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Surficial sediment texture along a beach and nearshore profile of Isles Dernieres, Louisiana

by

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INTRODUCTION

Barrier islands along the coast of Louisiana are presently the subject of an intensive study on barrier island erosion. This project is being cooperatively investigated by the U.S. Geological Survey (USGS) and the Louisiana Geological Survey (LGS). An overview of this study is presented in Sallenger et.al., 1987.

The Isles Dernieres barrier island group lies approximately 128 km south-southwest of New Orleans, Louisiana (Fig. 1). Using vertical aerial photography taken in 1985, a shoreline of the central part of Isles Dernieres was digitized. This shoreline and the location of the beach and nearshore study area are shown in Figure 2. A Temporary Bench Mark (TBM) was established using an existing Corps of Engineers bench mark. The TBM is located at latitude 29°02.67'N and longitude 90°44.77'W. A beach and nearshore profile was established perpendicular to the shoreline and centered on the TBM. Onshore and in shallow water (1.5 m), horizontal and vertical distances were measured using a Hewlett-Packard Model 3810A infrared rangefinder. In waters deeper than 1.5 m, measurements were made using the rangefinder and a Raytheon DE 719 200 kHz continuous recording fathometer. Offshore measurements took place onboard the R/V Mestayer (length = 6.4 m) of the Louisiana Geological Survey and the R/V Acadiana (length = 17 m) of the Louisiana Universities Marine Science Consortium (LUMCON). The profile at Isles Dernieres was adjusted to the 1965 National Geodetic Vertical Datum using tide gauge data from the station at Cocodrie, Louisiana. The profile was measured from the bayou on the protected side of the island, across the barrier island, and offshore to a distance 1870 m from the TBM. Figure 3a presents the profile and the locations of 32 sediment samples taken along the profile.

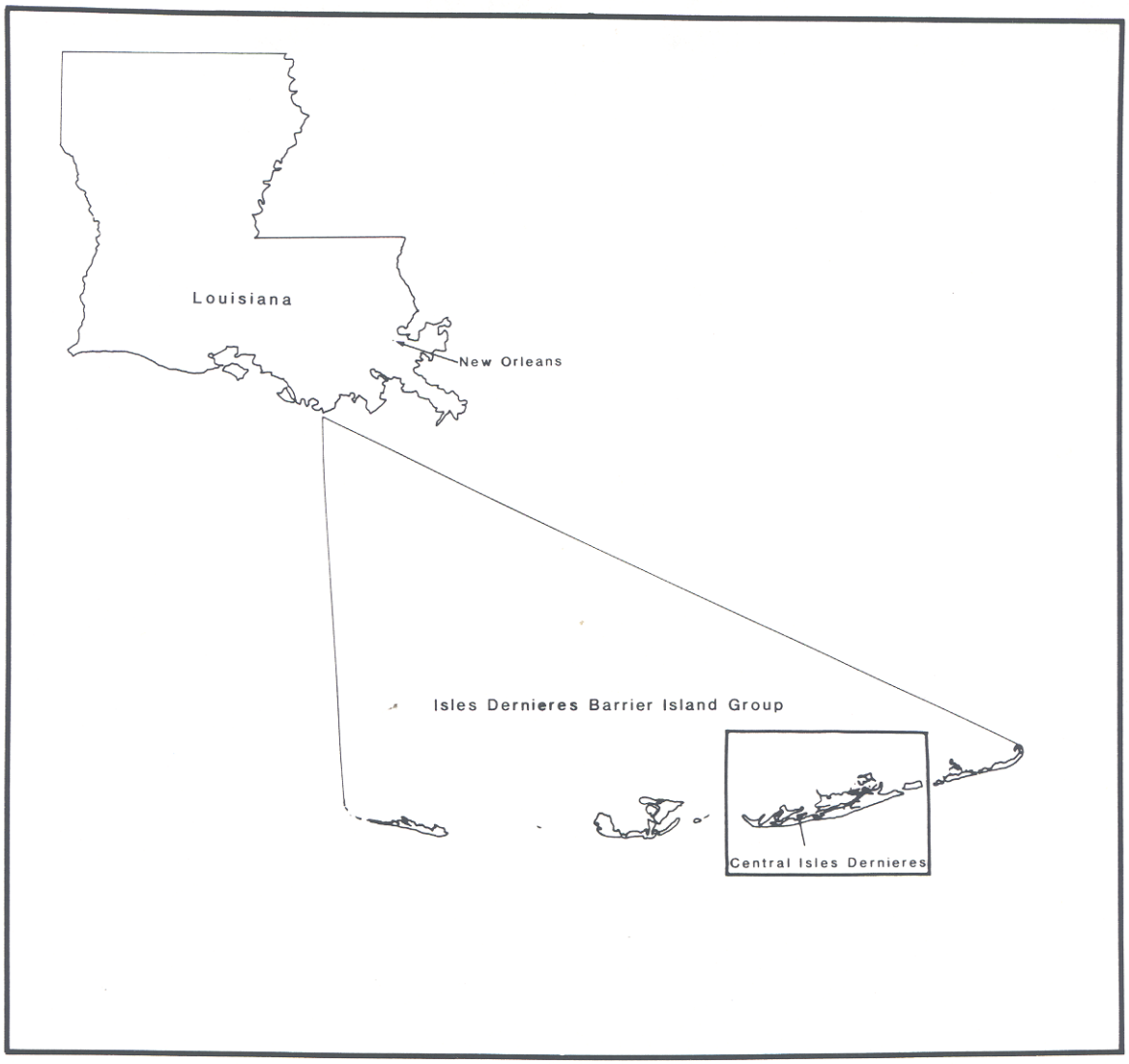

Figure 1. Map showing location of Isles Dernieres barrier island group along the coast of Louisiana; insert shows central Isles Dernieres.

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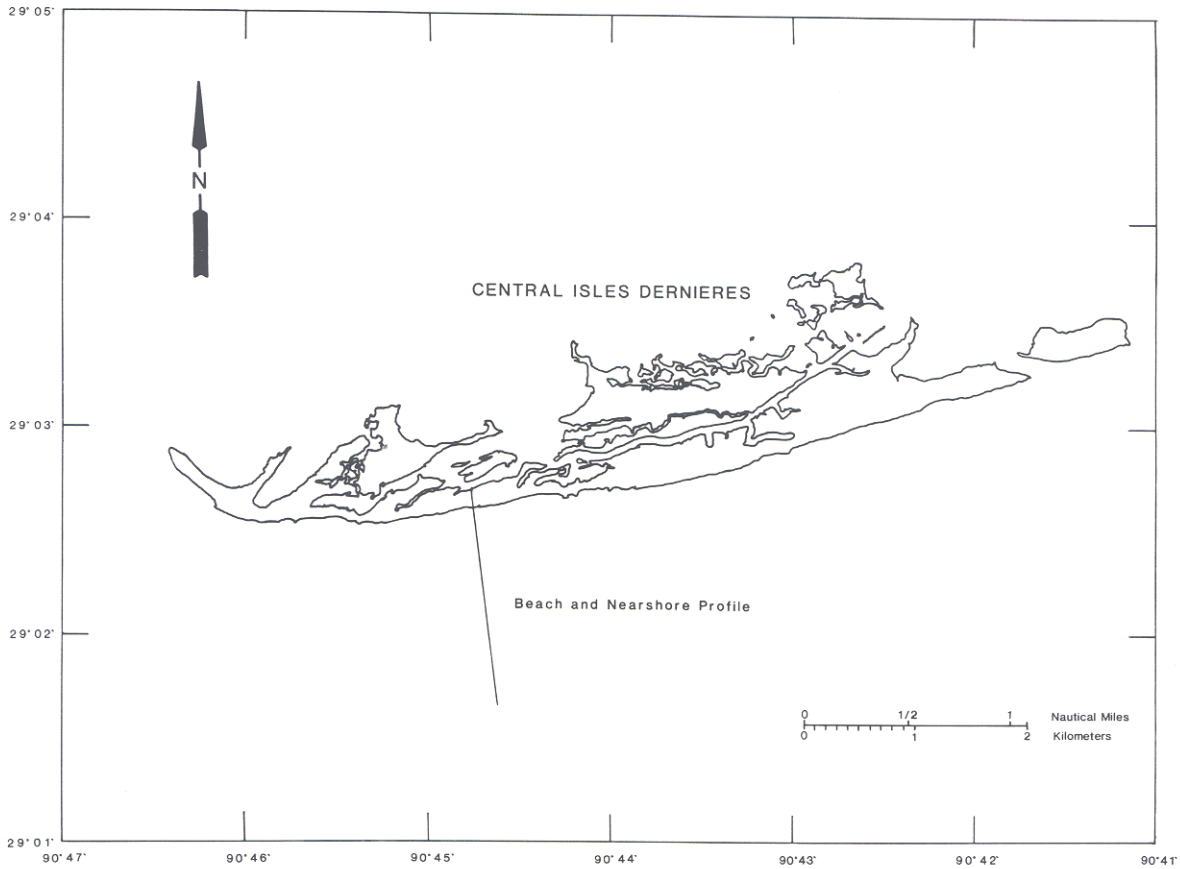

Figure 2. 1985 Shoreline of central Isles Dernieres and location of beach and nearshore profile.

Samples taken along line

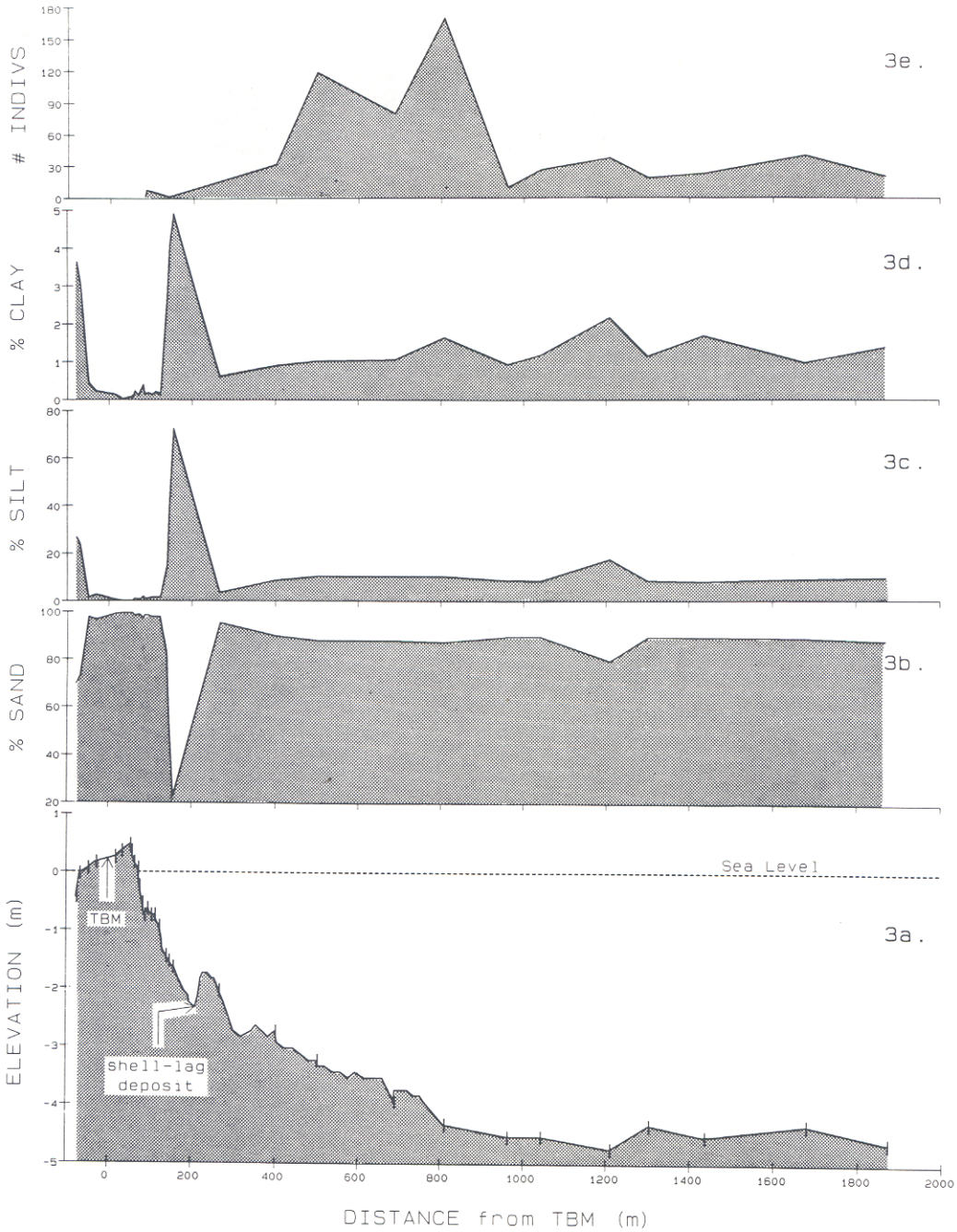

Figure 3. (a) Topography and bathymetry of beach and nearshore profile and sample locations; percent dry weight distribution of sand (b), silt (c), and clay (d) along profile; (e) number of individuals of M. lateralis found at each sample site.

METHODS and DATA PRESENTATION

Samples were taken onshore and in shallow water by hand using a plastic core tube 15 cm long with a diameter of 3.8 cm. In deeper water, the R/V Acadiana was used to launch and retrieve a small capacity (1300 cc) bottom grab sampler. Grain size analyses were done at the Sediment Analysis Laboratory of the U.S.G.S., Branch of Atlantic Marine Geology in Woods Hole, MA. Methods used included an RSA (Rapid Sediment Analyzer; Schlee, 1966) for sand size sediments and a Coulter Counter for silt and clay particles. Table 1 lists the values for sand, silt, and clay as a percent dry weight of the sample. The distances and elevations of the sediment samples, as measured from the TBM, are also listed in Table 1. The categories used in the sediment size analyses are sand, $< 4.0\ \phi$; silt, 4.0 to $8.0\ \phi$; and clay, $> 8.0\ \phi$.

The distribution of sand, silt, and clay along the profile are shown in Figure 3 b,c,and d. A sharp decrease in sand (22.77% dry weight of the sample) and increase in silt (72.34%) and clay (4.89%) occurs at approximately 150 m seaward of the TBM. Observations suggest this marked change may also occur in the shell-lag deposit found in an offshore trough (Fig. 3a). The shells in this trough are primarily large (5-15 cm in diameter) disarticulated bivalves belonging to the genera Mercenaria (quahog) and Laevicardium cf. robustum (Giant Atlantic Cockle). A sample was attempted by hand, but could not penetrate due to the consolidation characteristics of the sediment and presence of large shells.

Seaward of the shell-lag deposit, sediments are characteristically sandy-silts and contain high numbers of individuals of the infaunal dwarf surf clam, Mulinia lateralis (Say, 1822). Ninety-seven percent (97%) of the M. lateralis along the entire profile occurred in this sandy-silt environment (Fig. 3e). This agrees with Parker's works of 1956 and 1975 in which he states that M. lateralis is an indicator species of organic-rich sandy-silts in both the Atlantic and Gulf of Mexico.

Table 1. Distances, elevations, sediment types and number of dwarf surf clams along the beach and nearshore profile.

	SAMPLE ID	SAMPLE DIST (m)	SAMPLE ELEV (m)	% TOTAL SAND	% TOTAL SILT	% TOTAL CLAY	# OF INDIVS
1	BPS-22	-77.2	-0.4	69.69	26.67	3.64	-
2	BPS-21	-69.4	0.0	73.16	23.77	3.07	-
3	BPS-09	-49.0	0.1	97.81	1.75	0.44	-
4	BPS-08	-30.3	0.2	96.95	2.81	0.24	-
5	BPS-06	15.8	0.3	99.31	0.55	0.14	-
6	BPS-05	32.0	0.4	99.81	0.17	0.02	-
7	BPS-04	53.1	0.5	99.75	0.17	0.08	-
8	BPS-03	55.9	0.4	99.73	0.24	0.03	-
9	BPS-02	62.1	0.2	98.61	1.15	0.23	-
10	BPS-01	71.5	0.1	99.14	0.75	0.11	-
11	BPS-10	75.6	-0.2	98.93	0.82	0.24	-
12	BPS-11*	82.5	-0.5	97.49	2.11	0.40	2.0
13	BPS-12*	86.8	-0.7	98.79	1.06	0.15	8.0
14	BPS-20	94.9	-0.6	98.65	1.17	0.18	-
15	BPS-19	103.8	-0.7	98.16	1.71	0.13	-
16	BPS-18*	112.9	-0.7	98.08	1.71	0.21	5.0
17	BPS-17	123.6	-0.9	98.17	1.70	0.13	-
18	BPS-15*	139.5	-1.4	82.37	14.93	2.70	2.0
19	BPS-14	146.5	-1.5	54.02	41.93	4.06	-
20	BPS-13	156.0	-1.6	22.77	72.34	4.89	-
21	PC-01	266.1	-2.0	95.72	3.66	0.62	-
22	PC-02*	400.3	-2.7	90.26	8.84	0.90	32.0
23	PC-03*	501.0	-3.2	88.50	10.47	1.03	119.0
24	PC-04*	687.8	-3.9	88.47	10.47	1.06	80.0
25	PC-05*	808.5	-4.3	87.79	10.56	1.66	170.0
26	PC-06*	961.7	-4.5	90.23	8.82	0.95	10.0
27	PC-07*	1041.9	-4.5	90.21	8.60	1.18	27.0
28	PC-08*	1207.9	-4.7	80.09	17.73	2.18	38.0
29	PC-09*	1300.8	-4.3	90.16	8.69	1.15	19.0
30	PC-10*	1435.2	-4.5	90.07	8.23	1.69	23.0
31	PC-11*	1677.1	-4.3	89.87	9.14	0.99	40.0
32	PC-12*	1870.2	-4.6	88.97	9.65	1.38	21.0

* samples with *M. lateralis*

REFERENCES

Parker, R.H., 1956, Macro-invertebrate assemblages as indicators of sedimentary environments in east Mississippi Delta region. Bulletin of the American Association of Petroleum Geologists, 40(2):295-376.

_____, 1975, The Study of Benthic Communities: A Model and a Review. Elsevier Scientific Publishing Co., New York, 279p.

Sallenger, A.H.,Jr., Penland,S., Williams,S.J., and Suter, J.R., 1987, Louisiana barrier island erosion study. Coastal Sediments '87, American Society of Civil Engineers Specialty Conference, New Orleans, LA, May, 1987, v. 2, pp. 1503-1516.

Schlee, J., 1966, A modified Woods Hole Rapid Sediment Analyzer. Journal of Sedimentary Petrology, 36(2):403-413.

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