

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

P.M. (Mitch) Harris¹

Search and Discovery Article #60012 (2009)

Posted February 27, 2009

*Summary (table of contents and abstract) of unpublished M.S. Thesis, West Virginia University, Morgantown, WV, 1973, 214 p.

¹ETC, Chevron, San Ramon, CA, USA. (MitchHarris@chevron.com)

[Table of Contents](#)

[Abstract](#)

HOLOCENE SEDIMENTS AND STRATIGRAPHY OF MARSHES

AT

CHINCOTEAGUE INLET, VIRGINIA

Thesis

**Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science**

**In the
Faculty of the Graduate School
of
West Virginia University**

by

Paul Mitchell Harris, B.S.

**Morgantown
West Virginia
1973**

TABLE OF CONTENTS

	Page
INTRODUCTION.....	1
Purpose and Scope.....	1
Review of Literature.....	3
Barrier Islands.....	3
Lagoons.....	5
Delmarva Peninsula.....	7
Physiographic Setting and Depositional Environments.....	11
Barrier Islands.....	11
Wallops Island.....	11
Chincoteague Island.....	12
Assateague Island.....	14
Lagoonal Areas.....	15
Bay.....	18
Tidal Flat.....	18
Marsh.....	19
Tidal Channels.....	21
Mainland.....	22
Methods of Investigation.....	23
Field Methods.....	23
Fixed-Piston Cores.....	23
Jet-Borings.....	26
Laboratory Methods.....	27
Map Analysis.....	27
Sedimentation Analysis.....	31
Complete Sedimentation Analysis.....	34
Jet-Boring Descriptions.....	35
NASA Core Descriptions.....	36
Detailed Investigation of Fixed-Piston Core CP-1.....	36
Sample Preparation.....	37
Low-Temperature Ashing.....	38
X-Ray Diffraction Analysis.....	39
Sulfur Species Analysis.....	41
Land-Sea Relationships and Barrier Island Formation.....	42
ANALYSIS AND INTERPRETATION OF DATA.....	49
Map Analysis.....	49
Sediments of Depositional Environments, Stratigraphic Sequence and Relationships.....	58
Sediments of Marsh Depositional Environment.....	58
Sediments of Tidal Flat Depositional Environment.....	64
Sediments of Bay Depositional Environment.....	74
Sediments of Back-Barrier Island - Flood Tidal Delta Depositional Environment.....	80
Sediments of Fringing Marsh Depositional Environment.....	82
Sediments of Tidal Channel Depositional Environment.....	82
Summary.....	86

	Page
Stratigraphic Cross-Sections.....	89
Stratigraphic Cross-Section A-A'.....	91
Stratigraphic Cross-Section B-B'.....	94
Stratigraphic Cross-Section C-C'.....	96
Stratigraphic Cross-Section D-D'.....	98
Stratigraphic Cross-Section E-E'.....	100
Stratigraphic Cross-Section F-F'.....	100
Depositional Model for Sedimentation	
In Chincoteague Inlet Lagoon.....	104
Stage 1.....	107
Stage 2.....	109
Stage 3.....	111
Complete Size Analysis of Fixed-Piston Core CP-1 Samples	
and Characterization of the Size Frequency Distributions	
of Lagoonal Sediments.....	115
Samples From Lagoon Depositional Environments.....	120
Summary.....	123
Sulfur Species Analysis.....	125
Interrelationships Between Variables	
Measured on Fixed-Piston Core CP-1 Samples.....	131
RECOMMENDATIONS FOR FUTURE INVESTIGATIONS	
IN THE CHINCOTEAGUE INLET LAGOON.....	145
ABSTRACT.....	147
SELECTED REFERENCES.....	149
APPENDICES.....	155
Appendix A	
Eh and pH Readings for Fixed-Piston Cores.....	155
Appendix B	
Fixed-Piston Core Descriptions.....	162
Appendix C	
Jet-Boring and NASA Core Descriptions.....	198
Appendix D	
Integrated Intensity of Strong Line for	
Mineral Species Recognized in Core CP-1 Samples.....	212

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 thoroughfares 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.