Holocene Sediments and Stratigraphy of Marshes at Chincoteague Inlet, Virginia*

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Abstract

HOLOCENE SEDIMENTS AND STRATIGRAPHY OF MARSHES

AT

CHINCOTEAGUE INLET, VIRGINIA

Thesis

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of the Requirements for the Degree of
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by

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ABSTRACT

Characteristics of sediments deposited in the marsh, tidal flat, bay, oyster shoal (bay), tidal channel, and back-barrier island - flood tidal delta depositional environments of Chincoteague Inlet lagoon are sufficiently different that the environments can be recognized in fixed-piston cores. Detailed descriptions of many cores taken according to a predetermined grid system enable the cores to be correlated with one another and meaningful stratigraphic cross-sections constructed. The stratigraphic sequence and relationships described in the cross-sections depict the anatomy of the Chincoteague flood tidal delta. Facies of the tidal delta are used to construct a depositional model of sedimentation.

The model considers the origin of the lagoon and barrier islands during transgression of the sea, and the filling of the lagoon by flood tidal delta sediments according to three different stages:

(1) initial filling of the lagoon by the flood tidal delta, characterized by poorly-developed unstable channels that produced a fan-type mouth bar of sand near the inlet whereas finer sediments were dispersed farther into the lagoon;

(2) narrowing of the original width of the inlet by lateral accretion of the barrier islands and the formation of marsh islands along the crest of the mouth bar, causing stabilization of tidal channels, that serve as thorofares for sand transport farther into the lagoon and form tidal-

mouth bars at their termination in open bays; and

(3) further narrowing of the inlet by barrier island accretion and bay-fill of the subtidal delta platform resulting in the extensive development of marsh and distributary tidal channel delta plain environments, with tidal flow restricted to relatively deep, narrow, and stable channels and tidal-mouth bar sedimentation continuing in smaller more bayward mouth bars at the terminus of major channels.

Laboratory analysis on samples taken from the interpretive depositional environments penetrated by a core may be used to refine field descriptions. Geochemical, mineralogical, and textural parameters were quantitatively measured on very closely-spaced samples taken vertically in a fixed-piston core. Because interrelationships between the variables were very difficult to visually analyze, a Q-mode factor analysis was utilized to define any relationships that existed. Results of the computer analysis indicate an organic-silt factor, pH-quartz-sand factor, and Eh-pH-clay factor adequately explain nearly all the variance present in the original ten variables measured on 35 samples. The influence of each factor on the samples taken from different depositional environments can be shown graphically, indicating any correlation between the factor groupings of samples and facies groupings limiting a sample to a certain group. The factor analysis method of handling numerous quantitative parameters measured on core samples in the laboratory may be a valuable tool in the interpretation of depositional environments when combined with the qualitative visual field description of the core.