CUSHMAN FOUNDATION FOR FORAMINIFERAL RESEARCH

SPECIAL PUBLICATION NO. 2

ECOLOGY OF FORAMINIFERA FROM SAN ANTONIO BAY AND ENVIRONS, SOUTHWEST TEXAS

By

FRANCES L. PARKER, FRED B PHLEGER,

and JEAN F. PEIRSON

WASHINGTON, D. C., U. S. A.

JANUARY 29, 1953

Price $2.15 postpaid

ECOLOGY OF FORAMINIFERA FROM SAN ANTONIO BAY AND ENVIRONS, SOUTHWEST TEXAS

By

Frances L. Parker, Fred B Phleger
and Jean F. Peirson

SUMMARY

1. Foraminifera populations have been analyzed from approximately 320 equal-size samples of surface sediment from a nearshore area on the southwest coast of Texas.
2. The Foraminifera populations are grouped into four biofacies, as follows: open gulf, bay, marsh, and river biofacies. Two subfacies are distinguished, a beach subfacies and an upper San Antonio Bay "subfacies." Mixed faunas occur in the lower bays, particularly near passes.
3. Two principal factors causing the biofacies distribution in this area are believed to be the presence of barrier islands with narrow passes and variations in runoff into the bays. During times of low runoff oceanic water invades the bays, evaporates, and relatively high salinities result. Many of the open gulf species invade with the oceanic water masses at times of low runoff, and appear to become established within the bays. These species may be killed off during prolonged high runoff and consequent decrease in salinity.

INTRODUCTION

This is one of a series of papers describing and interpreting various aspects of the oceanography and sedimentology of San Antonio Bay and environs on the Gulf Coast of west Texas. The purposes of this study are: 1) to discover whether the Foraminifera faunas in the surface sediments are grouped into biofacies patterns, and 2) to attempt to interpret the distribution on the basis of available environmental data.

The authors are grateful to the staff of American Petroleum Institute Project 51 who collected the samples and made them available for study. The laboratory work was supported by the office of Naval Research, under Contract Nonr-23301 and by American Petroleum Institute Project 51.

LOCATION AND DESCRIPTION OF THE AREA

The area is on the coast of the northwest Gulf of Mexico, northeast of Corpus Christi, Texas. It extends between approximately N. Lat. 28°20′ and N. Lat. 28°47′, and between W. Long. 76°30′ and W. Long. 97°03′. The geographic areas sampled include San Antonio Bay, southwest Espiritu Santo Bay, Mesquite Bay, Aransas Bay, Copano Bay, St. Joseph Island, Matagorda Island, and offshore from the harrier islands to a depth of approximately 60 ft. (18 m.). Locations of the stations are shown on Figure 1; additional data on station locations are on file at the Scripps Institution of Oceanography.

The major geographic features of the area are a series of shallow bays separated from the Gulf of Mexico by almost continuous barrier islands composed of sand. The island barrier is broken by three "passes." Aransas Pass is the principal opening at the southern end of the area. Cedar Bayou, extending into Mesquite Bay, is a narrow pass which was open at the time of collection but which may he closed at other times. A third opening important in the circulation of the bays is Pass Cavallo at the north end of the area, not shown on the figures in this report.

The bays are generally very shallow. The maximum depth in San Antonio Bay is approximately 6½ ft. (2 m.), with an average depth of 4 to 5 ft. (1 m.) and large areas around the margins of the bay are yet shoaler. In Mesquite Bay the depths are somewhat shoaler, not exceeding about 4 ft. (1 m.). Aransas Bay is somewhat deeper with depths up to 12 ft. (4 m.), and Copano Bay averages about 7 ft. (2 m.) over much of its central portion. Most of the bay areas contain reefs, composed largely of oyster shell, which rise above the prevailing depths. A few samples were taken offshore from the barrier islands out to a depth of 60 ft. (18 m.), approximately 8 miles off the beach.

The sediment in the bays is dominated by mud, with sand forming a strip around the margins, and with numerous patches of shell. Grassy Point Marsh in the Guadalupe Delta region is composed of mud with a great amount of organic debris. The marsh on the inner side of Matagorda Island contains considerable sand with mud and organic debris; the barrier islands are composed almost entirely of sand. Offshore there is a zone of sand near the beach and this grades seaward into mud and sandy mud.

The salinity and temperature distribution in San Antonio Bay will be reported elsewhere, but the general aspects are given here because of their ecological significance. Previous to the collection of the present samples, there had been little rainfall in the region of which this area is a part, and the runoff from the rivers was low. The salinities were high, ranging up to approximately 42 o/oo, while the open gulf water samples had a salinity of 36.2 o/oo to 36.4 o/oo which is the normal range for offshore Gulf of Mexico water. Low salinities were reported only in Guadalupe Bay and vicinity; at the Guadalupe River effluent into the bay they were as low as approximately 2.9 o/oo. It appears that essentially all of the water in the bays was being furnished from the Gulf, and the salinity was increased by excessive evaporation.

Salinities in the bays reported by Galtsoff (1931)

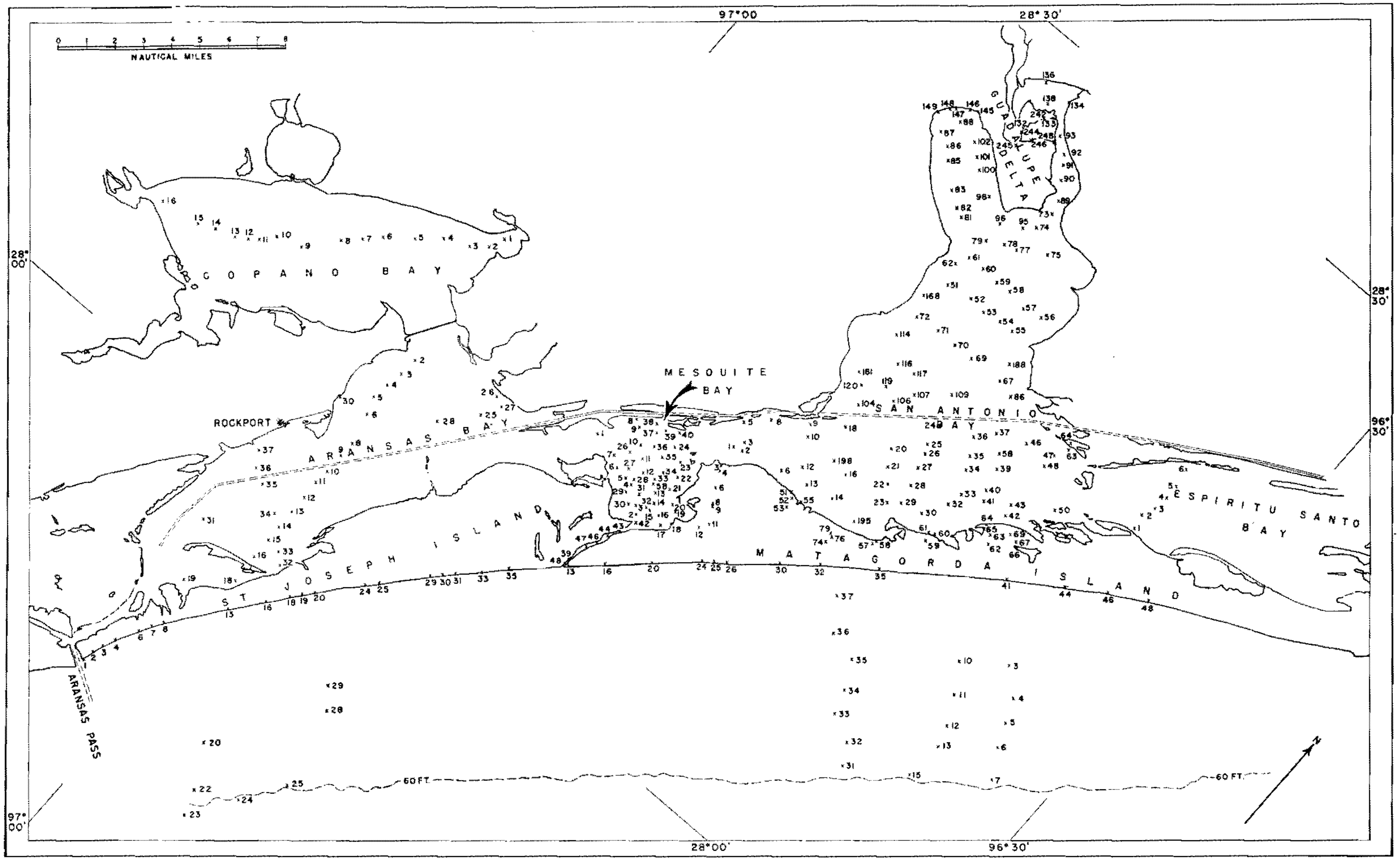


Figure 1. Locations of stations.

for January and February, 1926, are significantly lower. They average only a fraction of the July and August, 1951, salinities, especially in San Antonio and Mesquite Bays, and are little more than half the 1951 values in Aransas Bay. Gunter (1945) reports salinities in Aransas Bay higher than those of the Gulf of Mexico in August and September, 1941. Collier and Hedgpeth (1950) have summarized most of the known salinity data for this area previous to those collected by members of American Petroleum Institute Project 51. They point out that rainfall is erratic over the basin draining into the bays and that evaporation exceeds precipitation in the area. Whitehouse (MS) has listed most of the recorded salinities from 1936 to 1952; the lowest salinities which he gives are only a fraction of the highest. It seems quite probable that similar ranges in salinity may occur over any period of years. This area is in the boundary zone between the humid subtropical and the steppe climates. Periodic ranges in precipitation of considerable magnitude are to be expected over most of the drainage basins providing runoff to the area. These runoff variations will cause considerable and irregular variations in salinity in bay and nearshore water. Such salinity variations probably are characteristic of an area having the climate and geography of the present one.

Temperatures in Aransas and Copano Bays are summarized by Hedgpeth (1951, p. 54, fig. 5) and these may be taken to apply generally also to San Antonio and Mesquite Bays. The temperature range given by Hedgpeth is approximately 13°C to 31°C. These figures are conservative and the actual extreme range in the bays over a period of years probably is 5° to 10°C greater than those listed by Hedgpeth. This is based upon a maximum surface temperature obtained in upper San Antonio Bay in August, 1951, of 34.7°C.

The nearshore salinities, offshore from the barrier island, were 36.19 o/oo to 36.9 o/oo at the stations occupied during mid-August, 1951. These are typical of salinities farther offshore in the Gulf of Mexico, and demonstrate that offshore water masses were extending to the beach. Surface salinities obtained by the ATLANTIS off Corpus Christi in 1935 range from less than 31 o/oo to about 33 o/oo, according to Phleger (1951, p. 24, fig. 21). Surface temperatures were found at the stations occupied during August, 1951, ranging from 27.6°C to 31.4°C, and bottom temperatures ranged from 24.4°C to 30.7°C. The writers are not aware of any published data on minimum nearshore temperatures. Phleger (1951, p. 23) reports approximately 16.5°C at a depth of 18 m. in February, 1947, and it is probable that occasional temperatures are somewhat lower during the winter season.

METHOD OF STUDY

Samples for study of Foraminifera were collected with a small coring tube (described by Phleger, 1951) which obtains a relatively undisturbed sample of the surface of the sediment having an area almost 10 sq. cm. A section of the surface material 1 cm. in thickness was retained for study. A larger sample was taken of beach sand, averaging 100 gr. or more of material.

The Foraminifera were studied from approximately 320 stations distributed in all parts of the area. Total population counts or estimates of the total population were made. Studies of the living population will be reported at a later date. The samples were washed through a sieve with an average opening of 0.074 mm. and when dry were separated through a brass sieve having an average opening of 0.149 mm. and the two fractions were studied. The finer fraction contains an abundance of small specimens, a large proportion of which is probably juvenile and cannot be identified with certainty. In practice, therefore, most of the study was of the coarser fraction, and unless otherwise specified, the results listed are of the coarser fraction. Samples having large populations were divided with a micro-split described by Parker (1948, p. 218) and a fraction of at least 300 specimens was counted; total population estimates were made of such samples. The entire population was counted in samples having approximately 300 specimens or less. Total populations are listed in Figures 5 and 6 in hundreds of specimens per sample, and in Tables 1-7 in actual estimated number. In the latter, populations are given to the nearest whole number, except where they total less than 100, where the actual counts are given. Occurrences of species are given in percent of total population.

Few planktonic specimens were discovered and where present are treated separately from the benthonic population.

SPECIES AND THEIR DISTRIBUTION

Many species restricted to the bay and marsh environments are widespread geographically. This is to be expected of deep water species which can probably be more easily distributed, and even of nearshore open gulf forms, but is somewhat surprising for bay and marsh species. These species in this area may be divided into several groups:

1) Species which are widely distributed in brackish or nearshore areas:

Ammoastuta inepta (Cushman and McCulloch) (west coast U. S., northeast U. S., Trinidad)

Ammobaculites dilatatus Cushman and Bronnimann (northeast U. S., Trinidad)

Elphidium sp. cf. *E. tumidum* Natland (California)

Jadammina polystoma Bartenstein and Brand (Germany, northeast U. S., California)

Lagunculina vadescens Cushman and Bronnimann (northeast U. S., Trinidad)

Leptodermella variabilis Parker (northeast U. S., Germany)

Miliammina fusca (H. B. Brady) (British Isles, Netherlands, Japan, northeast U. S.)
Proteonina lagenaria (Berthelin) (northeast U. S.)
Reophax nana Rhumbler (Brazil, northeast U. S.)
Trochammina inflata (Montagu) (Netherlands, British Isles, northeast U. S., Japan, California, etc.)
T. macrescens H. B. Brady (Netherlands, British Isles, northeast U. S., Japan, etc.)
Urnulina compressa Cushman (northeast U. S., west coast U. S., Miocene of Florida)

2) Species restricted to the West Indian region:
Ammobaculites exiguus Cushman and Bronnimann (Trinidad)
A. salsus Cushman and Bronnimann (Trinidad)
Discorinopsis aguayoi Bermudez (Cuba, Trinidad)
Elphidium delicatulum Bermudez (Miocene of the Dominican Republic)
Palmerinella palmerae Bermudez (Cuba)
Pseudoclavulina gracilis Cushman and Bronnimann (Trinidad)
Triloculina fiterrei meningoi Acosta (Cuba)
Trochammina comprimata Cushman and Bronnimann (Trinidad)

Several additional species in groups one and two have been observed in material from the Gulf of Paria and from mangrove swamps of the west coast of Trinidad, B. W. I.

3) Species reported only from the Gulf Coast from Louisiana westward:
Ammobaculites sp. *A*.
A. sp. *B*.
Arenoparrella mexicana (Kornfeld)
Massilina protea Parker, n. sp.
Miliammina sp.
Recurvoides sp.
"Rotalia" beccarii (Linné) variant *C*
Urnulina sp. *A*.
U. sp. *B*.

Species which occur in both bay and open gulf areas also have a widespread distribution, but this is more understandable than for marsh and bay forms. Of approximately forty-three species 50% are widespread, 30% occur in the West Indian region, and 20% are found only in the western part of the Gulf of Mexico. These percentages are approximately the same as those observed for the bay-marsh species, showing that conditions of distribution appear to pertain equally in both cases. In this connection it is interesting to note that the distributions reported (Phleger and Parker, 1951, p. 2) in the northwestern Gulf of Mexico were: 55% widespread, 30% West Indian region, and 15% from the Gulf of Mexico only.

Some of the species found in both the bays and open gulf of this area were not reported in the offshore northwest Gulf of Mexico area (Phleger, 1951). A few of these species were observed in that area and were not included in the report due to their rarity, but most of them appear to occur only in shallow water. The shoalest depth studied in the earlier report was 15 m. in one traverse, but in most traverses deeper than 20 m., which corresponds with the deepest stations of the present survey. The species not reported in the earlier study are:
Bolivina striatula Cushman
Elphidium galvestonensis Kornfeld (Previous report from northwest Gulf of Mexico, should be assigned to *E. gunteri*)
E. sp. cf. *E. koeboeense* LeRoy
E. poeyanum (Orbigny)
Epistominella vitrea Parker, n. sp.
Gaudryina exilis Cushman and Bronnimann
Guttulina australis (Orbigny)
Massilina peruviana (Orbigny)
Quinqueloculina cultrata (H. B. Brady)
Q. poeyana Orbigny
Triloculina sidebottomi (Martinotti)

A study of the distribution tables shows that several of these species are more common in the bays than in the open gulf.

Discussions of the species and their distributions are given below. The area is termed the "Rockport area" in these discussions for purposes of brevity, after the principal coastal town. Distributions of the significant species are shown on Figures 7 to 47 in percent of total populations; estimated total populations are shown on Figures 5 and 6. Distributions of the total faunas for each geographic subdivision of the area are given in Tables 1 to 7.

All specimens illustrated on Plates 1 to 4 are in the collections of the U. S. National Museum, Washington, D. C.

Ammoastuta inepta (Cushman and McCulloch)
Plate 1, figure 12

Ammobaculites ineptus CUSHMAN and McCULLOCH, 1939, Allan Hancock Pacific Exped., vol. 6, no. 1, p. 89, pl. 7, fig. 6.

Ammoastuta salsa CUSHMAN and BRONNIMANN, 1948, Contr. Cushman Lab. Foram. Res., vol. 24, pt. 1, p. 17, pl. 3, figs. 14-16.

This species is reported from marshy areas in various places: Trinidad, northeastern United States, off Panama and Ecuador. The two latter reports do not give the number of specimens found but in both cases the species occurred in shallow water and was probably derived from marshy areas nearby. In the Rockport area it occurs at all Grassy Point marsh stations, three in Matagorda Island marsh, and three in San Antonio Bay. Frequencies are low, but range to 5% on Grassy Point.

Ammobaculites dilatatus Cushman and Bronnimann

Plate 1, figures 13-15

Ammobaculites dilatatus CUSHMAN and BRONNIMANN, 1948, Contr. Cushman Lab. Foram. Res., vol. 24, pt. 2, p. 39, pl. 7, figs. 10, 11.

The Gulf of Mexico specimens are slightly thicker than Cushman and Bronnimann's types but in other respects they are very similar. Exceptionally large specimens have a length of 0.9 mm. At some localities there are lobulate forms associated with the more typical ones which are apparently variations of this species.

It is present at most bay stations with frequencies generally less than 5% except at three in central and one in southeast San Antonio Bay, two in Aransas Bay and two in Copano Bay. It is recorded from three Matagorda Island marsh stations and three in the open gulf at frequencies of 1% or less.

Ammobaculites exiguus Cushman and Bronnimann

Plate 1, figure 16

Ammobaculites exiguus CUSHMAN and BRONNIMANN, 1948, Contr. Cushman Lab. Foram. Res., vol. 24, pt. 2, p. 38, pl. 7, figs. 7, 8.

Very typical specimens occur rarely in the area. They are usually found in the fine fraction counted, occasionally in the coarse. They are reported from shallow water of the Gulf of Paria, Trinidad, B. W. I. This species is recorded from one station on Matagorda Island, two in Mesquite Bay, and occurs commonly in the open gulf.

Ammobaculites salsus Cushman and Bronnimann and variants

Plate 1, figures 17-25

Ammobaculites salsus CUSHMAN and BRONNIMANN, 1948, Contr. Cushman Lab. Foram. Res., vol. 24, pt. 1, p. 16, pl. 3, figs. 7-9.

This species as it is defined in the San Antonio Bay area is a very variable one. Various divisions of the forms were attempted but no conclusions could be arrived at as to the environmental preferences of the variants. For this reason it seems unnecessary to try to define them explicitly in taxonomic terms. Most of the specimens more closely resemble Cushman and Bronnimann's variety *distinctus* (1948, p. 40) than the typical species. They attain a slightly larger size, the maximum dimensions being 0.9 mm. in length, 0.32 mm. in width, and 0.22 mm. in thickness. Several of the variations found are figured. The specimens are very fragile and poorly cemented, and it is questionable whether they survive very long in compacted sediments although they are found at the bottom of short cores collected in the area.

In this region *A. salsus* appears to be confined to the bay areas where it constitutes an important fraction of the fauna, and it also occurs at numerous stations in the Matagorda Island marsh. One occurrence is recorded from a beach sample.

Ammobaculites sp. A

Plate 1, figures 26-28

This is larger form than *A. salsus* and its variants. The initial coiled portion is larger and less compressed. The maximum length is 0.7 mm.; the maximum diameter of the initial portion 0.4 mm.

The species occurs at a few scattered stations in the bays at very low frequencies, and at numerous stations on Matagorda Island with one frequency as high as 21%.

Ammobaculites sp. B

Plate 1, figure 30

This is a large species, attaining a length of over a millimeter. The test is compressed but the apertural end of the uniserial portion often becomes circular in cross-section. The species has probably been sometimes reported as *A. agglutinans* (Orbigny) but the chambers are less high, and more inflated in the uniserial portion. It occurs at several stations in San Antonio Bay, five in Mesquite Bay, and two in Copano Bay; frequencies are low.

Urnulina compressa Cushman

Plate 1, figures 7, 8

Urnulina compressa CUSHMAN, 1930, Florida State Geol. Surv. Bull. 4, p. 15, pl. 1, figs. 2a, b.

This species is reported in and near rivers in the Gulf of Maine and Long Island Sound area off the northeastern United States. In the Rockport area it composes major percentages of samples in the Guadalupe River and occurs at most stations in Guadalupe Bay beyond the mouth of the river; also reported in one sample from the Grassy Point marsh.

Urnulina sp. A

Plate 1, figure 9

A few specimens of a form somewhat similar to *Urnulina difflugaeformis* Gruber occur. They differ from that species in the smaller size and in having a more rounded initial end. The maximum length is 0.2 mm.

Urnulina sp. B

Plate 1, figure 10

This species is pointed at the initial end, which terminates in a short spine. The length including the spines is less than 0.2 mm.

Urnulina sp. *A* and *U.* sp. *B* have been recorded from only one sample in the Guadalupe River.

Ammoscalaria pseudospiralis (Williamson)

Plate 1, figures 29, 35

Proteonina pseudospirale WILLIAMSON, 1858, Rec. Foram. Great Britain, p. 2, pl. 1, figs. 2, 3.

Ammobaculites prostomum HOFKER, 1932, Publ. Staz. Zool. Napoli, vol. 12, fasc. 1, p. 87, figs. 14, 15.

The Gulf of Mexico specimens are smaller (maximum length 0.72 mm.) and are constructed of larger sand grains than are those figured by Williamson and Höglund (1947, pl. 31, fig. 1). They are also smaller but otherwise identical with the specimen figured by Hada (1931, text fig. 18) from Mutsu Bay, Japan. The species is reported by Phleger (1951, p. 40) as *Ammobaculites* cf. *foliaceus* (H. B. Brady) in the northwestern Gulf of Mexico to a depth of 200 m., with the main occurrence shallower than 50 m. In the Rockport area it occurs in most of the open gulf samples, is widespread in lower San Antonio Bay, Mesquite Bay, and Aransas Bay, and is in the northern half of Copano Bay. The frequencies range from 1 to 5%.

Arenoparrella mexicana (Kornfeld)

Plate 2, figures 33, 34

Trochammina inflata (MONTAGU) var. *mexicana* KORNFELD, 1931, Contr. Stanford Geol. Dept., vol. 1, p. 86, pl. 13, figs. 5a-c.

This species is reported in shallow water off the coast of Louisiana. In the Rockport area it occurs at several of the Matagorda Island marsh stations and at most of the Grassy Point marsh stations.

Bigenerina irregularis Phleger and Parker

Plate 1, figures 33, 34

Bigenerina irregularis PHLEGER and PARKER, 1951, Mem. 46, Geol. Soc. America, pt. 2, p. 4, pl. 1, figs. 16-21.

In the original description of this species in comparing it with *Clavulina textularioidea* Goës it was erroneously stated that Goës' Caribbean species was described from the Arctic. It is much larger than *B. irregularis* with a more compressed initial biserial stage. The specimens of *B. irregularis* in the San Antonio Bay area are smaller than usual with a maximum length of 0.7 mm. The species occurs in the northwestern Gulf of Mexico to a depth of 117 m. In the Rockport area it is found at all open gulf stations at frequencies up to 12%, at most beach stations at low frequencies, at one station in lower Aransas Bay, and three in lower Mesquite Bay.

Bolivina lowmani Phleger and Parker

Plate 4, figure 1

Bolivina lowmani PHLEGER and PARKER, 1951, Mem. 46, Geol. Soc. America, pt. 2, p. 13, pl. 6, figs. 20a, b, 21.

This is a common species throughout the northwestern Gulf of Mexico. In the Rockport area it occurs in the fine fractions of most open gulf samples at low percentages; also in the fine fraction at one station in upper Mesquite Bay, and at several in lower San Antonio Bay.

Bolivina pulchella primitiva Cushman

Plate 4, figures 2, 3

Bolivina pulchella (ORBIGNY) var. *primitiva* CUSHMAN, 1930, Florida State Geol. Surv. Bull. 4, p. 47, pl. 8, figs. 12a, b.

This is a shallow water species in the Gulf Coast area and restricted to depths of less than 100 m. (Phleger, 1951, p. 42). In the Rockport area it occurs at low frequencies in the fine fraction at numerous open gulf localities and at four in Mesquite Bay.

Bolivina striatula Cushman

Plate 4, figures 4, 5

Bolivina striatula CUSHMAN, 1922, Publ. 311, Carnegie Instit. Washington, p. 27, pl. 3, fig. 10.

The occurrence of this species in the shallow open gulf facies of this area is of interest. It appears to be replaced in somewhat deeper water by the variety *spinata* Cushman whose upper limit of depth in the northwestern Gulf of Mexico is reported at 30 m. by Phleger (1951, p. 43). *B. striatula* occurs at very low frequencies at most of the stations in this area except those from the beach, from southern Copano Bay, Matagorda Island marsh, and it is at very few stations in upper San Antonio Bay. It usually occurs as a component of the fine fraction.

Buliminella sp. cf. **B. bassendorfensis** Cushman and Parker

Plate 4, figures 6, 7

Buliminella bassendorfensis CUSHMAN and PARKER, 1937, Contr. Cushman Lab. Foram. Res., vol. 13, pt. 1, p. 40, pl. 4, figs. 13a, b.

This species is characteristic of depths less than 100 m. in the Gulf Coast area, with sporadic occurrences down to 600 m. In the Rockport area it is present at most of the open gulf stations at low frequencies, and at one in Mesquite Bay.

Buliminella elegantissima (Orbigny)

Plate 4, figures 8, 9

Bulimina elegantissima ORBIGNY, 1839, Voy. Amér. Mérid., vol. 5, pt. 5, "Foraminifères," p. 51, pl. 7, figs. 13, 14.

The maximum depth for this species is between 300 and 400 m. although the maximum occurrence in the northwestern Gulf of Mexico is shallower than 80 m. (Phleger, 1951, p. 45). In the Rockport area it occurs at most of the open gulf stations at low frequencies in the fine fraction. It also is present at numerous Mesquite Bay localities, and at a few in San Antonio Bay.

Cibicidina strattoni (Applin)

Plate 4, figures 38, 39

Truncatulina americana CUSHMAN var. *strattoni* APPLIN, 1925, in Applin, Ellisor, and Kniker, Amer. Assoc. Petr. Geol. Bull. vol. 9, no. 1, p. 99, pl. 3, fig. 3.

This species is somewhat similar to *C. concentricus* (Cushman), with which it has been frequently confused, but is less sharply angled at the periphery and more equally biconvex. It is reported as *Cibicides concentricus* in the northwestern Gulf of Mexico to a depth of 127 m. In the present area it occurs at all open gulf stations at frequencies up to 11% and at all of the beach stations at low frequencies; also at very low frequencies at most Mesquite Bay localities, at four in Aransas Bay, at four in lower San Antonio Bay, and at two in Matagorda Island marsh.

Discorbis floridana Cushman

Plate 4, figures 18, 19

Discorbis floridanus CUSHMAN, 1922, Publ. 311, Carnegie Instit. Washington, p. 39, pl. 5, figs. 11, 12.

This species is reported as characteristic of depths less than 60 m. although it is occasionally found a little deeper. It is present at very low frequencies at most of the open gulf stations, many of the beach stations, numerous Mesquite Bay stations, at one in Aransas Bay, three in lower San Antonio Bay, and at one in the Matagorda Island marsh. Frequencies usually are less than 1%.

Discorinopsis aguayoi (Bermudez)

Plate 4, figures 23, 24

Discorbis aguayoi BERMUDEZ, 1935, Mem. Soc. Cubana Hist. Nat., vol. 9, no. 3, p. 204, pl. 15, figs. 10-14.

Discorinopsis vadescens CUSHMAN and BRONNIMANN, 1948, Contr. Cushman Lab. Foram. Res., vol. 24, pt. 1, p. 20, pl. 4, figs. 9, 10.

There are slight differences between the specimens of Bermudez and those of Cushman and Bronnimann, but they appear to be insufficient for specific differentiation. *D. vadescens* and *D. aguayoi* are both described as having 10 chambers in the final whorl, although the paratypes of the former average 9. The maximum described diameter of *D. vadescens* is 0.55 mm.; that of *D. aguayoi* 0.8 mm. Our specimens fall into the size range of the Trinidad specimens. It seems probable that these differences in size may be due to local environmental conditions. Bermudez' species is described from a station off the north coast of Cuba. He gives no details of the distance from shore, or depth. *D. vadescens* is described from a mangrove swamp on the west coast of Trinidad, B. W. I.

In the Rockport area *D. aguayoi* occurs at five Matagorda Island marsh stations, at one of which it is 86% of the meager fauna, and at five of seven Grassy Point marsh localities, at most of which it constitutes a very high percent of the fauna.

Elphidium advenum (Cushman)

Plate 3, figure 11

Polystomella advena CUSHMAN, 1922, Publ. 311, Carnegie Instit. Washington, p. 56, pl. 9, figs. 11, 12.

This species is not common in this area. It is less than 1% of the fauna at several lower San Antonio Bay stations, a few in Mesquite Bay, three in Matagorda Island marsh, and a few in the open gulf.

Elphidium delicatulum Bermudez

Plate 3, figures 12, 17

Elphidium delicatulum BERMUDEZ, 1949, Spec. Publ. 25, Cushman Lab. Foram. Res., p. 168, pl. 11, figs. 22, 23.

The types of this species have not been seen but it appears to be identical with our specimens, except that in the latter the wall is not highly polished. It is interesting to note that Bermudez reports it from the Upper Miocene Las Salinas formation of the Dominican Republic in which he also found *Palmerinella palmerae* Bermudez with which the Gulf of Mexico species is frequently associated. An interesting characteristic of the species as figured by Bermudez, although not described by him, is the slight evolution of the test making it possible to see part of the earlier whorls.

This species is widespread in the bay areas, at frequencies less than 1%, but in San Antonio Bay it is 7% at one station. It also occurs at about half the Matagorda Island marsh stations and at two in Grassy Point marsh.

Elphidium discoidale (Orbigny)

Plate 3, figures 13, 14

Polystomella discoidale ORBIGNY, 1839, in de la Sagra, Hist. Phys. Pol. Nat. Cuba, "Foraminifères," p. 56, pl. 6, figs. 23, 24.

This form is recorded in the northwestern Gulf of Mexico to a depth of 134 m. In the Rockport area it is abundant at all open gulf stations and common at the beach stations. It also occurs at low frequencies throughout Mesquite Bay, in lower San Antonio Bay and lower Aransas Bay. One record is from Copano Bay.

Elphidium galvestonense Kornfeld

Plate 3, figures 15, 16

Elphidium gunteri COLE var. *galvestonensis* KORNFELD, (part), 1931, Contr. Dept. Geol. Stanford Univ., vol. 1, no. 3, p. 87, pl. 15, figs. 1a, b (not 2a, b, 3a, b).

Specimens were compared to Kornfeld's types and it was found that he had included two species in his variety. Types no. 689 and 692 of the Stanford University Paleontological Type Collection are discussed under *E. gunteri* Cole being referable to that species. Type no. 691 is here designated as the lectotype of Kornfeld's *E. galvestonensis*. It is not related to *E. gunteri*, having very fine perforations, an umbilical area with a large protuberant plug that is sometimes single, sometimes broken into irregular parts, and heavier, more widely spaced retral processes. *E. gunteri* is a coarsely perforate form having an umbilical area which does not protrude and is filled with small rather uniformly sized bead-like processes. A study of samples used by Post (1951) in her report on this area shows that *E. galvestonensis* is probably the form referred by her to *E. morenoi* Bermudez. A further study of Bermudez' types should be made to see if it is synonymous to Kornfeld's species. Bermudez' figured specimen appears to be quite different. It is a finely perforate form, markedly depressed at the umbilicus and has small bead-like processes in the umbilicus and along the sutures. *E. galvestonensis* is very rare in the open gulf stations and was not observed by Phleger (1951) in his study of the northwestern Gulf of Mexico. In the present samples the species occurs at most of the bay, beach, and Matagorda Island marsh stations, mostly at low frequencies. It is present in low percentages at 4 nearshore stations in the open gulf.

Elphidium gunteri Cole

Plate 3, figures 18, 19

Elphidium gunteri Cole, 1931, Florida State. Geol. Surv. Bull. 6, p. 34, pl. 4, figs. 9, 10.

Elphidium gunteri Cole var. *galvestonensis* Kornfeld (part), 1931, Contr. Dept. Geol. Stanford Univ., vol. 1, no. 3, p. 87, pl. 15, figs. 2a, b, 3a, b (not figs. 1a, b).

The types of Kornfeld's variety have been compared with topotypes of Cole's species, kindly sent by Miss Louise Jordan of the Florida State Geological Survey, who compared them with Cole's type specimen. Two of the figured types of *E. gunteri* var. *galvestonensis* are synonymous with *E. gunteri*. These include Types no. 689 and 692 of the Stanford University Paleontological Type Collection which should now be designated as hypotypes.

This is a very common species in the area and is found to a depth of 100 m. in the northwestern Gulf of Mexico. It occurs at all except a few marsh stations with frequencies commonly 20% to 30%. The specimens found in the bays of this area are larger and better developed than those found in the open gulf.

Elphidium incertum mexicanum Kornfeld

Plate 3, figures 20, 21

Elphidium incertum (Williamson) var. *mexicana* Kornfeld, 1931, Contr. Geol. Dept. Stanford Univ., vol. 1, no. 3, p. 89, pl. 16, figs. 1a, b, 2a, b.

This species is reported in the northwestern Gulf of Mexico to a depth of 100 m. In the Rockport area it is most abundant in the beach samples, occurring at most of the stations at frequencies of 3-8%. It occurs at only one open gulf station at less than 1%, at several in Mesquite Bay, a few in San Antonio Bay, six in Aransas Bay and about half the Matagorda Island marsh stations; frequencies in these areas usually are 1% or less.

Elphidium sp. cf. **E. koeboeense** LeRoy

Plate 3, figures 22, 23

Elphidium koeboeense LeRoy, 1939, Natuurk. Tijdschr. Nederl.-Indie, dl. 99, afl. 6, p. 240, pl. 9, figs. 6, 7.

Gulf of Mexico specimens are very similar to LeRoy's except that the periphery appears to be a little more rounded. The maximum diameter is slightly larger: 0.36 mm. The sides are less convex than in *E. discoidale*; the umbo is surrounded by a channel so that it appears to be a less integrated part of the test, and the wall is more finely perforate. As LeRoy points out, his species is smaller than *E. discoidale* and lacks the coarse umbilical tubules. He does not point out the other differences which may not exist in his species but do in ours.

In the Rockport area this species occurs at most of the Mesquite, Aransas, Copano, and San Antonio Bay stations at frequencies less than 1%. There are a few localities in the open gulf at less than 1%; it occurs at several beach stations, and at a few in Matagorda Island marsh. At two beach stations the species is 8% of the fauna.

Elphidium matagordanum (Kornfeld)

Plate 3, figures 24, 25

Nonion depressula (Walker and Jacob) var. *matagordana* Kornfeld, 1931, Contr. Dept. Geol. Stanford Univ., vol. 1, no. 3, p. 87, pl. 13, figs. 2a, b.

Specimens have been compared with Kornfeld's type and are identical. His figure does not give a good idea of the species since it shows an umbilical plug which is not present in the type specimen. This species has been placed in the genus *Elphidium* since the wall of the test has a radiate structure as determined by M. N. Bramlette. There are also slight traces of retral processes in the later sutures. The species is reported as *Nonion pauciloculus* Cushman by Post (1951, p. 171) in this area. It is reported in the northwestern Gulf of Mexico to a depth of 117 m., occurring at much lower frequencies than in the bay areas. It is almost identical to specimens seen from Plymouth, England and may be the species referred to *Nonion depressula* (Walker and Jacob) by various authors. Walker and Jacob's original figures are very different, however, and it seems best to refer the form to Kornfeld's variety, giving it specific rank.

This species is widespread in the Rockport area at low frequencies, usually 5% or less. At a few stations on and near the Matagorda Island marsh it is 10% or more of the fauna, and it is 20% at one in upper Aransas Bay.

Elphidium poeyanum (Orbigny)

Plate 3, figure 26

Polystomella poeyana ORBIGNY, 1839, in de la Sagra, Hist. Phys. Pol. Nat. Cuba, "Foraminifères," p. 55, pl. 6, figs. 25, 26.

Two forms have been included in the frequency counts of this species. One is similar to Orbigny's species. The other, possibly a variant of this, is referable to *E. translucens* Natland (plate 3, figure 27). Natland has expressed the opinion (personal communication) that his species may be equivalent to d'Orbigny's. *E. translucens* is more lobulate than E. *poeyanum* and is slightly depressed at the umbilicus. Although by careful study the two forms may be differentiated, in counting the specimens for frequency, especially in wet samples, it is difficult to do so. They seem to have a similar distribution and a division does not seem worth the time and trouble that would be needed.

This species occurs at all bay stations except a few in Guadalupe Bay, with average frequencies ranging from 1 to 5%. It is present at low frequencies at a few Matagorda Island marsh stations, at two beach localities, and in the majority of open gulf samples.

Elphidium sp. cf. **E. tumidum** Natland

Plate 3, figures 28, 29

Elphidium tumidum NATLAND, 1938, Bull. Scripps. Instit. Ocean., Techn. Ser., vol. 4, no. 5, p. 144, pl. 5, figs. 5, 6.

This species is very similar to specimens sent to us by M. L. Natland. Specimens have not been compared to the type. The test is very broad and lobulate, with more distinct retral processes than shown by Natland's figures. Similar retral processes are seen, however, in the specimens that he sent. Natland reports the species off the coast of California as abundant to depths of 122 m., with rare occurrences deeper. It has not been found in the open Gulf of Mexico. In the present samples it is confined to the bay areas, occurring in most of the Mesquite Bay samples, a few from San Antonio Bay, and numerous Copano and Aransas Bay samples, at frequencies less than 1%. It occurs at about one-third of the Matagorda Island marsh stations with frequencies up to 4%.

Epistominella vitrea Parker, n. sp.

Plate 4, figures 34-36, 40, 41

Test small, convex on the dorsal side, depressed toward the umbilicus on the ventral side, periphery rounded, sometimes slightly lobulate, consisting of about 3 whorls; chambers slightly inflated, six in the last whorl; sutures very slightly depressed and slightly curved on the dorsal side, more depressed on the ventral side, the later ones slightly curved, earlier ones radial; wall smooth, translucent, very finely perforate; aperture long, narrow, slightly curved, with a narrow lip. Maximum diameter 0.27 mm.; thickness 0.11 mm.

Holotype is from the Mississippi Delta area at Sta. MP 72-51A, Lat. 29°16.5′ N, Long. 89°00.9′ W, at a depth of 55 ft. (17 m.).

Although this species is present in the Rockport area, it is described from specimens from the Mississippi Delta where it is more common. It most closely resembles *E. naraensis* (Kuwano) but is slightly larger, more concave on the ventral side, has more curved sutures, and a much more elongate aperture.

In the Rockport area it is reported from fine fractions in the open gulf stations, and one Mesquite Bay station at very low frequencies.

Gaudryina exilis Cushman and Bronnimann

Plate 1, figures 37, 38

Gaudryina exilis CUSHMAN and BRONNIMANN, 1948, Contr. Cushman Lab. Foram. Res., vol. 24, pt. 2, p. 40, pl. 7, figs. 15-16.

Our specimens are somewhat smaller than typical, the maximum length being 0.44 mm. They also appear to be slightly more coarsely arenaceous. The specimens were not compared with the types which are described from the Gulf of Paria, Trinidad, B. W. I.

In the Rockport area this species occurs at low frequencies at several open gulf stations, several in Mesquite Bay, one beach station, and a few in San Antonio, Copano, and Aransas Bays.

Guttulina australis (Orbigny)

Plate 3, figures 9, 10

Globulina australis ORBIGNY, 1839, Voy. Amér. Mérid., vol. 5, pt. 5, "Foraminifères," p. 60, pl. 1, figs. 1-4.

This species is reported in shallow water in the West Indian region. In the present area it occurs at two open gulf stations and at a few beach stations at frequencies of less than 1%.

Jadammina polystoma Bartenstein and Brand

Plate 2, figures 35-37

Jadammina polystoma BARTENSTEIN and BRAND, 1938, Senckenbergiana, vol. 20, no. 5, p. 381, text figs.1a-c, 2a-1, 3.

This species is reported from Barnstable marsh in

Massachusetts Bay as *Trochammina macrescens* H. B. Brady by Phleger and Walton (1950, p. 280). It is recorded from two Matagorda Island marsh stations.

Lagunculina vadescens Cushman and Bronnimann

Plate 1, figure 1

Lagunculina vadescens CUSHMAN and BRONNIMANN, 1948, Contr. Cushman Lab. Foram. Res., vol. 24, pt. 1, p. 15, pl. 3, figs. 1, 2.

In addition to the type locality in a mangrove swamp on the west coast of Trinidad, B. W. I., this species is found in the Connecticut River adjacent to Long Island Sound. In the Rockport area it is recorded from two stations in the Guadalupe River.

Lagunculina sp.

Plate 1, figure 2

This form is placed somewhat questionably in this genus. Unfortunately there is an insufficient number of specimens to make a thorough analysis of what is probably a new species and possibly a new genus. The test is triangular in cross section with rounded angles and slightly concave sides. The bottom of the test terminates at the center in a long central spine with shorter terminal spines at each of the angles. The wall is very thin and fragile, composed of finely arenaceous material similar to that of *L. vadescens*. The aperture is circular, at the apex of the test, and has a flaring lip which is curved back as in *L. vadescens*. The size of the specimens is uniform: 0.15 mm. in length exclusive of central spine and 0.18 mm. in length inclusive of the spine. At its widest point the width is 0.11 mm. We record it from two Guadalupe River stations.

Leptodermella variabilis Parker

Plate 1, figure 3

Leptodermella variabilis PARKER, 1952, Bull. Mus. Comp. Zool., vol. 106, no. 10, p. 452, pl. 1, figs. 11a, b, 12.

This species is reported from rivers flowing into Long Island Sound, and as *Leptodermella* sp. from the Nord Ostsee Kanal and a few nearshore stations in the North Sea by Rottgardt (1952). It is abundant at all our Guadalupe River stations, being the dominant species; it is recorded from one station in Guadalupe Bay directly off the mouth of the river.

Massilina peruviana (Orbigny)

Plate 1, figures 44, 45

Quinqueloculina peruviana ORBIGNY, 1839, Voy. Amér. Mérid., vol. 5, pt. 5, "Foraminifères," p. 73, pl. 4, figs. 1-3.

This form is assigned to d'Orbigny's species with some doubt. In so doing we are following Kornfeld's (1931, p. 85) identification. The species is not common in the area. It occurs at several open gulf stations, many beach stations, a few in Mesquite Bay, two in San Antonio Bay, and a few in Matagorda Island marsh. Frequencies are low.

Massilina protea Parker, n. sp.

Plate 2, figures 1-4; text figure 2

Test somewhat longer than broad, compressed, with a rounded periphery; chambers few in number, not always a half coil in length, exposing three to four chambers to a side; sutures depressed, often indistinct especially in the central portion; wall thick, variably costate, the costae low, running parallel to the periphery but not necessarily continuously; aperture almost circular, with a thick, polished lip and a short bifid tooth which varies greatly in breadth. Maximum length 0.54 mm.; maximum width 0.4 mm.; maximum thickness 0.32 mm.

Holotype from station MT62A, on Matagorda Island, Lat. 28°14'28" N, Long. 96°38'28" W, in an almost dry marsh (water 1" deep).

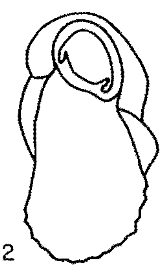


Figure 2. *Massilina protea* Parker, n. sp. Apertural view of Paratype. × 70 (approx.). Sta. MT62A.

This is a very irregular, variable species. Specimens are frequently distorted into odd shapes. The greatest number of specimens show three chambers on each side, but others occur with four, or in triloculine or quinqueloculine stages. The degree of costation varies from almost none to well marked ornamentation. The costae, however, are always somewhat irregular. The species is best characterized by the thick well-marked lip. It does not resemble any other described species very closely. It has fewer visible chambers than *M. obliquestriata* Cushman and Valentine, costae which more closely parallel the periphery, and the strongly marked lip and bifid tooth.

This species occurs in frequencies up to 21% at many Matagorda Island marsh stations. It is present at low frequencies at several beach stations, at four Mesquite Bay, three San Antonio Bay, and two Aransas Bay stations.

Miliammina fusca (H. B. Brady)

Plate 1, figures 40, 41

Quinqueloculina fusca H. B. BRADY, 1870, Ann. Mag.

Nat. Hist., ser. 4, vol. 6, p. 47 (286), pl. 11, figs. 2a-c, 3.

Specimens closely resemble Brady's figures. The species is reported from brackish and marshy areas in various parts of the world. In the Rockport area it occurs at high frequencies in the Matagorda Island marsh samples; it also is present in Grassy Island marsh. Low frequency occurrences in the bays generally are near marshy shores. One record is from the open gulf.

Miliammina sp.

Plate 1, figures 42, 43

At two stations in Grassy Point marsh a few specimens are found of a form which is more smoothly and finely arenaceous than *M. fusca* (H. B. Brady). The test is also narrower with respect to length.

Nonionella atlantica Cushman

Plate 3, figures 30, 31

Nonionella atlantica CUSHMAN, 1947, Contr. Cushman Lab. Foram. Res., vol. 23, pt. 4, p. 90, pl. 20, figs. 4, 5.

Our specimens are mostly smaller and more slender than Cushman's but occasional typical ones occur. The species is reported from the northwestern Gulf of Mexico to a depth of 200 m. In the Rockport area it is at all the open gulf stations at frequencies up to 7%. It also occurs at low frequencies at three beach stations, at one in lowermost Aransas Bay, in Cedar Bayou, at five stations in Mesquite Bay, two in lower San Antonio Bay, and two in middle San Antonio Bay.

Nonionella opima Cushman

Plate 3, figures 32, 33

Nonionella opima CUSHMAN, 1947, Contr. Cushman Lab. Foram. Res., vol. 23, pt. 4, p. 90, pl. 20, figs. 1-3.

This is reported as common to depths of 100 m. in the northwestern Gulf of Mexico. It occurs at the open gulf stations at frequencies up to 5%, at four in and near Cedar Bayou, and at occasional stations in lower San Antonio and Aransas Bays.

Nouria polymorphinoides Heron-Allen and Earland

Plate 3, figures 1, 2

Nouria polymorphinoides HERON-ALLEN and EARLAND, 1914, Trans. Zool. Soc. London, vol. 20, pt. 12, p. 376, pl. 37, figs. 1-15.

Proteonina comprima PHLEGER and PARKER, 1951, Mem. 46, Geol. Soc. America, pt. 2, p. 2, pl. 1, figs. 1-3.

Gulf of Mexico specimens are smaller than Heron-Allen and Earland's, not exceeding 0.7 mm. in length and usually about 0.5 mm. in length. The specimens are very fragile and only a small proportion of them survive the washing and drying of a sample. Most of the specimens show little indication of septation but a sufficient number do indicate the character of the species. The species was wrongly identified by Phleger and Parker in the northwest Gulf of Mexico, where it was reported to a depth of 130 m., although usually restricted to depths of less than 70 m. It is reported by various other authors in shallow waters. In the Rockport area it occurs at low frequencies at most open gulf stations.

Palmerinella palmerae Bermudez

Plate 4, figures 42-44

Palmerinella palmerae BERMUDEZ, 1934, Mem. Soc. Cubana Hist. Nat., vol. 8, no. 2, p. 84, text figs. 1-3.

Bermudez reports this species from the north coast of Cuba, where he says that it appears to prefer a brackish water environment. In the Rockport area it occurs at most bay and marsh localities, except southern Copano Bay, Guadalupe Bay and Guadalupe River. It is usually at low frequencies (1% or less) and mostly in the fine fraction. It is present in a few beach samples.

Proteonina atlantica Cushman

Plate 1, figure 4

Proteonina atlantica CUSHMAN, 1944, Spec. Publ. 12, Cushman Lab. Foram. Res., p. 5, pl. 1, fig. 4.

The specimens are smaller than those off the northeastern coast of the United States where the species was originally described, but otherwise identical. The largest specimens in the San Antonio Bay area are about 0.55 mm. in length, which is the lower size limit given by Cushman. The species is reported as *P. difflugiformis* (H. B. Brady) (Phleger, 1951, p. 48) at all depths in the northwestern Gulf of Mexico with the highest frequencies at depths of less than 60 m. In the present area it occurs only in the open gulf samples at very low frequencies.

Proteonina lagenaria (Berthelin)

Plate 1, figures 5, 6

Haplophragmium lagenarium BERTHELIN, 1880, Mém. Soc. Géol. France, ser. 3, vol. 1, no. 5, p. 21, pl. 4, figs. 2a, b.

This species is reported from the Connecticut River and the adjacent area of Long Island Sound. In the Rockport area it occurs in the fine fraction in three Guadalupe River samples and in most of the samples from Guadalupe Bay.

Pseudoclavulina gracilis Cushman and Bronnimann

Plate 1, figure 39

Pseudoclavulina gracilis CUSHMAN and BRONNIMANN, 1948, Contr. Cushman Lab. Foram. Res., vol. 24, pt. 2, p. 40, pl. 7, figs. 17, 18.

This species is described from shallow water in the Gulf of Paria, Trinidad, B. W. I. In the present area it occurs at three Matagorda Island marsh stations.

Quinqueloculina sp. cf. **Q. compta** Cushman

Plate 2, figures 5, 6

Quinqueloculina compta CUSHMAN, 1947, Contr. Cushman Lab. Foram. Res., vol. 23, pt. 4, p. 87, pl. 19, fig. 2.

The specimens are somewhat smaller than Cushman's and the chambers less sharply angled. More typical specimens are reported in somewhat deeper water in the northwestern Gulf of Mexico, where they are restricted to water shallower than 200 m. In the Rockport area it is present at low frequencies in all beach samples examined, at most open gulf stations, and at several in Mesquite Bay.

Quinqueloculina cultrata (H. B. Brady)

Plate 2, figures 7, 8

Miliolina cultrata H. B. BRADY, 1881, Quart. Journ. Micr. Sci., vol. 21, p. 45; 1884, Rep't. Voy. *Challenger*, Zool., vol. 9, p. 161, pl. 5, figs. 1, 2.

Some specimens show a triloculine stage but the majority are quinqueloculine. The keel varies in width and is occasionally absent. Brady reports the species from shallow water in the Indo-Pacific, In the present material it occurs at frequencies less than 1% in all areas except the Guadalupe River and Grassy Point marsh.

Quinqueloculina funafutiensis (Chapman)

Plate 2, figures 9, 10

Miliolina funafutiensis CHAPMAN, 1900, Journ. Linn. Soc. Zool., vol. 28, p. 178, pl. 19, fig. 6.

This species is reported from the Tortugas region off Florida. In the Rockport area it occurs at most open gulf stations at frequencies up to 6%; also present at low frequencies at many beach stations, in Mesquite Bay, Aransas Bay, San Antonio Bay, and at one station in Copano Bay.

Quinqueloculina lamarckiana Orbigny

Plate 2, figures 11, 12

Quinqueloculina lamarckiana ORBIGNY, 1839, in de la Sagra, Hist. Phys. Pol. Nat. Cuba, "Foraminifères," p. 189, pl. 11, figs. 14, 15.

This species is reported from the northwestern Gulf of Mexico shallower than 200 m., with the chief occurrence shallower than 100 m. In the Rockport area it occurs at most of the open gulf stations and at many beach stations at very low frequencies; also at two stations in lower Mesquite Bay.

Quinqueloculina poeyana Orbigny

Plate 2, figures 13, 14

Quinqueloculina poeyana ORBIGNY, 1839, in de la Sagra, Hist. Phys. Pol. Nat. Cuba, "Foraminifères," p. 191, pl. 11, figs. 25-27.

Our specimens are identical with ones from the coast of Cuba. The species is found in various parts of the West Indian region at shallow depths but its depth range has not been defined. In the Rockport area it occurs at low frequencies at three open gulf stations, several beach stations, numerous Mesquite and Aransas Bay stations, a few in San Antonio Bay and several in Matagorda Island marsh. At one station in Aransas Bay it is 29% of the fauna and at one in Mesquite Bay it is 11%.

Quinqueloculina rhodiensis Parker, new name

Plate 2, figures 15-17

Quinqueloculina costata ORBIGNY *(nomen nudum)*, 1826, Ann. Sci. Nat., vol. 7, p. 301, no. 3.

Quinqueloculina costata ORBIGNY, TERQUEM, 1878 (part), (not *Q. costata* KARRER, 1867) Mém. Soc. Géol. France, Ser. 3, vol. 1, no. 3, p. 63, pl. 11, figs. 3a-c (not figs. 4a-c, 5a-c).

Quinqueloculina costata ORBIGNY, of authors

The Gulf of Mexico specimens are very similar to the specimen figured by Terquem although his is about 1.34 mm. in length whereas ours reach a maximum length of 0.7 mm. Terquem's other figures (pl. 11, figs. 4a-c, 5a-c) represent an elongate form with a definite neck which resembles d'Orbigny's figure published by Fornasini (1905, pl. 2, fig. 6). The species figured by Hada (1936, p. 855, text figs. 9, 10) as *Q. boueana* Orbigny is identical with the Gulf of Mexico specimens and is excellently illustrated.

In the Rockport area this species occurs at low frequencies at numerous bay stations. It occurs at most of the Matagorda Island marsh localities where it is considerably more abundant than elsewhere, with frequencies recorded up to 27%. It is present at low frequencies at six beach stations and one shelf station.

Quinqueloculina seminulum (Linné)

Plate 2, figures 18, 19

Serpula seminulum LINNÉ, 1767, Syst. Nat., ed. 12, p. 1264.

Specimens are very similar to ones from Rimini. The species is widespread in shallow water. In the present area it occurs at high frequencies (10-56%) at all beach stations, at low frequencies at a few innermost shelf stations, at low frequencies in Cedar Bayou and at most stations in Mesquite and lower San Antonio Bays, and at three in lower Aransas Bay.

Quinqueloculina wiesneri Parr

Plate 2, figures 20-22

Quinqueloculina anguina TERQUEM var. *wiesneri* PARR, 1950, B. A. N. Z. Antarctic Research Exped. 1929-1931, Repts., ser. B, vol. 5, pt. 6, p. 290, pl. 6, figs. 9-10.

The Gulf of Mexico species is similar to Parr's except that the neck is slightly shorter. The dimensions coincide except for the thickness which in our specimens has a maximum of 0.24 mm. An examination of the wall petrographically reveals small grains imbedded in the wall, but when treated with acid there is no appreciable residue. As Parr says, the wall appears to be agglutinated. It does not appear to the writers to be related to Terquem's species, which is twice as large, has a long, narrow neck and smooth wall.

In our area this species is relatively abundant in the Matagorda Island marsh samples, with frequencies up to 12%, and it also occurs in relative abundance in samples from Matagorda Island beach. Occasional specimens are found at a few localities in the bays, and it is recorded from one open gulf station.

Rectobolivina advena (Cushman)

Plate 4, figures 10, 11

Siphogenerina advena CUSHMAN, 1922, Publ. 311, Carnegie Instit. Washington, p. 35, pl. 5, fig. 2.

Bifarina decorata PHLEGER and PARKER, 1951, Mem. 46, Geol. Soc. America, pt. 2, p. 12, pl. 6, figs. 9a, b, 10.

This species is most common shallower than 100 m. in the northwestern Gulf of Mexico but is found as deep as 205 m. In the Rockport area it is confined to the open gulf samples where it occurs at very low frequencies and usually only in the fine fraction.

Recurvoides sp.

Plate 1, figures 31, 32

This species occurs at two stations in Grassy Point marsh. There are 6-8 very much inflated chambers in the final whorl. The axis of coiling of the whorls changes regularly but to a more marked degree in some specimens than others. The test is much less compact than that of previous species of this genus. The wall is finely arenaceous and mostly smooth. Larger suites of specimens are necessary in order to learn the range of variation.

Reophax nana Rhumbler

Plate 1, figure 11

Reophax nana RHUMBLER, 1913, Ergeb. Plankton-Exped. Humboldt Stiftung, vol. 3, pt. 2, p. 471, pl. 8, figs. 6-12.

Höglund (1947) records the form in the Gullmar Fjord to a depth of 85 m. and in the Skagerak to a depth of 400 m. Parker (1952, p. 457) records it in the Long Island Sound-Buzzards Bay area most commonly in her facies 2 or bay facies. It occurs in a few of the present samples at very low frequencies.

Reussella atlantica Cushman

Plate 4, figures 12, 13

Reussella spinulosa (REUSS) var. *atlantica* CUSHMAN, 1947, Contr. Cushman Lab. Foram. Res., vol. 23, pt. 4, p. 91, pl. 20, figs. 6, 7.

This species is reported in the northwestern Gulf of Mexico to a depth of 200 m. with the greatest abundance shallower than 120 m. In the present area it occurs at low frequencies at most stations in the open gulf facies, at one beach station, at two in lower Mesquite Bay, and at one in southern Aransas Bay.

"Rotalia" beccarii (Linné) variants A, B, C

Plate 4, figures 20-22, 25-30

Nautilus beccarii LINNÉ, 1758, Syst. Nat., ed. 10, p. 710.

Variant A (Plate 4, figures 20-22) is the closest to the typical species. It is the form that has been frequently referred to *Rosalina parkinsoniana* Orbigny. It is very similar to specimens from Rimini but is smaller and less ornate. This variant occurs at most stations at high frequencies in the Rockport area. It is not present at a few Guadalupe River localities. The average frequencies in the bay and island areas are approximately 30-50%, in the beach samples about 30%, and in the open gulf about 10%.

Variant B (Plate 4, figures 25-28) is the form assigned by Cushman to the variety *tepida*. It has fewer chambers than the typical form, usually about 6 in the final whorl. It is also more lobulate with less limbate, more depressed sutures. In the Rockport area it is abundant and widely distributed in all environments.

Variants A and B are reported to a depth of 120 m. in the northwestern Gulf of Mexico with the greatest frequency shallower than 70 m.

Variant C (Plate 4, figures 29, 30) is somewhat similar to variant B, but is more compressed, has 7 or 8 chambers in the final whorl, is less lobulate, with narrow sutures, the final ones being slightly depressed but not so much as in variant B. This variant has apparently not been described. It is very abundant in the Grassy Point marsh and Guadalupe River samples and occurs at moderately low frequencies at most of the bay stations. It is not recorded from the open gulf.

"Rotalia" pauciloculata Phleger and Parker

Plate 4, figures 31, 37

"Rotalia" pauciloculata PHLEGER and PARKER, 1951, Mem. 46, Geol. Soc. America, pt. 2, p. 23, pl. 12, figs. 8a, b, 9a, b.

In the northwestern Gulf of Mexico the species is reported as characteristic of depths less than 75 m. In the Rockport area it occurs at low frequencies at several open gulf stations, at one beach station, and at one in lower Mesquite Bay.

"Rotalia" rolshauseni Cushman and Bermudez

Plate 4, figures 32, 33

Rotalia rolshauseni CUSHMAN and BERMUDEZ, 1946, Contr. Cushman Lab. Foram. Res., vol. 22, pt. 4, p. 119, pl. 19, figs. 11-13.

This species is reported from the northwestern Gulf of Mexico shallower than 48 m. In the Rockport area it occurs in all open gulf samples at frequencies of 2-8%, at most of the beach stations, and at one in Aransas Bay.

Textularia sp. cf. **T. mayori** Cushman

Plate 1, figure 36

Textularia mayori CUSHMAN, 1922, Publ. 311, Carnegie Instit. Washington, p. 23, pl. 2, fig. 3.

Specimens only occasionally show traces of the spiny processes characteristic of the species. It is reported at less than 100 m., with one exceptional occurrence at 122 m., in the northwestern Gulf of Mexico. In the Rockport area it occurs at most stations in the open gulf, at one in Cedar Bayou, and at one in lower Aransas Bay.

Triloculina fiterrei meningoi Acosta

Plate 2, figures 23, 24

Triloculina fiterrei ACOSTA var. *meningoi* ACOSTA, 1940, Torreia, no. 3, p. 26, pl. 4, figs. 1-5.

A few specimens of typical *T. fiterrei* occur but are too rare to be of importance in the frequency counts. The costate form is more abundant. Acosta reports it from shallow water stations (13 m. or less) off the south coast of Cuba. It occurs at low frequency in several of the Matagorda Island marsh stations, and at one in Mesquite Bay.

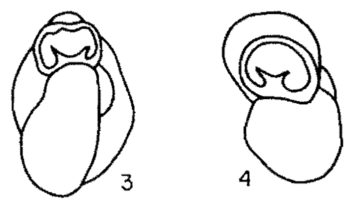
Triloculina sidebottomi (Martinotti)

Plate 2, figures 25-28; text figures 3, 4

Miliolina subrotunda SIDEBOTTOM (not *Vermiculum subrotundum* MONTAGU), 1904, Manchester Lit. Phil. Soc., vol. 68, no. 5, p. 8, text fig. 2, pl. 3, figs. 1-7.

Sigmoilina sidebottomi MARTINOTTI, 1920, Atti. Soc. Ital. Sci. Nat., vol. 59, pl. 2, fig. 29; text figs. 59-61.

This species is reported by Sidebottom from the coast of Delos, by Martinotti off Tripoli and by Colom from the Bay of Palma, Majorca Island. It occurs at numerous stations throughout the Rockport area, usually at low frequencies. At one station in the Matagorda Island marsh it constitutes 42% of the fine fraction.



Figures 3, 4. *Triloculina sidebottomi* (Martinotti). Apertural views. × 70 (approx.). Sta. MT66A,

Triloculina trigonula (Lamarck)

Plate 2, figure 29

Miliolites trigonula LAMARCK, 1804, Ann. du Mus., vol. 5, p. 351, no. 3.

Triloculina trigonula ORBIGNY, 1826, Ann. Sci. Nat., vol. 7, p. 299, no. 1, pl. 16, figs. 5-9; Modèles, no. 93.

The specimens are smaller than Rimini ones and the tooth is usually not so well developed. The species occurs at low frequencies in several open gulf and beach samples.

Triloculinella obliquinoda Riccio

Plate 2, figures 30-32

Triloculinella obliquinodus RICCIO, 1950, Contr. Cushman Found. Foram. Res., vol. 1, pts. 3, 4, p. 90, pl. 15, figs. 1a-c, 2a-c.

Our specimens are smaller than Riccio's but are otherwise so similar that we have assigned them to his species. The maximum length is 0.5 mm. A large number of the specimens are quinqueloculine but triloculine ones also occur. This suggests that a more intensive study of the various species of *Miliolinella*, especially the genotype, should be studied further in order to be sure that the erection of two genera for the forms developing a semicircular tooth in the aperture is valid and necessary. The specimens referred by Post (1951, p. 170) to *Triloculina oblonga* (Montagu) in this area probably refer to the same species.

In the Rockport area this species is abundant at many stations in the marshes examined, especially the Matagorda Island marsh, occurs at low frequencies at a few bay stations and at some beach stations.

Trochammina comprimata Cushman and Bronnimann

Plate 3, figures 3, 4

Trochammina comprimata CUSHMAN and BRONNIMANN, 1948, Contr. Cushman Lab. Foram. Res., vol. 24, pt. 2, p. 41, pl. 8, figs. 1-3.

This is a very irregular form, especially in its later stages. The species shows a good deal of resemblance to *T. rotaliformis* J. Wright but the type figures of that species show a very regular test. *T. comprimata* is reported from a mangrove swamp on the west coast of Trinidad, B. W. I. In the Rockport area it occurs at many of the marsh stations at relatively low frequencies, except at one in Matagorda Island marsh where it is 18% of the fauna.

Trochammina inflata (Montagu)
Plate 3, figures 5, 6

Nautilus inflatus MONTAGU, 1808, Test. Brit., p. 81, pl. 18, fig. 3.

This species is reported from marshes and nearby areas. The marshes with which it is associated appear to be true salt marshes and not the brackish ones found near rivers. In the Rockport area it is a major element of the fauna at several Matagorda Island marsh localities, and also occurs at the stations in the Grassy Point marsh at very low frequencies.

Trochammina macrescens H. B. Brady
Plate 3, figures 7, 8

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

Specimens of this species vary considerably in thickness and in the amount of involution of the test. The thicker specimens are usually completely involute, showing only the final whorl. The specimen figured by Brady belongs to the thin, evolute type. His figured specimen has collapsed chambers which frequently occur when specimens are dried. This results in the chambers appearing concave and in the apertural face being squeezed inward as in Brady's figure. The aperture is a simple one at the base of the chamber at the periphery. Care must be taken in identifying the species not to confuse it with *Jadammina polystoma* Bartenstein and Brand, which is very similar except for the apertural characters, although usually more compressed. The two species occasionally occur together although they are usually found independent of each other. *T. macrescens* is reported from brackish water at various localities. In the Rockport area this species occurs at low frequencies at several marsh stations, and in one sample from Grassy Point marsh it is 51% of the fauna.

Urnulina, see page 5

Virgulina pontoni Cushman
Plate 4, figures 14, 15

Virgulina pontoni CUSHMAN, 1932, Contr. Cushman Lab. Foram. Res., vol. 8, pt. 1, p. 17, pl. 3, fig. 7.

This species is reported in the northwestern Gulf of Mexico as characteristic of depths shallower than 125 m.; as rare to 1000 m. In the Rockport area it occurs at very low frequencies at most stations in the open gulf facies, with two records in the beach facies and one in Mesquite Bay.

Virgulina spinicostata Phleger and Parker
Plate 4, figures 16, 17

Virgulina spinicostata PHLEGER and PARKER, Mem. 46, Geol. Soc. America, pt. 2, p. 19, pl. 9, figs. 11a, b, 12a, b, 13a, b, 14.

This species is reported in the northwestern Gulf of Mexico in most cases shallower than 100 m., with the highest frequencies shallower than 80 m. In the Rockport area it occurs at low frequencies at three open gulf stations.

BIOFACIES

The distributions of the important species are summarized in very general form on Figure 49, based upon the data from Figures 7 to 47 and Tables 1 to 7. The Foraminifera appear to be grouped into four principal facies. Two additional types of distribution are superimposed upon this pattern, and these are here termed subfacies. The geographic distributions of the facies are summarized on Figure 48. These facies and subfacies are described below.

Open Gulf Facies

This facies extends seaward from the beach of the barrier islands. The following species occur principally in the open gulf areas, but also may be present in relatively low frequencies in the lower bay and/or beach samples:

Bigenerina irregularis
Bolivina lowmani
B. pulchella primitiva
Buliminella sp. cf. *B. bassendorfensis*
B. elegantissima
Cibicidina strattoni
Elphidium discoidale
Epistominella vitrea
Gaudryina exilis
Guttulina australis
Nonionella altantica
N. opima
Nouria polymorphinoides
Proteonina atlantica
Quinqueloculina sp. cf. *Q. compta*
Q. funafutiensis
Q. lamarckiana
Reussella atlantica
"Rotalia" pauciloculata
"R." rolshauseni
Textularia sp. cf. *T. mayori*
Triloculina trigonula
Virgulina pontoni

The following species occur in the open gulf facies, but are not especially characteristic of this facies, also occurring in approximately equal frequency in the bay facies:

Bolivina striatula
Discorbis floridana

Elphidium advenum
E. gunteri
E. sp. cf. *E. koeboeense*
E. poeyanum
Massilina peruviana
"Rotalia" beccarii variant A
"R." beccarii variant B
Triloculina sidebottomi

Beach Subfacies

The beach fauna is essentially an open gulf assemblage in which a few species are concentrated in abundance. There is a varied fauna present, but fewer species are recorded than from the offshore samples. The following species occur in higher frequencies in the beach subfacies than elsewhere in the samples studied:

Elphidium incertum mexicanum
Quinqueloculina sp. cf. *Q. compta*
Q. seminulum
Q. wiesneri

Other species which are relatively abundant, but which are also abundant elsewhere, are as follows:

Bigenerina irregularis
Cibicidina strattoni
Elphidium discoidale
E. gunteri
E. matagordanum
"Rotalia" beccarii variant A

Palmerinella palmerae, a typical bay species, also occurs in appreciable numbers in the beach material.

Bay Facies

The following species appear to be characteristic of San Antonio, Espiritu Santo, Mesquite, Aransas, and Copano Bays, although they may also be present in significantly lower frequencies in the open gulf:

Ammobaculites dilatatus
A. salsus and variants
A. sp. A
A. sp. B
Elphidium delicatulum
E. galvestonense
E. sp. cf. *E. tumidum*
Palmerinella palmerae

The following species are present in the lower bay assemblage in low frequencies, although they appear to be essentially open gulf forms:

Bigenerina irregularis
Bolivina lowmani
Buliminella elegantissima
Cibicidina strattoni
Discorbis floridana
Elphidium advenum
E. discoidale
Gaudryina exilis
Massilina peruviana
Nonionella atlantica
N. opima
Quinqueloculina sp. cf. *Q. compta*
Q. funafutiensis
Q. lamarckiana
Q. seminulum
Reussella atlantica
"Rotalia" pauciloculata
"R." rolshauseni
Textularia sp. cf. *T. mayori*
Virgulina pontoni

Upper San Antonio Bay Subfacies

Some of the species which occur in significant abundances in lower San Antonio Bay and in Mesquite, Aransas and Copano Bays are not recorded from upper San Antonio Bay. Many of the species are those which appear to be principally open gulf forms. The following species are widespread in the bay fauna and do not occur in upper San Antonio Bay:

Buliminella elegantissima
Discorbis floridana
Elphidium discoidale
E. incertum mexicanum
Quinqueloculina cultrata
Q. funafutiensis
Triloculinella obliquinoda

Marsh Facies

Two small areas of marsh have been studied from this area, one on the bay side of Matagorda Island and the other at Grassy Point on the delta of the Guadalupe River. Each of these marshes has somewhat different ecologies and there are considerable faunal differences between some stations in the same marsh. A few species are essentially restricted to these marsh environments, in some cases with some mixing in adjacent areas. Such species found in both marshes are:

Ammoastuta inepta
Arenoparrella mexicana
Discorinopsis aguayoi
Miliammina fusca
Trochammina comprimata
T. inflata
T. macrescens

Ammobaculites salsus occurs at unusually high frequencies in both marsh areas.

The following species are confined to the Matagorda Island marsh:

Jadammina polystoma
Pseudoclavulina gracilis
Triloculina fiterrei meningoi

The last species is also found at one station in Mesquite Bay. *Trochammina inflata* is much more abundant in this marsh than at Grassy Point. The marsh is characterized by relatively high populations of *Palmerinella palmerae* and also contains several species which are characteristic of both the bay facies and the open gulf facies. *Massilina protea* is more abundant here than elsewhere.

Miliammina sp. is restricted to the Grassy Point marsh. *Discorinopsis aguayoi* occurs here at very high frequencies and *Trochammina comprimata* is more abundant than on Matagorda Island.

River Facies

The river facies is characterized by *Lagunculina vadescens*, *Lagunculina* sp., *Leptodermella variabilis*, *Proteonina lagenaria* and several species of *Urnulina*. Many of these species occur in Guadalupe Bay, especially *P. lagenaria*, which is found at significant frequencies. *Urnulina compressa* is found at one station at Grassy Point marsh at a very low frequency.

DISCUSSION

It appears that the principal factor affecting the distributions of Foraminifera described above is the presence of islands between the open gulf and the bays. The islands act as an effective barrier in either 1) inhibiting the flow of oceanic water into the bays during high runoff from the land, or 2) in trapping oceanic water which flows in through the passes during times of low runoff from the land. During high runoff, the salinities in the bays are typically estuarine, ranging from nearly fresh water at the river deltas to about 30 o/oo at the passes, according to Collier and Hedgpeth (1950, p. 176). During dry periods most of the water in the bays appears to be oceanic water entering through the passes. Excessive evaporation in shallow, enclosed bays tends to produce salinities of higher values than open gulf water. The high salinities which obtained during July and August, 1951, when these collections were made, apparently are due to this mechanism.

The bay fauna is composed of what appear to be three ecologic groups of species. One group is essentially restricted to the bays and is dominated by *Ammobaculites dilatatus* and *A. salsus* and variants. It is suggested that these species constitute an indigenous bay population. A second group of species in the bays is the typical open gulf assemblage which has invaded the lower bays and formed a low percentage of the population. They are most prevalent near the passes, but are not confined to such locations. Examples of the third group are *Elphidium gunteri*, *"Rotalia" beccarii* variant A, and *"R." beccarii* variant B. These species occur at high frequencies in both the open gulf and the bay environments, and may be at high frequencies in the river and marsh facies as well.

It is suggested that *Elphidium gunteri* and *"Rotalia" beccarii* variants A and B may be open gulf species which have invaded the bay environments with the open gulf water. This is based upon evidence from the coast of Mississippi (Phleger, MS) where these species are confined to outside the barrier islands. The Mississippi area is one of high rainfall and it appears that all the open gulf assemblage is kept outside the islands along with the open gulf water masses. It is suggested that these species may have invaded the bays of the Rockport area along with the open gulf water masses during time of low runoff from the land. They appear to be forms which can withstand certain environmental extremes, at least for short periods of time. It is probable that these species are more adaptable than some of the other open gulf forms which have not generally invaded the bays.

It is interesting to speculate whether these species may be able to withstand a prolonged period of high runoff from the land. Such an environmental change, if over a long period of time, may either reduce their abundance or perhaps eliminate them as a living population from the bay environment. Periods of low and high rainfall in the drainage basin thus may be recorded in the vertical sequences of faunas in sediment cores taken from the bays.

The open gulf species which occur at low frequencies in the lower bays may have invaded this environment either by physical transport by currents or by radiation as a living population. The geographic distribution of this element of the bay population suggests that is is caused by invasion by a living population. Presence of these species behind the barrier islands far from passes, as in lower San Antonio Bay, is difficult to explain by physical transport of tests. Large-scale wash-over of the islands by unusual storms, however, is a possibility to be considered. A study of the living population, planned for the future, should give critical information in this connection.

The beach assemblage is characterized mainly by open gulf species, but with some of these species in relatively higher frequencies than offshore. This suggests a physical concentration of these species by wave and current action. Another possibility is that these species find the surf zone more amenable than offshore, or conversely, that other species cannot withstand the beach environment. Many of the open gulf species which are either rare or unrecorded from the beach samples are small forms which may be destroyed or carried beyond the surf zone. The offshore island is breached by a small pass, Cedar Bayou, thus forming Matagorda Island to the northeast and St. Joseph Island to the southwest. Cedar Bayou is sometimes open and sometimes closed; previous to the present collection it had been open for several years. It is of interest to note that the beach fauna of St. Joseph Island is somewhat different from that of Matagorda Island, as can be seen by examining Tables 1 and 4. The reason for this difference is not apparent.

Many of the common open gulf species occur at the majority of stations sampled in Mesquite Bay. This faunal mixing appears to be due to faunal migration and/or physical transportation through Cedar Bayou which opens directly into Mesquite Bay. Closing of Cedar Bayou probably would be reflected in a change of the fauna in Mesquite Bay with elimination of part or all of the open gulf species. This may be recorded in the faunal sequences in long cores from Mesquite Bay.

A few generalizations may be made concerning the distribution of total populations of Foraminifera. Relatively low populations are found in the western and northwestern parts of San Antonio Bay, in the bed of the Guadalupe River, and in the offshore area. Offshore there is a very slight indication of increased populations seaward. Relatively high populations are found in the northeastern, eastern, and lower San Antonio Bay, Mesquite Bay, Aransas Bay, and Matagorda Island and Grassy Point marsh areas.

The underlying causes of population shifts are probably of various kinds, differing in the various areas. For example, the causes of high populations in marshes probably differ from those in Mesquite Bay. There is a suggested correlation of size of population with sediment type in Mesquite and San Antonio Bays. The "clay and silty clay" areas carry, in general, a smaller population than the "mud-sand and mud" areas. There is insufficient evidence offshore to draw any conclusions on the variation in total populations. In the event of there being an increase seaward, of which there is a slight suggestion, this might be caused by the mechanical destruction of tests in the surf and nearshore area.

No attempt has been made to divide the area using any of the various schemes of terminology based on salinity or chlorinity suggested by North European writers for Netherlands and Baltic Sea shallow water regions. These various schemes have been summarized recently by Rottgardt (1952, p. 195). As pointed out by Hedgpeth (1951, p. 53), it is impossible to apply these terms rigidly in the San Antonio Bay region since there is such a wide variation both seasonally and periodically. Dahl (1948) points out similar difficulties in classifying the waters of the west coast of Sweden. While these various terminologies are of theoretical interest it seems dangerous to attempt to apply them in this area since such application implies a rigidity of control that may not in reality obtain. Seasonal studies of living Foraminifera would do much to clarify this situation since they might show to what degree these large and perhaps temporary variations affect the species present. Ladd (1951, p. 135) and Gunter (1941, p. 11) both maintain that in many respects the area is an ideal one for the study of the relationship of organisms to salinity.

The interpretation of the area given above is in essential agreement with that of Post (1951) who made an analysis of the present area and outlying bays based on sixty-two bottom samples and dredge hauls. She divides the area into three facies: 1) bay-head, 2) inter-reef and reef, and 3) polyhaline bays, passes, and open gulf. We have extended the distribution limits of many of the species that she found confined to one of these facies. This is to be expected in view of the much more extensive sampling, which also has given much additional data not included in Mrs. Post's report.

REFERENCES

Collier, A. and Hedgpeth, J. W., 1950, An introduction to the hydrography of the tidal water of Texas: Publ. Inst. Marine Sci., Univ. Texas, vol. 1, no. 2, pp. 123-194.

Cushman, J. A. and Bronnimann, P. ,1948, Additional new species of arenaceous Foraminifera from shallow waters of Trinidad: Contr. Cushman Lab. Foram. Res., vol. 24, pt. 2, pp. 37-42.

Dahl, E., 1948, On the smaller Arthropoda of marine algae, especially in the polyhaline waters off the Swedish west coast: Lund: C. W. K. Gleerup Unders. Öresund, vol. 35, pp. 5-193.

Fornasini, C., 1905, Illustrazione di specie Orbignyane di Miliolidae istituite nel 1826: Mem. Accad. Sci. Istit. Bologna, Ser. 6, vol. 2, pp. 59-70.

Galtsoff, P. S., 1931, Survey of oyster bottoms in Texas: U. S. Bur. Fish. Invest. Rept., no. 6, pp. 1-30.

Gunter, G., 1941, Report of the subcommittee on the ecology of marine organisms, National Research Council, pp. 11, 12.

———, 1945, Studies on marine fishes of Texas: Publ. Inst. Marine Sci. Univ. Texas, vol. 1, no. 1, pp. 1-190.

Hada, Y., 1931, Report of the biological survey of Mutsu Bay. 19. Notes on the Recent Foraminifera from Mutsu Bay: Sci. Repts. Tôhoku Imp. Univ., ser. 4, Biol., vol. 6, no. 1, pp. 45-148.

———, 1936, Studies on the Foraminifera of brackish waters. 1. Hijirippu and Mochirippu Lakes: Zool. Mag., vol. 48, nos. 8, 9, 10, pp. 847-860.

Hedgpeth, J. W., 1951, in: Report of the committee on a treatise on marine ecology and paleoecology, No. 11, pp. 49-56.

Höglund, H., 1947, Foraminifera in the Gullmar Fjord and the Skagerak: Zool. Bidrag från Uppsala, bd. 26, pp. 1-328.

Kornfeld, M. M., 1931, Recent littoral Foraminifera from Texas and Louisiana: Contr. Dept. Geol. Stanford Univ., vol. 1, no. 3, pp. 77-101.

Ladd, H. S., 1951, Brackish-water and marine assemblages of the Texas coast, with special reference to mollusks: Publ. Inst. Marine Sci., vol. 2, no. 1, pp. 125-164.

PARKER, F. L., 1948, Foraminifera of the continental shelf from the Gulf of Maine to Maryland: Bull. Mus. Comp. Zool., vol. 100, no. 2, pp. 214-234.

———, 1952, Foraminiferal distribution in the Long Island Sound-Buzzards Bay area: Bull. Mus. Comp. Zool., vol. 106, no. 10, pp. 428-473.

PHLEGER, F. B, 1951, Ecology of Foraminifera, northwest Gulf of Mexico. Pt. 1. Foraminifera distribution: Mem. 46, Geol. Soc. America, pp. 1-88.

———, and PARKER, F. L., 1951, *ibid.* Pt. 2, Foraminifera species: pp. 1-64.

——— and WALTON, W. R., 1950, Ecology of marsh and bay Foraminifera, Barnstable, Mass.: Am. Journ. Sci., vol. 248, pp. 274-294.

POST, RITA J., 1951, Foraminifera of the south Texas coast: Publ. Inst. Marine Sci., vol. 2, no. 1, pp. 165-176.

ROTTGARDT, D., 1952, Mikropaläontologisch wichtige Bestandteile recenter brackischer Sedimente an den Küsten Schleswig-Holsteins: Meyniana, Geol. Instit. Univ. Kiel, vol. 1, pp. 169-228.

Contributions from the Scripps Institution of Oceanography, New Series, no. 603.

Contribution no. 13, Marine Foraminifera Laboratory.

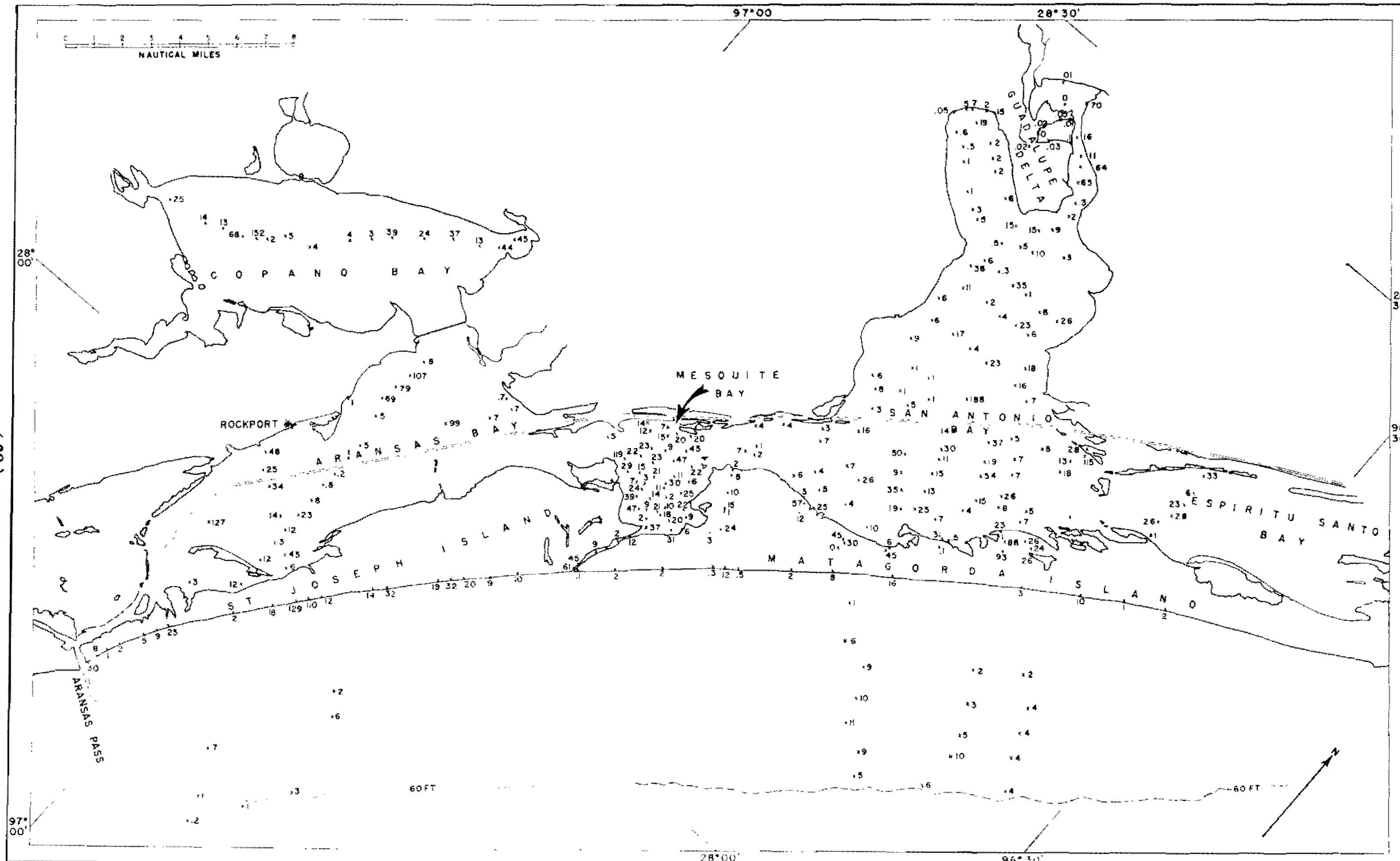


Figure 5. Total populations of Foraminifera in sample fraction larger than 0.149 mm., in hundreds of specimens.

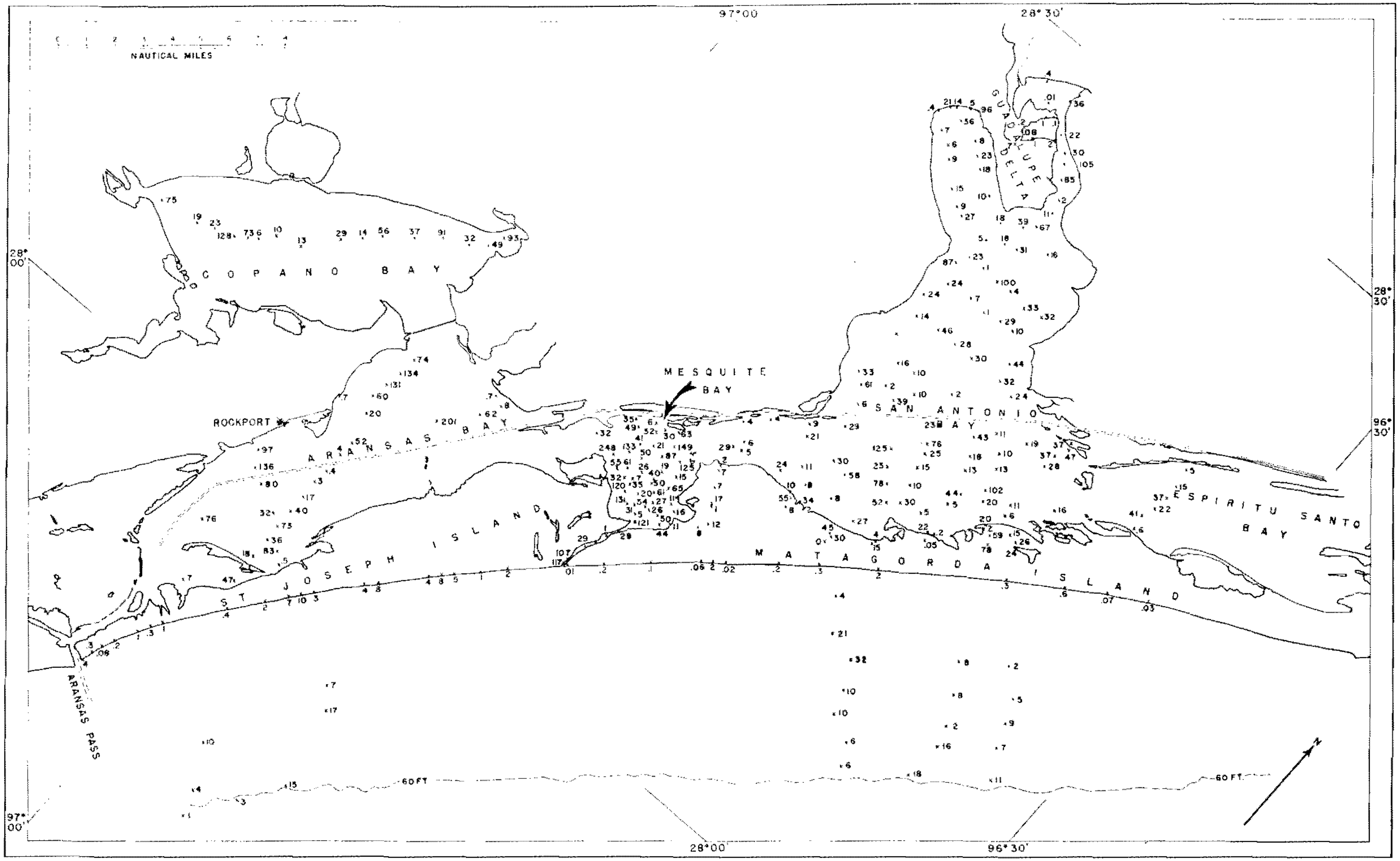


Figure 6. Total populations of Foraminifera in sample fraction smaller than 0.149 mm., in hundreds of specimens.

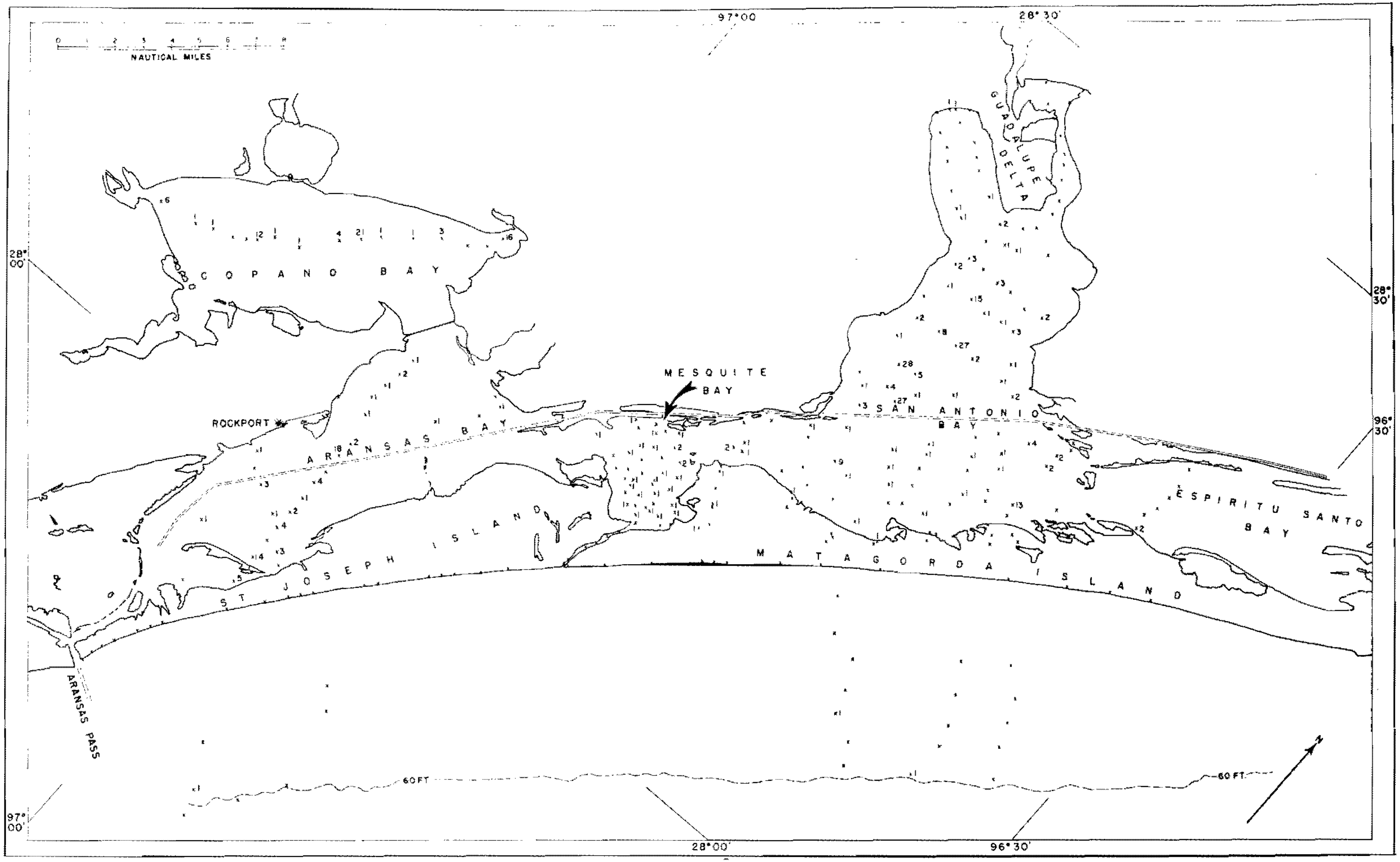


Figure 7. Distribution of *Ammobaculites dilatatus* Cushman and Bronnimann in percent of total population. Fraction larger than 0.149 mm.

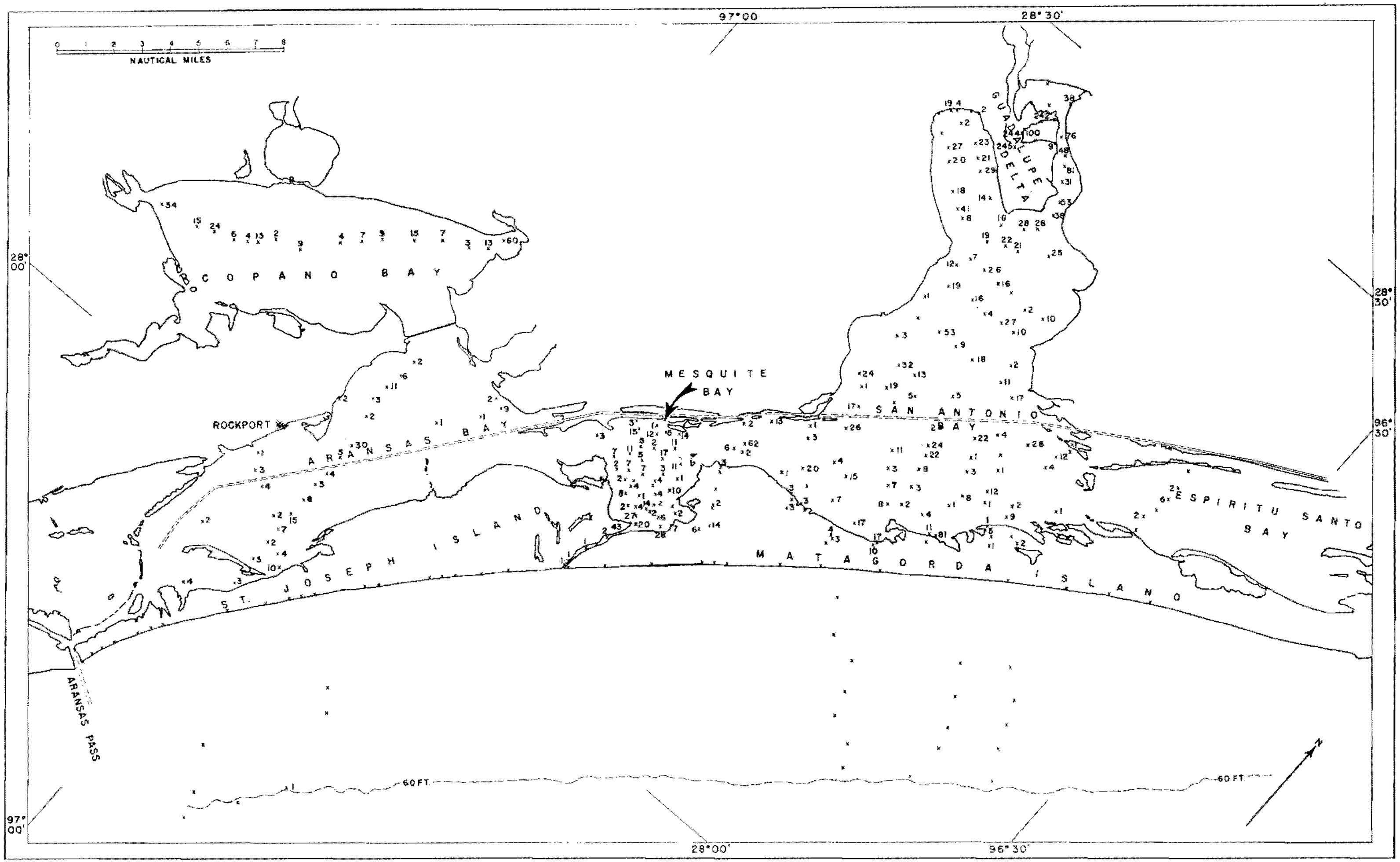


Figure 8. Distribution of *Ammobaculites salsus* Cushman and Bronnimann and variants in percent of total population. Fraction larger than 0.149 mm.

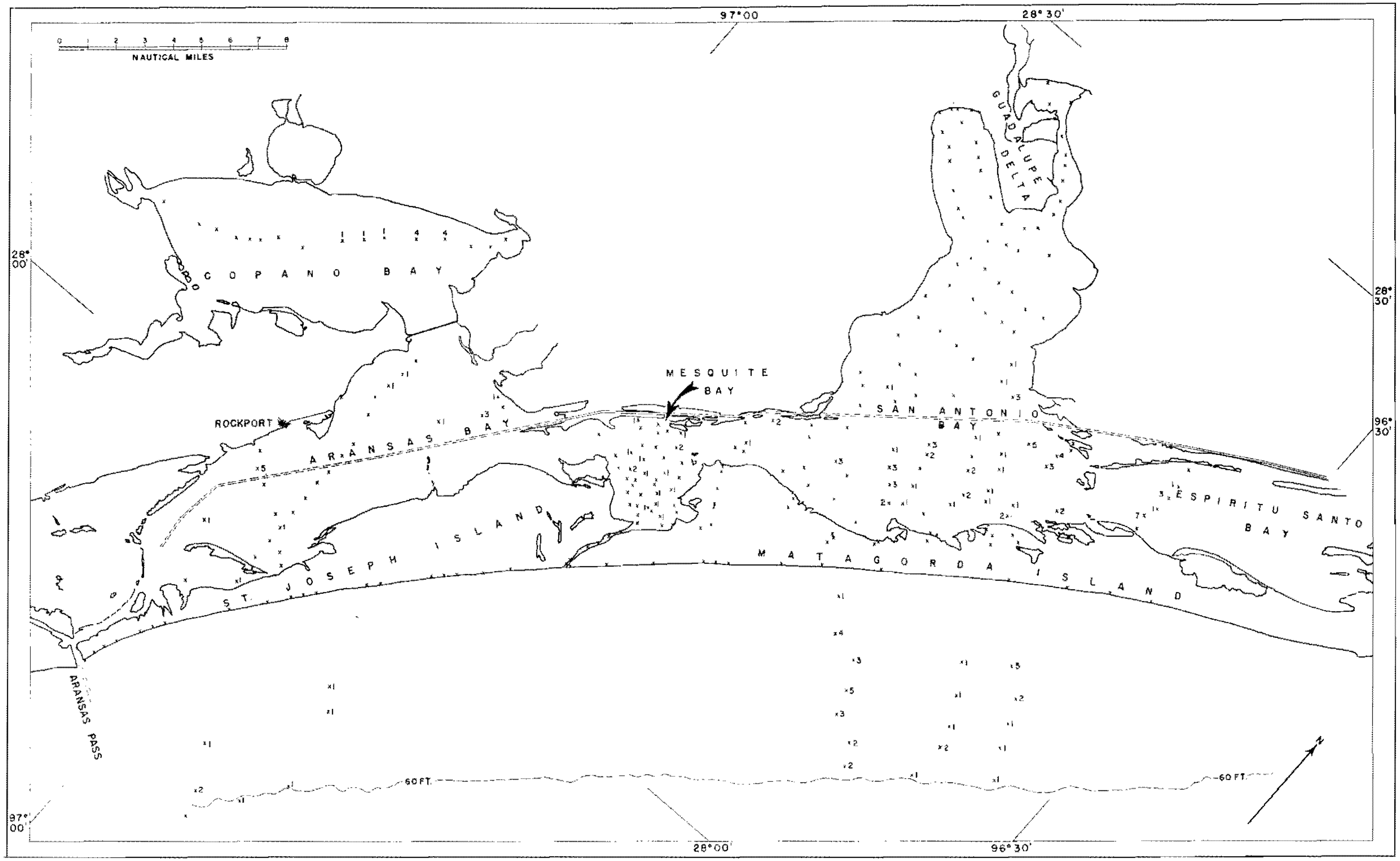


Figure 9. Distribution of *Ammoscalaria pseudospiralis* (Williamson) in percent of total population. Fraction larger than 0.149 mm.

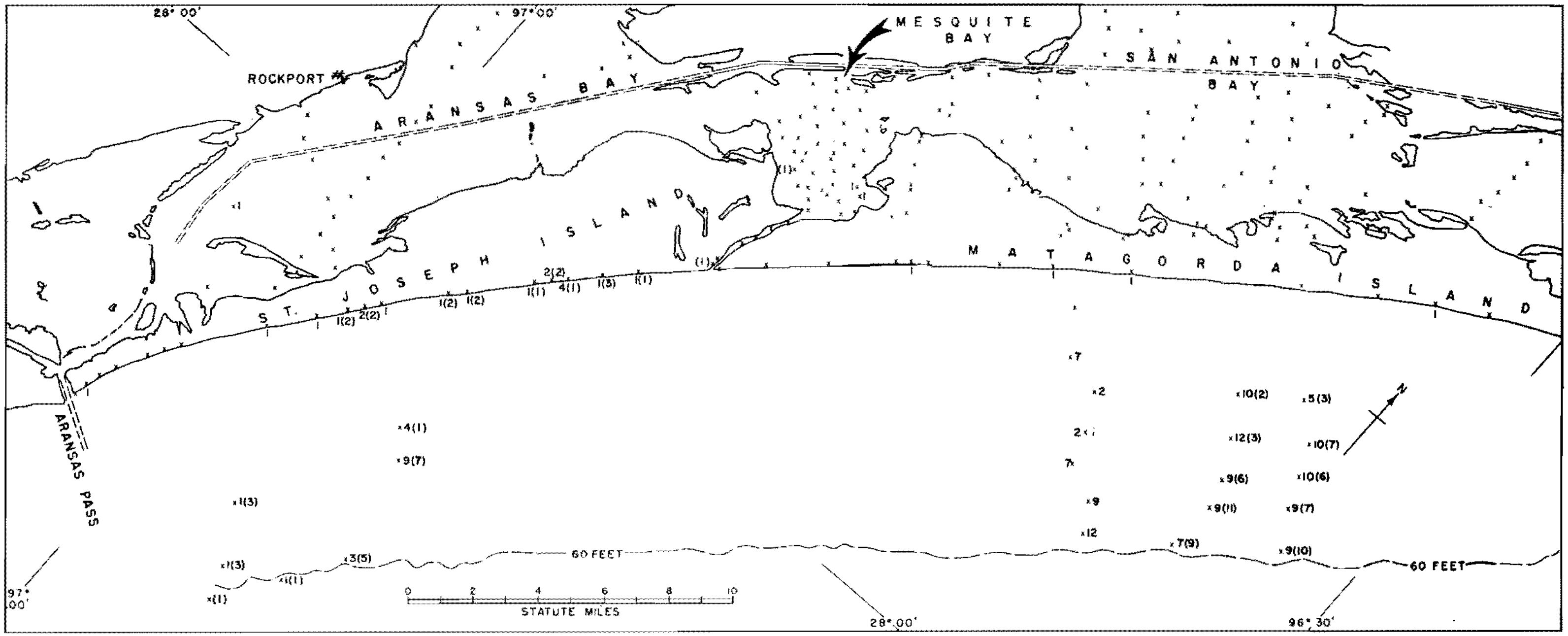


Figure 10. Distribution of *Bigenerina irregularis* Phleger and Parker in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

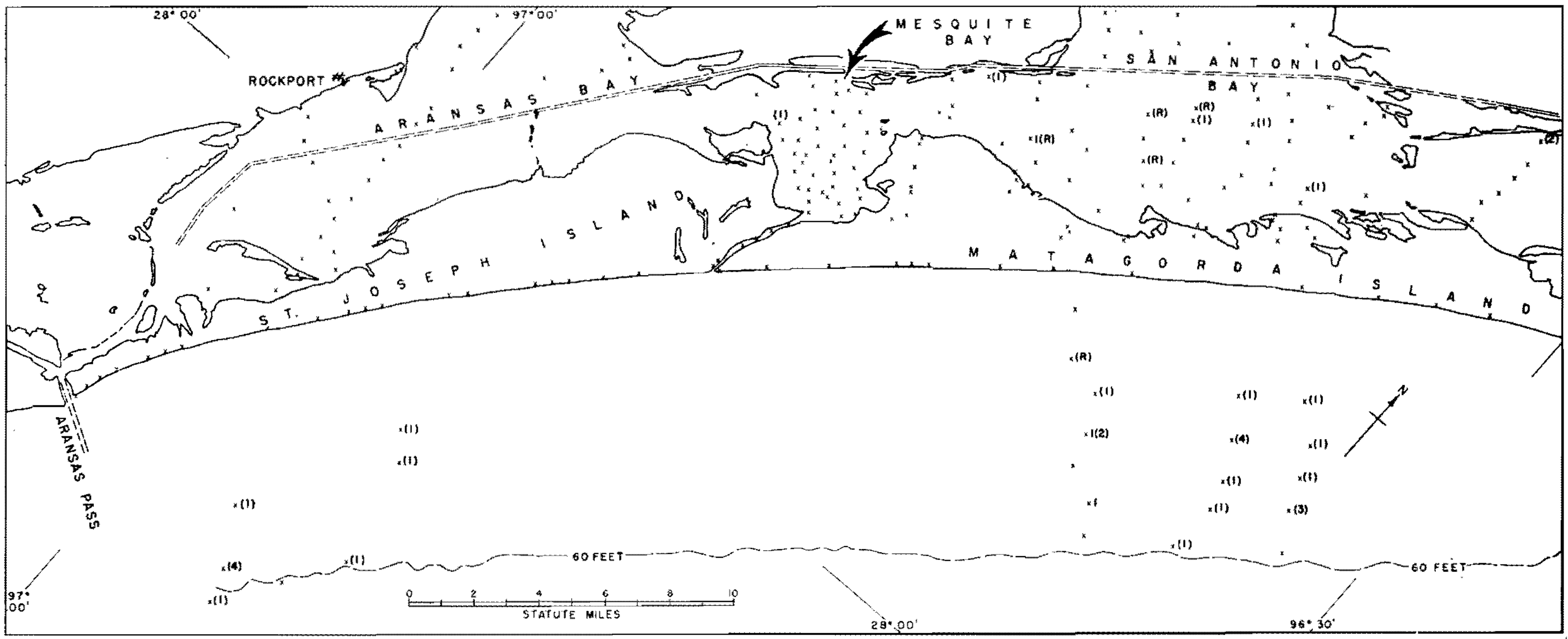


Figure 11. Distribution of *Bolivina lowmani* Phleger and Parker in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

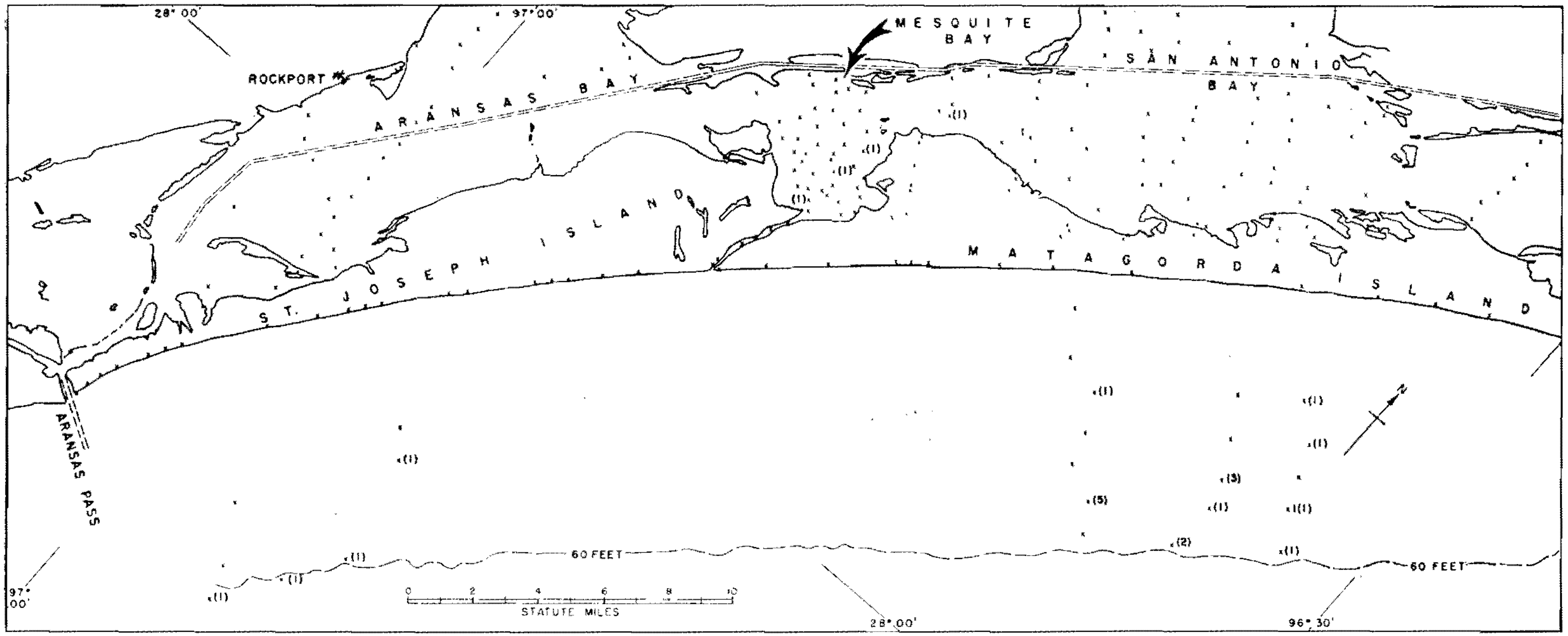


Figure 12. Distribution of *Bolivina pulchella primitiva* Cushman in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

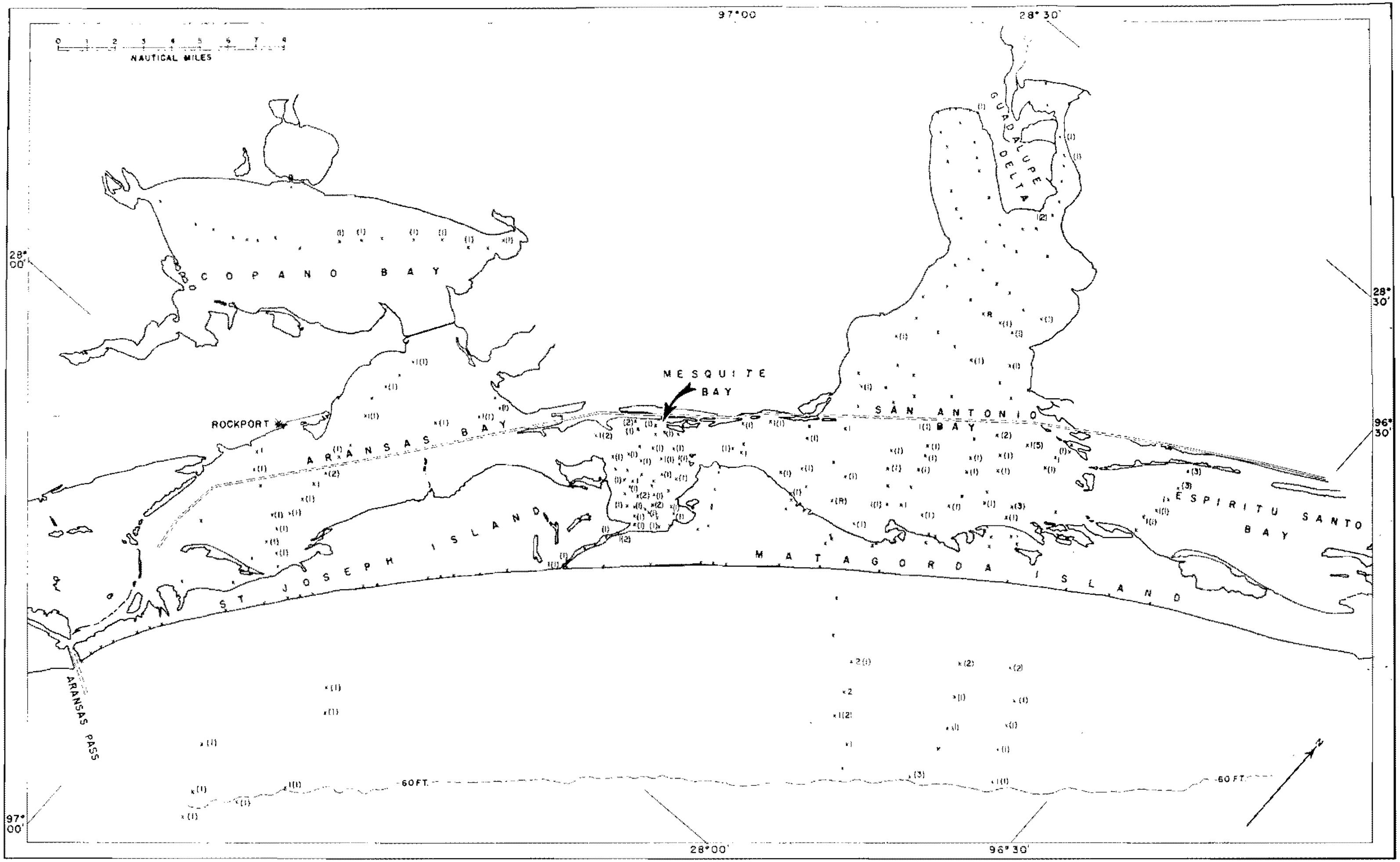


Figure 13. Distribution of *Bolivina striatula* Cushman in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

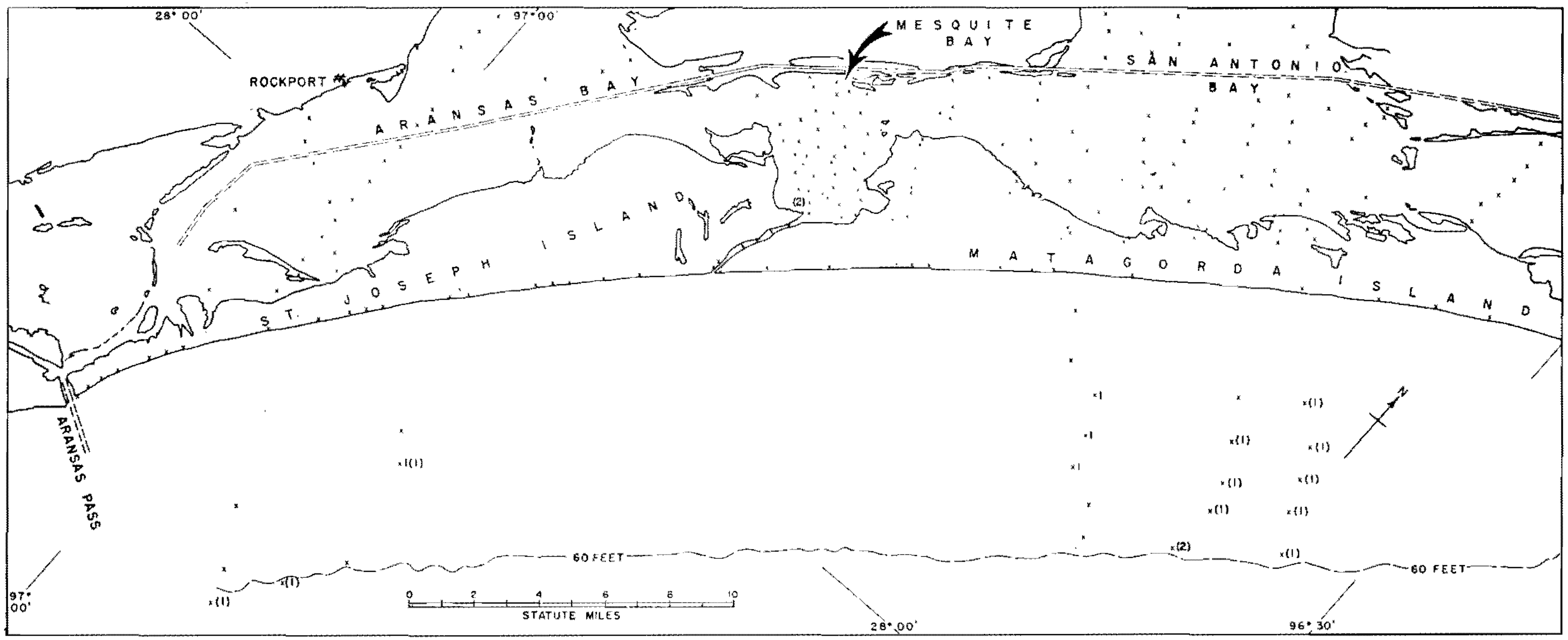


Figure 14. Distribution of *Buliminella* sp. cf. *B. bassendorfensis* Cushman and Parker in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

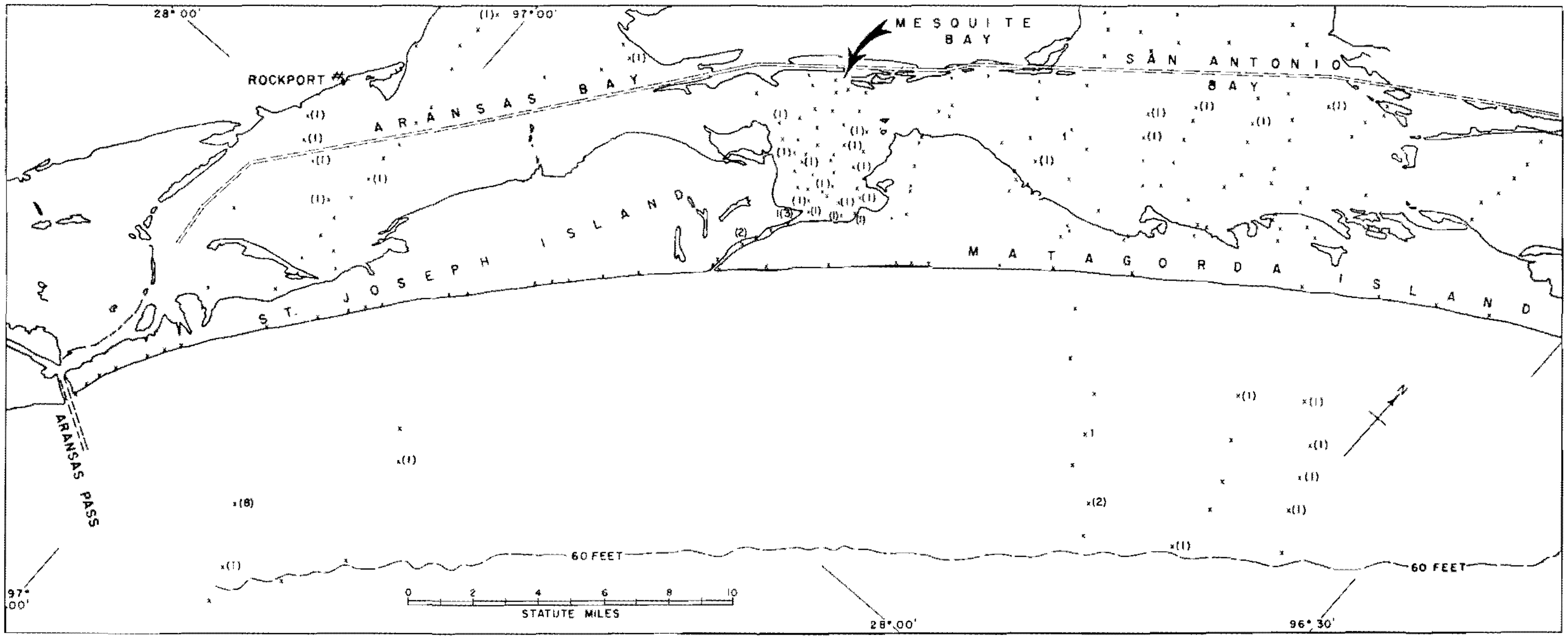


Figure 15. Distribution of *Buliminella elegantissima* (Orbigny) in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

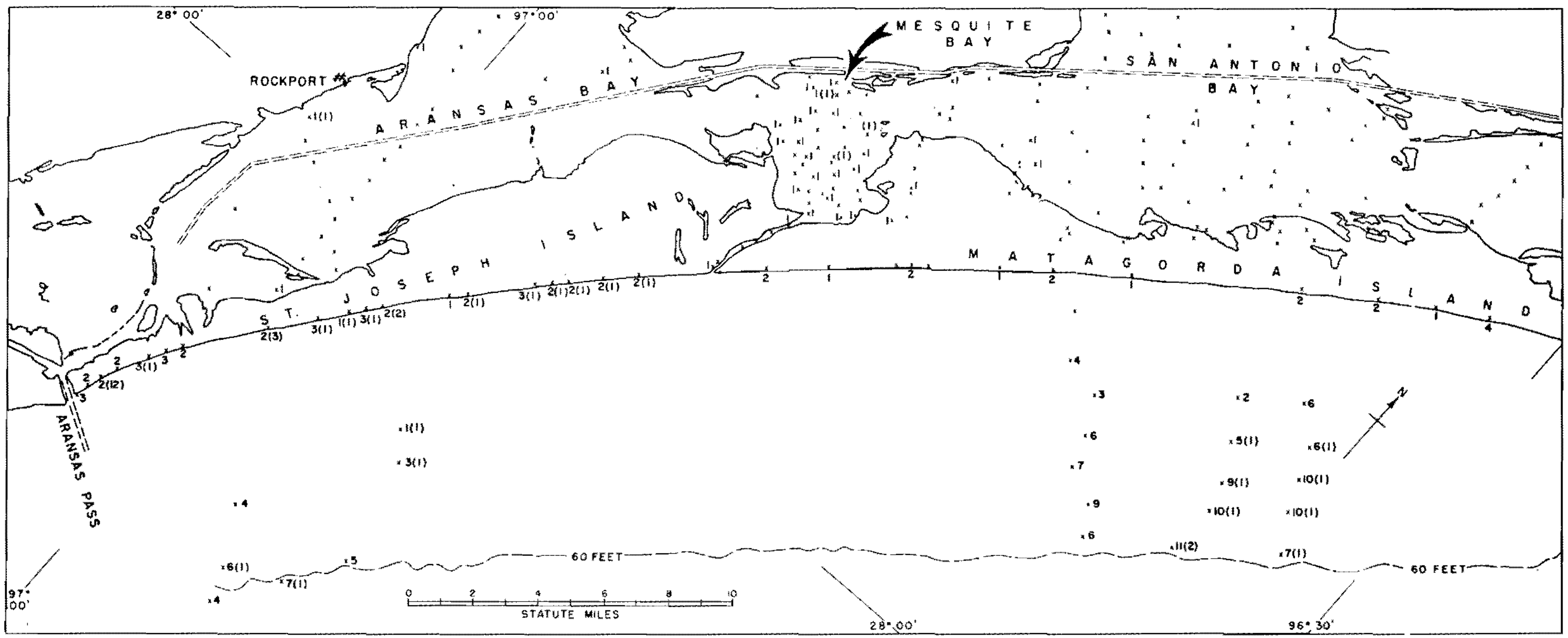


Figure 16. Distribution of *Cibicidina strattoni* (Applin) in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

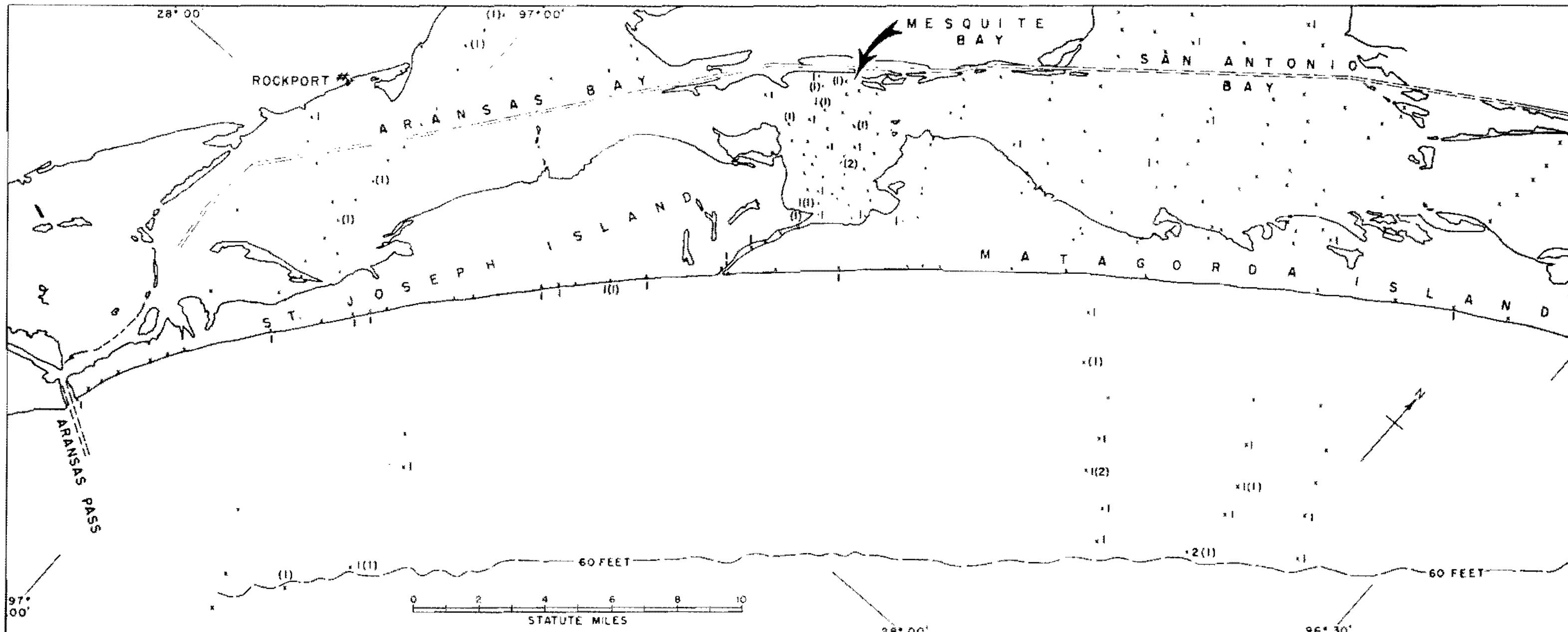


Figure 17. Distribution of *Discorbis floridana* Cushman in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

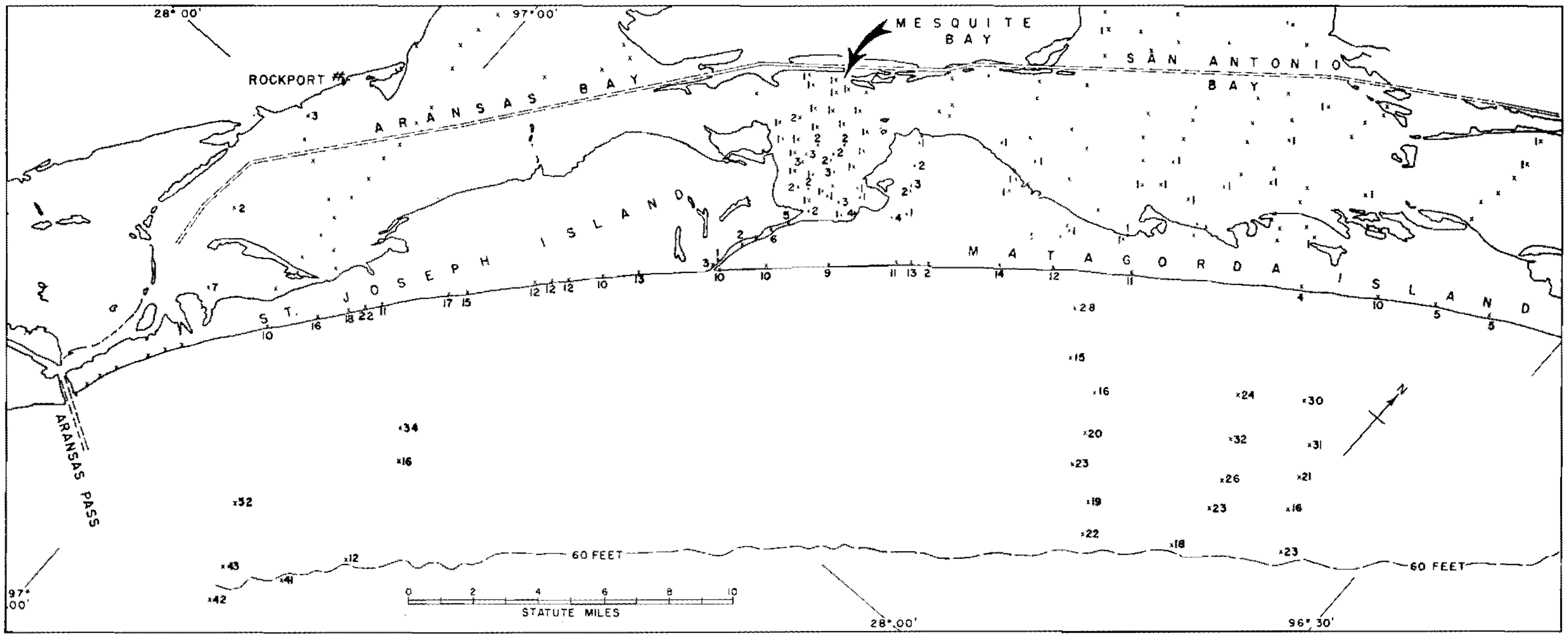


Figure 18. Distribution of *Elphidium discoidale* (Orbigny) in percent of total population. Fraction larger than 0.149 mm.

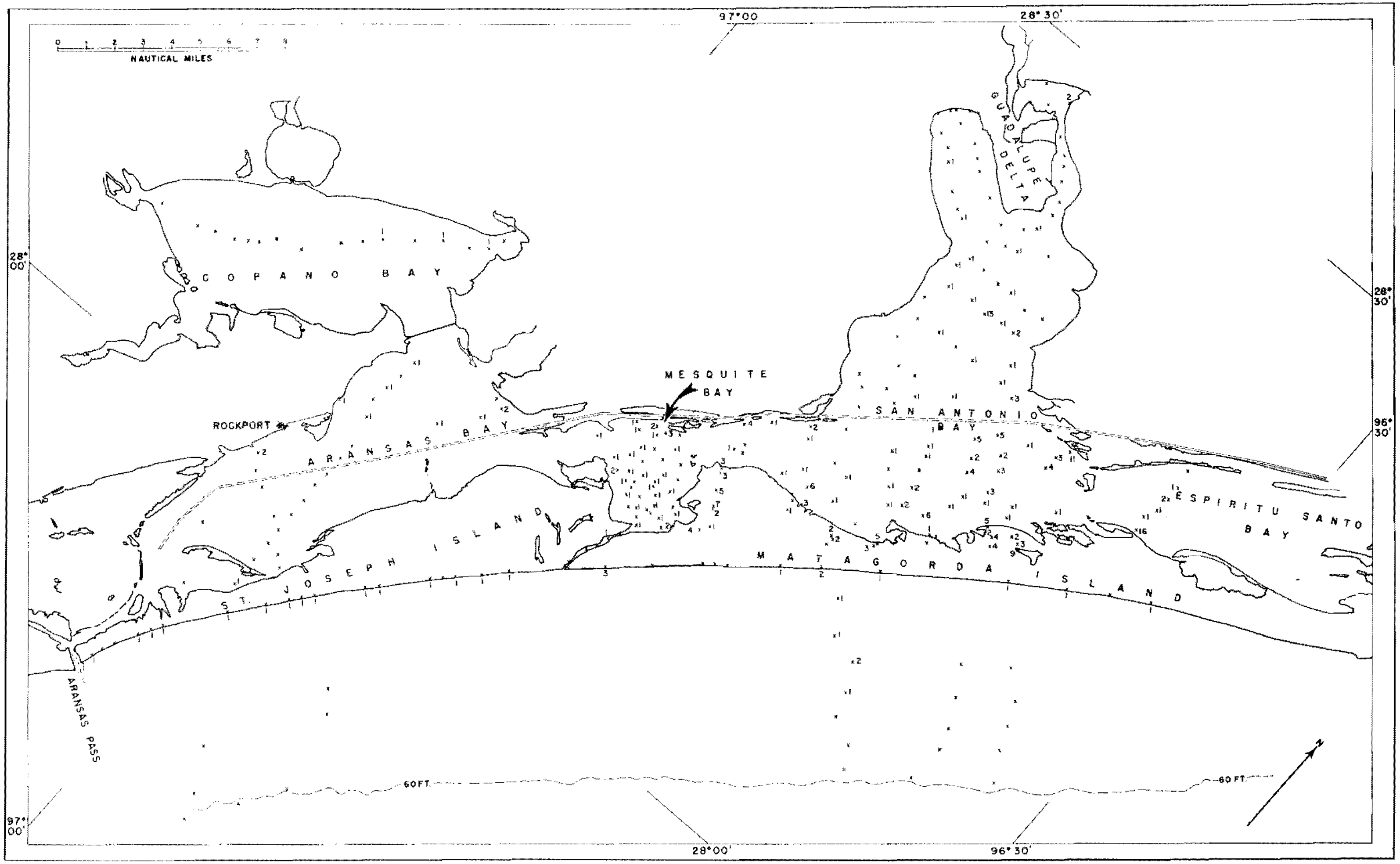


Figure 19. Distribution of *Elphidium galvestonense* Kornfeld in percent of total population. Fraction larger than 0.149 mm.

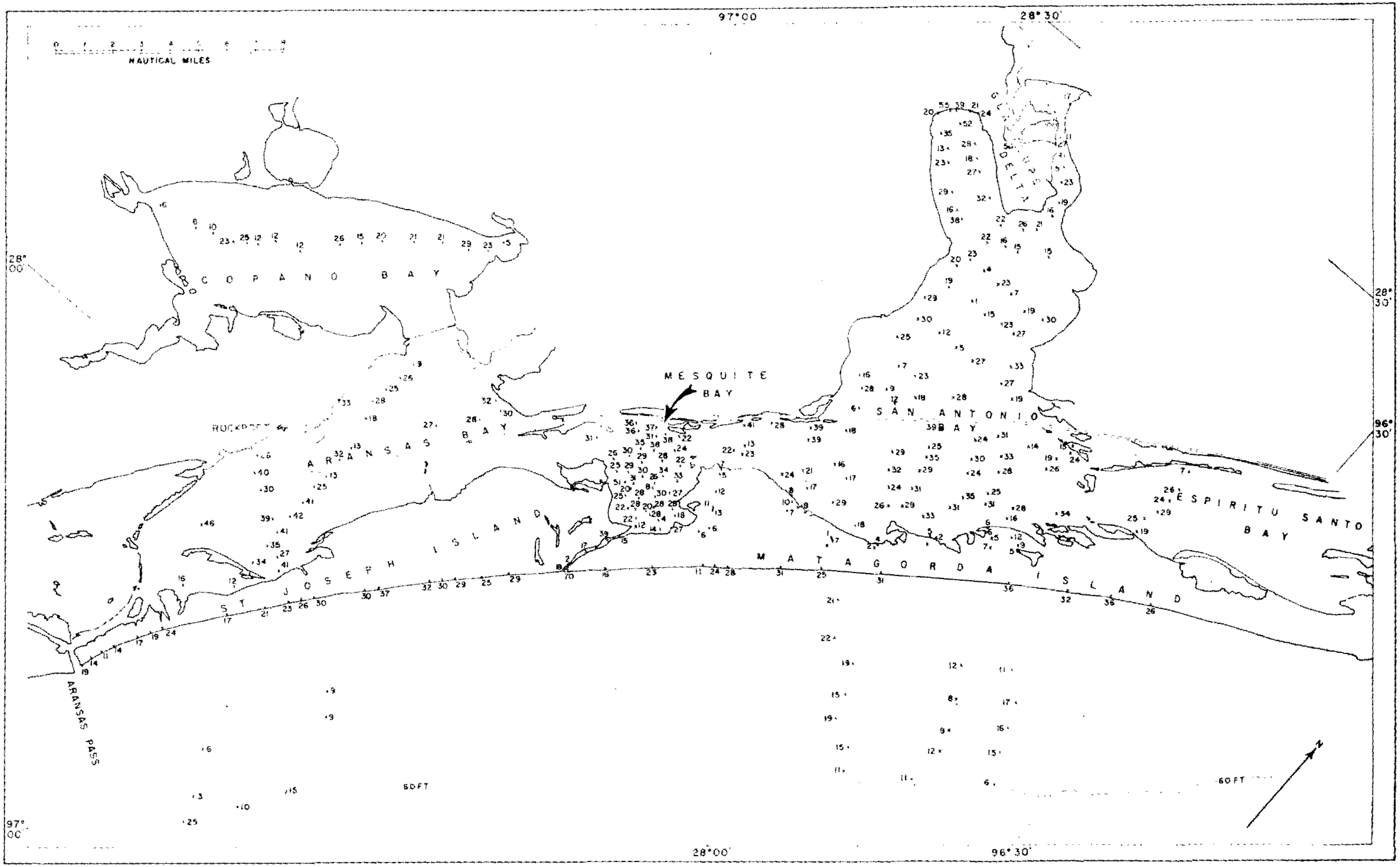


Figure 20. Distribution of *Elphidium gunteri* Cole in percent of total population. Fraction larger than 0.149 mm.

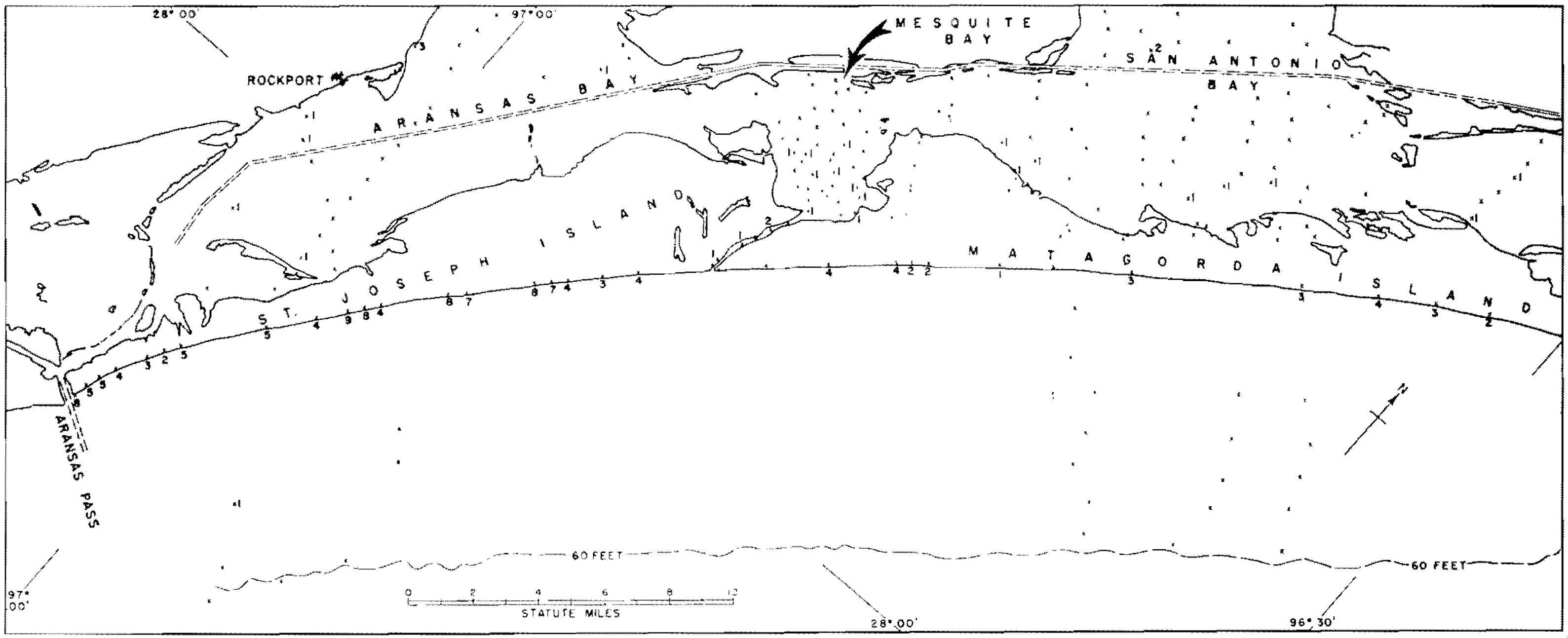


Figure 21. Distribution of *Elphidium incertum mexicanum* Kornfeld in percent of total population. Fraction larger than 0.149 mm.

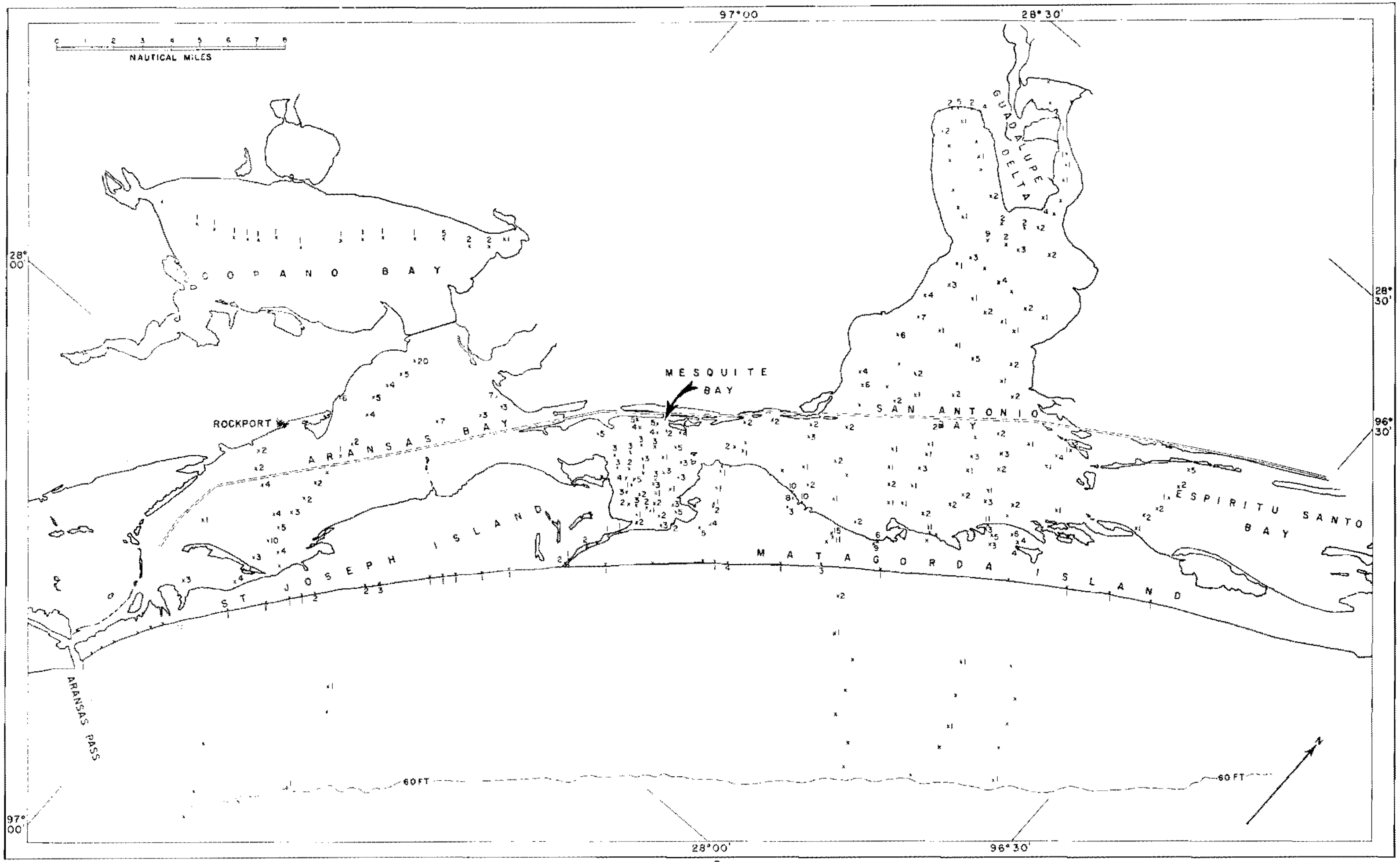


Figure 22. Distribution of *Elphidium matagordanum* (Kornfeld) in percent of total population. Fraction larger than 0.149 mm.

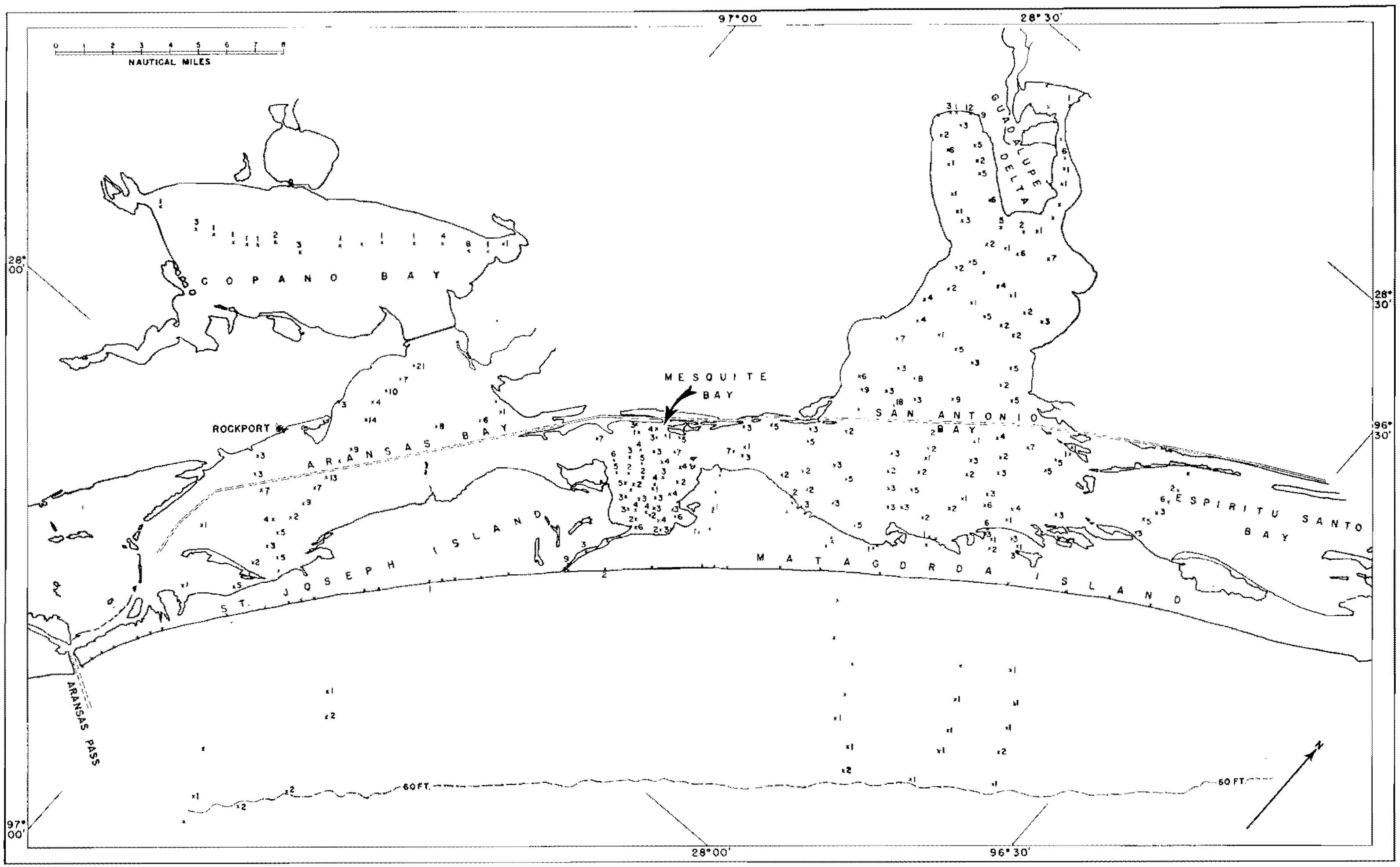


Figure 23. Distribution of *Elphidium poeyanum* (Orbigny) in percent of total population. Fraction larger than 0.149 mm.

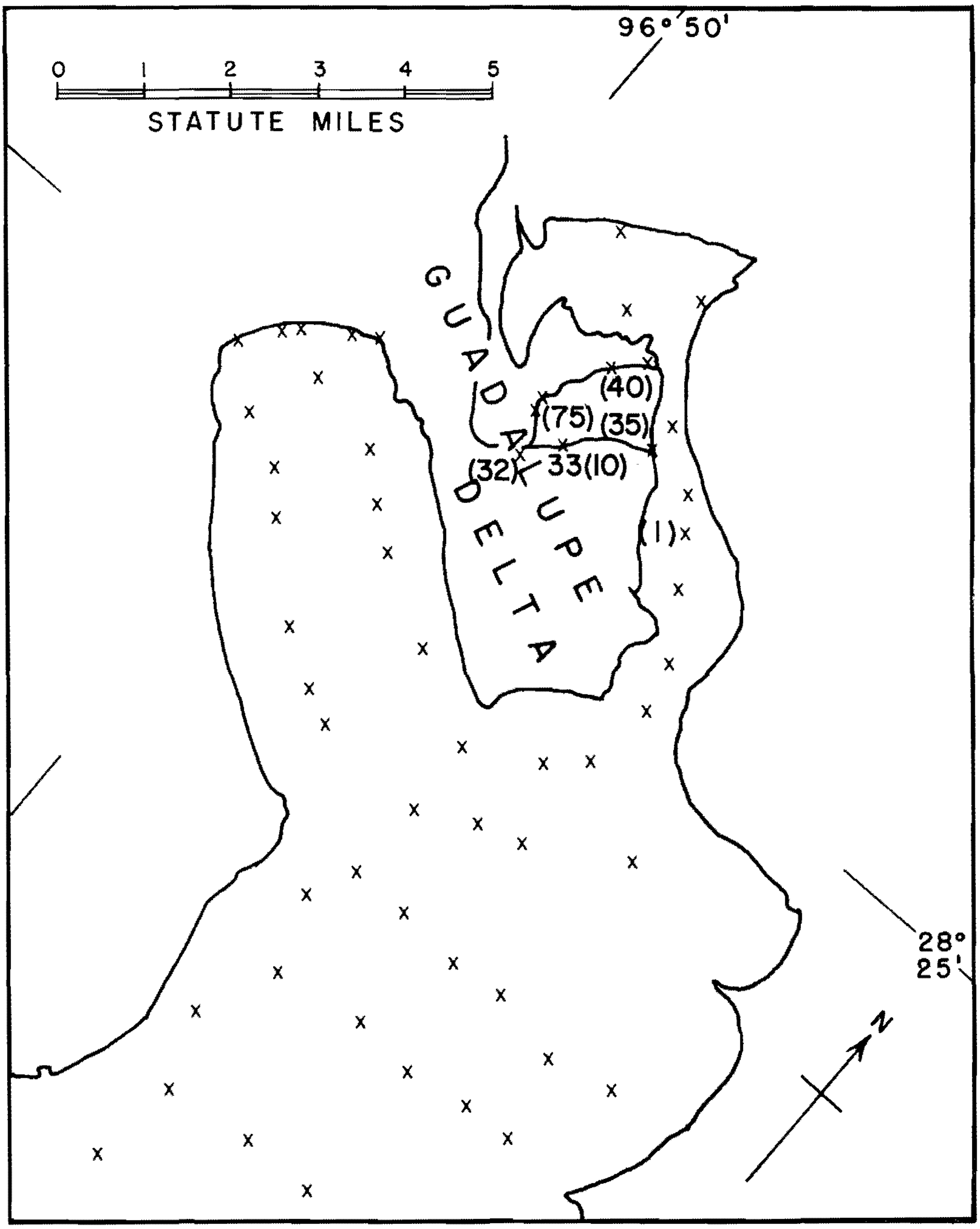


Figure 24. Distribution of *Leptodermella variabilis* Parker in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

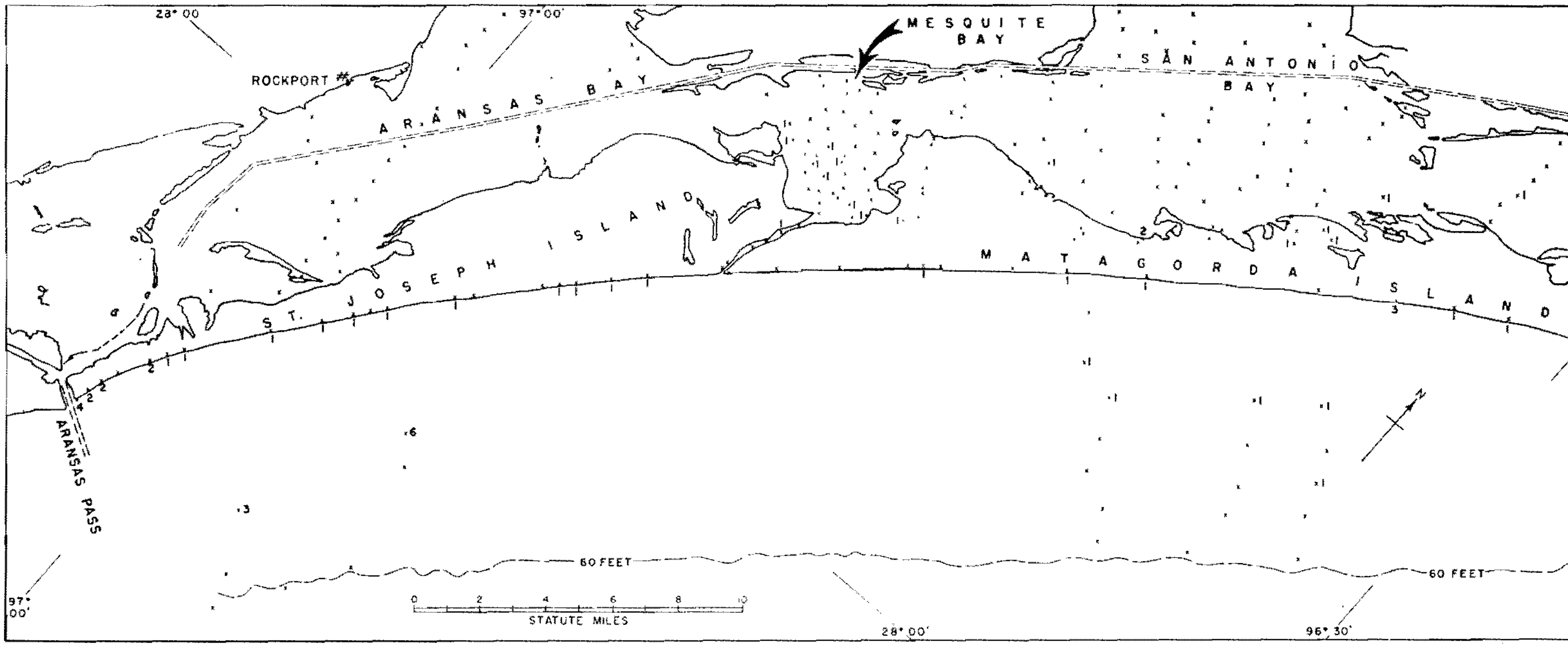


Figure 25. Distribution of *Massilina peruviana* (Orbigny) in percent of total population. Fraction larger than 0.149 mm.

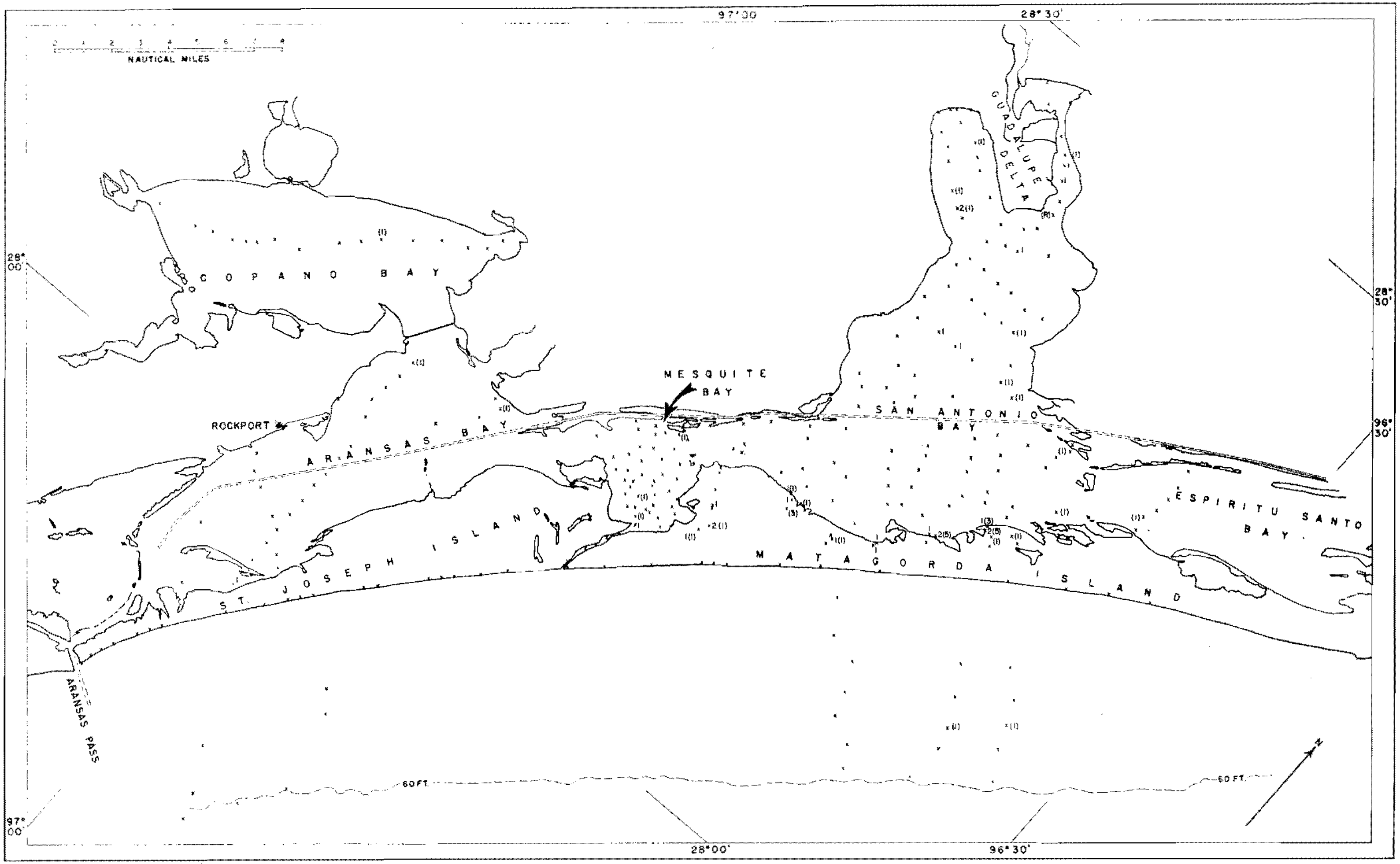


Figure 26. Distribution of *Miliammina fusca* (H. B. Brady) in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

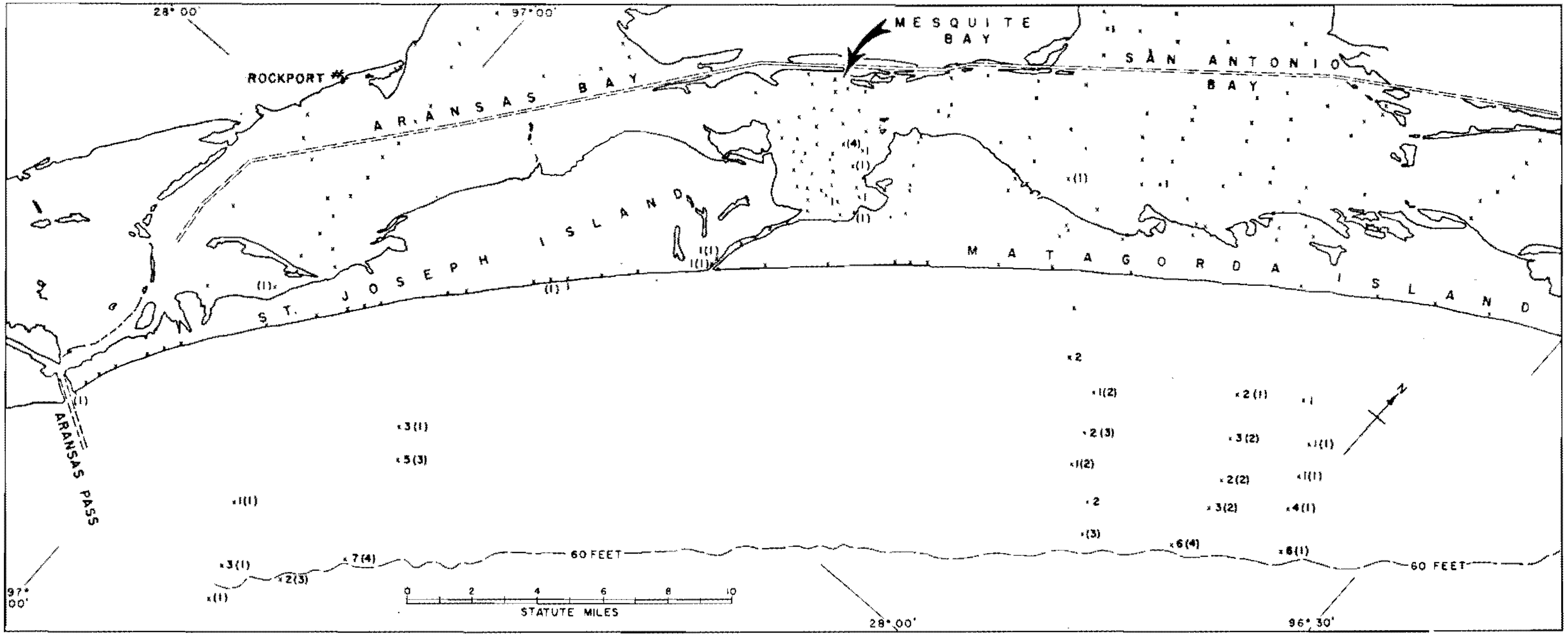


Figure 27. Distribution of *Nonionella atlantica* Cushman in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

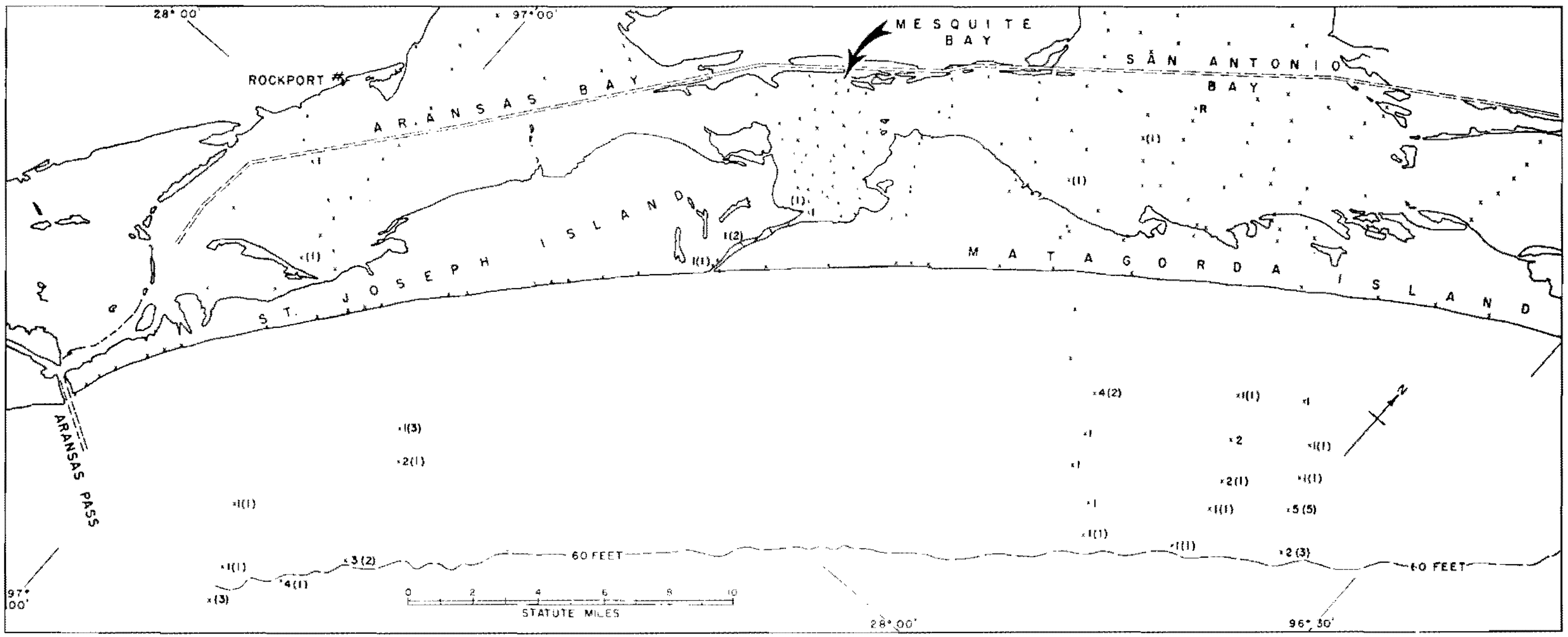


Figure 28. Distribution of *Nonionella opima* Cushman in percent of total pouplation. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

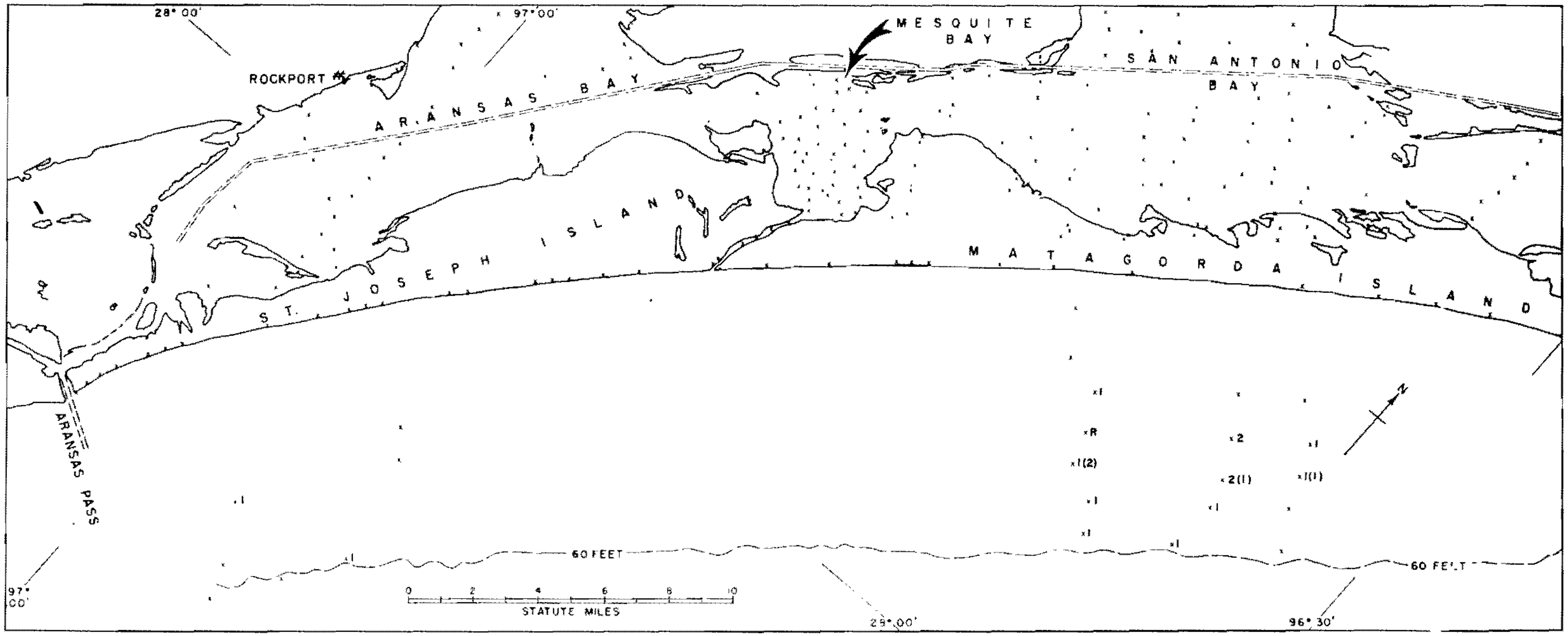


Figure 29. Distribution of *Nouria polymorphinoides* Heron-Allen and Earland in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

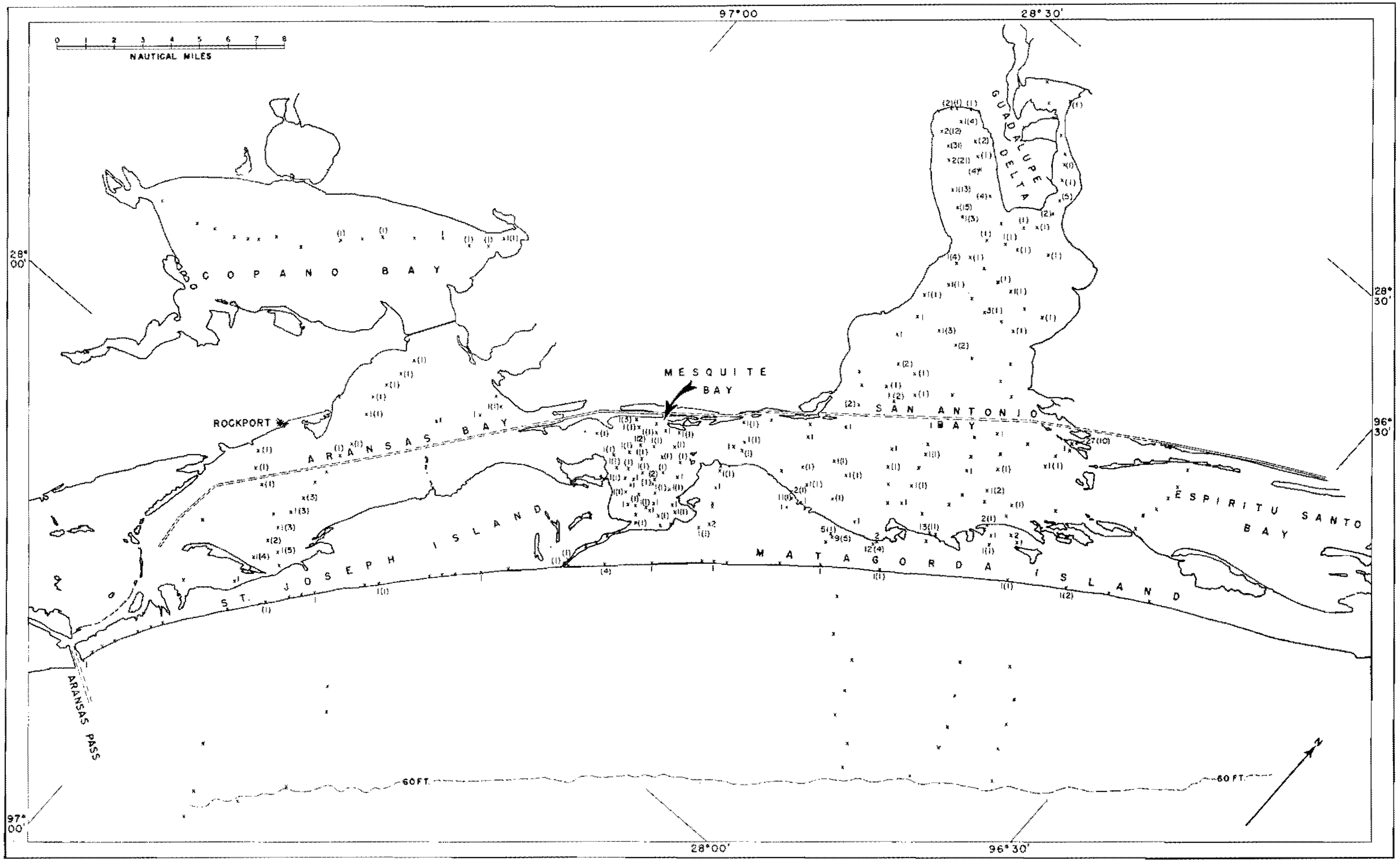


Figure 30. Distribution of *Palmerinella palmerae* Bermudez in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

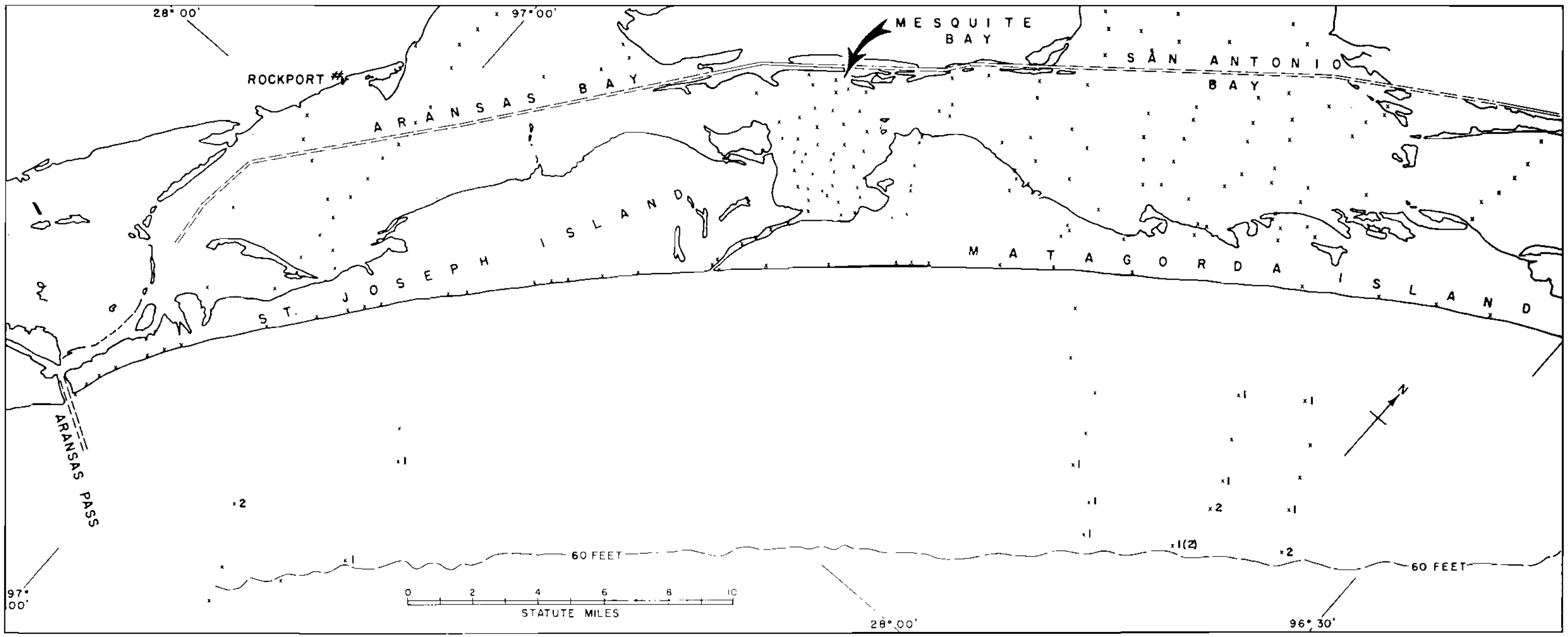


Figure 31. Distribution of *Proteonina atlantica* Cushman in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

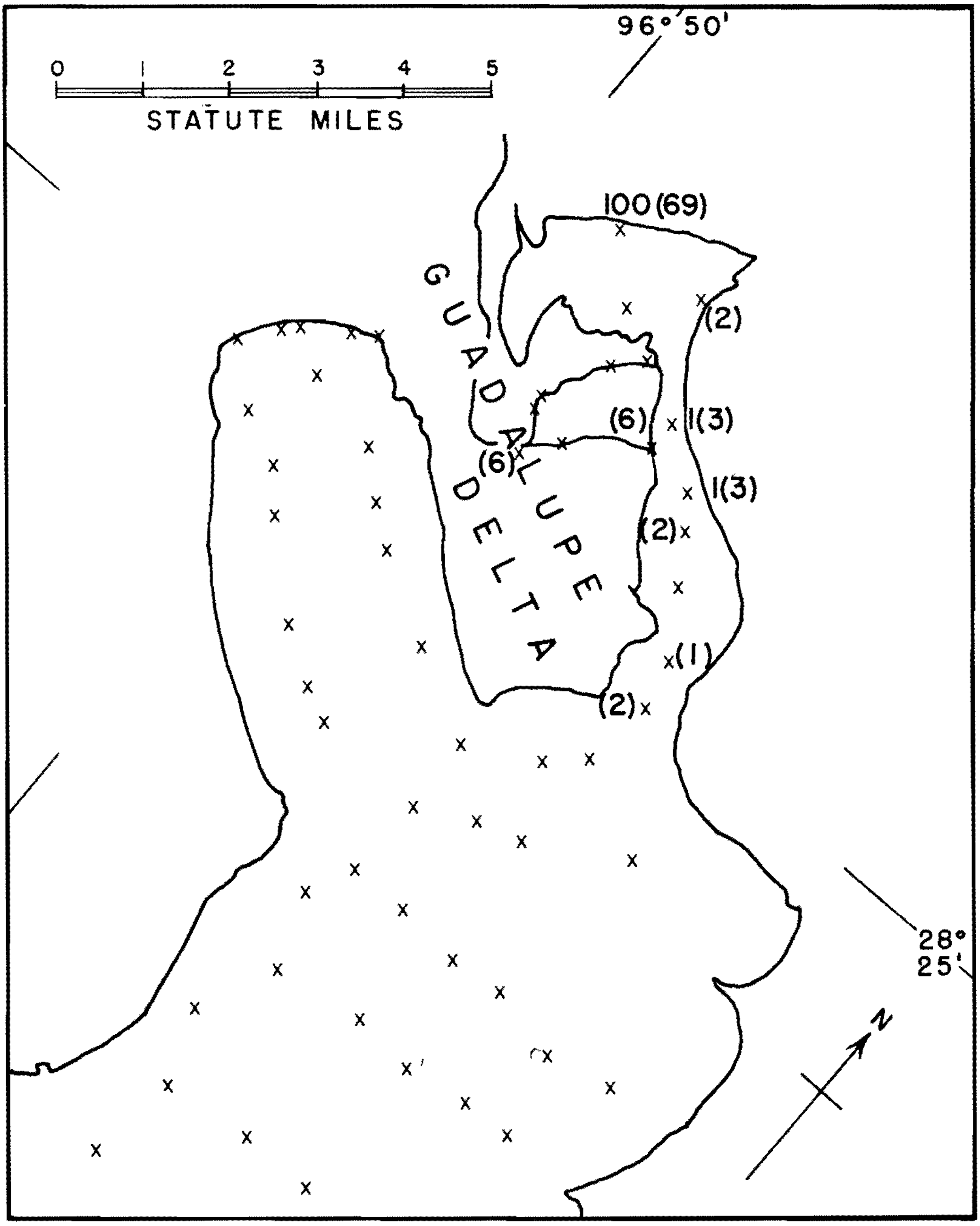


Figure 32. Distribution of *Proteonina lagenaria* (Berthelin) in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

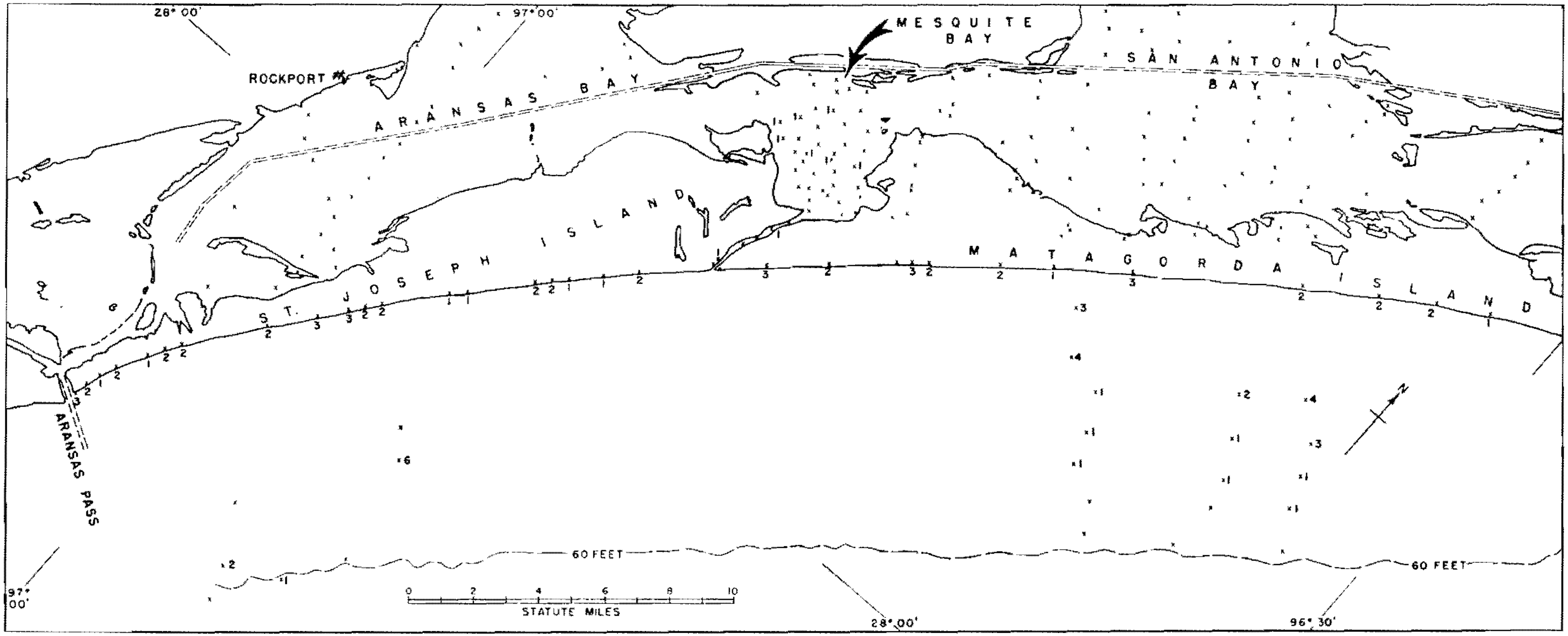


Figure 33. Distribution of *Quinqueloculina* sp. cf. *Q. compta* Cushman in percent of total population. Fraction larger than 0.149 mm.

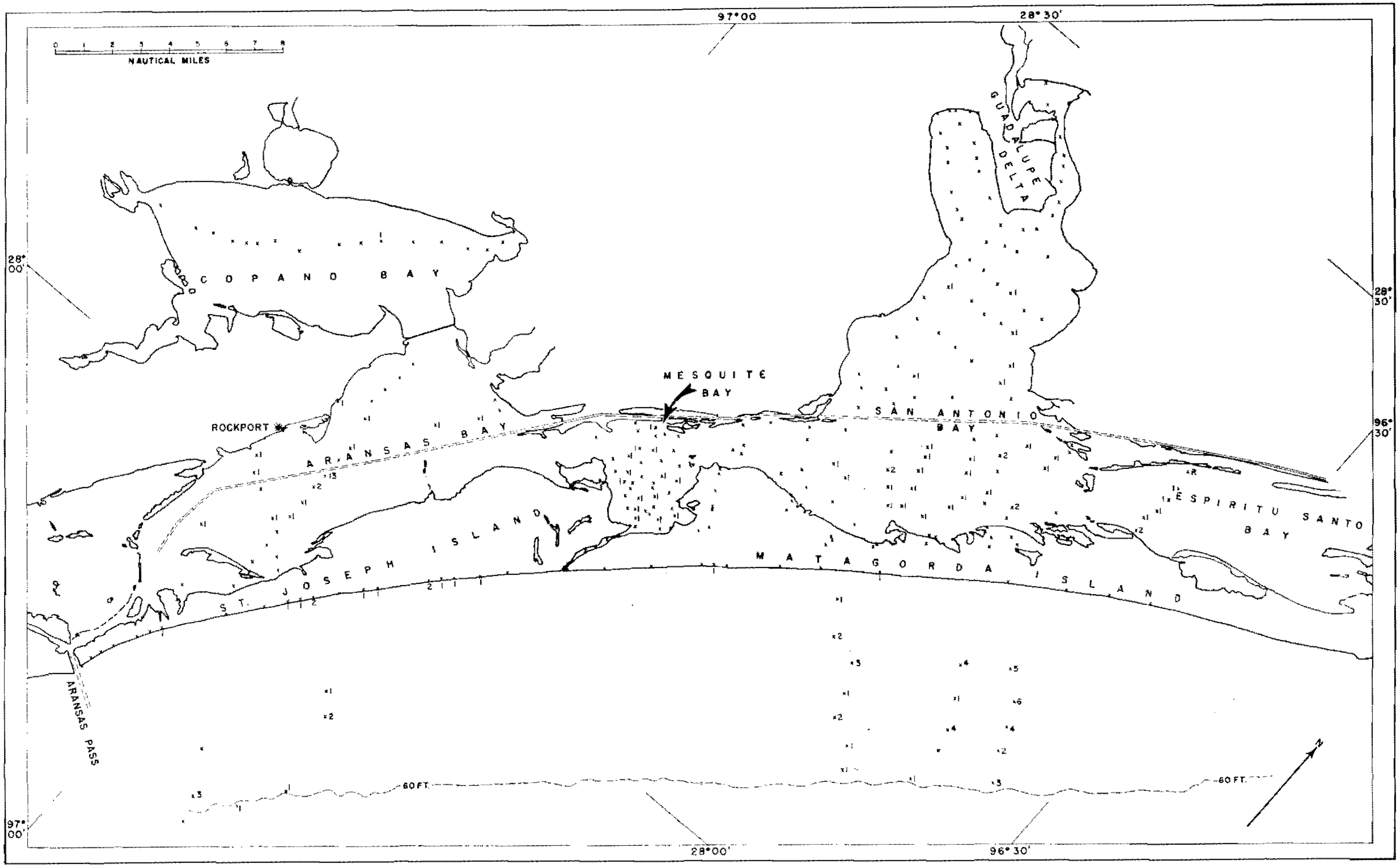


Figure 34. Distribution of *Quinqueloculina funafutiensis* (Chapman) in percent of total population. Fraction larger than 0.149 mm.

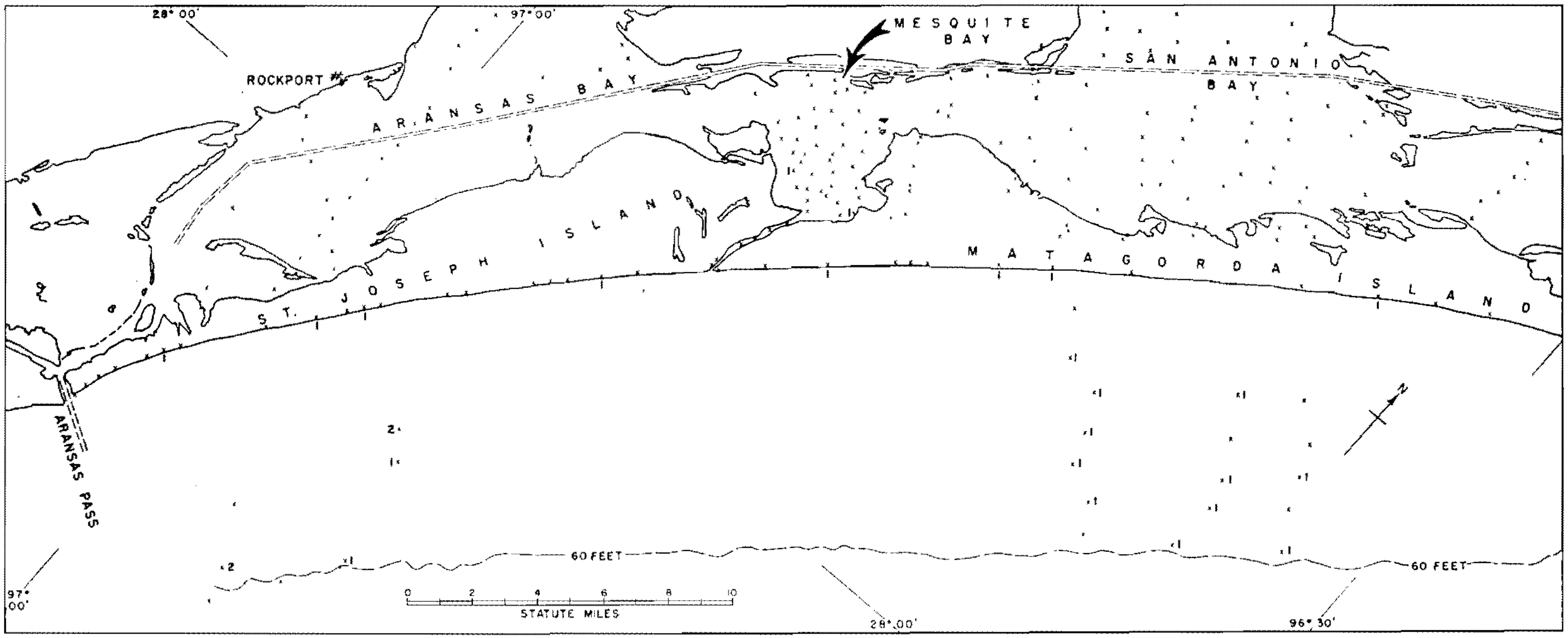


Figure 35. Distribution of *Quinqueloculina lamarckiana* Orbigny in percent of total population. Fraction larger than 0.149 mm.

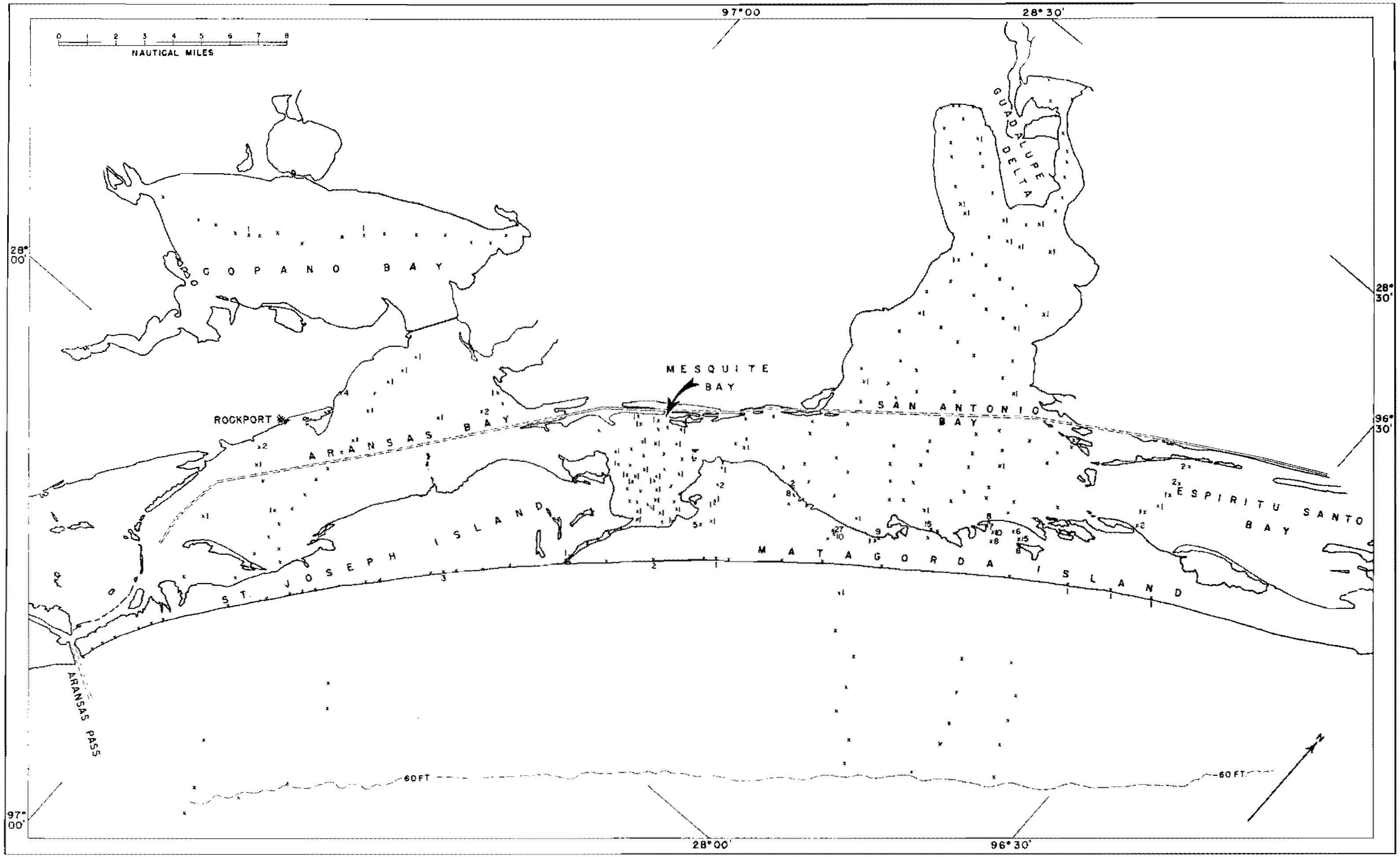


Figure 36. Distribution of *Quinqueloculina rhodiensis* Parker in percent of total population. Fraction larger than 0.149 mm.

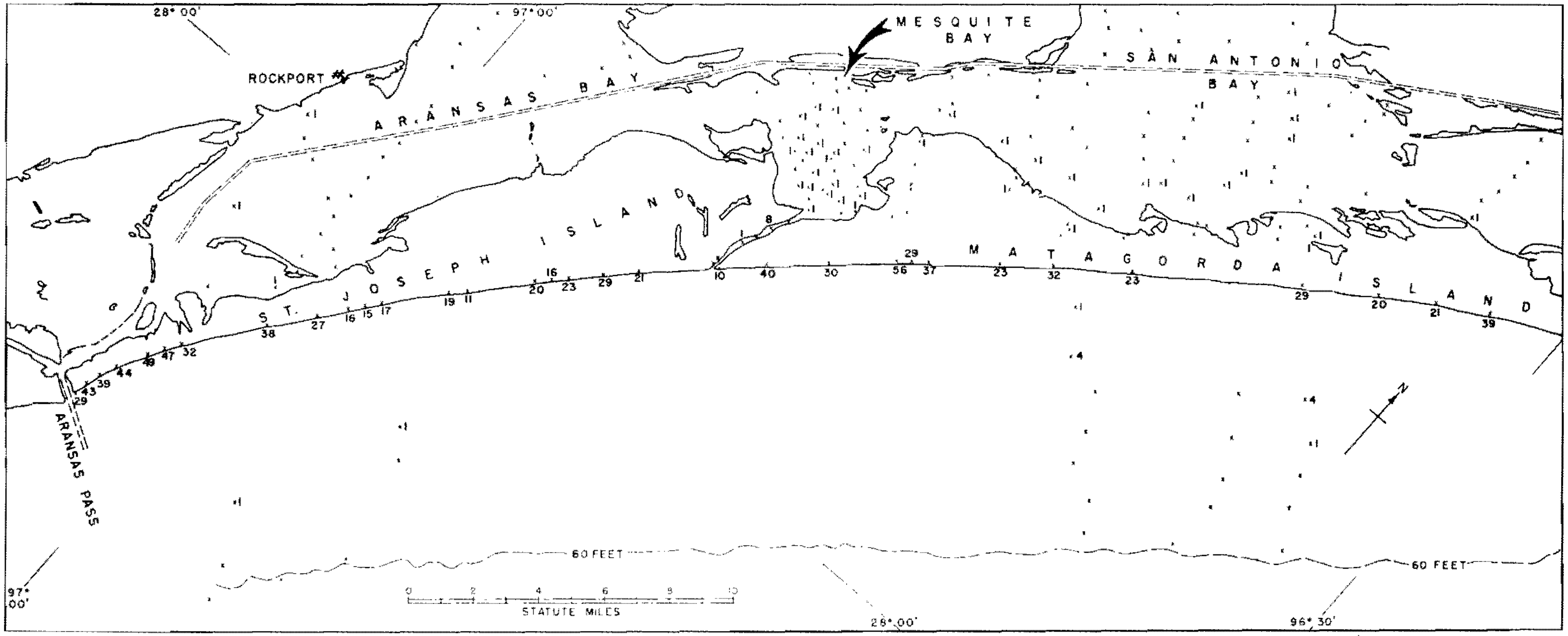


Figure 37. Distribution of *Quinqueloculina seminulum* (Linné) in percent of total population. Fraction larger than 0.149 mm.

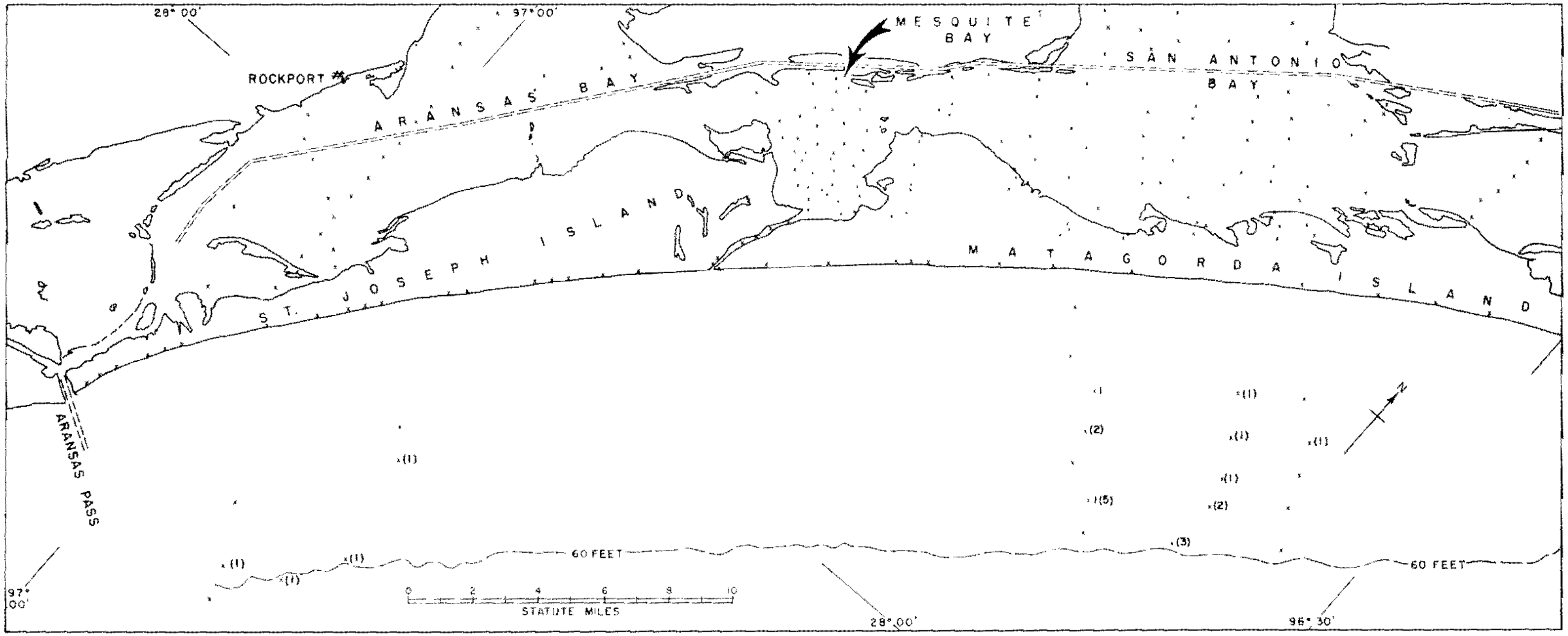


Figure 38. Distribution of *Rectobolivina advena* (Cushman) in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

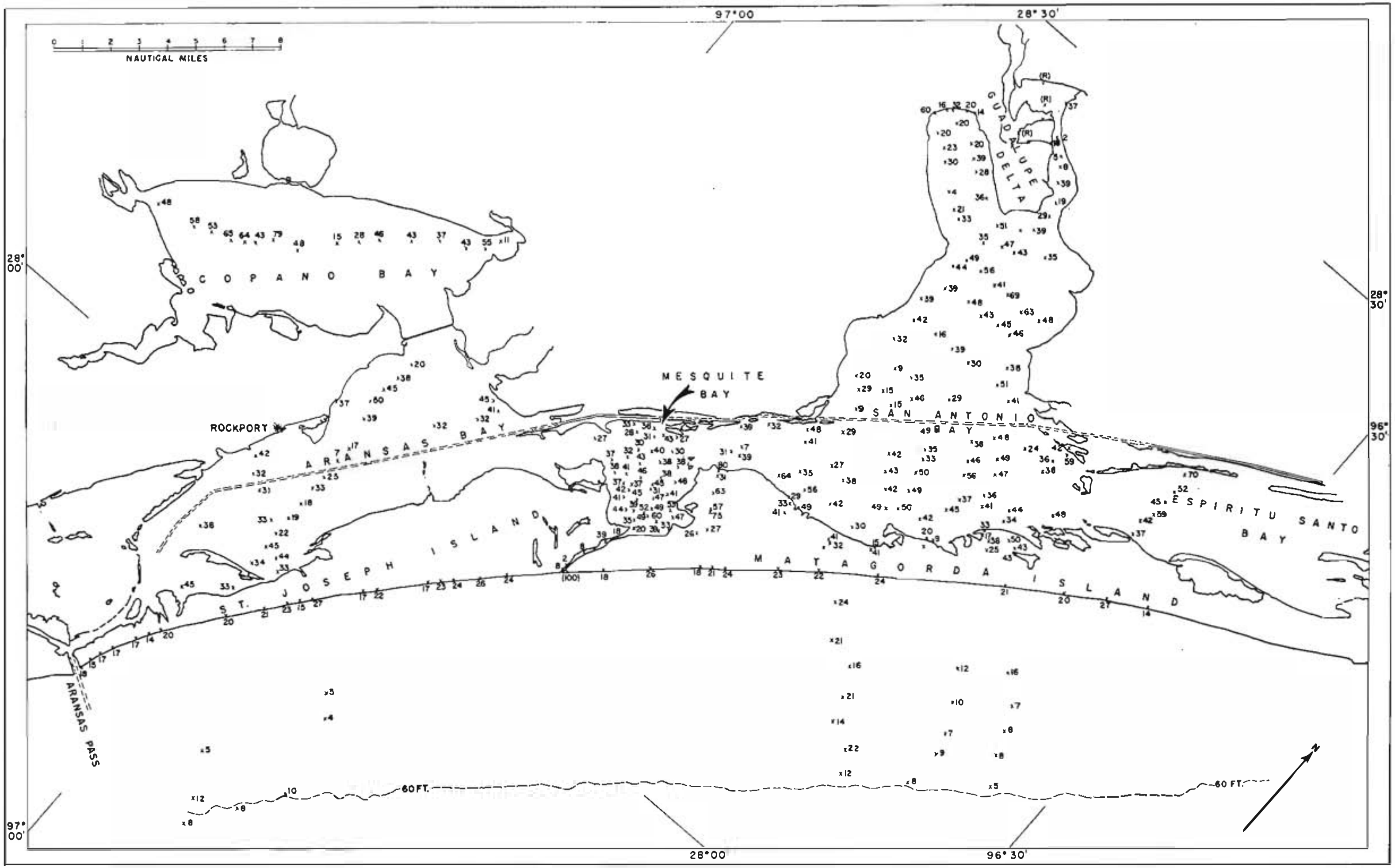


Figure 39. Distribution of *"Rotalia" beccarii* (Linné) variant A in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

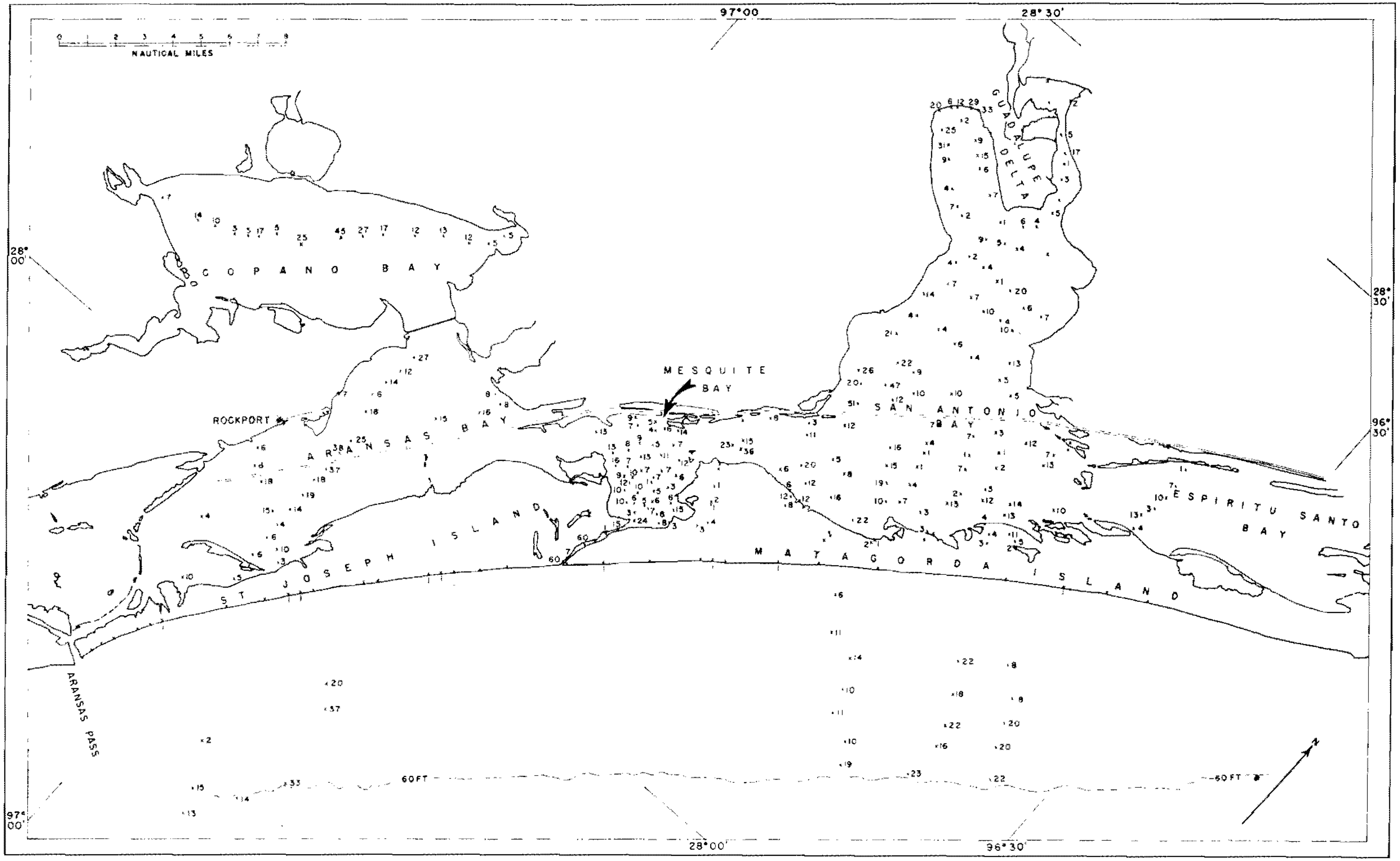


Figure 40. Distribution of "*Rotalia*" *beccarii* (Linné) variant B in percent of total population. Fraction larger than 0.149 mm.

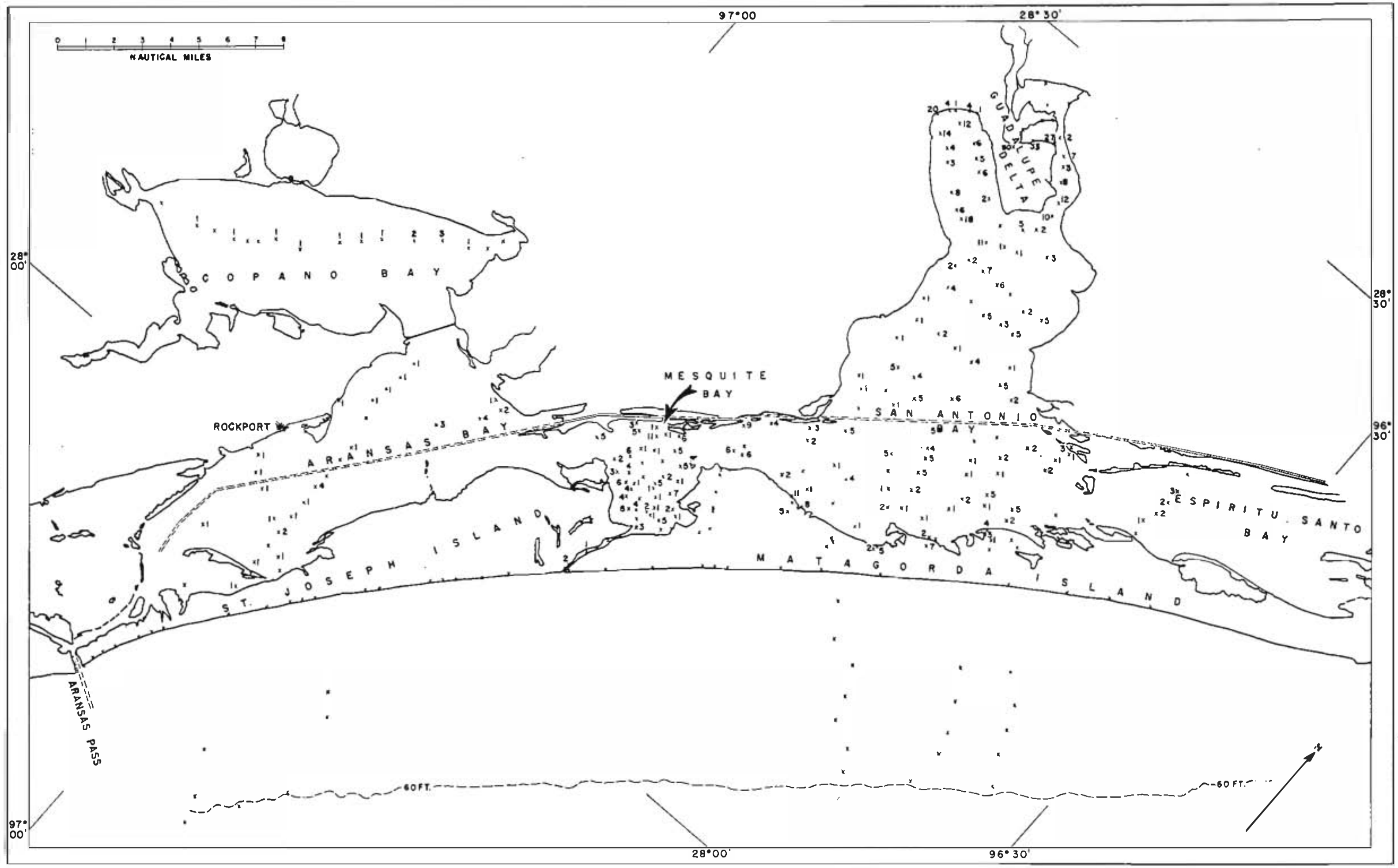


Figure 41. Distribution of "*Rotalia*" *beccarii* (Linné) variant C in percent of total population. Fraction larger than 0.149 mm.

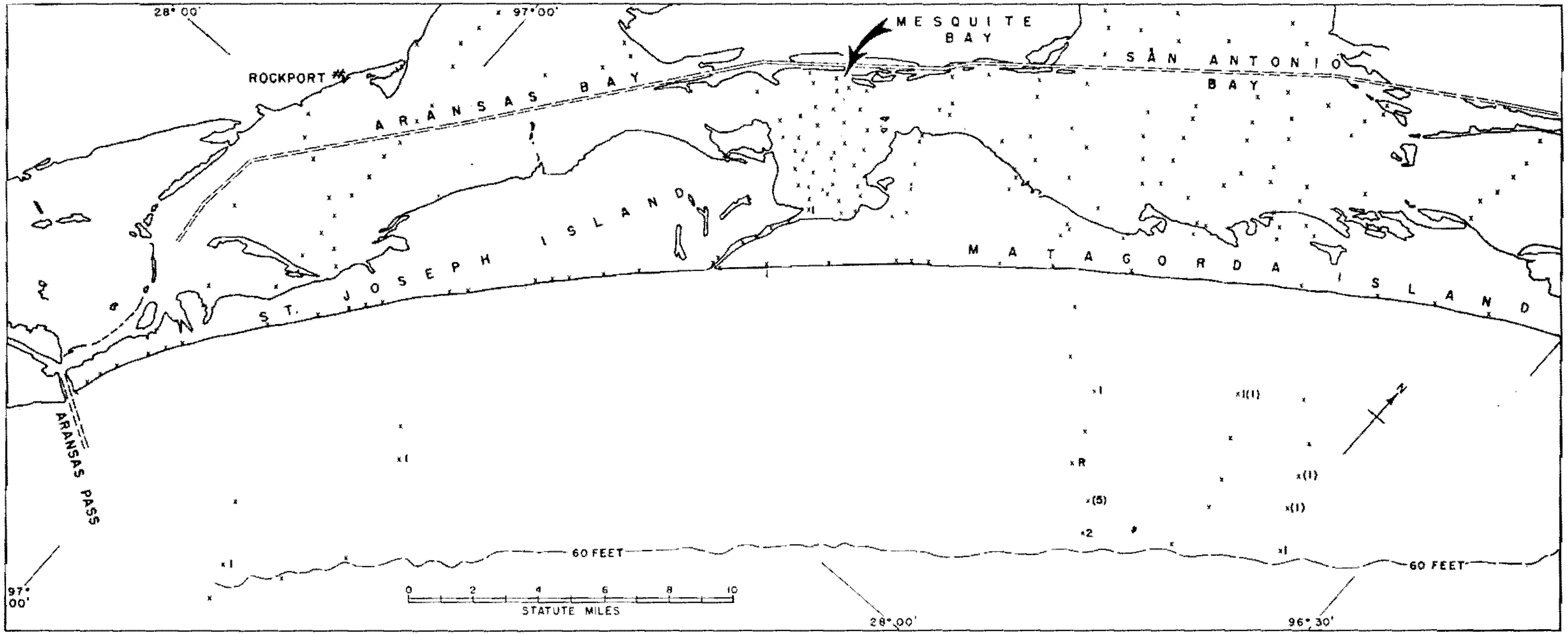


Figure 42. Distribution of "*Rotalia*" *pauciloculata* Phleger and Parker in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

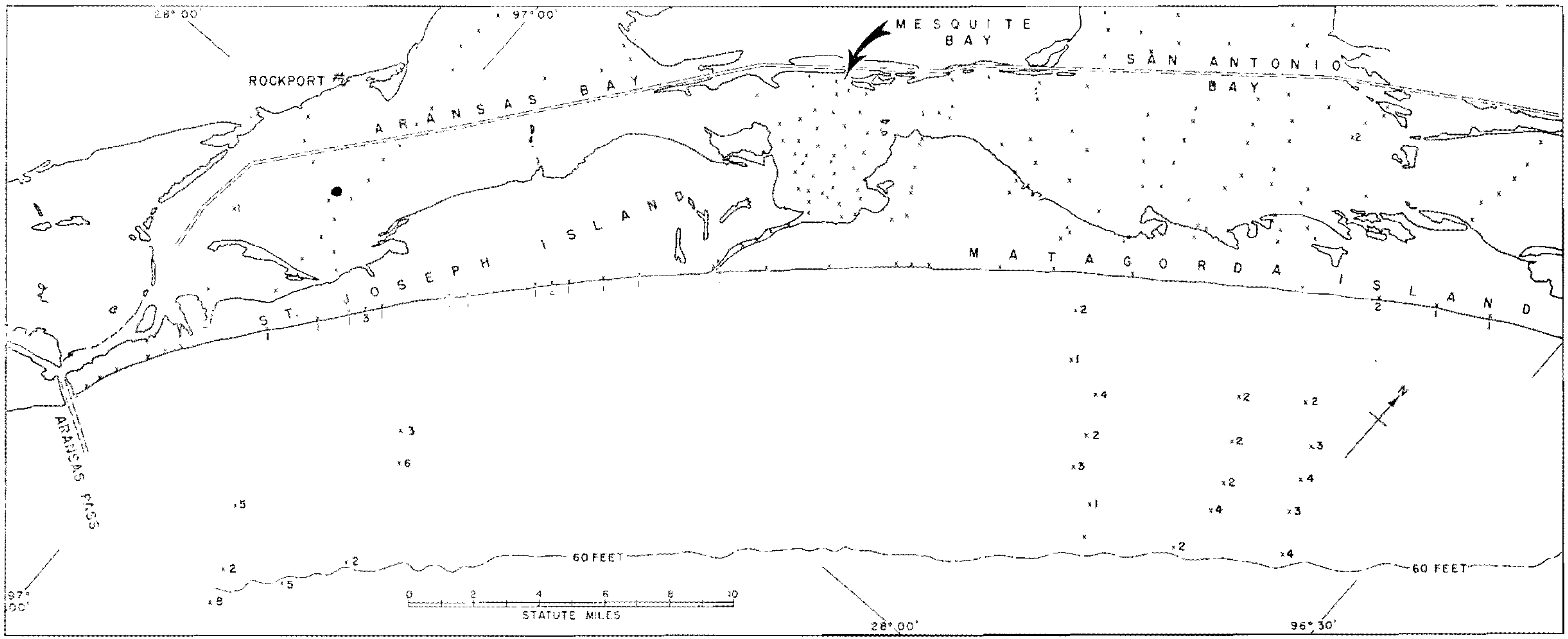


Figure 43. Distribution of "*Rotalia*" *rolshauseni* Cushman and Bermudez in percent of total population. Fraction larger than 0.149 mm.

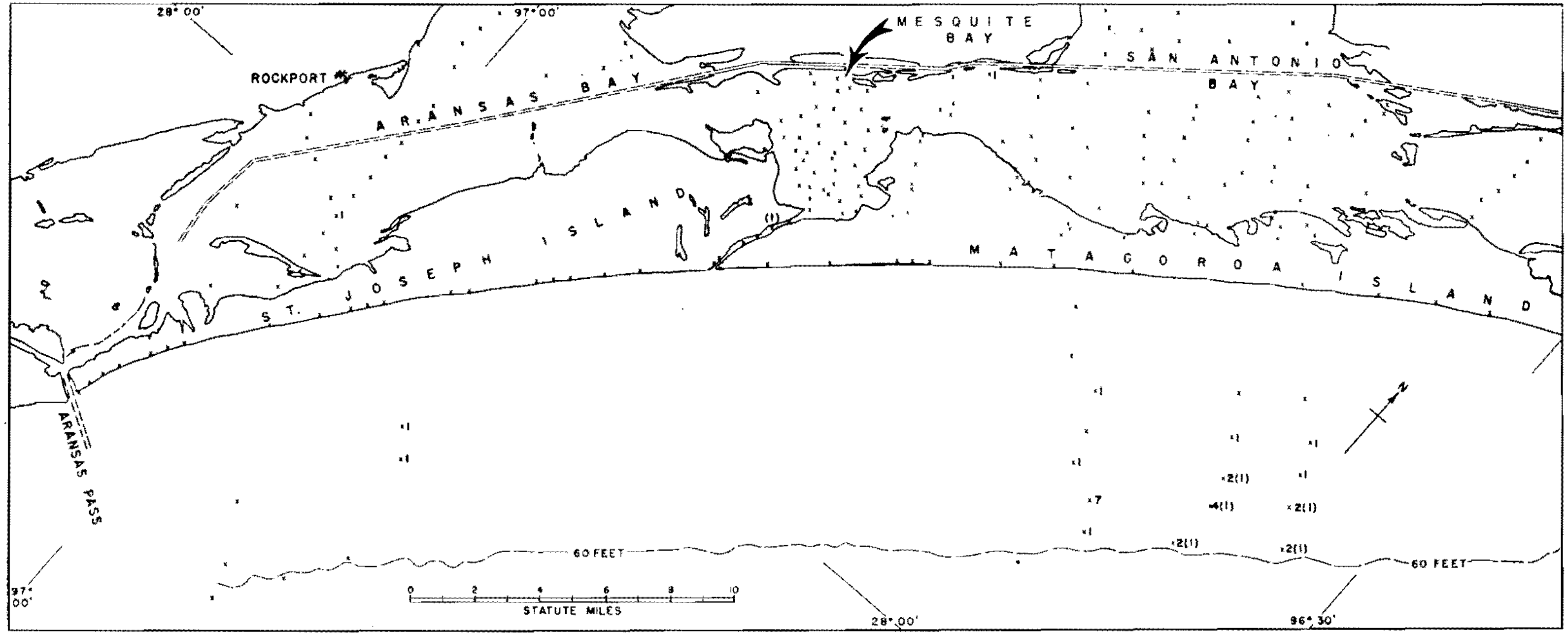


Figure 44. Distribution of *Textularia* sp. cf. *T. mayori* Cushman in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

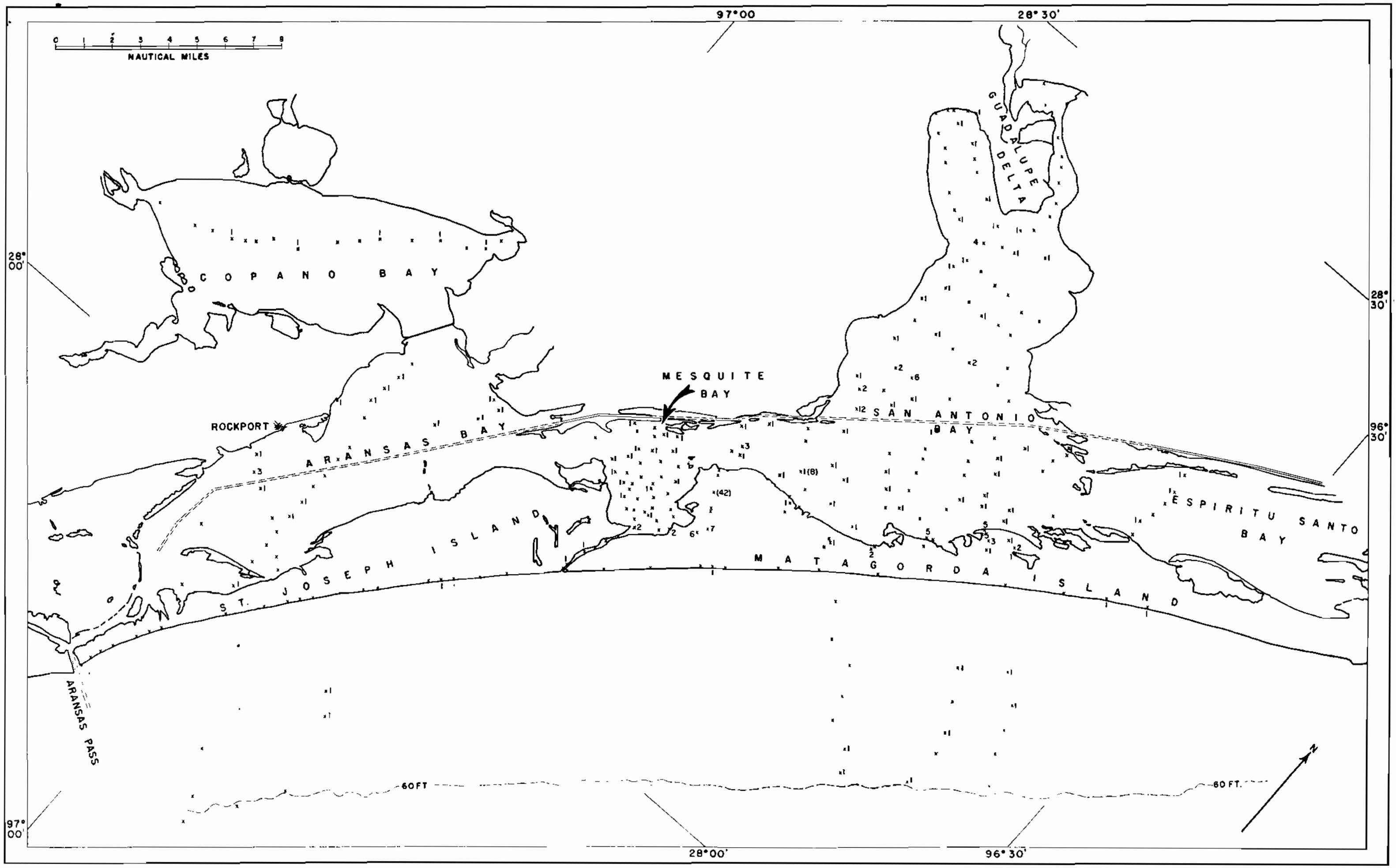


Figure 45. Distribution of *Triloculina sidebottomi* (Martinotti) in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

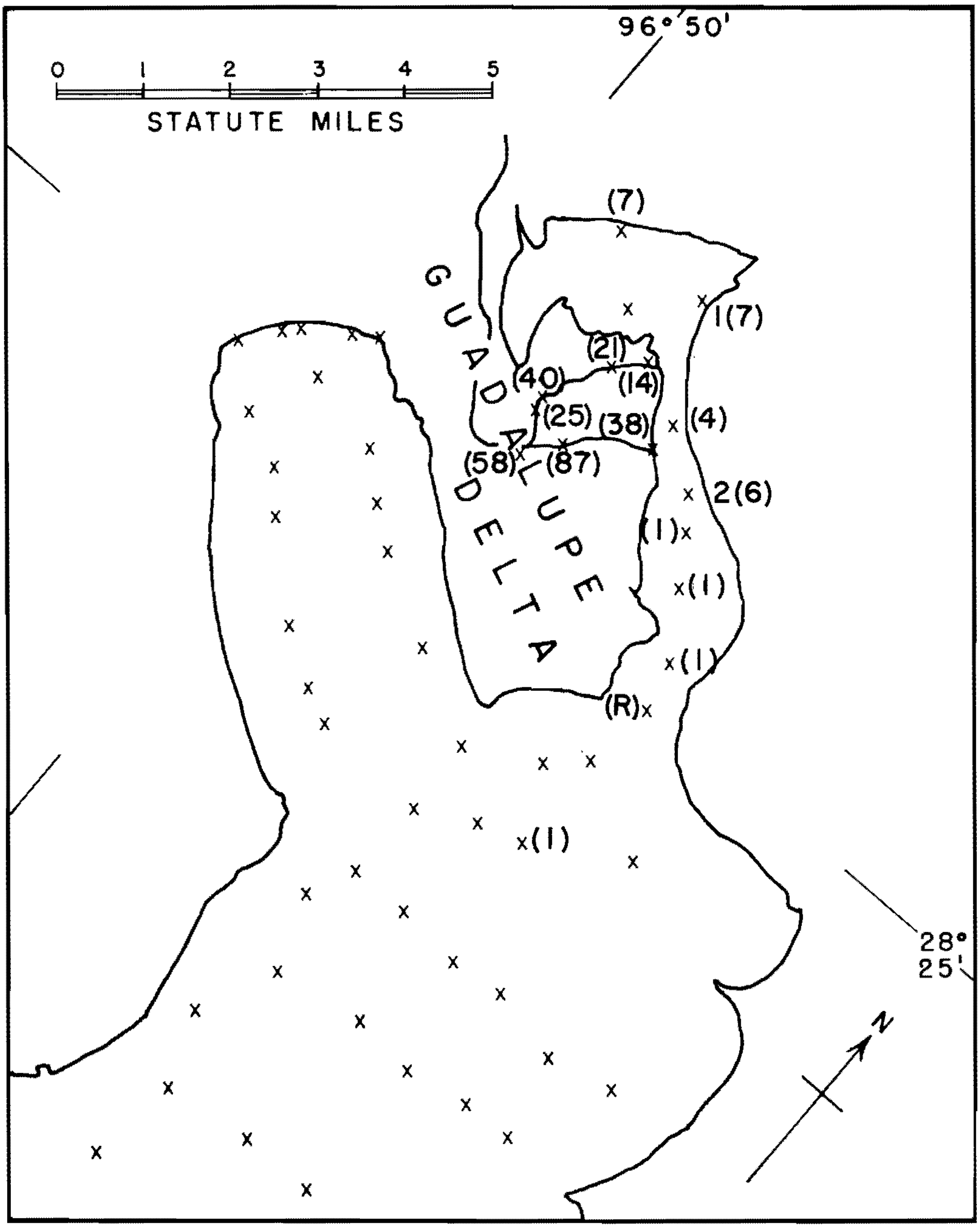


Figure 46. Distribution of *Urnulina compressa* Cushman in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

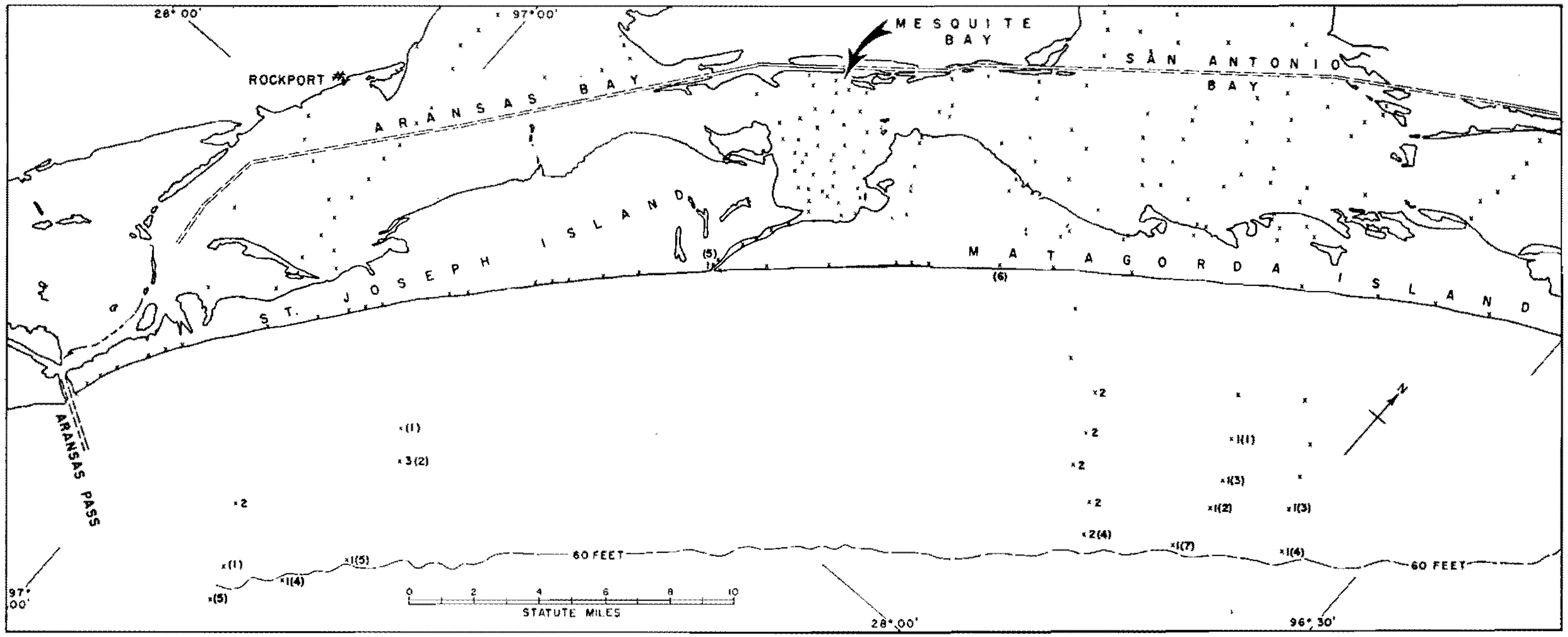


Figure 47. Distribution of *Virgulina pontoni* Cushman in percent of total population. Fraction larger than 0.149 mm. without parentheses; fraction smaller than 0.149 mm. in parentheses.

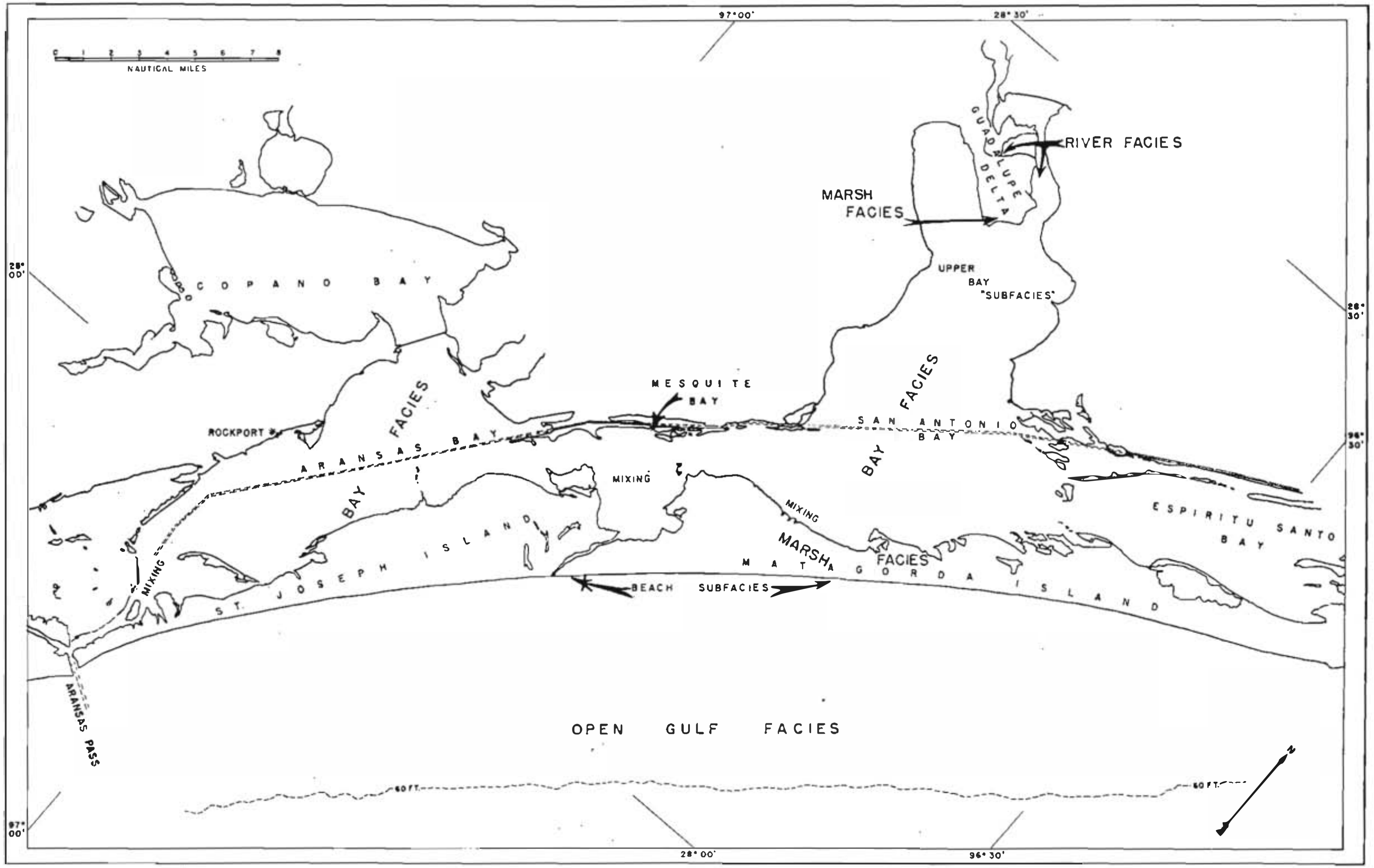
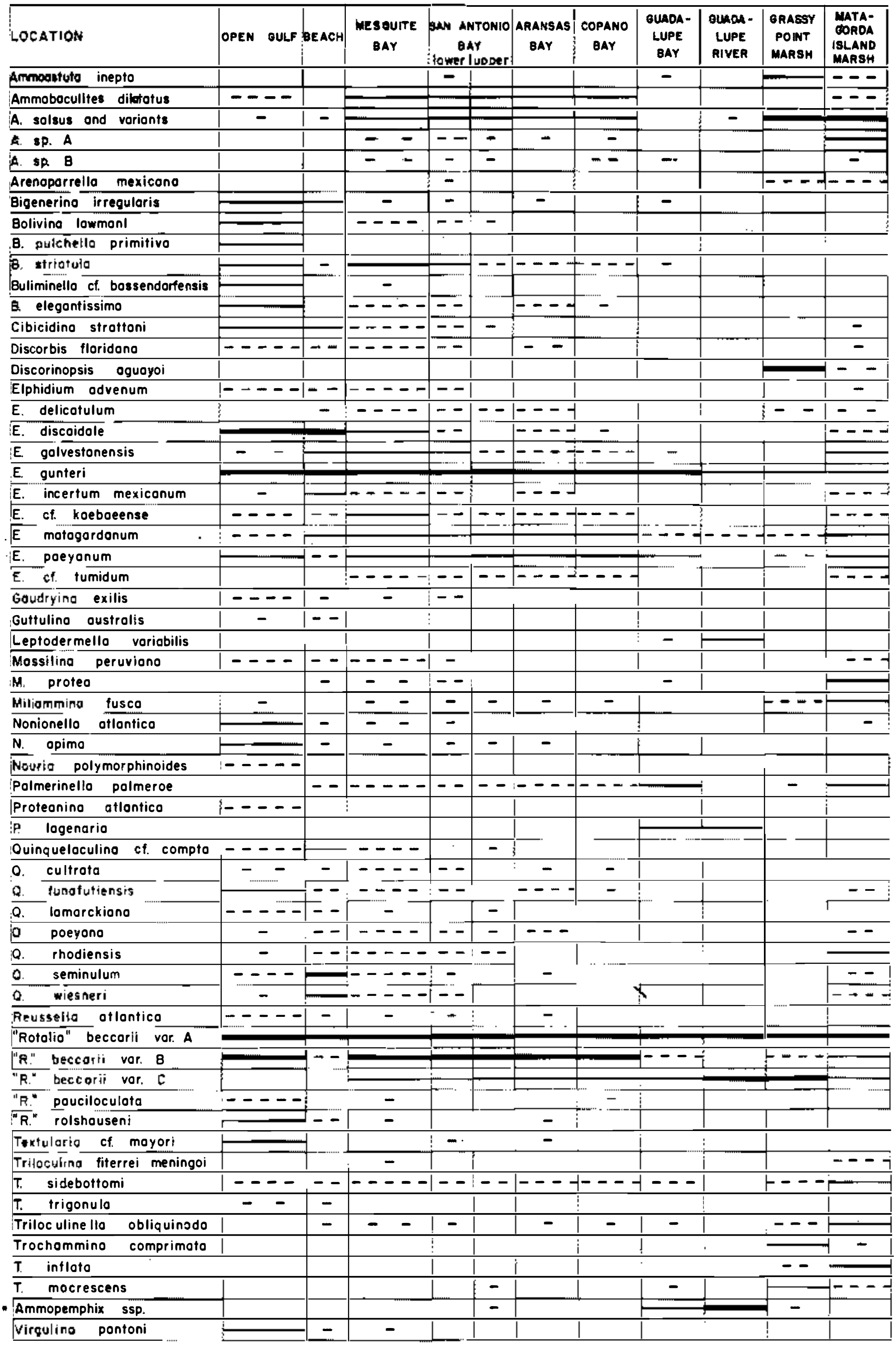


Figure 48. Foraminifera biofacies.



* Read: Urnulina ssp.

Figure 49. Generalized distributions of Foraminifera.

LOCATION	OPEN GULF																								ST. JOSEPH ISLAND																			
STATION	3	4	5	6	7	10	11	12	13	15	20	22	23	24	25	28	29	31	32	33	34	35	36	37	1	2	3	4	6	7	8	13	16	18	19	20	24	25	29	30	31	33	35	39
TOTAL POPULATION >0.149 mm.	180	360	380	380	370	190	310	500	1000	600	700	87	24	100	350	660	210	510	900	1200	1000	960	580	130	3000	840	94	170	550	875	2500	250	1800	1290	1000	1300	1400	3200	1900	3200	2000	880	1050	4500
Ammobaculites dilatatus							.3			.7		1								.3																								
A. salsus and variants		.6													.3																													
Ammoscalaria pseudospiralis	5	2	1	.3	.3	1	.3	.2	2	1	.6	2		1		.3	1	2	2	3	5	3	4	.8																				
Bigenerina irregularis	5	10	10	9	9	10	12	9	9	7	14	1		1	3	9	4	12	9	7	6	6	7			.5						.8	.4	.7	2	.6	1	.5	.8	2	.4	.2	.8	
Bolivina lowmani																			.4		.8																							
B. pulchella primitiva				.5																1																								
B. striatula					.3										.3				.7		2	2																						
Buliminella cf. bassendorfensis																.3				.3	.8	.2																						
B. elegantissima																					.8	X																						
Cibicidina strattoni	6	6	10	10	7	2	5	9	10	11	4	6	4	7	5	3	1	5	9	5	6	3	3		3	2	2	2	3	3	2	2	3	1	.3	2	1	2	3	2	2	2	2	
Discorbis floridana				.5	.5		1	.6	1	2					1	.3		1	1	.7	.4			.8	.3							.4		.2	.3				.2	.3		.7	.2	
Elphidium advenum					.3				.2	.3					.3				.2		X	.2		.8		.2																		
E. discoidale	30	31	21	16	23	24	32	26	23	18	52	43	42	41	12	16	34	22	19	23	20	16	15	28	16	14	22	17	7	11	13	10	16	18	22	11	17	15	12	12	12	10	13	1
E. galvestonensis																			.2		1	2	1	.8	.8	.5			1	.7	.3	.8	1	1	.3	1	.3	.5	.2		.6	.2	.6	
E. gunteri	11	17	16	15	6	12	8	9	12	11	6	3	25	10	15	9	9	11	15	19	15	19	22	21	19	14	11	14	17	19	24	17	21	23	26	30	30	37	32	30	29	25	29	2
E. incertum mexicanum											.3														8	5	5	4	3	2	5	5	4	9	8	4	8	7	8	7	4	3	4	
E. cf. koebaeense			.3		.3	1	.3	.2									.5		.2	.3									.2		.3													
E. matagordanum					.3	.5		.2							.3	.3							1	2	1						.3	.8	1	1	1	2	2	3	.8	1	1	.7	.4	2
E. poeyanum	1	1	.5	2	.5		.3	.8	.6	.7		1		2	2	2	1	2	.2	1																			.2					9
Epistominella vitrea					.3									1																														
Gaudryina exilis					.5		.3							1			.5		.7	1	.8	.4	.3																					
Guttulina australis		.3														.3															.3			.2			.3				.2			
Massilina peruviana	1		3			.5					3						6					.4	.3		4	2	2		2	1	.6	.8	.4	.2		.6	.3			.5	.2	.5	.6	
M. protea																																		.5									8	
Nonionella atlantica	.5	.3	1	4	6	2	3	2	3	6	.8	2		2	7	5	3	3	2	1	2	1	2																	.3				.7
N. opima	.5	8	8	5	2	.5	2	2	1	1	.8	1		4	3	2	.5	1	1	.3	1	4																						2
Nouria polymorphinoides		.8	.8				2	2	.6	1	.3				.6			.8	.4	.3	X	.2																						
Palmerinella palmerae																										.5								.2		.3					.6			
Proteonina atlantica	5			.8	2	1		1	2	.3	2				.6	1		.4	2	.3																								
Quinqueloculina cf. compta	4	3	.5	1		2	.3	2				2		1			6			.3	8	.8	4	3	3	2	1	2	.7	2	2	2	3	3	2	2	1	1	2	2	1	1	2	.2
Q. cultrata						.5											.5		.2			.2	.3																					.2
Q. funafutiensis	5	6	4	2	3	4	.6	.2		.3		3		1	1	2	.5	.4	4	2	.8	3	2	.8							.3			1	1	2	1	.7	2	.8	.6	.5		
Q. lamarckiana			.5		.5	1		.6	.8	.3		2			1	1	2		.7	1	.4	1	1							.5			.4		.6						.4			
Q. poeyana		.6																		.7				.8								2	.4	.7							.6		.2	.4
Q. rhodiensis																								.8																.3				.5
Q. seminulum	4	1									.6						1						4	8	29	43	39	44	49	47	32	38	27	16	15	17	19	11	20	16	23	29	21	
Q. wiesneri	2																																											
Rectobolivina advena																			.7	.7	.4	.8																						
Reophax nana							.3																																					
Reussella atlantica		.3	.3	.5	.8		.6		2	1					.3		.5	.4	.2	.3	.4	.2		.8									.4											
"Rotalia" beccarii variant A	16	7	8	8	5	12	10	7	9	8	5	12	8	8	10	4	5	12	22	14	21	16	21	24	18	15	17	17	17	14	20	20	21	23	15	27	17	22	17	23	24	26	24	2
"R." beccarii variant B	8	8	20	20	22	22	18	22	16	23	2	15	13	14	33	37	20	19	10	11	10	14	11	6							.6			.2	.3					.4	.5			70
"R." beccarii variant C																																												2
"R." pauciloculata					.3	.5				.7		1				.3		2		X		.2																						
"R." rolshauseni	2	3	4	3	4	2	2	2	4	2	5	2	8	5	2	6	3	1	1	3	2	4	7	2	.3							.4	.4	1	3	.3	1	.2	.8	2	.4	.2	.8	
Textularia cf. mayori		1	1	2	2		1	2	4	2	3				1	1	.5	1	1	1		.8	1																					
Triloculina sidebottomi	.5	.3				1		4		.3						.3	.5	.4	.2																					.3				7
T. trigonula		.3		.5	1				.2	.7								2					.3		.3			.6				.4							.2				.2	
Triloculinella obliquinoda																																												3
Virgulina pontoni				.8	.5		1	.2	.2	1				1	1	.3		2	2	2	2	2																						
Globigerina bulloides					X												X				X																							
Globigerinoides rubra				X	X				X						X			X	X	X																								
Globorotalia menardii																			X																									
Orbulina universa				X																																								
TOTAL POPULATION (<0.149 mm. and >0.074 mm.)	190	550	940	980	1100	770	770	250	1700	1800	1000	430	150	280	1500	1700	700	580	650	1000	980	3200	2100	380	340	30	8	20	89	30	110	38	230	590	1000	270	430	825	440	800	530	160	180	10,700
Ammobaculites exiguus					2		1	.8	.4	3	.8	.5			.8	.4																												
A. (juvenile)	2	1	.6			.4	8		2	.3		.5		.4																														
Ammoscalaria pseudospirale																							1																					
Bigenerina irregularis	3	7	6	7	10	2	3	6	11	9	3	3	1	1	5	7	.5	3	2	3	2	3	1											2	2		2	2	1	2	.8	3	.5	
Bolivina lowmani	1	.4	.3	3		.8	4	.8	.4	1	.8	4	.7		.8	.8	1				2	.5	X																					
B. pulchella primitiva	.5	.4		1	1			3	.4	2				.4	1	.8			5			1																						
B. striatula	2	1	.3	1	.4	2	1	.8		.3	8	1	1	1	.4	1	1			2		.5																						.6
Buliminella cf. bassendorfensis	1	.7	1	1	.4		.4	1	.7	2			.7	.7		.4																												
B. elegantissima	1	.4	1	.7		.4				.3	.8	.5				.8			2																									
Cibicidina strattoni		.4	.6	1	1		1	.8	1	2		1		.4		.4	.5	1		2			1				12		1			3	1	.6	.8	2		1	1	.5	.8	.6	.5	
Discorbis floridana								.8		.7				.7	.4					2			1																			1		
Elphidium (juvenile)	25	29	23	19	18	28	30	23	27	25	26	25	21	16	15	22	26	25	27	32	39	33	45	83	42	54	12	45	39	23	38	39	39	44	45	50	49	63	50	48	51	54	42	22
Epistominella vitrea					.4				.4	1				2	2																													
Gaudryina exilis				.7	3		2		.7	3	.4	.5			1	.4																												
Miliammina fusca			.3			.8		1																																				
Miliolidae (juvenile)	4	5	7	6	3	5	5	6	1		.4	2	1	3	2	2	5								23	20		25	16	37	27	39	30	31	27	9	15	14	17	12	15	11	15	13
Nonionella atlantica		.4	.3	1	1			2	2	4	.8	1	3	3	4	3	1	3		2	3	2			1										1				.3					.6
N. opima		.7	.3	5	3	.8	2	.8	.7	.3	.6	.5	1	1	2	.8	3	1				2																						.1
Nouria polymorphinoides			.3					.8												3																								
Palmerinella palmerae																																	.4			.7								.1
Proteonina atlantica										2																																		
P. lagenaria				.4																																								
Rectobolivina advena		.4				.4	1	.8	2	3		.5		.7	.4	.4		1	5		2																							
Reophax nana			.6				4	.4						.4								X	1																					
Reussella atlantica				.4	.4		.4		.4	1		.5			1	.4				2		1																						
"Rotalia" (juvenile)	61	53	57	48	52	58	47	47	46	37	63	57	65	63	57	58	62	59	69	54	49	58	48	17	34	26	75	30	44	40	35	19	30	23	25	38	33	20	31	38	32	30	41	62
"R." pauciloculata			.3	.4		.4													5																									
"R." rolshauseni																																												.1
Textularia cf. mayori				7	1			.4	1	.7										2																								
Virgulina pontoni				3	4		.8	3	2	7	2	1	5	4	5	2	.5	4																										.5
V. spinicostata										1				.4	.8																													
Globigerina bulloides														X																														
Globigerinoides rubra														X																														

Table 1. Distribution of Foraminifera in surface sediment samples from the open gulf and St. Joseph Island.

LOCATION	COPANO BAY															
STATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TOTAL POPULATION > 0.149 mm.	4,500	4,400	1,350	3,700	2,400	3,800	340	390	380	510	210	15,200	6,800	1,350	1,450	2,500
Ammobaculites dilatatus	16			3	1	1	21	4	1	.2	12			.6	.3	6
A. salsus and variants	60	13	3	7	15	9	6	3	9	1	13	3	6	24	15	34
A. sp. A							.3									
A. sp. B		.7			.3											
Ammoscalaria pseudospiralis				4	4	1	.3	.5								
Bigenerina irregularis																
Bolivina striatula								.3								
Cibicidina strattoni																
Discorbis floridana																
Elphidium delicatulum																
E. discoidale				1												
E. incertum mexicanum																
E. galvestonensis		.7		.2		.2										
E. gunteri	5	3	29	21	21	20	15	26	12	12	12	25	23	10	8	6
E. cf. koeboeense	.4		1	1	.3	.4			.5	.2		.2				
E. matagordanum	.7	2	2	5	1	1	1	.3	1	1	.5	1	1	1	.6	
E. poeyanum	.4	1	8	4	1	1		1	3	1	2	.4	1	1	3	.3
E. cf. tumidum				.4							1	.8		.3	.6	
Massilina protea																
Miliammina fusca																
Miliolidae			.3	.2												
Nonionella opima																
Palmerinella palmerae	.4			.2												
Quinqueloculina cultrata												.2				
Q. funafutiensis						.2										
Q. poeyana																
Q. rhodiensis							.3					.2				
Q. seminulum																
Q. wiesneri																.3
Reussella atlantica																
"Rotalia" beccarii variant A	11	55	43	37	43	46	28	15	48	79	43	64	65	53	58	46
"R." beccarii variant B	5	5	12	13	12	17	27	49	25	5	17	5	3	10	14	7
"R." beccarii variant C			1	3	2	1	1	.3	.8	.8			.7		.8	
"R." pauciloculata			.3													
"R." rolshauseni																
Textularia cf. mayori																
Triloculina sidebottomi		.4		.4		.2			.3				.2			
Triloculinella obliquinoda	.7		.3													
TOTAL POPULATION <0.149 mm. and >0.074 mm.	9,300	4,900	3,200	9,200	3,700	5,600	1,400	2,900	1,300	970	600	7,300	12,800	2,300	1,850	7,500
Ammobaculites (juvenile)	61	14	4	11	12	10	43	14	9	3	23	4	10	27	13	35
Bolivina striatula	.7		1	.7	1		1									
Buliminella elegantissima				.2												
Cibicidina strattoni																
Discorbis floridana																
Elphidium (juvenile)	12	40	38	39	29	34	17	36	26	17	24	32	29	17	20	11
Gaudryina exilis			.5			.1										
Lagenidae																
Miliammina fusca						.1										
Miliolidae (juvenile)	3	1	1	1	1	.3		.8	1		.5	2		.7		7
Nonionella (juvenile)																
Palmerinella palmerae	1	.3	1			.4		.3								
Reophax nana	.7					.1										
"Rotalia" (juvenile)	21	45	54	48	57	55	38	48	64	79	53	62	61	55	67	47

LOCATION	ARANSAS BAY																											
STATION	2	3	4	5	6	8	9	10	11	12	13	14	15	16	18	19	25	26	27	28	30	31	32	33	34	35	36	37
TOTAL POPULATION > 0.149 mm.	850	10,700	8,900	6,900	480	470	110	16	83	800	2,300	1,200	300	1,300	1,250	280	720	75	720	9,900	110	12,700	58	4,500	1,400	3,400	2,500	4,800
Ammobaculites dilatatus	.5	2	1	.5	.2	2	18		4	.3	2	4		14	5				.3	.2		.3		3	1	3		.7
A. salsus and variants	1	6	10	3	1	29	5		3	8	14	7	.6	3	3	4	.8	1	10	.8	1	1	13	4	2	5	3	.7
A. sp. A		.3																										
A. sp. B																												
Ammoscalaria pseudospiralis		.6	.2								.3				1		3	1		1		.5					5	
Bigenerina irregularis																1						.3						
Bolivina striatula	.2				.2				1								.1											.3
Cibicidina strattoni															.3		.3				1	.8						.3
Discorbis floridana																												.3
Elphidium delicatulum		.1		.2													.5			.5					.3			.7
E. discoidale														.3		7					1	2						3
E. incertum mexicanum														.6			.3				3	1					.3	1
E. galvestonensis	.2		.2		.2										1		.1		2	.2	1							2
E. gunteri	9	25	21	28	18	13	32	13	25	41	42	41	35	34	12	16	28	32	30	27	33	46	43	27	39	30	40	26
E. cf. koeboeense		.4		.5		.2							.3	.3		1	.7		1	.5	1	.5		.4			.3	3
E. matagordanum	20	5	4	5	4	2	1		2	2	3	5	10	3	4	3	3	7	3	7	6	1		4	4	4	2	2
E. poeyanum	21	7	9	4	14	9		13	7	9	2	5	3	2	5	1	6	1		8	3	.8		5	4	7	3	3
E. cf. tumidum	.6	.3	.2	.5		.2					.3	.3				3		1	.5	.6						.2	.3	.7
Massilina protea														.3	.6													
Miliammina fusca															.3													
Miliolidae																	.6			.3		.6						
Nonionella opima																										.2		
Palmerinella palmerae					.4							.3		1	.3		.3		.3	.2				1				
Quinqueloculina cultrata	.2				.4																							
Q. funafutiensis					.4	1		13	2	.5	.3						1			.6	1	.8			.3		1	1
Q. poeyana														.3	29		.1					.8	7	1		.2	.3	3
Q. rhodiensis	.2	.3	.2		1	.7											2	1		1	4	.5			.3		1	2
Q. seminulum															.3							.5						.3
Q. wiesneri															.3	4	.1			.2							.6	
Reussella atlantica																											.3	
"Rotalia" beccarii variant A	20	38	39	50	39	17	7	25	33	18	19	22	45	34	33	45	32	45	41	32	37	38	33	44	33	31	32	42
"R." beccarii variant B	27	12	14	6	18	25	38	37	18	19	14	14	6	6	5	10	16	8	8	15	7	4	3	10	15	18	8	6
"R." beccarii variant C	1	1	1	1		1			4	1	1	2		.3	.6		4	1	2	3	1	.3		.4	.8	.7	.3	.3
"R." pauciloculata																												
"R." rolshauseni																						.3						
Textularia cf. mayori												.3																
Triloculina sidebottomi		.4	.2	.5	3					.8	1				.6		1	3	.5	1						.7	3	1
Triloculinella obliquinoda																1												.3
TOTAL POPULATION <0.149 mm. and >0.074 mm.	7,400	13,400	13,000	6,000	2,000	5,200	420	43	270	1,700	4,000	7,300	3,600	1,800	4,700	675	6,200	74	800	20,100	68	7,600	47	8,300	3,200	8,000	13,600	9,700
Ammobaculites (juvenile)	9	15	15	11	4	27	27	5	6	14	13	12	3	8	3		2	5	11	3	4	3	4	16	7	12	7	2
Bolivina striatula	1		.7		.2		.7	2		.2	.4	.4	1				1		.5	.6				.4	.5		1	
Buliminella elegantissima	.1									.2									.3						.5	1	.5	.7
Cibicidina strattoni																												.7
Discorbis floridana	.8			.3						.2		.2																
Elphidium (juvenile)	34	33	30	36	34	35	29	32	38	46	58	59	58	49	52	52	41	47	41	35	46	43	28	45	57	42	35	37
Gaudryina exilis	.1						.5			.2																.4	1	
Lagenidae	.3		.2		2	.2	1		.4	.2		.4							.5			2						
Miliammina fusca	.1																		.5									
Miliolidae (juvenile)	.4	1	.7	2	9	2	9		3	3	3	1		4	3	9	4	5	2	6	21	5	30	3	1	2	11	18
Nonionella (juvenile)	.1													.4	.7													
Palmerinella palmerae	.1	1	.7	.8	1	1	1			3	2	3	2	4					.8					5		.4	.5	7
Reophax nana	.2																											
"Rotalia" (juvenile)	53	49	53	50	50	35	31	61	52	33	23	24	36	34	41	39	52	43	43	55	28	47	38	31	34	42	44	41

Table 2. Distribution of Foraminifera in surface sediment samples from Copano Bay and Aransas Bay.

LOCATION	MESQUITE BAY																																													ESPIRITU SANTO BAY					
STATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	42	43	44	46	48	58	1	2	3	4	5	6
TOTAL POPULATION >0.149 mm.	500	250	950	2,400	850	2,900	11,900	1,600	3,200	2,300	2,300	2,100	2,000	970	1,800	2,400	3,100	600	880	2,200	2,500	1,300	2,200	4,500	4,200	1,500	430	3,900	4,700	1,400	2,100	3,000	1,150	4,600	950	1,500	730	2,000	2,000	3,700	1,200	250	960	6,100	1,100	93	2,600	2,800	2,300	590	3,300
Ammobaculites dilatatus	.8	5		.7				.8		.2			.4		.4	.5			.2	.4	.3	.5	2	2	.2		.7		.3	.3		.3	1		.2	.3			.8							2					
A. exiguus																		.3																																	
A. salsus and variants	3	27	3	8	.4	2	6	3	14	5	5	7	3	2	2	5	31	7	9		10	1	11	11	10	7		8	7	1	14	4	3	16	2	11	1	5	14	20	43	2	.8	1			2		5	2	
A. sp. A																								.1				.6			.4																	.6			
A. sp. B						.8																	.2	.7																.2											.5
Ammoscolaria pseudospiralis								.8			.3	.4	.4	.2		.2					.3		.2	2	.8	2					.4		.7						1								7	1	3	1	
Bigenerina irregularis																			.2	.2																															
Bolivina striatula	1												.4										.2				.4							.3							.7			1			.3	.3	.3		
Buliminella elegantissima																																									.7										
Cibicidina strattoni					.2		.3		.3	.2		.2	.4	.2	.2	.5	1	1			.3	.3			.2	.3	.4		1	.3					.2	.3	.3			.4	.7			.3							
Discorbis floridana	8	.5	.2					.3		.2		.4						.7							.2								.3							.2			.4	.3							
Elphidium advenum								.3				.2		.2							.3				.2															.2								.3			1
E. delicatulum			.6	.7	.2			.3		.3				.2								.3					.4			.3													.4								
E. discoidale		1	2	3	1	1	.8	.3	.3	1	1	2	3	.2	.7	2	1	4	1	.6	1	.6	.4	.7	2	1	3	1	2	1	.4	2	2	.7	.6	3	.6	.4		2	5	6	2	3	2					.3	.5
E. galvestonensis	1		.2		.2	2	1	1	.3	.2		.4	.4	.4		.8		2	.2		.6		1	.4	.6	.8		.2				1	.3			1	2	3		.7		.8			1	16	.3	.6	2	1	9
E. gunteri	31	22	28	20	25	25	26	32	36	35	29	30	30	28	29	20	14	27	18	28	27	33	22	24	30	29	31	25	22	28	20	26	34	28	38	31	37	38	22	12	15	39	17	18	8	19	25	29	24	26	7
E. incertum mexicanum					.3							.4						.3	.7	.6							1			1		.3		.7						.7		2	1	.8		1			.3		
E. cf. koeboeense	2	1	3	3	4	1	1	2	2	3	1	2	2	4	3	1	5	3	.7	2	2	3	1	2	2	3	5	3	.7	6	1	1	2	3	3	2	4	.4	2	7							1	.3	.7	1	
E. matagordanum	5	1	3	1	3	3	3	5	4	3	3	.6	1	2	1	2	3	2	5	3	.6	3	3	5	3	2	5	3	2	2	2	3	3	1	3	4	5	2	4	2	7	.8	2	2	3	1	2	2	1	2	5
E. poeyanum	7	2	4	4	4	5	6	3	1	4	5	2	3	3	5	3	2	3	6	3	4	2	4	7	3	2	2	3	3	3	2	4	3	4	3	3	4	.7	5	6			3	2	1	3	5	3	6	2	
E. cf. tumidum	.4						5		.5	.3			.8		4		1			.4	.3	.8				.3				.3					.4				.8	2	.7		1	2			1			.3	
Goudryina exilis																																								2											
Massilina peruviana				.3	.1	.3						.2				.2		.3												.3												.4			.4			.3			
M. protea												2														.3																			24						2
Miliammina fusca																																								.2											
Miliolidae						6				1		2			4				2			2								.3				.3	1		.3		.8									X			1
Nonionella atlantica																.3			7			2																		7				.8							
N. opima																																											1	5							
Palmerinella palmerae				3	.2	8	1	1	8	1	3	.6	.4	2	4				2	.4	3	.5			.8		7	.6	.7		.4				8	.8		4	.8						7						
Quinqueloculina cf. compta					.2	.8	.3														.3				.2		.4								.4							.4			.4						
Q. cultrata					.1					.2						.3		.3				.2			2		.4						.3				.3	.4		.2							.3				
Q. funafutiensis		.8	.2		.3					.5			.4		.2				.5			.3			.6	3				.3			1		2		3									2	.3	6	7	3	X
Q. lamarckiana				7														.3																																	
Q. poeyana					.8	3	3		5									2			6	.3					7												.4	1			.8			11			7	1	5
Q. rhodiensis		.4		3	3	.5	.3	3	3	.2		.2	.8	2	2	.2		.7	.5			.2		7			.7					.3			.2		3		1	2					3	2	3	1	.3	2	2
Q. seminulum			1		.2					.7		.8		2	.7	1		5	.7			.3			.6	.5	.7		.3	.3		.3			.2					4		8	.8		1	1		X			
Q. wiesneri				.3			.3																																						3						1
Reophax nana																																								2											
Reussella atlantica																			2																					.2											
"Rotalia" beccarii variant A	27	51	44	42	44	38	37	39	28	33	43	46	47	53	49	50	39	36	47	53	41	46	38	30	32	41	37	41	44	45	52	45	40	38	40	31	38	43	27	20	18	39	8	8	31	37	42	59	43	50	70
"R." beccarii variant B	13	3	6	12	9	16	13	9	7	9	13	7	5	6	7	8	8	3	15	6	3	6	12	7	8	7	10	10	10	10	5	7	7	11	5	4	5	6	14	24	15	4	60	60	4	4	13	3	10	7	5
"R." beccarii variant C	5		4	4	6	3	2	3	5	1			.4	.8	1	5			1	2	7	1	5	5	6	4	1	4	6	.3	2	5	2		6	11	1	4	6	3			1		4		.6	2	2	3	
"R." pauciloculata																																								.2				3							
"R." rolshauseni																																												1							
Triloculina fiterrei meningoi																																													4						
T. sidebottomi				.3	.5	.3	.3	.3		1					2			2			1	.3		1	.2			.2							.4			.4	.4	2			4		1		3			3	1
Triloculinella obliquinoda	2											2	4										.2																	2	7			5	19						
Virgulina pontoni																			.2																									3							
TOTAL POPULATION <0.149 mm. and >0.074 mm.	3,200	500	3,100	3,500	3,200	5,500	24,800	3,500	4,900	4,100	5,000	2,600	6,100	2,700	2,600	5,000	4,400	1,100	1,600	1,100	6,500	1,500	12,500	14,900	13,300	6,100	700	12,000	13,100	2,000	5,400	4,000	1,900	8,700	2,100	3,200	580	3,000	6,300	12,100	2,900	100	2,900	11,700	5,000	57	4,100	2,200	3,700	1,500	530
Ammobaculites exiguus																		1	4																																
A. (juvenile)	3	8	14	5	4	11	4	6	8		11	7	7	12	9	8	21	13	9	4	7	7	6	6	13	8	3	7	10	10	18	10	7	11	8	11	6	6	6	5	7	3	5	2		2	5	3	9	6	4
Bigenerina irregularis																												3																.3							
Bolivina lowmani		.6					.3						.3									4																						3							2
B. striatula	2	.6	8	5	.7		5	2	3		.5		5	2	1		.4		1	1		1	.8	2	1				2	2			4	.6	.8		5		5	5	2	1	5	.8			3	7		3	3
Buliminella cf. bassendorfensis		2																																																	
B. elegantissima		1		5	.7		.5									.3	.4	.5	1		2		.1								.6		.4							5	3		2								
Cibicidina strattoni																							.1									.8				.5															
Discorbis floridana		.6					.3		3	5																						2		2			.5				.5										
Elphidium (juvenile)	34	31	39	45	47	41	54	48	48	51	38	48	44	44	45	39	36	38	30	44	42	42	42	41	41	40	49	41	46	38	39	45	37	48	45	45	52	51	41	42	35	34	34	29	14	33	39	32	32	34	35
Epistominella vitrea		.6																																																	
Goudryina exilis			.4																			.4												2					3	.1			.5			2	.8			7	
Lagenidae												.6														.5													.8	.1	5										
Miliammina fusca		.6																												.4									5	1							4				
Miliolidae (juvenile)	3	5	.8	.5	.7	1	1	1	1	.5		2	2		.5	2	3	9	5	2	2	.8	2	1	1	5	3	.5	1	2	.6	.8	3	1	1		1	.5	5	5		11	7	2	77	25	2	3	2	5	21
Nonionella atlantica																		.5															.4											.5							
N. opima		.6																																									2	3							
Palmerinella palmerae	1		8		4	.6	.5	3	.3	2	1	.6	.5			.3			.7		.2		1	.6	1	.5		.5			.6	2	.8	1	8	1			.8	.4				.3							
Quinqueloculina wiesneri																																																			6
Reophax nana					.4							.6	.3																											1										1	
"Rotalia" (juvenile)	57	49	44	49	46	46	39	40	43	46	49	42	45	42	45	51	40	38	53	49	48	48	48	51	43	46	45	51	43	47	41	40	51	38	45	42	39	43	50	47	52	51	54	65	9	38	52	62	56	51	29
Textularia cf. mayori																																										1									

Table 3. Distribution of Foraminifera in surface sediment samples from Mesquite Bay and Espiritu Santo Bay.

LOCATION	MATAGORDA ISLAND																																						
STATION	3	4	6	8	9	11	12	13	16	20	24	25	26	30	32	35	41	44	46	48	50	51	52	55	57	58	59	60	61	62	63	64	65	66	67	69	74	76	79
TOTAL POPULATION >0.149 mm.	230	820	1,000	1,500	130	2,400	300	10	240	240	27	1,300	49	160	780	1,600	280	1,000	150	210	260	5,700	630	2,500	4,500	650	15	53	3,100	9,300	8,800	2,250	150	2,600	2,400	2,600	0	3,000	4,500
Ammoastuta inepta																																	.7						
Ammobaculites dilatatus		1		.3			6														.4			.3		.6													
A. exiguus																					.4																		
A. salsus and variants	3		.4	1		14	6								.5						3		3	3	10	17		81	11	.3		.7	5	1		2		3	4
A. sp. A		21	3	4		8	13														2	6	8	1	1	7		2							.3				
Arenoparrella mexicana							1														7			1					.3		.7		21						
Bigenerina irregularis												.3			.5	.7				.5																			
Cibicidina strattoni				.3			1		2	.8		2		1	2	1	2	2	.7	4																			
Discorbis floridana		.5					.3			.4									.7																.3				
Discorinopsis aguayoi																										2	86												
Elphidium advenum			.4	.3			.7					.3					.4								.4				.3										
E. delicatulum																					.8			.3								.4							
E. discoidale	3	.5	2	3	2	.7	4	10	10	9	11	13	2	14	12	11	4	10	5	5		.6	.6		.7	1								.3					.5
E. galvestonensis	3	3	5	7	2	.3	4		3			1		.6	2	.5	.4	.4		.5		2	1	3	3	5			.5	4	4	5	2	9	3	2		2	2
E. gunteri	7	5	12	4	13	6	6	70	16	23	11	24	28	31	25	31	36	32	36	26	8	10	7	8	2	4		2	5	7	5	6	6	5	9	12		7	1
E. incertum mexicanum									6	4	4	2	2	.6		3	3	4	3	2		.6																	
E. cf. koeboeense		8	2	4	.8	1	3			.8		.6		2		1		2	.7	2	.4		8						1		.4				.3	1			.2
E. matagordanum		.5	1	1	2	4	5		.8			1	4	1	3	.2		.6	1	.5	10	8	3	10	9	6			11	3	5	11	3	4	4	6		11	15
E. poeyanum				1																	2			3	.4				.5	2	1	6	3	3	.7	3			
E. cf. tumidum																					.8	2	.3			4		2		.7								4	5
Gaudryina exilis									.4																														
Guttulina australis																.2	.4	.2		1																			
Massilina peruviana							.3					.3			.5	.2		3	.7	1						2				.7					.7	.3			
M. protea		6	.4	2	.8	20	4											.2				3			1	7			5	21	11	8	4	15	11	2		.3	2
Miliammina fusca				.3		2	1														1	.6			.4	1		2	.5			.7	2					.3	
Miliolidae								10										.2		.5						2	7							.3					
Nonionella opima																								.3															
Palmerinella palmerae		1	1			2	1			1		.3			.5	.5	.4	.6			2	11	.6	.3	12	2			13	.7	.4	2			.7	2		9	5
Quinqueloculina cf. compta									3	2		3	2	2	1	3	2	2	2	1																			
Q. funafutiensis												.6				.5																							
Q. lamarckiana										.4				.6	.5			.2																					
Q. poeyana			.4	.3			1					.3				.7	.4						1			1			1	.3									
Q. rhodiensis		.5	2	.5	.8	1	5			2		.6						.2	.7	.5	2	8			1	9			15	8	10	8	7	8	15	6		27	10
Q. seminulum		.5					1	10	40	30	56	29	37	23	32	23	29	20	21	39			.3											.6	.3			.3	
Q. wiesneri		18	4	11	.8	2	1														10	3	13		5	.6		2	2	3	2		2	2	1	.3		.3	.4
"Rotalia" beccarii variant A	80	31	63	57	75	27	26		18	26	18	21	24	23	22	24	21	20	27	14	29	33	41	49	41	15		9	20	25	38	33	17	43	43	50		32	41
"R." beccarii variant B			.4	2	.8	4	3		.4			.6		.6				.8			6	12	8	12	2	1			3	3	4	4	4	2	5	11			2
"R." beccarii variant C																					11		5	8	2	5	7		2		1	4	3					[illegible]	
"R." ralshauseni																		2	.7	1																			
Triloculina fiterrei meningoi					.8																					2			.3	.7	1	3	2	.6					.4
T. sidebottomi						8	12					.3							.7	.5		.6			2				5	.7	3	5	6	2	2	1			.7
Triloculinella obliquinoda	3	3	2	.5	2	.7															2	.6	1		7	4			4	19	13	3	1	4	4	2		5	12
Trochammina inflata																					2		.3	.3		2					.7		10						
T. macrescens																																	.7						
TOTAL POPULATION <0.149 mm. and >0.074 mm.	190	670	700	1,700	140	1,200	800	1	25	10	6	160	2	17	26	240	27	57	7	3	1,000	5,500	750	3,500	1,500	450	4	21	2,200	7,800	5,900	2,000	250	2,400	2,600	1,500	0	2,800	3,300
Ammoastuta inepta																																	2						
Ammobaculites (juvenile)		12		3	2	23	17														2	2	3	5	9	18		80	9			3	17	.3	.5	1		.6	.5
Arenoparrella mexicana							1																	1									8						
Bolivina striatula																					.5																		
Discorinopsis aguayoi																											50												
Elphidium (juvenile)	17	9	12	19	37	14	21		28	50	50	49	50	23	47	58	59	61	57	33	11	43	20	20	17	18		5	12	11	12	23	10	22	11	26		21	23
Gaudryina exilis				2																																			
Miliammina fusca						4	1														1		3	.5				5			.5	3	5			1		.6	
Miliolidae (juvenile)			42	8	4	29	45		36	30	17	21		18	19	17	11	10		33	16	24	24	4	48	53			59	84	82	37	26	55	75	50		52	65
Palmerinella palmerae		4					.4		4							.8	4	2			1	1			4				11	.4		1						5	1
Quinqueloculina wiesneri		24	12	27	28																																		
"Rotalia" (juvenile)	75	43	35	26	26	30	14	100	32	20	33	30	50	53	35	25	26	26	43	33	68	30	44	70	22	11	50	5	9	4	6	33	23	23	13	22		10	11
Triloculinella obliquinoda	8	9		15	3																																		
Trochammina inflata																							5					5					8						
T. macrescens																																	.8						
Virgulina pontoni														6																									

Table 4. Distribution of Foraminifera in surface sediment samples from Matagorda Island.

LOCATION	SAN ANTONIO BAY																							
STATION	1	2	3	5	6	8	9	10	12	13	14	16	18	20	21	22	23	24	25	26	27	28	29	30
TOTAL POPULATION >0.149 mm.	700	1600	98	440	790	390	300	680	430	520	380	2600	1700	5000	860	3500	640	300	3000	1100	1500	1300	2500	700
Ammoastuta inepta									2															
Ammobaculites dilatatus	2	.6	1				.3					1	1	1	.5	.3			1	.4				.6
A. solsus and variants	6	2	62	.7	5	13	1	2	20		7	15	26	11	3	7	8	.6	24	22	8	3	2	4
A. sp. B										.8		.3												
Ammoscalaria pseudospiralis			1			2								1	.3	3	2		3	2		.8	1	
Arenoparrella mexicana														.1										
Bolivina lowmani									.2															
B. striatula		.5				.5											.5	.3	.3				.3	
Cibicidina strattoni				.2					.2	.4										.2				
Discorbis floridana					.3											.3				.2				
Elphidium advenum				.7		.5													.3					.6
E. delicatulum														.1	.2									
E. discoidale					.3					.8							.3					.3	2	3
E. galvestonensis	1			4	.5	.8	2	1	.5	6	.5	.5	.8	.1		1	.6	1	1	2	1	2	2	.6
E. gunteri	22	23	3	41	26	28	39	39	21	17	29	17	18	29	32	24	26	39	25	35	29	31	29	33
E. incertum mexicanum					.3					.4														1
E. cf. koebocense						.5		.6	2			.3	1	.3	1			.3			.3	.6	.3	1
E. matagordanum	2	.6		2		2	2	3	.2	2	.8	1	2	1	1	2	1	2	1	5	3	.6	1	2
E. poeyanum	7	3	1	3	1	5	3	5	2	2	3	5	2	3	2	3	3	2	3	1	1	5	3	2
E. cf. tumidum																								
Gaudryina exilis		.6																	X	.2				
Massilina peruviana										.4														
M. protea																	.3							
Miliolidae						.3											.2	3	.1	2		.6		
Nanionella atlantica																							.3	
Palmerinella palmerae	.6			.5				.3		.4		.5	.5	.1				.3	.1			.3	.3	
Quinqueloculina cultrata	.6	1		.2		.3		.3	.5		.3	.3			.2				.1	.2				.3
Q. funafutiensis									.2			.8			2	.7	2		1	1	1	1	.3	.3
Q. poeyana			1	.5		.3			.5		.5				2		2							
Q. rhodiensis		.6																					.3	.6
Q. seminulum		.6			1					2							.5		.3				.6	.3
Q. wiesneri											.3												.6	
Reussella atlantica																								
"Rotalia" beccarii variant A	30	26	3	39	62	36	47	36	34	56	42	36	31	32	39	59	45	43	33	32	52	50	51	48
"R." beccarii variant B	23	36	5		6	8	3	11	20	12	16	18	12	16	15	19	10	7	4	.7	1	4	7	3
"R." beccarii variant C	6	6		9	2	4	3	2		.4		4	5	5		1	2	5	4	5	.5	2	1	2
Textularia cf. mayori						.3																		
Triloculina sidebottomi		.6	3		.3	.3			.5		.5	8	1		.2	.3		.3					.6	
Triloculinella obliquinoda				.2																	.3	.3		
Globigerina bulloides																								
TOTAL POPULATION <0.149 mm. and >0.074 mm.	2600	520	600	440	2400	2700	880	2100	1100	760	810	5800	2300	12500	2300	7800	3200	2300	7600	2500	1500	960	3000	500
Ammobaculites (juvenile)	11	5	41	4	1	12	1	7	14	2	6	17	15	11	7	12	2	4	7	4	4	8	7	4
Bolivina lowmani		.4				.3			X					X		X			X	.7				
B. striatula	.8	.4		1	.4	1		1	.5		X	.7	X	.3	.5		1	.6	.3	.7	1			.4
Buliminella elegantissima										1			X	.3	.5				.3					
Elphidium (juvenile)	31	28	17	45	35	35	50	46	29	27	30	20	32	42	38	50	35	35	44	48	43	45	38	37
Gaudryina exilis	.3	.4		.2		.3			X		.6	.3		X		X	.2		.6					
Miliammina fusca																								
Miliolidae (juvenile)	1	17	3	3	.7	4	.7	2	8	.5	7	2	2	.3	5	2	3	2	1	.7	4	4	7	1
Nonionella atlantica											6													
N. opima											.6				.5									
Palmerinella palmerae	1	.8	1	.3					1	.5	1	.7			.5				1	1		.7		
Quinqueloculina wiesneri																								
Reophax nana		.4																						
"Rotalia" (juvenile)	55	48	37	44	63	48	48	44	48	58	55	50	48	43	47	58	58	58	45	45	47	43	48	57

LOCATION	SAN ANTONIO BAY																													
STATION	32	33	34	35	36	37	38	39	40	41	42	43	46	47	48	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
TOTAL POPULATION >0.149 mm.	370	1300	5400	1600	3700	530	770	680	2500	840	680	510	800	1300	1800	760	1100	160	390	2300	650	2600	780	110	3500	27	660	3800	1500	2800
Ammoastuta inepta																	4													
Ammobaculites dilatatus		.3		.7			.2	.1			.3		4	2	2		7	15	.2	.7	3	2			3		3	2		
A. solsus and variants	.3	8	5	.7	22	4		.6	12	.5	9	.8	3	2	4	1	19	16	11	20	10	10	2		16	26	6	12		.6
A. sp. B					2		.2		1					.6													6			
Ammoscalaria pseudospiralis	1	2	2		1		1	.6	5	.5	2	.6	5	4	3	.8														
Arenoparrella mexicana																														
Bolivina lowmani																														
B. striatula													.5	.3																
Cibicidina strattoni																														
Discorbis floridana																														
Elphidium advenum	.3			.7	.4	1	.2	.1					1			.3	.4												.6	
E. delicatulum		.5	.3		.4			.1	.6	.2			.5	.3	.2													.4		
E. discoidale	.3							.1		2			1			.5														
E. galvestonensis	5	.8	4	2	5	5	2	3	3	1	4	4	1	5	4	.3	1	.6	13	.3	2			1			.3	1	11	6
E. gunteri	31	35	24	30	24	31	33	28	25	31	16	28	13	19	26	34	19	6	15	23	27	30	19	7	23	4	23	20	24	13
E. incertum mexicanum	.3									.5										.3										
E. cf. koebocense		3	.6	2	.4		.6	.7	.3	1		.6		.3		3	.4		.3		.3	.3	.8					.4		
E. matagordanum	2	2	1	3		2	3	2	.6	3		2	.5	4	1	1	3	.6	2	1	.6	6	2		4		3	.8	1	2
E. poeyanum	2	1	2	3	.4	4	2	3	3	6	1	4	6	5	5	3	2		5	2	2	3	2	1	4		5	2	.6	1
E. cf. tumidum							.2	.4		.5																				
Gaudryina exilis										.5																				
Massilina peruviana																.3														
M. protea	.5																													
Miliolidae	.3								.3		.6				.2					.3										.3
Nanionella atlantica																														
Palmerinella palmerae			.3			.8			.3						.7		.4		.3					1				.4	.6	27
Quinqueloculina cultrata	.5	.8	3				.8	.6	3		1		.5				.4		.3									.4		
Q. funafutiensis	.8	5	1	1			2		.3	1		2	3	1	1		.4				1			1						
Q. poeyana								.1	.3		1			.3															.6	1
Q. rhodiensis								.3													.3	.3						.8		2
Q. seminulum	.5	3				.4	.2	.1																						
Q. wiesneri													1	.3	.2															
Reussella atlantica																.3														
"Rotalia" beccarii variant A	45	44	54	53	38	48	52	55	41	41	37	42	20	40	38	48	41	60	48	45	39	41	67	69	42	59	54	49	60	43
"R." beccarii variant B	13	2	7	1	7	3	1	2	3	12	13	14	12	7	13	10	7	7	10	4	10	7	6	20	1	4	2	4		
"R." beccarii variant C	.5	2	1	1			2	1	5	.5	2	5	2	1	2		4		5	3	5	5	2		6	7	2	2	1	3
Textularia cf. mayori																														
Triloculina sidebottomi		.3					.2	.6	3	.2	.6	.4	.5				.7		1								1	.4		1
Triloculinella obliquinoda																			.5					1	.4			1		
Globigerina bulloides																	X													
TOTAL POPULATION <0.149 mm. and >0.074 mm.	530	4400	1300	1800	4300	1100	980	1300	10200	2000	620	1100	1900	3700	2800	1600	2400	700	150	2900	960	3200	3300	410	10000	110	2300	8700	4700	3700
Ammobaculites (juvenile)	6	8	8	.5	27	8	3	5	18	5	18	5	18	23	7	7	10	36	17	23	14	10	1	1	13	15	10	11	3	5
Bolivina lowmani				.5								1					.3													
B. striatula	1		.8	.5		2	1	1		1	1	3	5		1				X	.6	.4	2								1
Buliminella elegantissima				1									4							3										
Elphidium (juvenile)	34	43	45	46	35	35	50	38	32	35	17	30	28	30	24	34	39	7	53	29	28	40	18	8	44	28	39	37	27	28
Gaudryina exilis	.6			.5																										
Miliammina fusca																.5					4									
Miliolidae (juvenile)	2	3	.8	.5	3	.6		4	1	3	4	5	4	7	1	5	1	2	7		4	.7		.5	.4		1	3	18	15
Nonionella atlantica																														
N. opima																														
Palmerinella palmerae								1	2			1			.5		1		1		.4	.2		1	.8		1	4		10
Quinqueloculina wiesneri													1																	
Reophax nana									1				.4																	
"Rotalia" (juvenile)	56	46	46	50	35	55	46	51	46	55	50	54	44	40	57	58	49	56	45	47	53	48	81	90	42	57	48	45	49	42

Table 5. Distribution of Foraminifera in surface sediment samples from San Antonio Bay, Sta. 1-64.

LOCATION: SAN ANTONIO BAY

STATION	66	67	69	70	71	72	73	74	75	77	78	79	81	82	83	85	86	87
TOTAL POPULATION >0.149 mm.	730	1,650	2,300	450	1,750	630	190	900	280	980	460	54	490	290	140	125	48	56
Ammoastuta inepta																		
Ammobaculites dilatatus	2	.7	2	27	8	2				1	.2		.8	.4				
A. salsus and variants	17	11	19	8	53		38	28	25	34	22	19	8	41	18	20	27	
A. sp. A											2			.4				
A. sp. B						3					.4			.4				
Ammoscalaria pseudospiralis	3	.5																
Bigenerina irregularis																		
Bolivina striatula							.5											
Cibicidina strattoni																		
Discorbis floridana	.3																	
Elphidium advenum		.2								.3								
E. delicatulum	.3				.5		1		1				1			2		4
E. discoidale	.3																	
E. galvestonensis	3	1	1		.2			.3		3			.4		.7	.8		
E. gunteri	19	27	27	5	12	30	16	21	15	15	16	22	38	16	29	23	13	35
E. incertum mexicanum																		
E. cf. koeboeense	.3	.5	1	.2		3							.4					
E. matagordanum	2	2	4	1	1	7	4	2	2	3	2	9	1					2
E. poeyanum	5	2	3	5	1	4		1	7	6	1	2	3	1	.7	.8	6	2
E. cf. fumidum		.2																
Gaudryina exilis																		
Massilina protea																		
Miliammina fusca				.2	.2					.3				2				
Miliolidae	.3																	
Nonionella atlantica																		
Palmerinella palmerae					.2	.3					.2		.4		.7	2		2
Proteonina lagenaria																		
Quinqueloculina cf. compta																		
Q. cultrata				.2														
Q. funafutiensis		1																
Q. lamarckiana																		
Q. poeyana																		
Q. rhodiensis	.3					.3		.3	.4	.3	.2		.4	.4				
Q. seminulum																		
Reussella atlantica	.3																	
"Rotalia" beccarii variant A	41	45	35	45	18	45	26	41	45	46	54	22	26	26	39	32	19	16
"R." beccarii variant B	5	5	4	6	4	4	5	4		4	5	9	2	7	4	9	31	25
"R." beccarii variant C	2	5	4	1	2	1	10	2	3	1	1	11	18	6	8	3	4	14
Triloculina sidebottomi				2					.4	.6		4	.8					
Triloculinella obliquinoda																		
Trochammina macrescens																		
* Ammopemphix compressa																		
Globigerinoides rubra																		
TOTAL POPULATION <0.149 mm. and >0.074 mm.	2,400	3,200	3,050	2,800	4,600	1,400	1,100	5,700	1,600	3,100	1,800	460	2,700	940	1,500	940	600	750
Ammobaculites (juvenile)	24	15	15	18	53	12	17	49	32	20	19	20	13	28	28	9	21	4
Arenoparrella mexicana																		
Bolivina lowmani																		
B. striatula			.5				2											
Buliminella elegantissima																		
Discorbis floridana																		
Elphidium (juvenile)	27	27	30	26	20	44	33	19	31	37	18	37	41	18	25	24	6	31
Gaudryina exilis																		
Lagunculina vadescens																		
Leptodermella variabilis																		
Miliammina fusca	.5	.5					X							8	.5			
Miliolidae (juvenile)	1	18	2	3	1	4			2	1	1	3	.5	.5		.4		
Nonionella opima							1											
Palmerinella palmerae				2	3		2	1	.5	1	1	1	3	15	13	21	31	12
Proteonina lagenaria							2											
"Rotalia" (juvenile)	48	39	53	51	23	40	43	30	35	40	61	39	43	31	34	46	42	53
Trochammina macrescens																		
* Ammopemphix compressa							X			.5								
* A. sp. A																		
* A. sp. B																		

STATION	88	89	90	91	92	93	95	96	98	100	101	102	104	106	107	109	114	116
TOTAL POPULATION >0.149 mm.	1,950	32	6,500	6,400	1,100	1,600	1,600	1,500	560	230	190	200	35	530	150	18,000	910	110
Ammoastuta inepta					.4													
Ammobaculites dilatatus								2	.4				3	27	1	.5	.4	23
A. salsus and variants	14	53	32	81	48	76	28	15	14	29	21	23	17	13	5	5	2	26
A. sp. A												6						
A. sp. B				2	.4	4												
Ammoscalaria pseudospiralis																		
Bigenerina irregularis																		
Bolivina striatula																		
Cibicidina strattoni																		
Discorbis floridana															1			
Elphidium advenum																		
E. delicatulum				1				.3									.4	
E. discoidale																		
E. galvestonensis															1	.5		
E. gunteri	52	19	23	5	8	11	26	22	32	27	18	28	6	12	18	28	25	6
E. incertum mexicanum														.2				
E. cf. koeboeense	.6						.5		.4					.2			3	
E. matagordanum	1		1	1	1	.5	2	2	2	.4		1		2	1	2	6	
E. poeyanum	3		.6	1	6		2	5	6	5	2	5		18	3	9	7	3
E. cf. fumidum	.4						.3											
Gaudryina exilis																		
Massilina protea																		
Miliammina fusca			.3	.4														
Miliolidae																.5		
Nonionella atlantica																		
Palmerinella palmerae	.2													.6			.2	
Proteonina lagenaria					1	1												
Quinqueloculina cf. compta																		
Q. cultrata													3				.7	
Q. funafutiensis																		
Q. lamarckiana																		
Q. poeyana								.3										
Q. rhodiensis								.3				1						
Q. seminulum																		
Reussella atlantica																		
"Rotalia" beccarii variant A	15	16	32	5	3	1	29	51	36	27	39	19	9	15	53	40	32	12
"R." beccarii variant B	2		3	1	17	5	6	1	7	6	15	9	51	12	10	10	21	22
"R." beccarii variant C	12	12	8	3	7	2	5		2	6	5	6		2	5	6	1	5
Triloculina sidebottomi	.2						.3	.8	.4			1	12	.6	1		.7	2
Triloculinella obliquinoda					.4													
Trochammina macrescens					2													
* Ammopemphix compressa					2													
Globigerinoides rubra											X							
TOTAL POPULATION <0.149 mm. and >0.074 mm.	3,600	200	8,500	10,500	3,000	2,200	3,950	1,800	1,000	1,800	2,300	840	640	3,900	1,000	22,700	3,000	1,600
Ammobaculites (juvenile)	10	38	37	55	19	52	32	16	14	24	28	37	35	12	5	6	6	24
Arenoparrella mexicana																		
Bolivina lowmani			.6															
B. striatula					1	.6											.6	
Buliminella elegantissima																		
Discorbis floridana																		.4
Elphidium (juvenile)	42	17	26	30	29	21	29	41	42	35	23	26	7	38	32	37	49	14
Gaudryina exilis					1													
Lagunculina vadescens																		
Leptodermella variabilis				.5														
Miliammina fusca					1							.5						
Miliolidae (juvenile)	1							2	4	1		2	2	4	3	.4	.6	3
Nonionella opima																		
Palmerinella palmerae	4	5	.6	.5			1		4	4	1	2	2	2	.8			2
Proteonina lagenaria		1		2	4	3												
"Rotalia" (juvenile)	43	38	35	12	36	20	37	41	36	36	48	33	55	44	59	57	43	57
Trochammina macrescens					2													
* Ammopemphix compressa		.5	1	1	6	4												
* A. sp. A				X	2													
* A. sp. B																		

STATION	117	119	120	132	133	134	136	138	145	146	147	148	149	168	181	188	195	198
TOTAL POPULATION >0.149 mm.	140	97	790	2	1	7,000	1	0	1,550	190	690	350	5	600	640	1,800	970	750
Ammoastuta inepta																		
Ammobaculites dilatatus	5	4	1								1	7				1	1	9
A. salsus and variants	13	19	8	100		38			2		4	7		3	24	2	17	4
A. sp. A	1								8	11	1							
A. sp. B									2									.5
Ammoscalaria pseudospiralis		1														.2		3
Bigenerina irregularis														.3				
Bolivina striatula																		
Cibicidina strattoni														3				
Discorbis floridana																		
Elphidium advenum																.2		
E. delicatulum									2	7	4	3					.6	
E. discoidale			.3											1				
E. galvestonensis						2										.4		
E. gunteri	23	9	28		100	17			24	21	39	65	20	29	16	33	18	16
E. incertum mexicanum														.6				
E. cf. koeboeense			2			1				.5		.4		4	3	3	1	.5
E. matagordanum	2		6			1			4	2	5	2		4	4	2	2	2
E. poeyanum	8	3	9			2			9	12	1	3		4	6	5	5	3
E. cf. fumidum			.3						.3	2					.3	.4	6	
Gaudryina exilis			.3															3
Massilina protea																	2	
Miliammina fusca																		
Miliolidae																		
Nonionella atlantica			.3											.3				
Palmerinella palmerae														1			.2	.5
Proteonina lagenaria							100											
Quinqueloculina cf. compta														.3				
Q. cultrata															.3	7		
Q. funafutiensis	.7															1		.3
Q. lamarckiana														.3				
Q. poeyana															.3		.2	
Q. rhodiensis			.8														1	
Q. seminulum																	.2	
Reussella atlantica																		
"Rotalia" beccarii variant A	28	15	29			37			14	11	32	18	40	39	20	38	30	24
"R." beccarii variant B	9	47	20			2			33	29	12	6	20	14	26	13	22	31
"R." beccarii variant C	4		.3						1	4	1	4	20	.6	.3	.4	6	5
Triloculina sidebottomi	6		2						.7					.3	.3		.6	.5
Triloculinella obliquinoda																		
Trochammina macrescens									.3		.3							
* Ammopemphix compressa						.5												
Globigerinoides rubra																		
TOTAL POPULATION <0.149 mm. and >0.074 mm.	970	170	6,100	20	14	3,600	42	1	9,600	520	1,400	2,100	37	2,400	3,300	4,400	2,700	3,000
Ammobaculites (juvenile)	12	5	6	25		41	2		6	6	15	11		1	39	5	28	26
Arenoparrella mexicana									.5									
Bolivina lowmani																.4		
B. striatula			.5						.5							.7	.4	
Buliminella elegantissima																.4		
Discorbis floridana																		
Elphidium (juvenile)	38	21	43		43	22	2		43	43	47	53	49	48	24	45	23	27
Gaudryina exilis																		
Lagunculina vadescens				5														
Leptodermella variabilis																		
Miliammina fusca																		
Miliolidae (juvenile)	5	3	3						3	.8				1	5	4	4	1
Nonionella opima																		
Palmerinella palmerae	1	1				.8				.8	.5	2		1				.8
Proteonina lagenaria						2	69											
"Rotalia" (juvenile)	43	70	48	5	43	27	19	100	46	49	37	34	5	48	31	45	45	46
Trochammina macrescens									.5									
* Ammopemphix compressa				40	14	7	7											
* A. sp. A						.8												
* A. sp. B				25														

* Note—Read: Urnulina instead of Ammopemphix

Table 6. Distribution of Foraminifera in surface sediment samples from San Antonio Bay, Sta. 66-198.

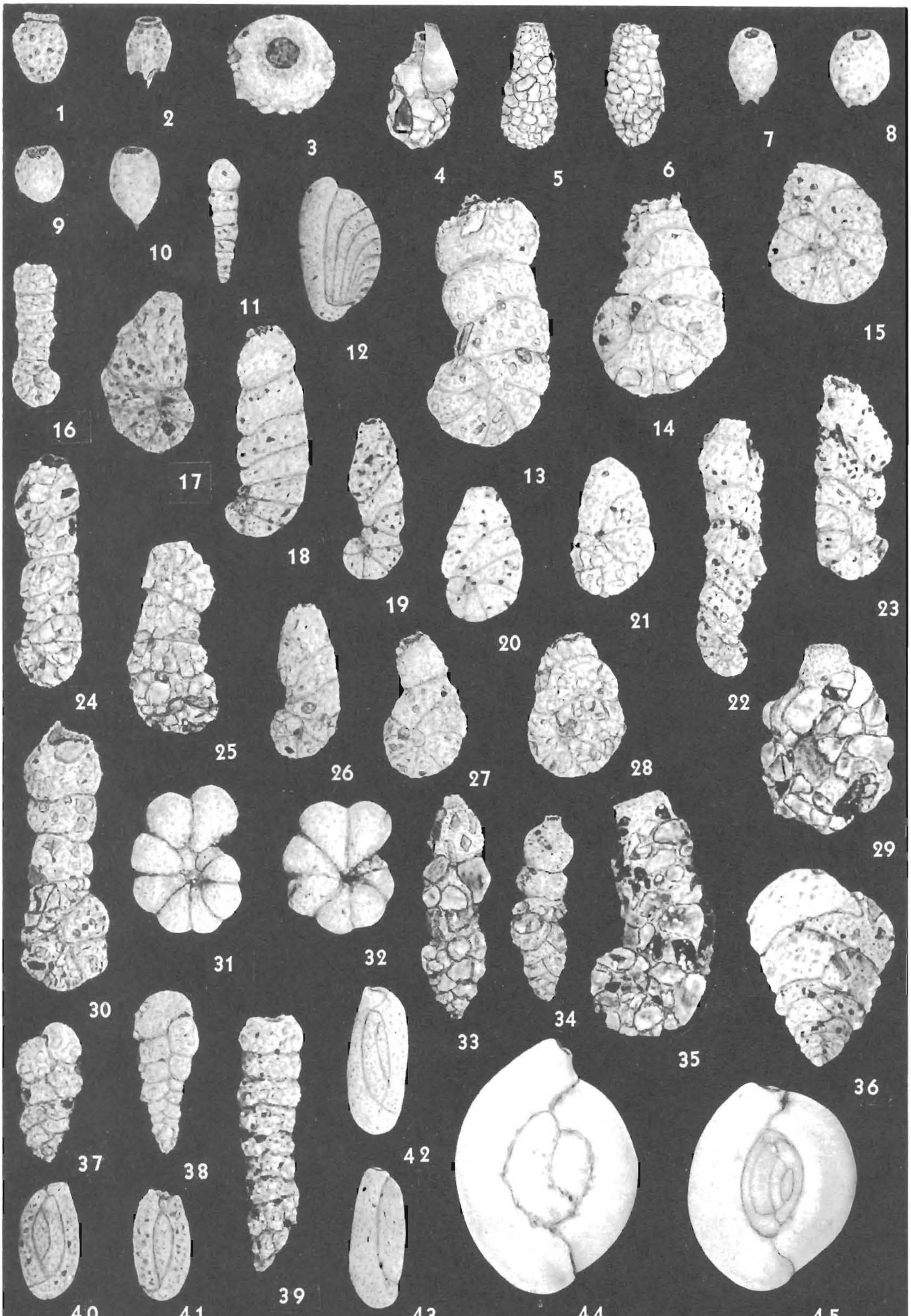
LOCATION	MATAGORDA ISLAND MARSH											GRASSY POINT MARSH							GUADALUPE RIVER					
STATION	83	83'	84	85	86	89	90	91	92	93	94	1	2	3	4	6	7	8	7	242	244	245	246	248
TOTAL POPULATION >0.149 mm.	4,200	140	990	160	300	3,700	560	1,050	5,000	260	650	15,800	840	620	420	960	1,050	2,200	19	5	0	2	3	11
Ammoastuta inepta						.03	1					X	.1	5	1	.1	1	4						
Ammobaculites dilatatus	.6																							
A. salsus and variants	2	14	86	13	10	1	4	.3	3	18	1	2	5	3	15	79	20	31						9
A. sp.																				100			33	
A. sp. B			.1																					
Ammoscalaria pseudospiralis										.4	.2													
Arenoparrella mexicana			1	7	21	.03				.4	.2	6			.2	1	.5	2						
Bigenerina irregularis						.03																		
Cibicidina strattoni						.1					.2													
Discorbis floridana						.03																		
Discorinopsis aguayoi	.4	.7							.2			X	63	60	19	2								
Elphidium advenum						.1		.3																9
E. delicatulum	.4					.7			.2		.6	2						.5						
E. discoidale	.6					.6		.7	.2															
E. galvestonensis	10	10				13	11	15	3	.4	10													
E. gunteri	4	11	.7			5	7	3	2	2	10	16		.2				.4	21			50		27
E. incertum mexicanum		.7				.1		.3	.3		.6													
E. cf. koeboeense	.8					.2	.7		.6		.6													
E. matagordanum	4	.7	.2			4	11	2	5	5	.6	10				.1		.7	11					
E. poeyanum	3	4				2	6	1	21	3	.5	6						2						
E. cf. tumidum	.4					.05						.5						.1						
Jadammina polystoma					6				.3															
Leptodermella variabilis																							33	
Massilina peruviana	2										1													
M. protea	3							14	5		2													
Miliammina fusca	.8	11	.7	7	23	.8	3		.5	4	.5		1	2	.2		.1							
M. sp.														.2				.1						
Miliolidae		1							5	.8	7													9
Nonionella atlantica						.03																		
Palmerinella palmerae	.2					3	4	1	.8	2	.8													
Pseudoclavulina gracilis			2			.03	.7																	
Quinqueloculina poeyana								1	.5		.6													
Q. rhodiensis	10	.7						7	1		3													
Q. seminulum	.4										.2													
Q. wiesneri	9							12	3		3													
Recurvoides sp.												.3						2						
Reophax nana						.3																		
"Rotalia" beccarii variant A	34	17				63	50	29	15	49	49	20	.1		.2			1	26					18
"R." beccarii variant B	4	1			.3	2	.7	.5	1	1	.6	6						.1	11					
"R." beccarii variant C	1	.7	.2			4	.7	.2	1	.8	.5	30	21	19	53	13	23	40	32			50	33	27
Triloculina fiterrei meningoi	.2							.7	2															
T. sidebottomi	4	23				.03		9	12		5	.3			.5	2		.1						
Triloculinella obliquinoda	6	2				.05		2	16		2		.6	3	2									
Trochammina comprimata			1	18	3								.5	.5	1	3	4	3						
T. inflata		2	8	40	34	.3			.5	9		.5	.1					.6						
T. macrescens				6	.3				.3	.4		.5	1	6	8		51	13						
T. (miscellaneous)				9	2				.2	3			8	1	.5	.2	.3							
TOTAL POPULATION <0.149 mm. and >0.074 mm.	2,700	450	240	93	580	700	240	810	860	1,300	980	103,900	580	340	210	290	460	2,800	71	120	8	66	130	190
Ammoastuta inepta												.2	.7	3	2	.7	6	5						
Ammobaculites (juvenile)	6	14	50	1	1	1	10		.5	8	3	2	4	.6	8	55	5	7		14				
Arenoparrella mexicana			3	3	25											.6		1						
Bolivina sp.												.2						.04						
Discorinopsis aguayoi												.2	35	40	12	2								
Elphidium (juvenile)	13	50	2		1	33	35	5	29	11	12	39	4		6	.3	.2	12	13	15		1	2	8
Lagunculina vadescens																			8					
L. sp.																						3		7
Leptodermella variabilis														.6						40	75	32	10	35
Miliammina (juvenile)	1	11	15	34	41	4	5		1	40			2	3			2							
M. sp.																		2						
Miliolidae (juvenile)	70	23				2		90	58	3	69		15	15	31	10		.2						
Palmerinella palmerae										3		.2												
Proteonina lagenaria																			20			6		6
Pseudoclavulina gracilis			9				5																	
Recurvoides sp.																		.2						
"Rotalia" (juvenile)	15	2	9			61	45	5	8	19	16	57	27	21	25	15	31	50	8	9				5
Trochammina comprimata			2																					
T. inflata			5		22																			
T. (juvenile)			5	62	10	.6			.5	16		1	12	.3	15	17	56	22						
T. macrescens														17										
* Ammopemphix compressa																		.04	28	21	25	58	87	38
* A. sp. A																			16					
* A. sp. B																			7					

* Note—Read: Urnulina instead of Ammopemphix

Table 7. Distribution of Foraminifera in surface sediment samples from Matagorda Island marsh, Grassy Point marsh and Guadalupe River.

EXPLANATION OF PLATE 1

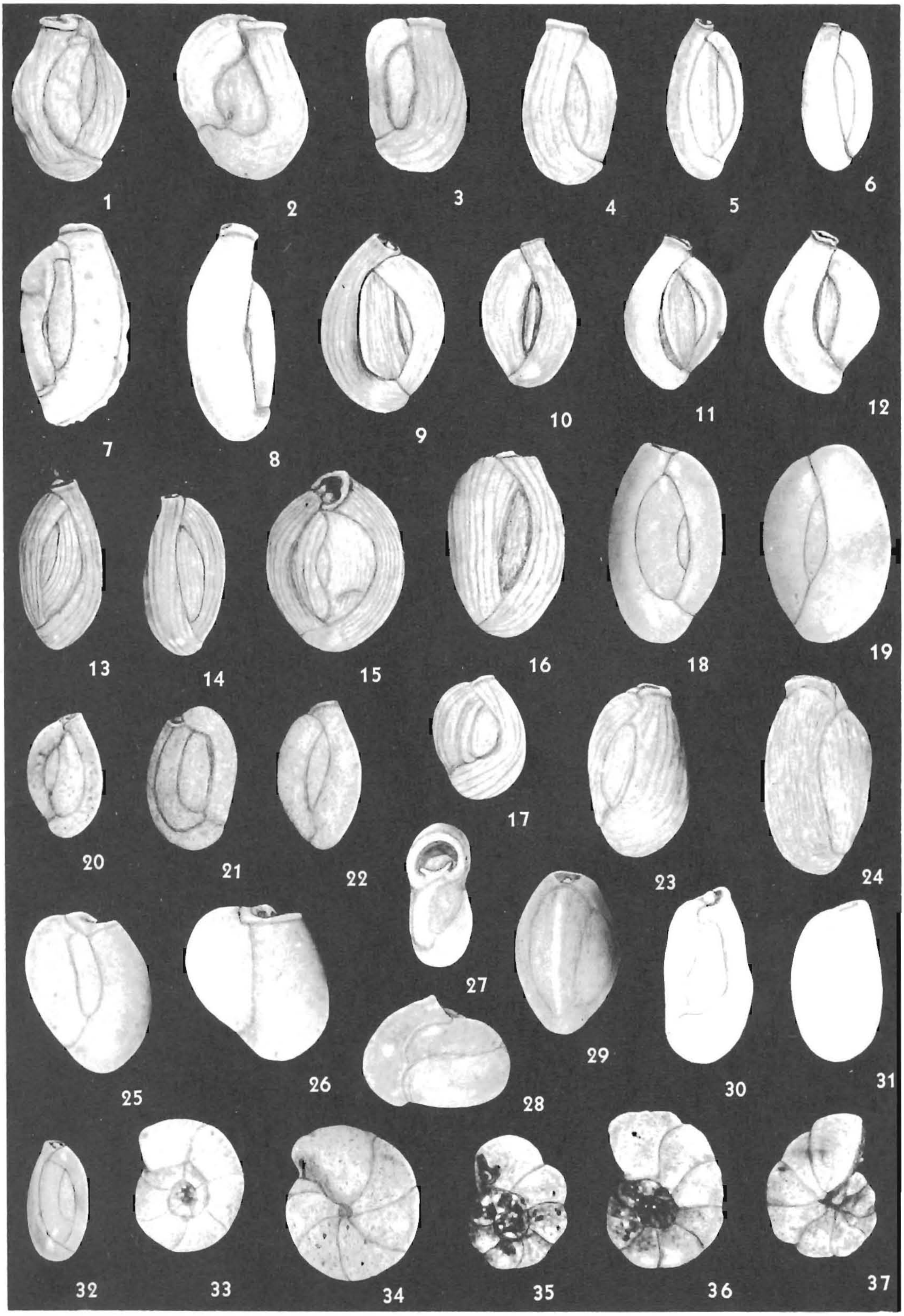
FIGS.		PAGE
1.	*Lagunculina vadescens* Cushman and Bronnimann. × 70. Sta. GR7A	10
2.	*Lagunculina* sp. × 70. Sta. S248B	10
3.	*Leptodermella variabilis* Parker. × 70. Sta. S91A	10
4.	*Proteonina atlantica* Cushman. × 50. Sta. J33A	11
5, 6.	*Proteonina lagenaria* (Berthelin). × 70. Sta. S135A	11
7, 8.	*Urnulina compressa* Cushman. × 70. Sta. S91A	5
9.	*Urnulina* sp. A. × 70. Sta. S92A	5
10.	*Urnulina* sp. B. × 70. Sta. S132A	5
11.	*Reophax nana* Rhumbler. × 70. Sta. M13A	13
12.	*Ammoastuta inepta* (Cushman and McCulloch). × 50. Sta. G1B	4
13-15.	*Ammobaculites dilatatus* Cushman and Bronnimann. × 50. 13, 14, Sta. MT51A; 15, Sta. S70A	5
16.	*Ammobaculites exiguus* Cushman and Bronnimann. × 70. Sta. JI5A	5
17-25.	*Ammobaculites salsus* Cushman and Bronnimann and variants. × 50. 17, Sta. MT11A; 18-20, Sta. S71A; 21-23, Sta. S91A; 24, 25, Sta. S20A	5
26-28.	*Ammobaculites* sp. A. × 50. Sta. MT51A	5
29, 35.	*Ammoscalaria pseudospiralis* (Williamson). × 50. Sta. S22A	6
30.	*Ammobaculites* sp. B. × 38. Sta. S91A	5
31, 32.	*Recurvoides* sp. × 50. Sta. G8B	13
33, 34.	*Bigenerina irregularis* Phleger and Parker. × 50. Sta. J34A	6
36.	*Textularia* sp. cf. *T. mayori* Cushman. × 38. Sta. J13A	14
37, 38.	*Gaudryina exilis* Cushman and Bronnimann. × 70. Sta. J33A	9
39.	*Pseudoclavulina gracilis* Cushman and Bronnimann. × 70. Sta. MT84B	11
40, 41.	*Miliammina fusca* (H. B. Brady). × 50. Sta. MT51A	10
42, 43.	*Miliammina* sp. × 70. Sta. G8B	11
44, 45.	*Massilina peruviana* (Orbigny). × 38. Sta. SJIA	10



Recent Foraminifera, San Antonio Bay Area, Texas

EXPLANATION OF PLATE 2

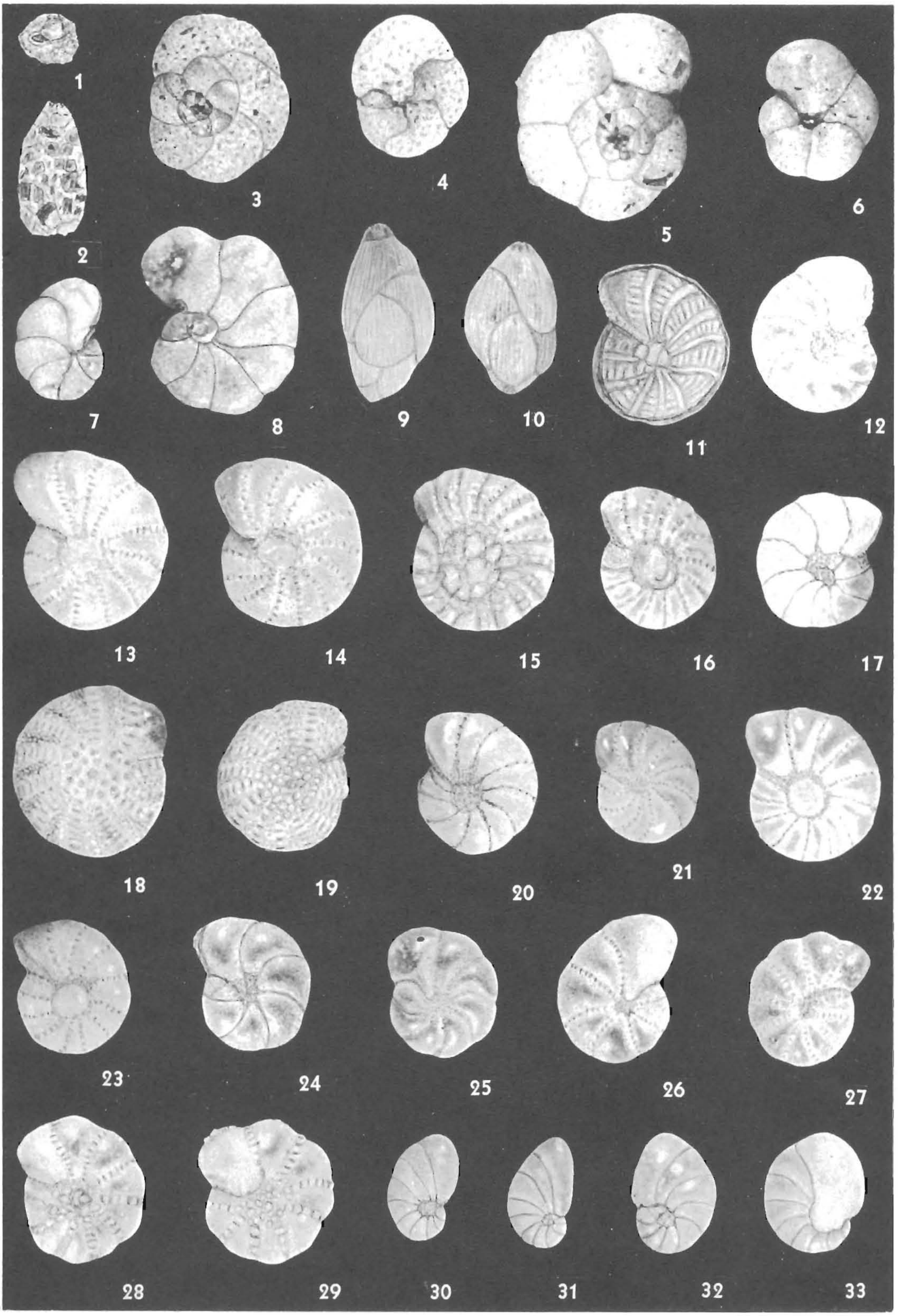
FIGS.		PAGE
1-4.	*Massilina protea* Parker, n. sp. × 50. 1, Holotype; 2-4, Paratypes. Sta. MT62A	10
5, 6.	*Quinqueloculina* sp. cf. *Q. compta* Cushman. × 50. Sta. J36A	12
7, 8.	*Quinqueloculina cultrata* (H. B. Brady). × 50. Sta. S62A	12
9, 10.	*Quinqueloculina funafutiensis* (Chapman). × 50. Sta. J35A	12
11, 12.	*Quinqueloculina lamarckiana* Orbigny. × 50. Sta. J35A	12
13, 14.	*Quinqueloculina poeyana* Orbigny. × 50. Sta. A18A	12
15-17.	*Quinqueloculina rhodiensis* Parker, n. n. × 50. Sta. MT62A	12
18, 19.	*Quinqueloculina seminulum* (Linné). × 50. Sta. MT62A	12
20-22.	*Quinqueloculina wiesneri* Parr. × 70. Sta. MT52A	13
23, 24.	*Triloculina fiterrei meningoi* Acosta. × 50. Sta. MT63A	14
25-28.	*Triloculina sidebottomi* (Martinotti). 25-27, × 38; 28, × 50. Sta. MT66A	14
29.	*Triloculina trigonula* (Lamarck). × 50. Sta. SJIA	14
30-32.	*Triloculinella obliquinoda* Riccio. 30, 31, × 70; 32, × 50. Sta. MT62A	14
33, 34.	*Arenoparrella mexicana* (Kornfeld). × 50. Sta. MT63A	6
35-37.	*Jadammina polystoma* Bartenstein and Brand. × 70. 35, Sta. MT92B; 36, 37, Sta. MT86B	9



Recent Foraminifera, San Antonio Bay Area, Texas

EXPLANATION OF PLATE 3

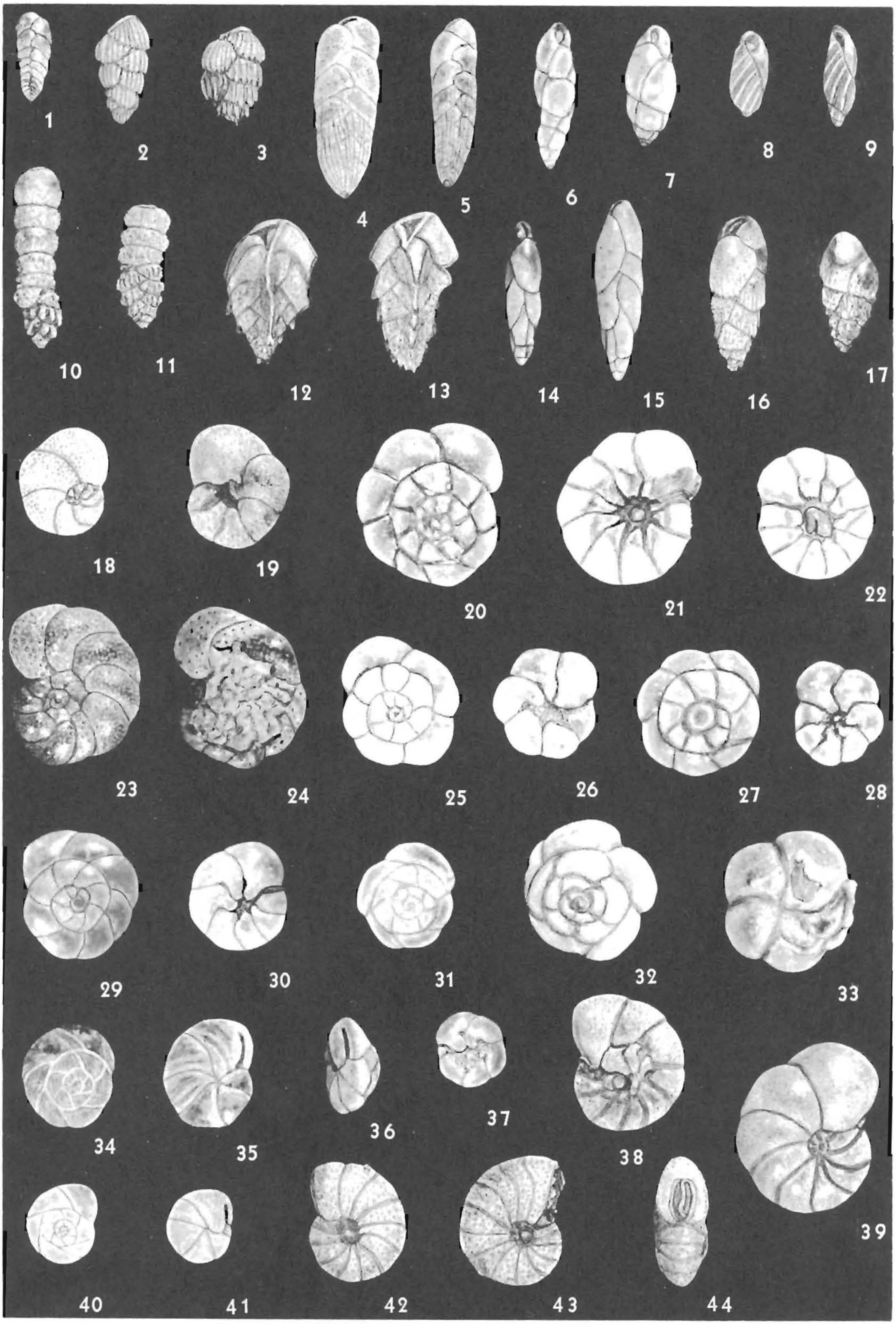
Figs.		Page
1, 2.	*Nouria polymorphinoides* Heron-Allen and Earland. × 50. Sta. J34A	11
3, 4.	*Trochammina comprimata* Cushman and Bronnimann. × 50. Sta. MT85B	14
5, 6.	*Trochammina inflata* (Montagu). × 50. Sta. MT65A	15
7, 8.	*Trochammina macrescens* H. B. Brady. × 50. Sta. S135A	15
9, 10.	*Guttulina australis* (Orbigny). × 50. Sta. MT48A	9
11.	*Elphidium advenum* (Cushman). × 50. Sta. E6A	7
12, 17.	*Elphidium delicatulum* Bermudez. × 70. Sta. S195A	7
13, 14.	*Elphidium discoidale* (Orbigny). × 50. Sta. J33A	7
15, 16.	*Elphidium galvestonense* Kornfeld. 15, × 38; 16, × 50. Sta. E6A	7
18, 19.	*Elphidium gunteri* Cole. 18, × 50, Sta. S62A; 19, × 38, Sta. C2A	8
20, 21.	*Elphidium incertum mexicanum* Kornfeld. 20, × 70; 21, × 50. Sta. SJ17A	8
22, 23.	*Elphidium* sp. cf. *E. koeboeense* LeRoy. 22, × 70, Sta. MT52A; 23, × 50, Sta. MT4A	8
24, 25.	*Elphidium matagordanum* (Kornfeld). × 50. Sta. MT51A	8
26.	*Elphidium poeyanum* (Orbigny). × 70. Sta. S62A	9
27.	*Elphidium translucens* Natland. × 50. Sta. A12A	9
28, 29.	*Elphidium* sp. cf. *E. tumidum* Natland. × 50. Sta. MT79A	9
30, 31.	*Nonionella atlantica* Cushman. × 50. Sta. M48A	11
32, 33.	*Nonionella opima* Cushman. × 70. Sta. M48A	11



Recent Foraminifera, San Antonio Bay Area, Texas

EXPLANATION OF PLATE 4

Figs.		Page
1.	*Bolivina lowmani* Phleger and Parker. × 70. Sta. J36A	6
2, 3.	*Bolivina pulchella primitiva* Cushman. × 70. Sta. J33A	6
4, 5.	*Bolivina striatula* Cushman. × 70. Sta. M48A	6
6, 7.	*Buliminella* sp. cf. *B. bassendorfensis* Cushman and Parker. × 70. Sta. J34A	6
8, 9.	*Buliminella elegantissima* (Orbigny). × 70. Sta. M48A	6
10, 11.	*Rectobolivina advena* (Cushman). × 70. Sta. J33A	13
12, 13.	*Reussella atlantica* Cushman. × 70. Sta. J33A	13
14, 15.	*Virgulina pontoni* Cushman. × 50. Sta. M48A	15
16, 17.	*Virgulina spinicostata* Phleger and Parker. × 70. Sta. J15A	15
18, 19.	*Discorbis floridana* Cushman. × 50. Sta. SJ19A	7
20-22.	"*Rotalia*" *beccarii* (Linné) variant A. × 38. Sta. S62A	13
23, 24.	*Discorinopsis aguayoi* (Bermudez). × 50. Sta. G2B	7
25-28.	"*Rotalia*" *beccarii* (Linné) variant B. 25, × 70; 26-28, × 50. 25, 26, Sta. J35A; 27, 28, Sta. C2A	13
29, 30.	"*Rotalia*" *beccarii* (Linné) variant C. × 70. Sta. S139A	13
31, 37.	"*Rotalia*" *pauciloculata* Phleger and Parker. × 70. 31, Sta. J15A; 37, Sta. J33A	13
32, 33.	"*Rotalia*" *rolshauseni* Cushman and Bermudez. × 50. Sta. J35A	14
34-36, 40, 41.	*Epistominella vitrea* Parker, n. sp. × 70. 34, Holotype; 35, 36, Paratypes, Mississippi Delta Sta. MP72-51A; 40, 41, Sta. J15A	9
38, 39.	*Cibicidina strattoni* (Applin). × 50. Sta. J34A	7
42-44.	*Palmerinella palmerae* Bermudez. × 50. Sta. MT51A	11



Recent Foraminifera, San Antonio Bay Area, Texas