Bol. Soc. Geol. Mexicana, t. 28, n. 1, p. 45-60, figs. 1-3c, 1 tabla, 1 lám. (1965)

LIVING FORAMINIFERA FROM COASTAL MARSH, SOUTHWESTERN FLORIDA

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ABSTRACT

Living foraminiferal faunas from mangrove bay areas in southwest Florida are dominantly calcareous and are similar to lagoon faunas of south Texas. A typical marsh species occurs at only a few stations. Rates of sedimentation are shown to be low, with most of the sediment being trapped in the landward margin of the area.

INTRODUCTION

There is little useful information on the sedimentary materials which accumulate in marine marshes. Foraminifera are abundant in marshes and thus constitute a significant part of these sediments. As living organisms, Foraminifera are delicately adjusted to the marsh environments which they inhabit. They can be used to gain insight into many features of marsh environments, and they thus constitute a record of environments existing when ancient sediments containing them were deposited.

There are several descriptions of foraminiferal populations of marine marshes from many parts of the world. Most of these studies, however, do not differentiate the living from the non-living population. The principal results of most of these marsh studies may be summarized as follows:

1. The marsh fauna is composed mostly of species having arenaceous tests, and calcareous Foraminifera generally do not occur in abundance.

2. The same species, or very closely related species, are worldwide in distribution.

The implications of these generalizations are that marine marshes everywhere have essentially similar environments and that the environment is

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everywhere too acid for the existence of calcareous Foraminifera. These generalizations, if true, are important in understanding sedimentation in modern marshes and in deciphering ancient ones.

Recently it has become apparent that neither of these generalizations is completely correct, and that the marsh sedimentary environments is complex and varies from place to place. It has been shown by Parker and Athearn (1959), for example, that living calcareous Foraminifera *(Elphidium)* are abundant in a Cape Cod, Massachusetts, marsh. These calcareous forms apparently do not survive burial, since empty tests are rare. Calcareous gastropods *(Cerithidea)* have been observed by the writer to live in some marshes in great abundance, such as in those of southern California and northern Mexico. Some marshes contain both living and dead calcareous Foraminifera in abundance (Phleger and Ewing, 1962). Some marshes are supplied abundant fresh-water runoff and are constantly brackish, as are those bordering the Mississippi Delta (Lowman, 1949); others are hypersaline, as are those in the Laguna Ojo de Liebre, Mexico (Phleger and Ewing, 1962). The sediment in a marsh depends upon source of supply and may be quartz sand with little silt, detrital silt and clay, or calcareous sand, silt or clay.

The present study describes living Foraminifera from the Ten Thousand Islands and Whitewater Bay areas of southwestern Florida and interprets the salient features of their populations. Foraminifera from the Ten Thousand Islands area were previously studied by Benda and Puri (1962). The living Foraminifera were not differentiated by Benda and Puri, and the present study is, in a sense, an extension of their work. The living populations reported are those contained in approximately 10 ml of wet surface sediment 1 cm in thickness. They were preserved in a solution of formalin and sea water to which an excess of neutralizing agent had been added. Living Foraminifera were recognized by the rose Bengal technique (Walton, 1952).

The samples were collected for the writer through the generosity of David W. Scholl. Laboratory work was supported by the National Science Foundation and by a contract of the Office of Naval Research with the University of California. The Foraminifera were identified by Jean P. Hosmer.

DESCRIPTION OF AREAS AND LOCATIONS OF SAMPLES

The areas of sampling are dominated by mangrove marsh (swamp) which extend approximately 50 miles along the coast of southwestern Florida (Fig. 1). There are numerous mangrove islands, and many small channels and

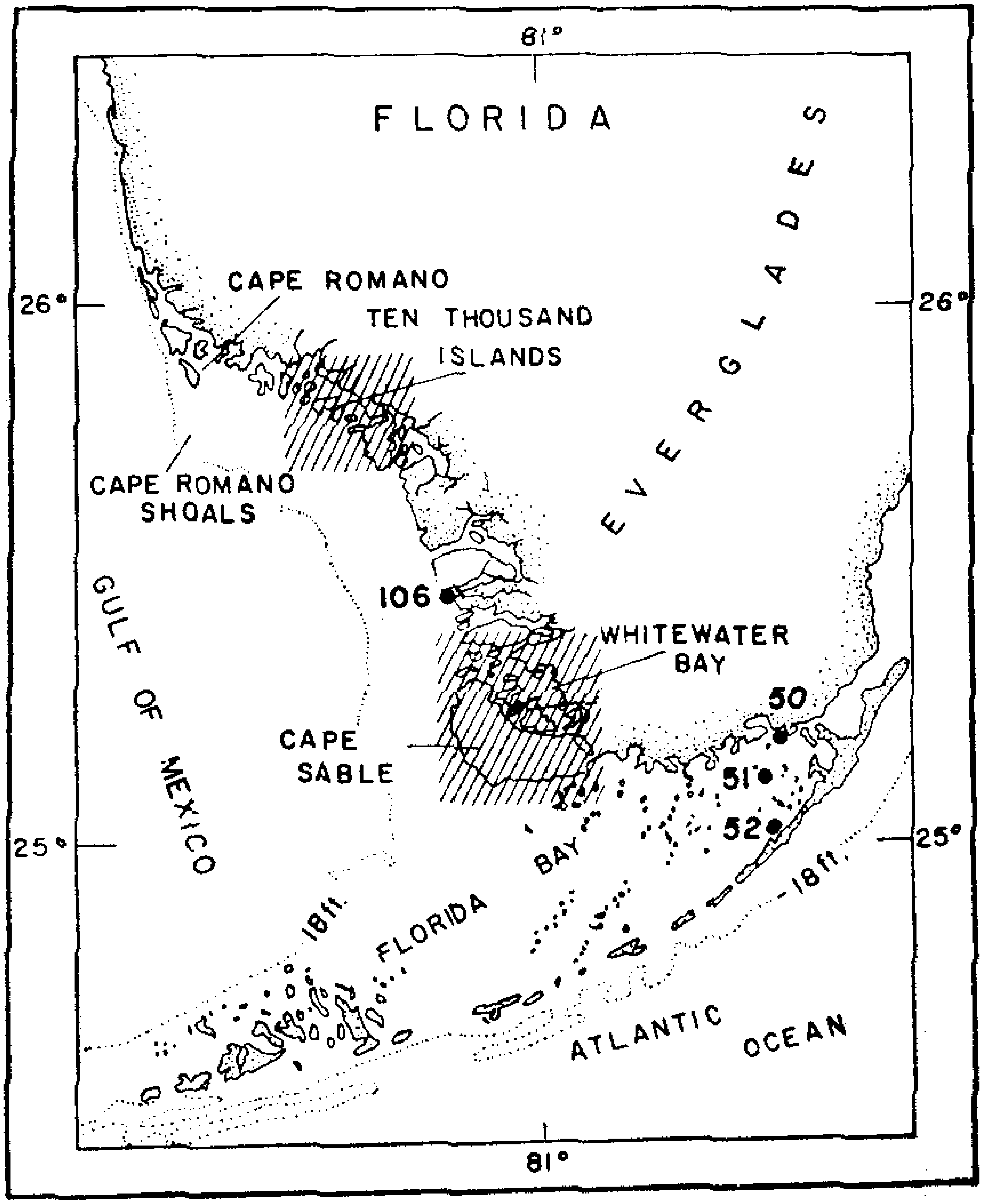

Figure 1. Locations of areas and of stations outside principal sampling areas.

streams traverse the more continuous mangrove forest. Water depths are shallow, seldom exceeding 6 to 8 ft except in a few channels.

The salinity, distribution of Mollusca and many features of the sediments have been described by Scholl (1963). According to Scholl, the water in these areas is brackish during summer when salinities rapidly decrease from the open Gulf to 5 $^0/_{00}$ and less on the landward margin; this is due to heavy runoff

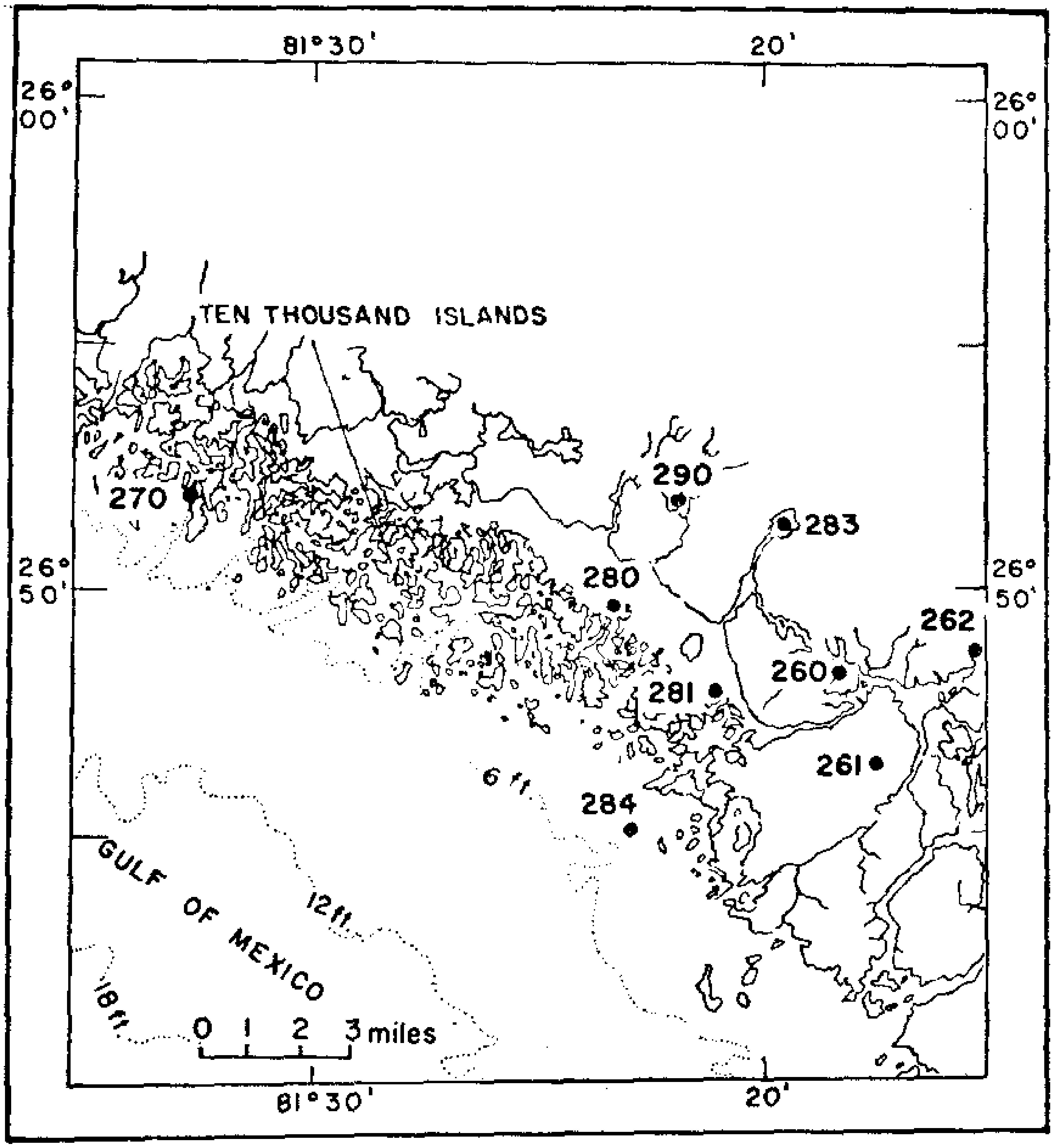

Figure 2a. Locations of stations in Ten Thousand Islands area.

from the land. In winter the salinities are much higher, ranging from 32 ‰ to 36 ‰. No measurements of water temperatures are available, but surface water temperature can be estimated from observations made elsewhere in the Gulf of Mexico. They are expected to range seasonally from extremes of about 5° to 32° C and marked diurnal ranges occur, especially in winter.

The sediments in the Ten Thousand Islands area are calcareous quartz sands and silts having 20-30% calcium carbonate. In Whitewater Bay they are calcareous sands and silts (60-80% calcium carbonate) with little quartz. The molluscan fauna has been separated into 3 facies by *Scholl (1963)*, an open gulf, a bay, and a marsh or "back swamp" facies. The distribution of these assemblages more or less parallels the seasonal isohaline lines.

Locations of stations for foraminiferal samples are shown on (Figs. 1 and 2a. 2b).

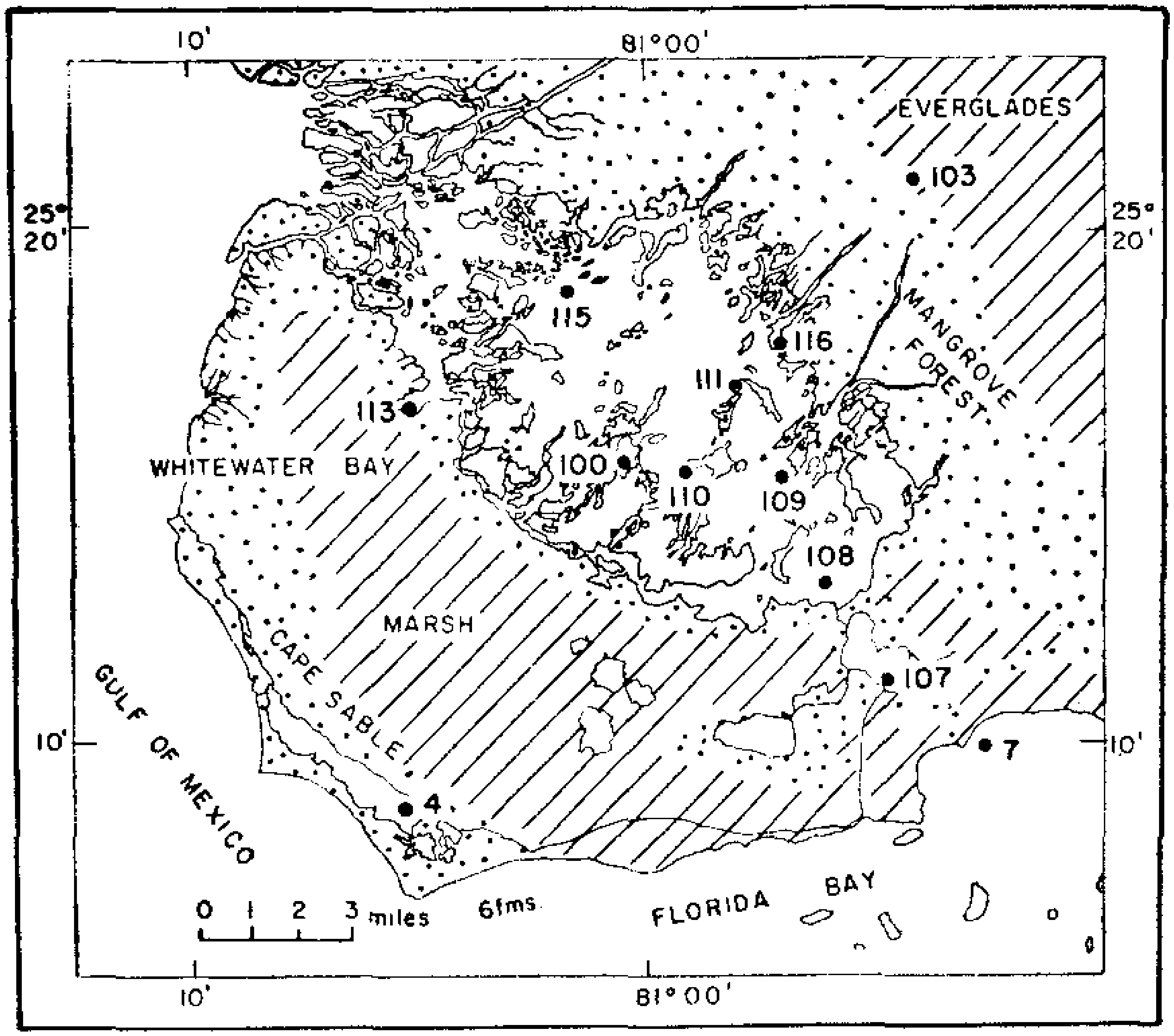

Figure 2b. Locations of stations in Whitewater Bay area.

STATION	4	7	50	51	52	100	103	106	107	108	109	110	111	113	115	116	260	261	262	270	280	281	283	284	290
LIVING POPULATION	571	1489	494	118	352	168	203	76	117	692	336	252	540	8	48	16	323	295	1195	72	192	325	204	258	342
Ammobaculites exiguus			.8					1								6		.3							
salsus vars.	3		1			8	2			.3	3	41	2		2	12	33	32	36	8	7	7	11		39
spp.						2											2	10	2	1	1	.3	.5		4
Ammonia becarii vars.	35	17	22	23		33	61	28	38	65	59	40	81		29	12	36	43	27	29	33	24	12	19	15
Bolivina striatula	17	.5	8		.3			16	3						19		.6			6	11	24		14	
variabilis	4		1										.6								2	.3		.8	
Bulimina marginata								1							2						.5	.6			
Buliminella elegantissima	4	.1						9	3						4		.3			4	3	4		3	.3
Elphidium galvestonense		.7	.4	2		21	.5			4	9	12				20			13						
gunteri							1	3	.9	.2							1		.8	7	7	4			
incertum mexicanum		.4	1			8			.9							6			.1	1	1	4		17	
matagordanum	.4	2	.4	.8	5	1	1	5	19		.3		2	12		6	20	15	9		2	4	75	.4	34
poeyanum	2	.5	.4	13	2	12	4		3	1	2	3				20			1	3	3	.3	.5	3	
tumidum	.4		.2				1	10						12		6			3			.6			.3
sp.	.4	3	.4	3		11	.	4	11	2	12	.4		25		6	2		.7						
spp.		.3	1	2		2						3			4	6			3	3	.5	2		.4	
Entosolenia spp.	1	.1			.9				.9	.8			1												
Gaudryina exilis	3								2								.6				8	2			.9
Glomospira sp.	.4		2	.8	1									12	4									.4	
Miliammina fusca										2	8				2		.3		.2	6					.6
Miliolinella circularis		2	.4	3	1				.9																
Miscellaneous miliolids	4	2	6	10	11		28	10	7	1		.4	3		21		2		4	8	8	.6		9	
Nonionella cf. N. atlantica	10																				2	11		1	
Quinqueloculina laevigata	9		12	14	19	2																		8	
lamarckiana			.4	.8																					
poeyana	.9	6	2	20	15				3	3														15	
tenagos		.5	.6						2	.2															
wiesneri		.5	1	3	.9		1																		
sp.	.9		.4	3	.3																.5	.3			
Reophax nana	.7							7									.3				2	3	.5	.4	
Rosalina floridana	.5	.1	6	2	15			3		.5	6		2									.6		.4	
Textularia earlandi																					2	1			.9
Triloculinella obliquinoda	1	64	32		12				5	19	.3		8	38	10	.	.3			21	3	4		8	.3
Miscellaneous species	2		.6		17		.5	3		.7					2		1		.2	3	3	2	.5	.4	4
% *calcareous forms*	92	89	96	99	91	90	98	92	96	97	89	59	98	88	92	82	62	58	62	85	77	86	88	99	50

Table 1. Occurrences of living Foraminifera in per cent of total living population.

SPECIES OF FORAMINIFERA

References to the species of Foraminifera are listed below, and illustrations of the more common forms are on Plate 1. Occurrences of the more common species are listed in Table 1.

Ammobaculites exiguus Cushman and Brönnimann. Pl. 1, fig. 3. (Cushman and Brönnimann, 1948, Contr. Cushman Lab. Foram. Res., v. 24, pt. 2, p. 38. pl. 7. figs. 7, 8). Parker, Phleger and Peirson, 1953, Cushman Found. Foram. Res., Spec. Publ. 2, p. 5, pl. 1, fig. 16.

Ammobaculites salsus Cushman and Brönnimann variants. Pl. 1, figs. 1, 2. Cushman and Brönnimann, 1948, Contr. Cushman Lab. Foram. Res., v. 24, pt. 1. p. 16, pl. 3, figs. 7-9). Parker *et al.*, 1953, Cushman Found. Foram. Res., Spec. Publ. 2, p. 5, pl. 1, figs. 17-25.

Ammonia beccarii (Linné) variants. Pl. 1, figs. 5, 6, 9, 10. (*Nautilus beccarii* Linné, 1758, Syst. Nat., ed. 10, p. 710). Parker *et al.*, 1953, (as "*Rotalia*"). Cushman Found. Foram. Res., Spec. Publ. 2, p. 13, pl. 4, figs. 20-22. 25-28 (not. 29, 30).

Bolivina pseudoplicata Heron-Allen and Earland. (Heron-Allen and Earland, 1930. Jour. Roy. Micr. Soc., Ser. 3, v. 50, p. 81, pl. 3, figs. 36-40). Walton, 1955, Jour. Paleont, v.. 29, p. 1002, pl. 102, fig. 1.

Bolivina striatula Cushman. Pl. 1, fig. 4. (Cushman, 1922, Carnegie Inst. Washington Publ. 311, p. 27, pl. 3, fig. 10). Parker, Phleger and Peirson, 1953, Cushman Found. Foram. Res, Spec. Publ. 2. p. 6, pl. 4, figs. 4, 5.

Bolivina variabilis (Williamson). Pl. 1, fig. 8. (*Textularia variabilis* Williamson. 1858, Recent Foram. Great Britain, p. 76, pl. 6, figs. 162, 163). Parker, 1952 (as *Bolivina)*, Harvard Coll. Mus. Comp. Zool. Bull., v. 106, n. 10, p. 445, pl. 4, fig. 12.

Bulimina marginata d'Orbigny. (d'Orbigny, 1826, Ann. Sci. Nat., v. 7, p. 269, n. 4, pl. 12, figs. 10-12). Parker, 1954, Harvard Coll. Mus. Comp. Zool. Bull., v. 111, n. 10, p. 510, pl. 6, fig. 20.

Buliminella elegantissima (d'Orbigny). Pl. 1, fig. 7. (*Bulimina elegantissima* d'Orbigny, 1839, Voy. Amér. Mérid., v. 5, pt. 5, "Foraminifères", p. 51, pl. 7, figs. 13, 14). Parker, Phleger and Peirson, 1953 (as *Buliminella* Cushman Found. Foram. Res., Spec. Publ. 2, p. 6, pl. 4, figs. 8, 9.

Elphidium galvestonense Kornfeld. Pl. 1, fig. 13. *(Elphidium gunteri* Cole var. *galvestonensis* Kornfeld, (part), 1931, Contr. Dept. Geol. Stanford Univ., v. 1, n. 3, p. 87, pl. 15, figs. 1a, b (not 2a. b, 3a. b). Parker *et al.*, 1953, Cushman Found. Foram. Res., Spec. Publ. 2, p. 7, pl. 3, figs. 15, 16.

Elphidium gunteri Cole. Pl. 1, fig. 12. (Cole, 1931, Florida State Surv. Bull. 6, p. 34, pl. 4, figs. 9, 10). Parker, Phleger and Peirson, 1953, Cushman Found. Foram. Res., Spec. Publ. 2, p. 8, pl. 3, figs. 18, 19.

Elphidium incertum mexicanum Kornfeld. Pl. 1, fig. 14. *(Elphidium incertum* (Williamson) var. *mexicana* Kornfeld, 1931, Contr. Geol. Dept. Stanford Univ., v. 1, n. 3, p. 89, pl. 16, figs. 1a. b. 2a, b). Parker, Phleger and Peirson, 1953, Cushman Found. Foram. Res., Spec. Publ. 2, p. 8, pl. 3,figs. 20, 21.

Elphidium matagordanum (Kornfeld). Pl. 1, fig. 11. *(Nonion depressula* (Walker and Jacob) var. *matagordana* Kornfeld, 1931, Contr. Geol. Dept. Stanford Univ., v. 1, n. 3, p. 87, pl. 13, figs. 2a. b). Parker, Phleger and Peirson, 1953, Cushman Found. Foram. Res., Spec. Publ. 2, p. 8, pl. 3, figs. 24, 25.

Elphidium poeyanum (d'Orbigny). Pl. 1, fig. 15. *(Polystomella poeyana* d'Orbigny, 1839, *In* de la Sagra, Hist. Phys. Pol. Nat. Cuba, "Foraminifères", p. 55, pl. 6, figs. 25, 26). Parker, Phleger and Peirson, 1953, (as *Elphidium)*, Cushman Found. Foram. Res., Spec. Publ. 2, p. 9, pl. 3, fig. 26.

Elphidium tumidum Natland. Pl. 1, fig. 16. (Natland, 1938, Scripps Inst. Ocean Tech. Ser. Bull., v. 4, n. 5, p. 144, pl. 5, figs. 5, 6). Parker, Phleger and Peirson, 1953 (as *E.* sp. cf. *E. tumidum)*, Cushman Found. Foram. Res., Spec. Publ. n. 2, p. 9, pl. 3, figs. 28, 29.

Elphidium sp. Pl. 1, fig. 17.

Gaudryina exilis Cushman and Brönnimann. Pl. 1, fig. 18. (Cushman and Brönnimann, 1948, Contr., Cushman Lab. Foram. Res., v. 24, pt. 2, p. 40, pl. 7, figs. 15, 16). Parker, Phleger and Peirson, 1953, Cushman Found. Foram. Res. Spec. Publ. 2, p. 9, pl. 1, figs. 37, 38.

Glomospira sp. Pl. 1, fig. 19.

Miliammina fusca (Brady). Pl. 1, fig. 20. *(Quinqueloculina fusca* Brady, 1870, Ann. Mag. Nat. Hist. Ser. 4, v. 6, p. 47 (286), pl. 11, figs.

2 a-c, 3). Parker, Phleger and Peirson, 1953 (as *Miliammina)*, Cushman Found. Foram. Res. Spec. Publ. 2, p. 10, pl. 1, figs. 40, 41.

Miliolinella circularis (Bornemann). Pl. 1, fig. 21. *(Triloculina circularis* Bornemann, 1855, Zeitschr. Deutsch. Geol. Ges., v. 7, p. 349, pl. 19, fig. 4). Parker, 1958 (as *Miliolinella)*, Swedish Deep- Sea Exped. Repts., v. VIII, n. 4, p. 255, pl. 1, figs. 16, 17.

Nonionella cf. *N. atlantica* Cushman. Pl. 1, fig. 22. (Cushman, 1947, Contr. Cushman Lab. Foram. Res., v. 23, pt. 4, p. 90, pl. 20, figs. 4, 5).

Quinqueloculina laevigata d'Orbigny. Pl. 1, fig. 23. (d'Orbigny, 1836, Ann. Sci. Nat., p. 301, n. 6; *In* Barker, Weeb and Berthelot, 1839, Hist. Nat. Iles Canaries, v. 2, pt. 2, "Foraminifères", p. 143, pt. 3, figs. 31-33). Lankford, 1962, Unpub. Ph. D. Thesis, Univ. of Calif., La Jolla, 185 p., pl. 2, figs. 5, 6.

Quinqueloculina lamarckiana d'Orbigny. Pl. 1, fig. 24. (d'Orbigny, 1839, *In* de la Sagra, Hist. Phys. Pol. Nat. Cuba, "Foraminifères", p. 189, pl. 11, figs. 14, 15). Parker, Phleger and Peirson, 1953, Cushman Found. Foram. Res., Spec. Publ. 2, p. 12, pl. 1, figs. 11, 12.

Quinqueloculina poeyana d'Orbigny. Pl. 1, fig. 25. (d'Orbigny, 1839, *In* de la Sagra, Hist. Phys. Pol. Nat. Cuba, "Foraminifères", p. 191, pl. 11, figs. 25-27). Parker, Phleger and Peirson, 1953, Cushman Found. Foram. Res., Spec. Publ. 2, p. 12, pl. 2, figs. 13, 14.

Quinqueloculina tenagos Parker. Pl. 1, fig. 27 (Parker, 1962, Contr. Cushman Found. Foram. Res., v. 13, pt. 3, p. 110: new name for *Q. rhodiensis* Parker, *In* Parker, Phleger and Peirson, 1953, Cushman Found. Foram. Res., Spec. Publ. 2, p. 12, pl. 2, figs. 15-17).

Quinqueloculina wiesneri Parr. Pl. 1, fig. 26. *(Quinqueloculina anguina* Terquem var. *wiesneri* Parr, 1950, B. A. N. Z. Antarctic Research Exped. Repts. Ser. B, v. 5, pt. 6, p. 290, pl. 6, figs. 9, 10). Parker, Phleger and Peirson, 1953, Cushman Found. Foram. Res., Spec. Publ. 2, p. 13, pl. 2, figs. 20-22.

Quinqueloculina sp. Pl. 1, fig. 28.

Reophax nana Rhumbler. Pl. 1, fig. 29. (Rhumbler, 1913, Ergeb. Plankton-Exped. Humboldt Stift., v. 3, pt. 2, p. 471, pl. 8, figs. 6-12). Parker, Phleger and Peirson, 1953, Cushman Found. Foram. Res., Spec. Publ. 2, p. 13, pl. 1, fig. 11.

Rosalina floridana (Cushman). Pl. 1, figs. 30, 31. *(Discorbis floridanus* Cushman, 1922, Carnegie Inst. Washington, Publ. n. 311, p. 39, pl. 5, figs. 11, 12). Parker, 1954 (as *Rosalina),* Harvard Coll. Mus. Comp. Zool. Bull., v. 111, n. 10, p. 254, pl. 8, figs. 19, 20.

Triocalinella obliquinoda Riccio. Pl. 1, fig. 32. (Riccio, 1950, Contr. Cushman Found. Foram. Res., v. 1, pts. 3, 4, p. 90, pl. 15, figs. 1a-c, 2a-c). Parker, Phleger and Peirson, 1953, Cushman Found. Foram. Res., Spec. Publ. 2, p. 14, pl. 2, figs. 30-32.

DISCUSSION OF THE FAUNAS

The number of samples available for study of living Foraminifera from these areas is not sufficient to ascertain reliable distribution patterns of different faunas of Foraminifera. Scholl (1963) showed three different molluscan assemblages in each area, which may be generally described as nearshore open-gulf, lagoon and marsh. Benda and Puri (1962) distinguished four assemblages of Foraminifera and Ostracoda: 1) marsh river, 2) a lagoonal 3) Mangrove island, and 4) open-gulf. Several species of the Foraminifera recognized in this area are considered to characterize the open ocean in other parts of the Gulf of Mexico. Examples of these are *Bolivina striatula, Bulimina marginata, Buliminella elegantissima* and *Rosalina floridana.* These forms occur at the more open-gulf stations but some of them also occur well away from apparent unrestricted open-gulf influence.

The fauna contained in most of the present samples may be described as an *Ammonia beccarii — Elphidium* assemblage. At six stations, however, *Ammobaculites salsus* is abundant and the assemblage is an *Ammobaculites — Ammonia — Elphidium* one. Five of these stations (260, 261, 262, 283 and 290) come within Scholl's assemblage III in the Ten Thousand Islands area which apparently has more marsh influence than his other faunas in that area.

The foraminiferal fauna in this area is dominantly calcareous. At most stations more than 90% of the species have calcareous tests, and no sample contains less than 50% calcareous forms. This composition differs markedly from most marsh faunas previously reported where the assemblages have been described as mostly or entirely composed of arenaceous tests. The absence of calcareous forms in other marshes has been attributed to the low pH existing in them, due to high contents of organic matter within fine-grained and clays. The present sediments contain abundant fine-grained

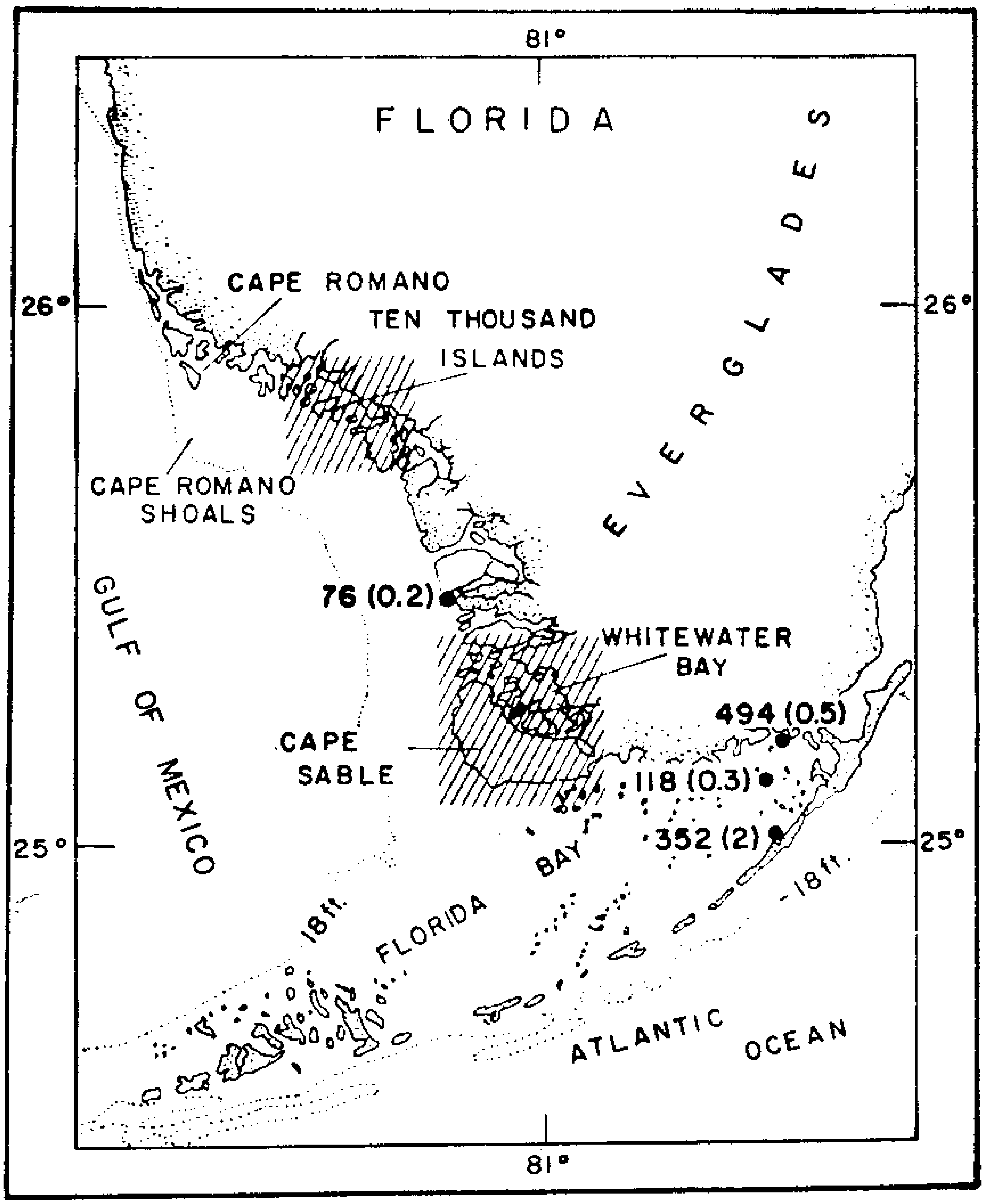

Figure 3a. Total living population per standard sample and living total ratios (in parentheses) at stations outside principal samplig areas.

materials and the organic contents are high, according to Scholl. An explanation for the propagation and survival of abundant calcareous species may be the composition of the sediments which contain an abundance of calcium carbonate, both as fine mud and as shelly material. Abundant calcium carbonate will neutralize the organically derived acids and provide an environ-

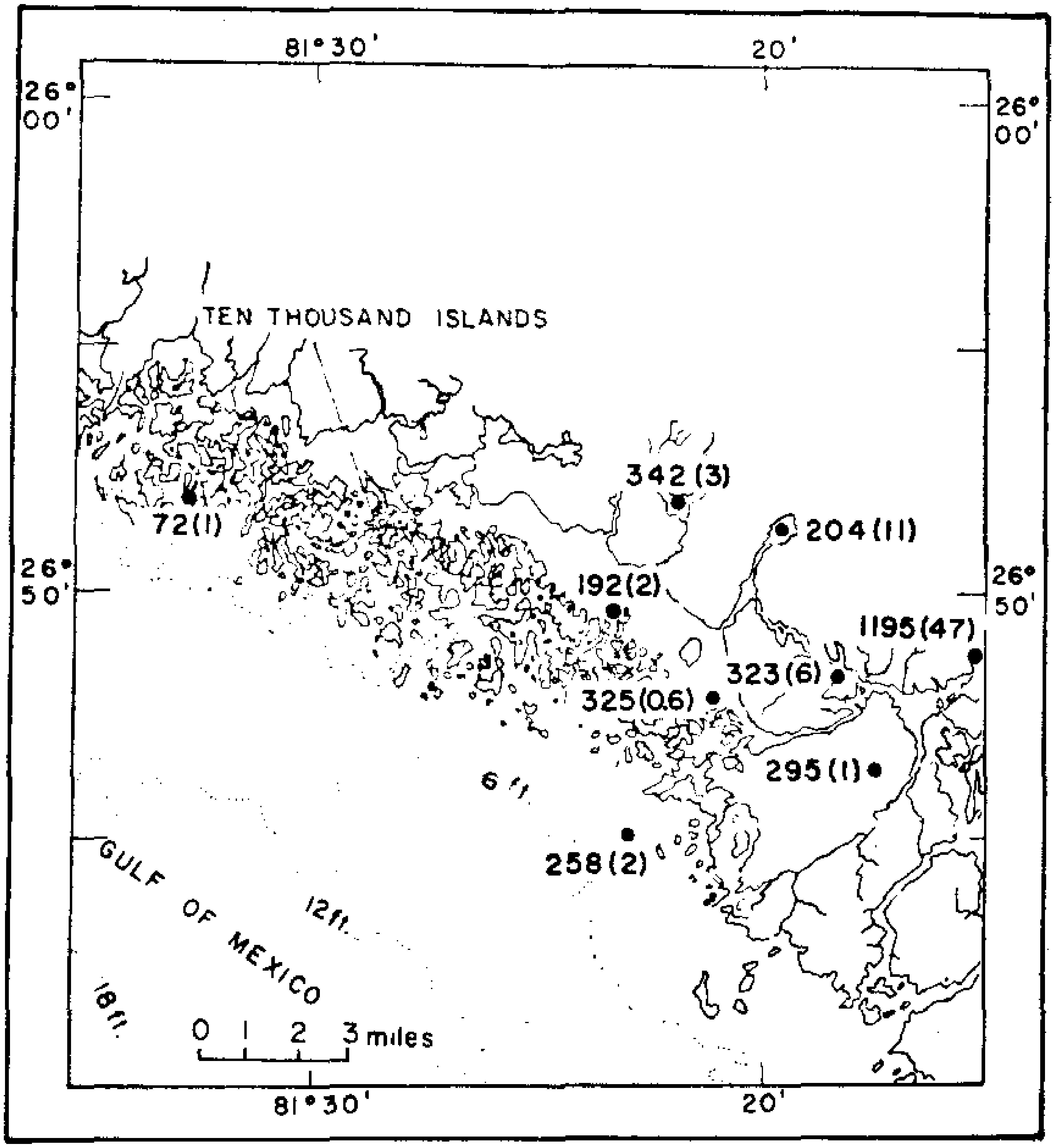

Figure 3b. Total living population per standard sample and living-total ratios (in parentheses) in Ten Thousand Island area.

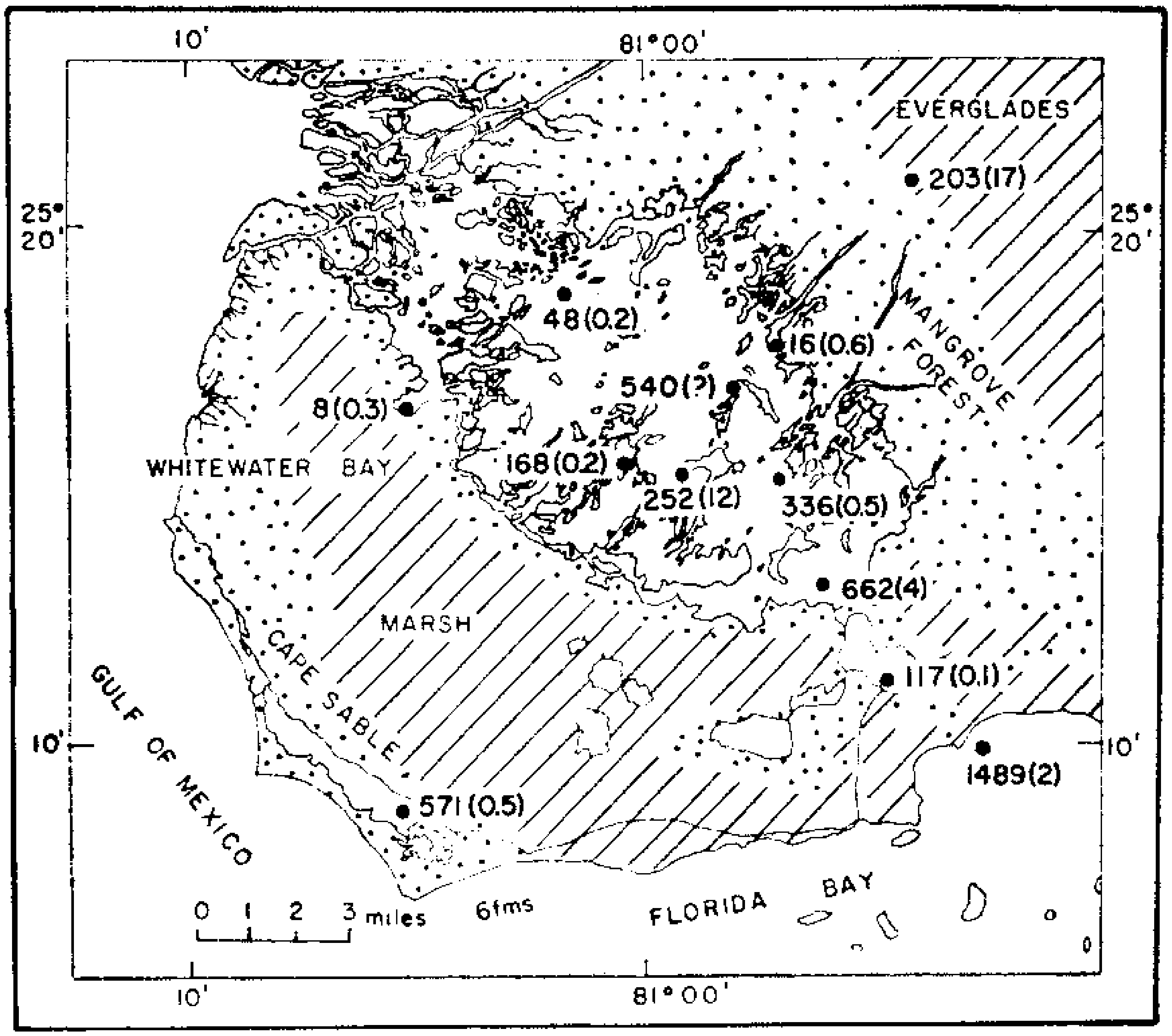

Figure 3c. Total living populations per standard sample and living-total ratios (in parentheses) in Whitewater Bay area.

ment suitable for the growth of calcareous tests. The presence of abundant molluscan shells preserved after death of the animal also indicates that this is occurring. Such an environment in this location probably is related to the source area for the sediments in which calcareous materials dominate and clay minerals are quantitatively insignificant.

The mangrove marsh environment is dominant in these areas. There are numerous mangrove islands, even in more open-bay areas; the open bay in the Ten Thousand Islands area is submerged mangrove marsh. It would appear, therefore, that the marsh environment should dominate the entire area and the foraminiferal faunas should be principally well-known marsh species. This is not the case. The only species present which is known to be restricted to a marsh environment elsewhere is *Miliammina fusca*, and this was found in very low frequencies in only a few samples. The general composition of the fauna is similar to the bay fauna in the San Antonio Bay, Texas, area (Parker *et al.*, 1953), which has a markedly different geography than the Ten Thousand Islands and Whitewater Bay areas.

The sizes of the living populations of Foraminifera are shown on Figs. 3 a-c as numbers of living specimens in 10 ml of wet surface sediment. The populations were much larger than average living populations in 6 of the 25 samples studied. The explanation for these large populations is not clear. It has been observed previously (Lankford, 1959) that marsh populations may vary greatly in size and that some are very large.

The living-total population ratio of Foraminifera has been used to estimate relative rates of deposition of sediment (see Phleger, 1960, p. 189). The living-total population ratios in the present areas are very low (0.1-4) at most stations (Figs. 3 a-c). The ratios are significantly larger at stations 103, 110, 260 and 262. This suggests that present-day sedimentation rate is very slow at the stationel samples except at the four indicated where a moderately rapid sedimentation rate is occurring. Three of the four stations having fast deposition are in small streams in the mainland marsh. This suggests that the mainland marsh is trapping much or all of the sediment being supplied to the area by streams during times of heavy runoff.

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PLATE 1

Figures

1, 2. ***Ammobaculites salsus*** **Cushman and Brönnimann variants. × 30.** Sta. 262

3. *Ammobaculites exiguus* Cushman and Brönnimann. × 51 Sta. 262.

4. *Bolivina striatula* Cushman. × 51. Sta. 4.

5, 6, 9, 10. *Ammonia beccarii* (Linné) variants. 5, × 43; 6, × 57; 9, 10, × 37. Sta. 109.

7. *Buliminella elegantissima* (d'Orbigny). × 62. Sta. 4.

8. *Bolivina variabilis* (Williamson). × Sta. 7.

11. *Elphidium matagordanum* (Kornfeld). × 43. Sta. 283.

12. *Elphidium gunteri* Cole. × 60. Sta. 4.

13. *Elphidium galvestonense* Kornfeld. × 30. Sta. 7.

14. *Elphidium incertum mexicanum* Kornfeld. ?. Sta. 4.

15. *Elphidium poeyanum* (d'Orbigny). × 43. Sta. 109.

16. *Elphidium tumidum* Natland × 43. Sta. 4.

17. *Elphidium* sp. × 37. Sta. 7.

18. *Gaudryina exilis* Cushman and Brönnimann. × 60. Sta. 4

19. *Glomospira* sp. × 57. Sta. 4.

20. *Miliammina fusca* (Brady). × 51. Sta. 283.

21. *Miliolinella circularis* (Bornemann). × 30. Sta. 7.

22. *Nonionella* cf. *N. atlantica* Cushman. × 67. Sta. 4.

23. *Quinqueloculina laevigata* d'Orbigny. × 37. Sta. 52.

24. *Quinqueloculina lamarckiana* d'Orbigny. × 30. Sta. 7.

25. *Quinqueloculina poeyana* d'Orbigny. × 51. Sta. 7.

26. *Quinqueloculina wiesneri* Parr. × 62. Sta. 7.

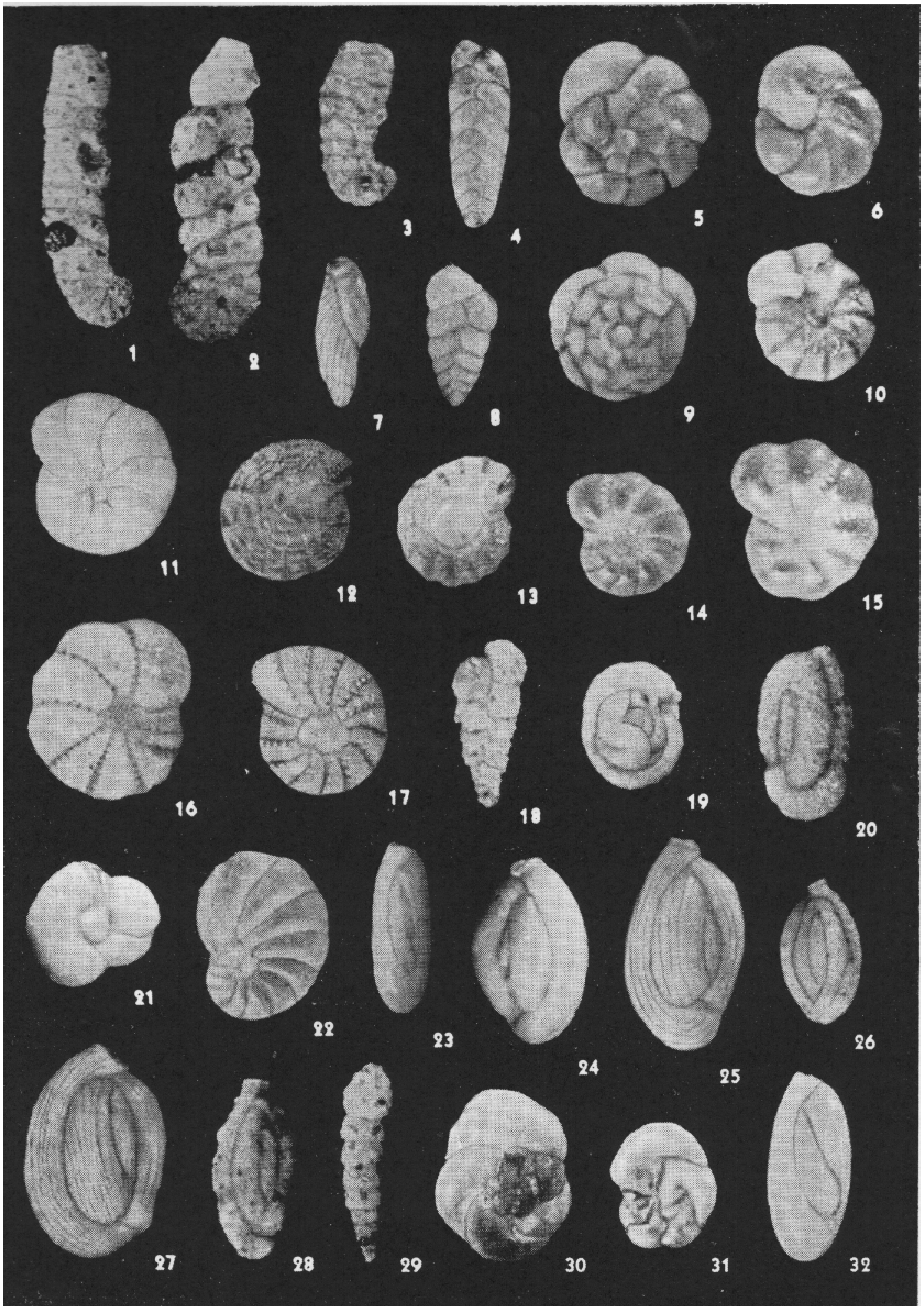
27. *Quinqueloculina tenagos* Parker. × 37. Sta. 7.

28. *Quinqueloculina* sp. × 60. Sta. 109.

29. *Reophax nana* Rhumbler. × 51. Sta. 4.

30, 31. *Rosalina floridana* (Cushman). × 30. Sta. 111.

32. *Triloculinella obliquinoda* Riccio. × 51. Sta. 52.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