnegie Inst. Washington, Publ. no. 311, (Dept. Marine Biol., Papers, vol. 17), p. 27, pl. 3, fig. 10. Shallow Water Foram., Tortugas.
1953. Bolivina striatula Cushman. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 6, pl. 4, figs. 4, 5. Recent Foram., Southwest Texas.
1954. Bolivina striatula Cushman. Phleger, Am. Assoc. Petroleum Geol. Bull., v. 38, no. 4, p. 637, Recent Foram., Mississippi Sound.
1954. Bolivina striatula Cushman. Bandy, U. S. Geol. Survey Prof. Paper 254-F, p. 135, pl. 31, fig. 9. Foram., Gulf of Mexico.

Buccella hannaï (Phleger and Parker)

Plate 1, Figures 7A,B,C

1951. Eponides hannaï Phleger and Parker, Geol. Soc. America Mem., vol. 46, pt. 2, p. 21, pl. 10, figs. 11A,B, 13A,B, 14A,B. Recent Foram., Northwest Gulf of Mexico.
1952. Buccella hannaï (Phleger and Parker), Emend. [fide Andersen, Washington Acad. Sci. Jour., Baltimore, Md., vol. 42, no. 5, p. 144, 147, text fig. 3A,B,C.] Buccella, New Rotulid Foram. Genus.
1954. Buccella hannaï (Phleger and Parker), Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 637, pl. 2, figs. 13, 14. Recent Foram., Mississippi Sound.
1954. Buccella hannaï (Phleger and Parker). Parker, Harvard Coll. Mus. Comp. Zoology Bull., v. III, no. 10, p. 530, pl. 9, figs. 25, 26. Recent Foram., Northeastern Gulf of Mexico.

Buccella hannaï occurs rather commonly in the open gulf at a frequency of less than 5 percent. It is essentially restricted to the open gulf.

Buliminella bassendorffensis Cushman and Parker

Plate 1, Figures 8A,B

1937. Buliminella bassendorffensis Cushman and Parker, Cushman Lab. Foram. Research Contr., vol. 13, pt. 1, p. 40, pl. 4, figs. 13A,B. Oligocene Bulimina and Buliminella.
1953. Buliminella sp. cf. B. bassendorffensis Cushman and Parker. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 6, pl. 4, figs. 6, 7. Recent Foram., Southwest Texas.
1954. Buliminella bassendorffensis Cushman and Parker. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 637, pl. 1, figs. 22, 23. Recent Foram., Mississippi Sound.
1954. Buliminella bassendorffensis Cushman and Parker. Parker, Harvard Coll. Mus. Comp. Zoology Bull., v. III, no. 10, p. 509, pl. 6, fig. 13, Recent Foram., Northeastern Gulf of Mexico.

Buliminella elegantissima (d'Orbigny)

Plate 1, Figures 9A,B

1839. Bulimina elegantissima d'Orbigny, [fide Voy. Amer. Merid., vol. 5, pt. 5, "Foraminiferes." p. 51, pl. 7, figs. 13, 14.]
1911. Buliminella elegantissima (d'Orbigny) Cushman, [fide U. S. Nat. Mus. Bull., 71, pt. 2, p. 88.] Genotype of Buliminella.

1933. Buliminella elegantissima (d'Orbigny). [fide Cushman and Cahill, U. S. Geol. Survey, Prof. Paper 175-A, p. 23.] Miocene Foram., Eastern U. S. Coastal Plain.
1944. Buliminella elegantissima (d'Orbigny). Cushman, Cushman Lab. Foram. Research, Spec. Publ., no. 12, p. 27, pl. 3, figs. 43, 44. Recent Foram., New England.
1953. Buliminella elegantissima (d'Orbigny). Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 6, pl. 4, figs. 8, 9. Recent Forams., Southwest Texas.
1954. Buliminella elegantissima (d'Orbigny). Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 637, pl. 1, figs. 24, 25. Recent Foram., Mississippi Sound.
1955. Buliminella elegantissima (d'Orbigny). Walton, Jour. Paleontology Bull., v. 29, no. 6, p. 1004, pl. 102, fig. 17. Living Foram., Baja, California.

Buliminella elegantissima is rather common in the open gulf as small percentages. It occurs abundantly along an area extending from off southeast of the Mississippi Delta to north of the Chandeleur Islands.

Elphidium gunteri Cole
Plate 1, Figures 10A,B

1931. Elphidium gunteri Cole, [fide Florida State Geol. Survey Bull. 6, p. 34, pl. 4, figs. 9, 10.] Pliocene and Pleistocene Foram., Florida.
1951. Elphidium gunteri Cole var. galvestonensis Kornfeld (Part), [fide Stanford University Dept. Geology Contr., vol. 1, no. 3, p. 87, pl. 15, figs. 2A,B, 3A,B (not figures 1A,B).] Recent Littoral, Texas and Louisiana.
1953. Elphidium gunteri Cole. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 8, pl. 3, figs. 18, 19. Recent Foram., Southwest Texas.
1954. Elphidium gunteri Cole. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 639, pl. 2, figs. 3, 4. Recent Foram., Mississippi Sound.
1954. Elphidium gunteri Cole. Parker, Harvard Coll. Mus. Zoology Bull., v. III, no. 10, p. 508, pl. 6, fig. 16. Recent Foram., Northeastern Gulf of Mexico.
1956. Elphidium gunteri Cole. Bandy, U. S. Geol. Survey Prof. Paper 274-G, p. 194, pl. 30, figs. 19A,B. Foram. Ecology, Northeastern Gulf of Mexico.

Elphidium gunteri is common to abundant in the passes and open gulf according to this study. It occurs as small percentages in the Sound. It is abundant in the bays along the Texas coast (Parker, et al., 1953). It occurs abundantly in both the open-gulf and Breton Sound areas (Phleger, 1955). It occurs commonly over much of the northeastern Gulf but the area of greatest abundance is about 5 fathoms or less.

Elphidium incertum mexicanum Kornfeld
Plate 1, Figures 11A,B

1931. Elphidium incertum (Williamson) var. mexicana Kornfeld, [fide Stanford University Dept. Geology, Contr., vol. 1, no. 3, p. 89, pl. 16, figs. 1A,B, 2A,B.] Recent Foram., Texas.
1953. Elphidium incertum mexicanum Kornfeld. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 8, pl. 3, figs. 20, 21. Recent Foram., Southwest Texas.
1954. Elphidium incertum mexicanum Kornfeld. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 639, pl. 2, figs. 5, 6. Recent Foram., Mississippi Sound.
1956. Elphidium mexicanum Kornfeld. Bandy, U. S. Geol. Survey Prof. Paper 274-G, p. 194, pl. 30, fig. 20. Foram. Ecology, North-eastern Gulf of Mexico.

Elphidium incertum mexicanum occurs as small percentages over most of the Elphidium gunteri distribution. It is rather common along the beaches of St. Joseph and Matagorda Islands (Parker, et al., 1953). It occurs as small percentages in both Breton Sound and the open gulf (Phleger, 1955).

Elphidium sp. cf. E. koeboeense Leroy
Plate 1, Figures 12A,B

1939. Elphidium koeboeense Leroy, [fide Natuurk. Tijdschr. Nederl.-Indie, dl. 99, afl. 6, p. 240, pl. 9, figs. 6, 7.]
1953. Elphidium sp. cf. E. koeboeense Leroy. Parker, et al., Cushman Found. Research, Spec. Publ. no. 2, p. 8, pl. 3, figs. 22-23. Recent Foram., Southwest Texas.

Elphidium sp. cf. E. koeboeense occurs as small percentages over most of the Elphidium distribution. It is rather common in Mesquite Bay, Texas (Parker, et al., 1953).

Elphidium matagordatum (Kornfeld)
Plate 1, Figures 13A,B

1931. Nonion depressula (Walker and Jacob) var. matagordatum Kornfeld, [fide Stanford Univ., Dept. Geology Contr., vol. 1, no. 3, p. 87, pl. 13, figs. 2A,B.] Recent, Littoral. Texas and Louisiana.
1953. Elphidium matagordatum (Kornfeld). Parker, in Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 8, pl. 3, figs. 24, 25. Recent Foram., Southwest Texas.
1954. Elphidium matagordatum (Kornfeld). Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 639, pl. 2, fig. 7. Recent Foram., Mississippi Sound.

Elphidium matagordatum occurs as small percentages over most of the Elphidium distribution. It is rather common in the bays along the Texas coast (Parker, et al., 1953) and in Breton Sound (Phleger, 1955).

Elphidium poeyanum (d'Orbigny)
Plate 1, Figures 14A,B

1839. Polystomella poeyana d'Orbigny, [fide in De la Sagra, Hist. Phys. Pol. Nat. Cuba, "Foraminiferes", p. 55, pl. 6, figs. 25, 26.]
1928. ? Elphidium poeyanum (d'Orbigny) Cushman, Cushman Lab. Foram. Research, Spec. Publ. no. 1, p. 205.
1930. Elphidium poeyanum (d'Orbigny). Cushman, U. S. Nat. Mus. Bull., 104, pt. 7, p. 25, pl. 10, figs. 4, 5. Recent Foram., Atlantic Ocean.
1953. Elphidium poeyanum (d'Orbigny). Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 9, pl. 3, fig. 26. Recent Foram., Southwest Texas.
1954. Elphidium poeyanum (d'Orbigny). Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 639, pl. 2, figs. 8, 9. Recent Foram., Mississippi Sound.
1954. Elphidium poeyanum (d'Orbigny). Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 509, pl. 6, fig. 17. Recent Foram., Northeastern Gulf of Mexico.

Elphidium poeyanum occurs as small percentages over most of the Elphidium distribution. It is rather common in both bays and open gulf along the Texas coast (Parker, et al., 1953) and in the mixed environment of Breton Sound and the open gulf (Phleger, 1955).

Epistominella vitrea Parker
Plate 1, Figures 15A,B,C

1953. Epistominella vitrea Parker, in Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 9, pl. 4, figs. 34-36, 40, 41. Recent Foram., Southwest Texas.
1954. Epistominella vitrea Parker. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 639, pl. 2, figs. 11, 12. Recent Foram., Mississippi Sound.
1954. Epistominella vitrea Parker. Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 534, pl. 10, figs. 20, 26. Recent Foram., Northeastern Gulf of Mexico.

Epistominella vitrea occurs as small percentages in the open gulf. It is abundant southeast of the Mississippi Delta (Phleger, 1955) and very common along the shelf-edge in the northeastern Gulf.

Gaudryina exilis Cushman and Bronnimann
Plate 1, Figures 16A,B

1948. Gaudryina exilis Cushman and Bronnimann, Cushman Lab. Foram. Research Contr., vol. 24, pt. 2, p. 40, pl. 7, figs. 15, 16. Arenaceous Foram., Trinidad.
1953. Gaudryina exilis Cushman and Bronnimann. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 9, pl. 1, figs. 37, 38. Recent Forams., Southwest Texas.
1954. Gaudryina exilis Cushman and Bronnimann. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 639, pl. 2, fig. 16. Recent Foram., Mississippi Sound.

Guttulina australis d'Orbigny
Plate 1, Figures 17A,B

1839. Guttulina (globulina) australis d'Orbigny, [fide Voyage dans l'Amérique Meridionale; Foraminifères. Strasbourg, France, LeVrault, tome 5, pt. 5, p. 60, pl. 1, figs. 1-4.]
1870. Polymorphina regina Brady, Parker and Jones, [fide Linnean Soc. Trans., vol. 27, p. 241, pl. 41, fig. 32.]
1930. Guttulina regina (Brady, Parker and Jones) Cushman and Ozawa, [fide U. S. Nat. Mus. Proc., vol. 77, art. 6, p. 34, pl. 6, figs. 1, 2.]
1953. Guttulina australis (d'Orbigny). Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 9, pl. 3, figs. 9, 10. Recent Foram., Southwest Texas.

1954. Guttulina australis (d'Orbigny). Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 639, pl. 2, fig. 15. Recent Foram., Mississippi Sound.
1954. Guttulina australis (Brady, Parker and Jones) Cushman and Ozawa. Bandy, U. S. Geol. Survey Prof. Paper 254-F, p. 136, pl. 29, fig. 7. Foram., Gulf of Mexico.
1956. Guttulina australis (d'Orbigny). Bandy, U. S. Geol. Survey Prof. Paper 274-G, p. 194. Foram. Ecology, Northeastern Gulf of Mexico.

Guttulina australis occurs rather commonly in the open gulf at frequencies of 5 percent or less.

Hanzawaia strattoni (Applin)
Plate 1, Figures 18A,B,C

1925. Truncatulina americana Cushman var. strattoni Applin, Am. Assoc. Petroleum Geol. Bull., vol. 9, no. 1, p. 99, pl. 3, fig. 3, Miocene Foram., Louisiana.
1931. Cibicides americana (Cushman) var. strattoni (Applin) Kornfeld, [fide Stanford Univ., Dept. Geology Contr., vol. 1, no. 3, p. 82.] Checklist Recent, Texas Coastal Region.
1951. Cibicides concentricus (Cushman). Phleger and Parker, Geol. Soc. America Mem. vol. 46, pt. 2, p. 29, pl. 15, figs. 14A,B, 15A,B. Recent, Northwestern Gulf of Mexico.
- [non] Truncatulina concentrica Cushman, 1918, U. S. Geol. Survey Bull., no. 676, p. 64, pl. 21, fig. 3.
1953. Cibicidina strattoni (Applin) Parker, in Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 7, pl. 4, figs. 38, 39. Recent Foram., Southwest Texas.
1954. Cibicidina strattoni (Applin). Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 544, pl. 13, figs. 8, 11. Recent Foram., Northeastern Gulf of Mexico.
1954. Cibicidina strattoni (Applin). Phleger, Am. Assoc. Petroleum Geol. Bull. vol. 38, no. 4, p. 638, pl. 1, figs. 26, 27. Recent Foram., Mississippi Sound.
1954. Hanzawaia strattoni (Applin) Bandy, U. S. Geol. Survey Prof. Paper 254-F, p. 136, pl. 31, fig. 4. Recent Foram., Gulf of Mexico.

Hanzawaia strattoni is abundant in the open gulf and usually constitutes 10 percent or more of the fauna. It dominates the fauna of most samples on the continental shelf of the northeastern Gulf of Mexico. It occurs as small percentages in the bays along the Texas coast and more abundantly in the open gulf (Parker, et al., 1953).

Nonionella atlantica Cushman
Plate 1, Figures 19A,B,C

1947. Nonionella atlantica Cushman, Cushman Lab. Foram. Research Contr., vol. 23, pt. 4, p. 90, pl. 20, figs. 4, 5. Foram., Coastal Southeast U. S.
1953. Nonionella atlantica Cushman. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 11, pl. 3, figs. 30, 31. Recent Foram., Southwest Texas.
1954. Nonionella atlantica Cushman. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 642, pl. 2, figs. 25, 26. Recent Foram., Mississippi Sound.
1954. Nonionella atlantica Cushman. Parker, Harvard Coll. Mus. Comp. Zoology, Bull., vol. III, no. 10, p. 567, pl. 6, figs. 6, 7. Recent Foram., Northeastern Gulf of Mexico.
1954. Nonionella atlantica Cushman. Bandy, U. S. Geol. Survey Prof. Paper 254-F, p. 137, pl. 29, fig. 10. Foram., Gulf of Mexico.

Nonionella atlantica is very rare in Mississippi Sound. It is rather common as small percentages in the open gulf according to this study and off Texas (Parker, et al., 1953). It is rather common in the Nonionella zone east of the delta system.

Nonionella opima Cushman
Plate 1, Figures 20A,B,C

1947. Nonionella opima Cushman, Cushman Lab. Foram. Research, vol. 23, pt. 4, p. 90, pl. 20, figs. 1-3. Foram., Coastal Southeast U.S.
1953. Nonionella opima Cushman. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 11, pl. 3, figs. 32, 33. Recent Foram., Southwest Texas.
1954. Nonionella opima Cushman. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 642, pl. 2, figs. 27-29. Recent Foram., Mississippi Sound.
1954. Nonionella opima Cushman. Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 507, pl. 6, figs. 10-12. Recent Foram., Northeastern Gulf of Mexico.

Nonionella opima is distributed in essentially the same manner as N. atlantica. N. opima dominates the fauna of the Nonionella zone which extends from southeast of the Mississippi Delta to east of the north end of the Chandeleur Islands.

Planulina exorna Phleger and Parker
Plate 1, Figures 22A,B,C

1951. Planulina exorna Phleger and Parker, Geol. Soc. America Mem., Vol. 46; pt. 2, p. 32, pl. 18, figs. 5A,B, 6A,B, 7A,B, 8A,B. Foram., Northwestern Gulf of Mexico.
1954. Planulina exorna Phleger and Parker. Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 540, pl. 11, figs. 28, 29. Recent Foram., Northeastern Gulf of Mexico.
1955. Planulina exorna Phleger and Parker. Walton, Jour. Paleontology Bull., vol. 29, no. 6, p. 1011, pl. 104, figs. 24, 25, 29, 30. Living Foram., Baja, California.

Quinqueloculina compta Cushman
Plate 2, Figures 1A,B,C

1947. Quinqueloculina compta Cushman, Cushman Lab. Foram. Research Contr., vol. 23, pt. 4, p. 87, pl. 19, fig. 2. Foram., Southeastern Coastal U. S.
1953. Quinqueloculina compta Cushman. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 12, pl. 2, figs. 5, 6. Recent Foram., Southwest Texas.
1954. Quinqueloculina compta Cushman. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 643, pl. 2, fig. 36. Recent Foram., Mississippi Sound.
1954. Quinqueloculina compta Cushman. Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 496, pl. 3, figs. 20, 21. Recent Foram., Northeastern Gulf of Mexico.
1954. Quinqueloculina compta Cushman. Bandy, U. S. Geol. Survey Prof. Paper 254-F, p. 138, pl. 28, fig. 2. Recent Foram., Gulf of Mexico.
1956. Quinqueloculina compta Cushman. Bandy, U. S. Geol. Survey Prof. Paper 274-G, p. 196, pl. 29, fig. 5. Foram. Ecology, Gulf of Mexico.

Quinqueloculina compta is rather common as small percentages in the open gulf. It commonly occurs on the beaches and occasionally in the bays and open gulf off Texas (Parker, et al., 1953).

Quinqueloculina lamarckiana d'Orbigny
Plate 2, Figures 2A,B,C

1839. Quinqueloculina lamarckiana d'Orbigny, [fide in De la Sagra, Hist. Phys. Pol. Nat. Cuba, "Foraminiferos", p. 189, pl. 11, figs. 14, 15.]

1953. Quinqueloculina lamarckiana d'Orbigny. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 12, pl. 2, figs. 11, 12. Recent Foram., Southwest Texas.
1954. Quinqueloculina lamarckiana d'Orbigny. Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 497, pl. 4, figs. 5, 6. Recent Forams., Northeastern Gulf of Mexico.
1954. Quinqueloculina lamarckiana d'Orbigny. Bandy, U. S. Geol. Survey Prof. Paper 254-F, p. 138, pl. 28, fig. 3. Recent Foram., Gulf of Mexico.

Quinqueloculina lamarckiana is rather common as small percentages in the open gulf according to this study and off Texas (Parker, et al., 1953).

Quinqueloculina poeyana d'Orbigny
Plate 2, Figures 3A,B,C

1839. Quinqueloculina poeyana d'Orbigny, [fide in De la Sagra, Hist. Phys. Pol. Nat. Cuba, "Foraminiferos", p. 191, pl. 11, figs. 25-27.]
1953. Quinqueloculina poeyana d'Orbigny. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 12, pl. 2, figs. 13, 14. Recent Foram., Southwest Texas.
1956. Quinqueloculina poeyana d'Orbigny. Bandy, U. S. Geol. Survey Prof. Paper 274-G, p. 196, pl. 29, fig. 6. Foram. Ecology, Northeastern Gulf of Mexico.

Quinqueloculina poeyana occurs occasionally as small percentages in the open gulf according to this study and in the bays of Texas (Parker, et al., 1953).

Quinqueloculina seminula (Linné)
Plate 2, Figures 4A,B,C

1767. Serpula seminulum Linné, [fide Syst. Nat., ed. 12, p. 1264.]
1826. Quinqueloculina seminula (Linné) d'Orbigny, [fide Ann. Sci. Nat., vol. 7; p. 303.]
1944. Quinqueloculina seminula (Linné). Cushman, Cushman Lab. Foram. Research, Spec. Publ. no. 12, p. 13, pl. 2, fig. 14.
1953. Quinqueloculina seminula (Linné). Parker, et al., Cushman Found. Spec. Publ. no. 2, p. 12, pl. 2, figs. 18, 19. Recent Foram., Southwest Texas.

Quinqueloculina seminula occurs occasionally as small percentages in the open gulf according to this study and is common to abundant along the south beaches of the islands off Texas (Parker, et al., 1953).

Rosalina bertheloti d'Orbigny
Plate 2, Figures 5A,B,C

1839. Rosalina bertheloti d'Orbigny, [fide in Barker-Webb and Berthelot, Hist. Nat., Iles' Canaries, vol. 2, pt. 2, "Foraminiferes", p. 135, pl. 1, figs. 28-30 (as R. berthelotiana in plates.)]
1954. Rosalina bertheloti d'Orbigny. Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 523, pl. 8, figs. 22, 23. Recent Foram., Northeastern Gulf of Mexico.
1956. non Hanzawaia bertheloti (d'Orbigny), Bandy, U. S. Geol. Survey Prof. Paper 274-G, p. 195, pl. 31, fig. 6. Foram. Ecology, Northeastern Gulf of Mexico.

Rosalina bertheloti occurs commonly as small percentages in the open gulf of this study.

Rosalina concinna (H. B. Brady)
Plate 2, Figures 6A,B,C

1884. Discorbina concinna H. B. Brady, [fide Rept. Voy. Challenger, Zoology, vol. 9, p. 646, pl. 90, figs. 7, 8.]
1948. Rosalina d'Orbigny, emend. Brotzen, [fide Sweden, Sver. Geol. Unders. Avh., Stockholm, Ser. C, no. 493 (Arsb. 42, no. 2), p. 72, tf. 19.]
1954. Rosalina concinna (H. B. Brady). Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 524, pl. 8, figs. 17, 18. Recent Foram., Northeastern Gulf of Mexico.
1956. Discorbis concinnus (H. B. Brady). Bandy, U. S. Geol. Survey Prof. Paper 274-G, p. 193, pl. 31, fig. 4. Foram. Ecology, Northeastern Gulf of Mexico.

Rosalina concinna is common in the open gulf and constitutes about 5 percent of the fauna. It is very abundant over the central shelf where it co-dominates the fauna with Hanzawaia strattoni.

Rosalina floridana (Cushman)
Plate 2, Figures 7A,B,C

1922. Discorbis floridanus Cushman, Carnegie Inst. Washington, Publ. no. 311 (Dept. Marine Biol., Papers, vol. 17), p. 39, pl. 5, figs. 11, 12. Shallow-water Foram., Tortugas.
1948. Rosalina d'Orbigny, emend. Brotzen, [fide Sweden, Sver. Geol. Unders. Avh., Stockholm, Ser. C, no. 493 (Arsb. 42, no. 2), p. 72, tf. 19.]

1953. Discorbis floridana Cushman. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 7, pl. 4, figs. 18, 19. Recent Foram., Southwest Texas.
1954. Rosalina floridana (Cushman). Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 524, pl. 8, figs. 19, 20. Recent Foram., Northeastern Gulf of Mexico.
1954. Discorbis floridanus Cushman. Bandy, U. S. Geol. Survey Prof. Paper 254-F, p. 136, pl. 31, fig. 1. Recent Foram., Gulf of Mexico.
1954. Discorbis floridanus Cushman. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 638, pl. 1, figs. 30, 33, 34. Recent Foram., Mississippi Sound.

Rosalina floridana is common as small percentages in the open gulf according to this study and the open gulf, beaches, and bays off Texas (Parker, et al., 1953).

Rosalina suzensis (Said)
Plate 2, Figures 8A,B,C

1948. Rosalina d'Orbigny, emend. Brotzen, [fide Sweden, Sver. Geol. Unders. Avh., Stockholm, Ser. C, no. 493 (Arsb. 42, no. 2), p. 72, tf. 19]
1949. Discorbis suzensis Said, Cushman Lab. Foram. Research, Spec. Publ. no. 26, p. 36, pl. 3, fig. 34. Foram., Northern Red Sea.
1954. Rosalina suzensis (Said). Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 525, pl. 8, figs. 21, 26, 27. Recent Foram., Northeastern Gulf of Mexico.

Rosalina suzensis is rather common in the open gulf of this area but is more common on the central shelf.

Streblus beccarii (Linné) var. sobrinus (Shupack)
Plate 2, Figures 9A,B,C

1930. Rotalia beccarii (Linné) var. parkinsoniana (d'Orbigny) Cushman, in Cushman Lab. Foram. Research, vol. VI, pt. 4, p. 100, pl. XIII, figs. 14A-C. Pleistocene Foram., Maryland.
1934. Rotalia beccarii (Linné) var. sobrina Shupack, [fide Am. Mus. Nat. Hist., Novitates, New York, N. Y., no. 737, p. 6, pl. opp. p. 9, figs. 4A-C.] Recent and Pleistocene Foram., N. Y. Harbor.
1953. "Rotalia" beccarii (Linné) variant A. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 13, pl. 4, figs. 20-22. Recent Foram., Southwest Texas.

1954. "Rotalia beccarii (Linné) variant A. Phleger, Am. Assoc. Petroleum Geol. Bull., v. 38, no. 4, p. 645, pl. 3, figs. 4-6. Recent Foram., Mississippi Sound.
1954. "Rotalia beccarii (Linné) variant A. Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 531, pl. 10, figs. 1, 5. Recent Foram., Northeastern Gulf of Mexico.
1954. Streblus beccarii (Linné) var. sobrinus (Shupatck). Bandy, U. S. Geol. Survey Prof. Paper 254-F, p. 138, pl. 30, fig. 7. Recent Foram., Northern Gulf of Mexico.

Streblus beccarii var. sobrinus is very abundant in the Sound in areas of mixing. It is very common in the open gulf.

Streblus beccarii (Linné) var. tepidus (Cushman)
Plate 2, Figures 10A,B,C

1926. Rotalia beccarii (Linné) var. tepida Cushman, Carnegie Inst. Washington Pub., No. 344, (Dept. Marine Biology Papers, vol. 23), p. 79, pl. 1. Recent Foram., Porto Rico.
1953. "Rotalia beccarii (Linné) variant B. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 13, pl. 4, figs. 25-28. Recent Foram., Southwest Texas.
1954. "Rotalia beccarii (Linné) variants. Parker, Harvard Coll. Mus. Comp. Zoology Bull., vol. III, no. 10, p. 531, pl. 10, figs. 2, 6? Recent Foram., Northeastern Gulf of Mexico.
1954. "Rotalia beccarii (Linné) variants. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 645, pl. 3, figs. 7, 8, 9? Recent Foram., Mississippi Sound.
1956. non Streblus tepidus (Cushman). Bandy, U. S. Geol. Survey Prof. Paper 274-G, p. 197, pl. 31, fig. 2. Foram. Ecology, Northeastern Gulf of Mexico.

Streblus beccarii var. tepidus is common in areas of environmental mixing and abundant in the open gulf.

Trochammina macrescens H. B. Brady
Plate 2, Figures 11A,B,C

1870. Trochammina inflata (Montagu) var. macrescens H. B. Brady, fide Ann. Mag. Nat. Hist., ser. 4, vol. 6, p. 51, pl. 11, figs. 5a-c.7

1953. Trochammina macrescens H. B. Brady. Parker, et al., Cushman Found. Foram. Research, Spec. Publ. no. 2, p. 15, pl. 3, figs. 7, 8. Recent Foram., Southwest Texas.
1954. Trochammina macrescens H. B. Brady. Phleger, Am. Assoc. Petroleum Geol. Bull., vol. 38, no. 4, p. 646, pl. 3, fig. 24. Recent Foram., Mississippi Sound.

Trochammina macrescens is essentially a marsh species in all reports related to this study.

Trochammina cf. T. ochracea (Williamson)
Plate 2, Figures 12A,B,C

1858. Rotalina ochracea Williamson, W. C., [fide Royal Soc. London, p. 55, pl. 4, fig. 112, pl. 5, fig. 113.] Recent Foram., Gr. Britain.
1884. Trochammina ochracea (Williamson) Balkwill and Millet, [fide Journ. Micro., vol. 3, p. 24, pl. 1, fig. 7.]
1944. Trochammina ochracea (Williamson). Cushman, Cushman Lab. Foram. Research, Spec. Publ. no. 12, p. 19, pl. 2, figs. 12, 13. Recent Foram., New England.

Trochammina cf. T. ochracea is rather common as small percentages in Mississippi Sound. It becomes more abundant near the beach on Horn Island.

CORE NUMBER	7124-G	7407-H	7408-H	7417-H	7418-H
WATER DEPTH IN FEET	15	16	16	22	18
DEPTH IN CORE (INCHES FROM TOP)	1/2-1 1/2 20-21 40-41 60-61 80-81 100-101 120-121 140-141 160-161 180-181 200-201 220-221 240-241 260-261 280-281 300-301 320-321 340-341 360-361 380-381 400-401 420-421 440-441 460-461 480-481 500-501 520-521 540-541 560-561 580-581 600-601 620-621 640-641 660-661 680-681 700-701 720-721 740-741 760-761 780-781 800-801 820-821 840-841 860-861 880-881 900-901 920-921 940-941 960-961 980-981 1000-1001	1/2-1 1/2 20-21 40-41 60-61 80-81 100-101 120-121 140-141 160-161 180-181 200-201 220-221 240-241 260-261 280-281 300-301 320-321 340-341 360-361 380-381 400-401 420-421 440-441 460-461 480-481 500-501 520-521 540-541 560-561 580-581 600-601 620-621 640-641 660-661 680-681 700-701 720-721 740-741 760-761 780-781 800-801 820-821 840-841 860-861 880-881 900-901 920-921 940-941 960-961 980-981 1000-1001	1/2-1 1/2 20-21 40-41 60-61 80-81 100-101 120-121 140-141 160-161 180-181 200-201 220-221 240-241 260-261 280-281 300-301 320-321 340-341 360-361 380-381 400-401 420-421 440-441 460-461 480-481 500-501 520-521 540-541 560-561 580-581 600-601 620-621 640-641 660-661 680-681 700-701 720-721 740-741 760-761 780-781 800-801 820-821 840-841 860-861 880-881 900-901 920-921 940-941 960-961 980-981 1000-1001	1/2-1 1/2 20-21 40-41 60-61 80-81 100-101 120-121 140-141 160-161 180-181 200-201 220-221 240-241 260-261 280-281 300-301 320-321 340-341 360-361 380-381 400-401 420-421 440-441 460-461 480-481 500-501 520-521 540-541 560-561 580-581 600-601 620-621 640-641 660-661 680-681 700-701 720-721 740-741 760-761 780-781 800-801 820-821 840-841 860-861 880-881 900-901 920-921 940-941 960-961 980-981 1000-1001	1/2-1 1/2 20-21 40-41 60-61 80-81 100-101 120-121 140-141 160-161 180-181 200-201 220-221 240-241 260-261 280-281 300-301 320-321 340-341 360-361 380-381 400-401 420-421 440-441 460-461 480-481 500-501 520-521 540-541 560-561 580-581 600-601 620-621 640-641 660-661 680-681 700-701 720-721 740-741 760-761 780-781 800-801 820-821 840-841 860-861 880-881 900-901 920-921 940-941 960-961 980-981 1000-1001
TOTAL BENTHONIC POPULATION	720	230	42	2	2
NUMBER BENTHONIC SPECIES	11	42	2	2	2
<i>Ammobaculites diversus</i>	NO	NO	NO	NO	NO
<i>A. exiguus</i>	NO	NO	NO	NO	NO
<i>A. exilis</i>	NO	NO	NO	NO	NO
<i>A. salom</i>	NO	NO	NO	NO	NO
<i>A. spp. (fragments)</i>	NO	NO	NO	NO	NO
<i>Angulagrina bella</i>	NO	NO	NO	NO	NO
<i>A. jamaicensis</i>	NO	NO	NO	NO	NO
<i>Arenopagella mexicana</i>	NO	NO	NO	NO	NO
<i>Asterigerina corinata</i>	NO	NO	NO	NO	NO
<i>Bigenirina irregularis</i>	NO	NO	NO	NO	NO
<i>Bellvina leucomai</i>	NO	NO	NO	NO	NO
<i>B. pulchella primitiva</i>	NO	NO	NO	NO	NO
<i>B. striatula</i>	NO	NO	NO	NO	NO
<i>B. sp.</i>	NO	NO	NO	NO	NO
<i>Buccella hawaii</i>	NO	NO	NO	NO	NO
<i>Bullimina sculptata</i>	NO	NO	NO	NO	NO
<i>B. marginata</i>	NO	NO	NO	NO	NO
<i>Bullimina cf. boscendorferensis</i>	NO	NO	NO	NO	NO
<i>B. elegantissima</i>	NO	NO	NO	NO	NO
<i>Cassidulina subglobosa</i>	NO	NO	NO	NO	NO
<i>Cibicides sp.</i>	NO	NO	NO	NO	NO
<i>Cornuspira sp.</i>	NO	NO	NO	NO	NO
<i>"Discorbis" bulbosa</i>	NO	NO	NO	NO	NO
<i>Elphidium odevum</i>	NO	NO	NO	NO	NO
<i>E. delicatulum</i>	NO	NO	NO	NO	NO
<i>E. galvestonensis</i>	NO	NO	NO	NO	NO
<i>E. gutteri</i>	NO	NO	NO	NO	NO
<i>E. incertum mexicanum</i>	NO	NO	NO	NO	NO
<i>E. kosboensis</i>	NO	NO	NO	NO	NO
<i>E. malagordani</i>	NO	NO	NO	NO	NO
<i>E. polyorum</i>	NO	NO	NO	NO	NO
<i>E. spp. (small unidentified)</i>	NO	NO	NO	NO	NO
<i>Entesolenia sp.</i>	NO	NO	NO	NO	NO
<i>Epistominella vitrea</i>	NO	NO	NO	NO	NO
<i>Eponides spp.</i>	NO	NO	NO	NO	NO
<i>Gaudryina exilis</i>	NO	NO	NO	NO	NO
<i>Globulina caribaea</i>	NO	NO	NO	NO	NO
<i>Guttulina australis</i>	NO	NO	NO	NO	NO
<i>Hanzawaia straffoni</i>	NO	NO	NO	NO	NO
<i>Leptanthis</i>	NO	NO	NO	NO	NO
<i>Miliammina fusca</i>	NO	NO	NO	NO	NO
<i>Miliolides (various unidentified)</i>	NO	NO	NO	NO	NO

TABLE I PART A
BENTHONIC FORAMINIFERAL DISTRIBUTIONS IN MISSISSIPPI SOUND CORES
% = OCCURRENCE IN PERCENT OF TOTAL BENTHONIC POPULATIONS
NO = OCCURRENCE IN ACTUAL NUMBER OF SPECIMENS COUNTED
X = LESS THAN 0.5%

CORE NUMBER	7124-S	7407-H	7408-H	7417-H	7418-H
WATER DEPTH IN FEET	10	10	10	22	10
DEPTH IN CORE (INCHES FROM TOP)	1-1/2" 2-1/2" 3-1/2" 4-1/2" 5-1/2" 6-1/2" 7-1/2" 8-1/2" 9-1/2" 10-1/2" 11-1/2" 12-1/2" 13-1/2" 14-1/2" 15-1/2" 16-1/2" 17-1/2" 18-1/2" 19-1/2" 20-1/2" 21-1/2" 22-1/2" 23-1/2" 24-1/2" 25-1/2" 26-1/2" 27-1/2" 28-1/2" 29-1/2" 30-1/2" 31-1/2" 32-1/2" 33-1/2" 34-1/2" 35-1/2" 36-1/2" 37-1/2" 38-1/2" 39-1/2" 40-1/2" 41-1/2" 42-1/2" 43-1/2" 44-1/2" 45-1/2" 46-1/2" 47-1/2" 48-1/2" 49-1/2" 50-1/2" 51-1/2" 52-1/2" 53-1/2" 54-1/2" 55-1/2" 56-1/2" 57-1/2" 58-1/2" 59-1/2" 60-1/2" 61-1/2" 62-1/2" 63-1/2" 64-1/2" 65-1/2" 66-1/2" 67-1/2" 68-1/2" 69-1/2" 70-1/2" 71-1/2" 72-1/2" 73-1/2" 74-1/2" 75-1/2" 76-1/2" 77-1/2" 78-1/2" 79-1/2" 80-1/2" 81-1/2" 82-1/2" 83-1/2" 84-1/2" 85-1/2" 86-1/2" 87-1/2" 88-1/2" 89-1/2" 90-1/2" 91-1/2" 92-1/2" 93-1/2" 94-1/2" 95-1/2" 96-1/2" 97-1/2" 98-1/2" 99-1/2" 100-1/2"	1-1/2" 2-1/2" 3-1/2" 4-1/2" 5-1/2" 6-1/2" 7-1/2" 8-1/2" 9-1/2" 10-1/2" 11-1/2" 12-1/2" 13-1/2" 14-1/2" 15-1/2" 16-1/2" 17-1/2" 18-1/2" 19-1/2" 20-1/2" 21-1/2" 22-1/2" 23-1/2" 24-1/2" 25-1/2" 26-1/2" 27-1/2" 28-1/2" 29-1/2" 30-1/2" 31-1/2" 32-1/2" 33-1/2" 34-1/2" 35-1/2" 36-1/2" 37-1/2" 38-1/2" 39-1/2" 40-1/2" 41-1/2" 42-1/2" 43-1/2" 44-1/2" 45-1/2" 46-1/2" 47-1/2" 48-1/2" 49-1/2" 50-1/2" 51-1/2" 52-1/2" 53-1/2" 54-1/2" 55-1/2" 56-1/2" 57-1/2" 58-1/2" 59-1/2" 60-1/2" 61-1/2" 62-1/2" 63-1/2" 64-1/2" 65-1/2" 66-1/2" 67-1/2" 68-1/2" 69-1/2" 70-1/2" 71-1/2" 72-1/2" 73-1/2" 74-1/2" 75-1/2" 76-1/2" 77-1/2" 78-1/2" 79-1/2" 80-1/2" 81-1/2" 82-1/2" 83-1/2" 84-1/2" 85-1/2" 86-1/2" 87-1/2" 88-1/2" 89-1/2" 90-1/2" 91-1/2" 92-1/2" 93-1/2" 94-1/2" 95-1/2" 96-1/2" 97-1/2" 98-1/2" 99-1/2" 100-1/2"	1-1/2" 2-1/2" 3-1/2" 4-1/2" 5-1/2" 6-1/2" 7-1/2" 8-1/2" 9-1/2" 10-1/2" 11-1/2" 12-1/2" 13-1/2" 14-1/2" 15-1/2" 16-1/2" 17-1/2" 18-1/2" 19-1/2" 20-1/2" 21-1/2" 22-1/2" 23-1/2" 24-1/2" 25-1/2" 26-1/2" 27-1/2" 28-1/2" 29-1/2" 30-1/2" 31-1/2" 32-1/2" 33-1/2" 34-1/2" 35-1/2" 36-1/2" 37-1/2" 38-1/2" 39-1/2" 40-1/2" 41-1/2" 42-1/2" 43-1/2" 44-1/2" 45-1/2" 46-1/2" 47-1/2" 48-1/2" 49-1/2" 50-1/2" 51-1/2" 52-1/2" 53-1/2" 54-1/2" 55-1/2" 56-1/2" 57-1/2" 58-1/2" 59-1/2" 60-1/2" 61-1/2" 62-1/2" 63-1/2" 64-1/2" 65-1/2" 66-1/2" 67-1/2" 68-1/2" 69-1/2" 70-1/2" 71-1/2" 72-1/2" 73-1/2" 74-1/2" 75-1/2" 76-1/2" 77-1/2" 78-1/2" 79-1/2" 80-1/2" 81-1/2" 82-1/2" 83-1/2" 84-1/2" 85-1/2" 86-1/2" 87-1/2" 88-1/2" 89-1/2" 90-1/2" 91-1/2" 92-1/2" 93-1/2" 94-1/2" 95-1/2" 96-1/2" 97-1/2" 98-1/2" 99-1/2" 100-1/2"	1-1/2" 2-1/2" 3-1/2" 4-1/2" 5-1/2" 6-1/2" 7-1/2" 8-1/2" 9-1/2" 10-1/2" 11-1/2" 12-1/2" 13-1/2" 14-1/2" 15-1/2" 16-1/2" 17-1/2" 18-1/2" 19-1/2" 20-1/2" 21-1/2" 22-1/2" 23-1/2" 24-1/2" 25-1/2" 26-1/2" 27-1/2" 28-1/2" 29-1/2" 30-1/2" 31-1/2" 32-1/2" 33-1/2" 34-1/2" 35-1/2" 36-1/2" 37-1/2" 38-1/2" 39-1/2" 40-1/2" 41-1/2" 42-1/2" 43-1/2" 44-1/2" 45-1/2" 46-1/2" 47-1/2" 48-1/2" 49-1/2" 50-1/2" 51-1/2" 52-1/2" 53-1/2" 54-1/2" 55-1/2" 56-1/2" 57-1/2" 58-1/2" 59-1/2" 60-1/2" 61-1/2" 62-1/2" 63-1/2" 64-1/2" 65-1/2" 66-1/2" 67-1/2" 68-1/2" 69-1/2" 70-1/2" 71-1/2" 72-1/2" 73-1/2" 74-1/2" 75-1/2" 76-1/2" 77-1/2" 78-1/2" 79-1/2" 80-1/2" 81-1/2" 82-1/2" 83-1/2" 84-1/2" 85-1/2" 86-1/2" 87-1/2" 88-1/2" 89-1/2" 90-1/2" 91-1/2" 92-1/2" 93-1/2" 94-1/2" 95-1/2" 96-1/2" 97-1/2" 98-1/2" 99-1/2" 100-1/2"	1-1/2" 2-1/2" 3-1/2" 4-1/2" 5-1/2" 6-1/2" 7-1/2" 8-1/2" 9-1/2" 10-1/2" 11-1/2" 12-1/2" 13-1/2" 14-1/2" 15-1/2" 16-1/2" 17-1/2" 18-1/2" 19-1/2" 20-1/2" 21-1/2" 22-1/2" 23-1/2" 24-1/2" 25-1/2" 26-1/2" 27-1/2" 28-1/2" 29-1/2" 30-1/2" 31-1/2" 32-1/2" 33-1/2" 34-1/2" 35-1/2" 36-1/2" 37-1/2" 38-1/2" 39-1/2" 40-1/2" 41-1/2" 42-1/2" 43-1/2" 44-1/2" 45-1/2" 46-1/2" 47-1/2" 48-1/2" 49-1/2" 50-1/2" 51-1/2" 52-1/2" 53-1/2" 54-1/2" 55-1/2" 56-1/2" 57-1/2" 58-1/2" 59-1/2" 60-1/2" 61-1/2" 62-1/2" 63-1/2" 64-1/2" 65-1/2" 66-1/2" 67-1/2" 68-1/2" 69-1/2" 70-1/2" 71-1/2" 72-1/2" 73-1/2" 74-1/2" 75-1/2" 76-1/2" 77-1/2" 78-1/2" 79-1/2" 80-1/2" 81-1/2" 82-1/2" 83-1/2" 84-1/2" 85-1/2" 86-1/2" 87-1/2" 88-1/2" 89-1/2" 90-1/2" 91-1/2" 92-1/2" 93-1/2" 94-1/2" 95-1/2" 96-1/2" 97-1/2" 98-1/2" 99-1/2" 100-1/2"
TOTAL BENTHONIC POPULATION	100	100	100	100	100
NUMBER BENTHONIC SPECIES	10	10	10	10	10
<i>Nonion cf. griseolampi</i>					
<i>Nonionella attitica</i>					
<i>N. optica</i>					
<i>Nouris sp.</i>					
<i>Palmerella sp.</i>					
<i>Paraceras praetense</i>					
<i>Planorbina mediterranea</i>					
<i>Planulina carnea</i>					
<i>Pyrgo cf. nasutus</i>					
<i>Quinqueloculina cuneata</i>					
<i>Q. cultrata</i>					
<i>Q. imperatoria</i>					
<i>Q. polyana</i>					
<i>Q. polyana</i>					
<i>Q. rhodiensis</i>					
<i>Q. subulosa</i>					
<i>Q. seminula</i>					
<i>Recurvirostra</i>					
<i>Rapax gracilis</i>					
<i>R. nana</i>					
<i>Russelia attitica</i>					
<i>Russelia bertheloffi</i>					
<i>R. concinna</i>					
<i>R. floridana</i>					
<i>R. wuensis</i>					
<i>"Russelia" rothauseni</i>					
<i>Succinea attitica</i>					
<i>Spirillina vivipara</i>					
<i>Spirilloculina grea</i>					
<i>Streblus beccarii var. acrinus</i>					
<i>S. beccarii var. rapidus</i>					
<i>Testularia mayri</i>					
<i>Triloculina alabottomi</i>					
<i>Trochammina cf. lobata</i>					
<i>T. cf. macrescens</i>					
<i>T. ochracea</i>					
<i>T. spp. (unidentified)</i>					
<i>Uvigerina hipido-testata</i>					
<i>Virgulina complanata</i>					
<i>V. mexicana</i>					
<i>V. pantoni</i>					

TABLE I. PART 8
BENTHONIC FORAMINIFERAL DISTRIBUTIONS IN MISSISSIPPI SOUND CORES
% = OCCURRENCE IN PERCENT OF TOTAL BENTHONIC POPULATIONS
NO. = OCCURRENCE IN ACTUAL NUMBER OF SPECIMENS COUNTED
X = LESS THAN 0.5%

CORE NUMBER	7424-H												7425-H												7432-H																																																																																																																																																																															
WATER DEPTH IN FEET	41												41												40																																																																																																																																																																															
DEPTH IN CORE (INCHES FROM TOP)	1/2-1 1/2"	1-1 1/2"	3/4-1"	1/2-3/4"	1/4-1/2"	1/8-1/4"	1/16-1/8"	1/32-1/16"	1/64-1/32"	1/128-1/64"	1/256-1/128"	1/512-1/256"	1/1024-1/512"	1/2048-1/1024"	1/4096-1/2048"	1/8192-1/4096"	1/16384-1/8192"	1/32768-1/16384"	1/65536-1/32768"	1/131072-1/65536"	1/262144-1/131072"	1/524288-1/262144"	1/1048576-1/524288"	1/2097152-1/1048576"	1/4194304-1/2097152"	1/8388608-1/4194304"	1/16777216-1/8388608"	1/33554432-1/16777216"	1/67108864-1/33554432"	1/134217728-1/67108864"	1/268435456-1/134217728"	1/536870912-1/268435456"	1/1073741824-1/536870912"	1/2147483648-1/1073741824"	1/4294967296-1/2147483648"	1/8589934592-1/4294967296"	1/17179869184-1/8589934592"	1/34359738368-1/17179869184"	1/68719476736-1/34359738368"	1/137438953472-1/68719476736"	1/274877906944-1/137438953472"	1/549755813888-1/274877906944"	1/1099511627776-1/549755813888"	1/2199023255552-1/1099511627776"	1/4398046511104-1/2199023255552"	1/8796093022208-1/4398046511104"	1/17592186044416-1/8796093022208"	1/35184372088832-1/17592186044416"	1/70368744177664-1/35184372088832"	1/140737488355328-1/70368744177664"	1/281474976710656-1/140737488355328"	1/562949953421312-1/281474976710656"	1/1125899906842624-1/562949953421312"	1/2251799813685248-1/1125899906842624"	1/4503599627370496-1/2251799813685248"	1/9007199254740992-1/4503599627370496"	1/18014398509481984-1/9007199254740992"	1/36028797018963968-1/18014398509481984"	1/72057594037927936-1/36028797018963968"	1/144115188075855872-1/72057594037927936"	1/288230376151711744-1/144115188075855872"	1/576460752303423488-1/288230376151711744"	1/1152921504606846976-1/576460752303423488"	1/2305843009213693952-1/1152921504606846976"	1/4611686018427387904-1/2305843009213693952"	1/9223372036854775808-1/4611686018427387904"	1/18446744073709551616-1/9223372036854775808"	1/36893488147419103232-1/18446744073709551616"	1/73786976294838206464-1/36893488147419103232"	1/147573952589676412928-1/73786976294838206464"	1/295147905179352825856-1/147573952589676412928"	1/590295810358705651712-1/295147905179352825856"	1/1180591620717411303424-1/590295810358705651712"	1/2361183241434822606848-1/1180591620717411303424"	1/4722366482869645213696-1/2361183241434822606848"	1/9444732965739290427392-1/4722366482869645213696"	1/18889465931478580854784-1/9444732965739290427392"	1/37778931862957161709568-1/18889465931478580854784"	1/75557863725914323419136-1/37778931862957161709568"	1/151115727451828646838272-1/75557863725914323419136"	1/302231454903657293676544-1/151115727451828646838272"	1/604462909807314587353088-1/302231454903657293676544"	1/1208925819614629174706176-1/604462909807314587353088"	1/2417851639229258349412352-1/1208925819614629174706176"	1/483570327845851669882464-1/2417851639229258349412352"	1/967140655691703339764928-1/483570327845851669882464"	1/1934281311383406679529856-1/967140655691703339764928"	1/3868562622766813359059712-1/1934281311383406679529856"	1/7737125245533626718119424-1/3868562622766813359059712"	1/1547425049106725343623888-1/7737125245533626718119424"	1/3094850098213450687247776-1/1547425049106725343623888"	1/6189700196426901374495552-1/3094850098213450687247776"	1/12379400392853802748991104-1/6189700196426901374495552"	1/24758800785707605497982208-1/12379400392853802748991104"	1/49517601571415210995964416-1/24758800785707605497982208"	1/99035203142830421991928832-1/49517601571415210995964416"	1/1980704062856608439838576-1/99035203142830421991928832"	1/3961408125713216879677152-1/1980704062856608439838576"	1/7922816251426433759354304-1/3961408125713216879677152"	1/15845632502852867518708608-1/7922816251426433759354304"	1/31691265005705735037417216-1/15845632502852867518708608"	1/63382530011411470074834432-1/31691265005705735037417216"	1/126765060022822940149668864-1/63382530011411470074834432"	1/253530120045645880299337728-1/126765060022822940149668864"	1/507060240091291760598675456-1/253530120045645880299337728"	1/1014120480182583521197350912-1/507060240091291760598675456"	1/2028240960365167042394701824-1/1014120480182583521197350912"	1/4056481920730334084789403648-1/2028240960365167042394701824"	1/8112963841460668169578807296-1/4056481920730334084789403648"	1/1622592768292133633917614592-1/8112963841460668169578807296"	1/3245185536584267267835229184-1/1622592768292133633917614592"	1/6490371073168534535670458368-1/3245185536584267267835229184"	1/12980742146337069071340916736-1/6490371073168534535670458368"	1/25961484292674138142681833472-1/12980742146337069071340916736"	1/51922968585348276285363666944-1/25961484292674138142681833472"	1/103845937170696552570727333888-1/51922968585348276285363666944"	1/207691874341393105141454667776-1/103845937170696552570727333888"	1/415383748682786210282909335552-1/207691874341393105141454667776"	1/830767497365572420565818671104-1/415383748682786210282909335552"	1/1661534994731144841131737342208-1/830767497365572420565818671104"	1/3323069989462289682263474684416-1/1661534994731144841131737342208"	1/6646139978924579364526949368832-1/3323069989462289682263474684416"	1/13292279957849158729053898737664-1/66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TABLE X PART A
BENTHONIC FORAMINIFERAL DISTRIBUTIONS IN OPEN GULF CORES

% = OCCURRENCE IN PERCENT OF TOTAL BENTHONIC POPULATIONS
NO. = OCCURRENCE IN ACTUAL NUMBER OF SPECIMENS COUNTED
X = LESS THAN 0.5%

CORE NUMBER	7424-H										7425-H										7432-H																		
WATER DEPTH IN FEET	41										41										40																		
DEPTH IN CORE (INCHES FROM TOP)	1/2-1 1/2"	18-18"	39-40"	59-60"	79-80"	99-100"	119-120"	139-140"	159-160"	179-180"	1/2-1 1/2"	20-21"	40-41"	60-61"	80-81"	100-101"	120-121"	140-141"	160-161"	180-181"	199-200"	1/2-1 1/2"	20-21"	40-41"	60-61"	80-81"	99-100"	119-120"	139-140"	159-160"	179-180"	199-200"	219-220"	239-240"	259-260"	279-280"	299-300"	319-320"	
TOTAL BENTHONIC POPULATION	44	27	34	34	34	34	34	34	34	34	44	27	34	34	34	34	34	34	34	34	34	44	27	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	
NUMBER BENTHONIC SPECIES	44	27	34	34	34	34	34	34	34	34	44	27	34	34	34	34	34	34	34	34	34	44	27	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	
<i>Nonion cf. grateloup</i>	%	NO									%	NO										%	NO																
<i>Nonionella atlantica</i>	%	NO	8	1	4	2	1	1	4	1	%	NO	8	1	4	2	1	1	4	1		%	NO	8	1	4	2	1	1	4	1								
<i>N. opima</i>	%	NO	3	19	15	14	9	23	11	6	%	NO	3	19	15	14	9	23	11	6		%	NO	3	19	15	14	9	23	11	6								
<i>Peneroplis proteus</i>	%	NO	40	18	81	104	84	67	43	38	%	NO	41	18	58	34	74	108	117	68	107	80	%	NO	41	18	58	34	74	108	117	68	107	80					
<i>Panulina esorae</i>	%	NO									%	NO										%	NO																
<i>Pyrgo muricina</i>	%	NO									%	NO										%	NO																
<i>P. cf. nasutus</i>	%	NO									%	NO										%	NO																
<i>Quinqueloculina compta</i>	%	NO	4	X	N	1	4	8	1	1	%	NO	4	X	N	1	4	8	1	1		%	NO	4	X	N	1	4	8	1	1								
<i>Q. cultrata</i>	%	NO	1	1	1	1	1	1	1	1	%	NO	1	1	1	1	1	1	1	1		%	NO	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
<i>Q. cf. funiculata</i>	%	NO									%	NO										%	NO																
<i>Q. lomarchiana</i>	%	NO	1	N	1	1	1	1	3	3	%	NO	1	N	1	1	1	1	3	3		%	NO	1	N	1	1	1	1	1	1	1	1	1	1	1	1	1	
<i>Q. poeyana</i>	%	NO	8	3	3	8	8	7	12	17	%	NO	8	3	3	8	8	7	12	17		%	NO	8	3	3	8	8	7	12	17								
<i>Q. rhodiensis</i>	%	NO									%	NO										%	NO																
<i>Q. scabulosa</i>	%	NO									%	NO										%	NO																
<i>Q. seminula</i>	%	NO									%	NO										%	NO																
<i>Rectobolivina advena</i>	%	NO									%	NO										%	NO																
<i>Rausellia atlantica</i>	%	NO									%	NO										%	NO																
<i>Rosalina bertheloti</i>	%	NO									%	NO										%	NO																
<i>R. concinna</i>	%	NO	6	6	4	8	2	1	8	2	%	NO	6	6	4	8	2	1	8	2		%	NO	6	6	4	8	2	1	8	2								
<i>R. floridana</i>	%	NO	1	1	2	1	6	8	8	3	%	NO	1	1	2	1	6	8	8	3		%	NO	1	1	2	1	6	8	8	3								
<i>R. floridensis</i>	%	NO	7	5	7	6	19	12	6	20	%	NO	7	5	7	6	19	12	6	20		%	NO	7	5	7	6	19	12	6	20								
<i>R. suessengia</i>	%	NO									%	NO										%	NO																
<i>"Rotella" rothauseni</i>	%	NO									%	NO										%	NO																
<i>Siphonotulera rothauseni</i>	%	NO									%	NO										%	NO																
<i>Spiraloculina grata</i>	%	NO									%	NO										%	NO																
<i>S. soldani</i>	%	NO									%	NO										%	NO																
<i>Streblus beccarii</i> var. <i>sabrinus</i>	%	NO	8	3	3	8	8	8	8	6	%	NO	8	3	3	8	8	8	8	6		%	NO	8	3	3	8	8	8	8	6								
<i>S. beccarii</i> var. <i>tepidus</i>	%	NO	20	2	2	3	1	2	6	1	%	NO	20	2	2	3	1	2	6	1		%	NO	20	2	2	3	1	2	6	1								
<i>Textularia mayori</i>	%	NO	10	10	9	17	13	7	7		%	NO	10	10	9	17	13	7	7			%	NO	10	10	9	17	13	7	7									
<i>Triloculina sigebottomi</i>	%	NO									%	NO										%	NO																
<i>T. trigonula</i>	%	NO									%	NO										%	NO																
<i>T. ochracea</i>	%	NO									%	NO										%	NO																
<i>T. spp. (unidentified)</i>	%	NO									%	NO										%	NO																
<i>Uvigerina hispidula-costata</i>	%	NO									%	NO										%	NO																
<i>U. parvula</i>	%	NO									%	NO										%	NO																
<i>U. peregrina</i>	%	NO									%	NO										%	NO																
<i>Virgulina complanata</i>	%	NO									%	NO										%	NO																
<i>V. mexicana</i>	%	NO									%	NO										%	NO																
<i>V. pontoni</i>	%	NO									%	NO										%	NO																
<i>Wuellerstorfi</i>	%	NO									%	NO										%	NO																

TABLE II PART B

BENTHONIC FORAMINIFERAL DISTRIBUTIONS IN OPEN GULF CORES

% = OCCURRENCE IN PERCENT OF TOTAL BENTHONIC POPULATIONS

NO = OCCURRENCE IN ACTUAL NUMBER OF SPECIMENS COUNTED

X = LESS THAN 0.5%

CORE NUMBER	7800-H	7811-H	7820-H	7822-H	7823-H	7824-H	7831-H
WATER DEPTH IN FEET	17	38	12	14	50	41	44
DEPTH IN CORE (INCHES FROM TOP)	17 3-1/2 41-1/2 48-1/2	38 3-1/2 35-1/2 36-1/2	12 3-1/2 11-1/2 12-1/2	14 3-1/2 11-1/2 12-1/2	50 3-1/2 46-1/2 47-1/2	41 3-1/2 37-1/2 38-1/2	44 3-1/2 40-1/2 41-1/2
TOTAL BENTHONIC POPULATION	2,200	625	175	25	2,000	1,000	1,000
NUMBER BENTHONIC SPECIES	20	20	20	20	20	20	20
<i>Ammodiscus diversus</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>A. calvus</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>A. salus</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>A. spp. (fragments)</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Ammodiscus</i> spp.	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Angulogemma bella</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Arenoporella mexicana</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Asterigerina carinata</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Bigenaria irregularis</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Bollina lowmani</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>B. pulchella primitiva</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>B. striatula</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>B. sp.</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Buccella hawaii</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Bulinina aculeata</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>B. marginata</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Bulininella cf. boecondorfensis</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>B. elegantissima</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Cassidulina curvata</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>C. subglobosa</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Cibicides</i> sp.	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Cornuspira</i> sp.	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Elphidium advenum</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>E. delicatulum</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>E. discoides</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>E. galvadinense</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>E. gunteri</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>E. incertum mexicanum</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>E. kosobesense</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>E. malacodanum</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>E. posyanum</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>E. spp. (small unidentified)</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Epistominella vitrea</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Goudryina exilis</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Glabulina caribaea</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Gutulina australis</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Hanzawaia strattoni</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Milammina fusca</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Miliolidae (various unidentified)</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1
<i>Nodobuccellaella cf. cecum</i>	% 1	% 1	% 1	% 1	% 1	% 1	% 1

[illegible]

TABLE III
BENTHONIC FORAMINIFERAL DISTRIBUTIONS

% = OCCURRENCE IN PERCENT OF TOTAL BENTHONIC POPULATIONS
NO. = OCCURRENCE IN ACTUAL NUMBER OF SPECIMENS COUNTED
X = LESS THAN 0.6%

PLATE 1

(All magnifications are 70X unless otherwise stated)

- Fig. 1. Ammobaculites exiguus Cushman and Bronnimann. Core 7124-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view.
- Fig. 2. Ammobaculites salsus Cushman and Bronnimann. Core 7124-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view.
- Fig. 3. Bigennerina irregularis Phleger and Parker. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view.
- Fig. 4. Bolivina lowmani Phleger and Parker. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view. 100X
- Fig. 5. Bolivina pulchella primitiva Cushman. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view.
- Fig. 6. Bolivina striatula Cushman. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view.
- Fig. 7. Buccella hannai (Phleger and Parker). Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view.
- Fig. 8. Buliminella bassendorfsensis Cushman and Parker. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view.
- Fig. 9. Buliminella elegantissima (d'Orbigny). Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view.
- Fig. 10. Elphidium gunteri Cole. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, apertural view.
- Fig. 11. Elphidium incertum mexicanum Kornfeld. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, apertural view.
- Fig. 12. Elphidium sp. cf. E. koeboeense Leroy. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, apertural view.
- Fig. 13. Elphidium matagordanum (Kornfeld). Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, apertural view.
- Fig. 14. Elphidium poeyanum (d'Orbigny). Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, apertural view (apertural face broken).
- Fig. 15. Epistominella vitrea Parker. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view. 100X

- Fig. 16. Gaudryina exilis Cushman and Bronnimann. Core 7124-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view. 100X
- Fig. 17. Guttulina australis d'Orbigny. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, apertural view.
- Fig. 18. Hanzawaia strattoni (Applin). Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view.
- Fig. 19. Nonionella atlantica Cushman. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view.
- Fig. 20. Nonionella opima Cushman. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view.
- Fig. 21. Nouria sp. Core 7124-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, apertural view.
- Fig. 22. Planulina exorna Phleger and Parker. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view.

PLATE 2

(All magnifications are 70X unless otherwise stated)

- Fig. 1. Quinqueloculina compta Cushman. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view; C, apertural view.
- Fig. 2. Quinqueloculina lamarckiana d'Orbigny. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view; C, apertural view.
- Fig. 3. Quinqueloculina poeyana d'Orbigny. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view; C, apertural view.
- Fig. 4. Quinqueloculina seminula (Linne). Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, side view; B, front view; C, apertural view.
- Fig. 5. Rosalina bertheloti d'Orbigny. Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view.
- Fig. 6. Rosalina concinna (H. B. Brady). Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view.
- Fig. 7. Rosalina floridana (Cushman). Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view. 100X
- Fig. 8. Rosalina suezensis (Said). Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view.
- Fig. 9. Streblus beccarii (Linne) var. sobrinus (Shupack). Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view.
- Fig. 10. Streblus beccarii (Linne) var. tepidus (Cushman). Core 7417-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view.
- Fig. 11. Trochammina macrescens H. B. Brady. Core 7124-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view. 100X
- Fig. 12. Trochammina sp. cf. T. ochracea (Williamson). Core 7124-H, $\frac{1}{2}$ - $1\frac{1}{2}$ inches. A, dorsal view; B, ventral view; C, apertural view. 100X

PLATE 2

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