

Best, Kelly M., QUATERNARY GEOLOGIC EVOLUTION OF THE CROATAN BEACH RIDGE COMPLEX, BOGUE SOUND, AND BOGUE BANKS CARTERET COUNTY, NC. (Under the direction of Drs. David J. Mallinson and Stephen J. Culver) Department of Geological Sciences, January 19, 2010.

Foraminiferal, lithologic, chronostratigraphic, and geophysical data were utilized to describe the Quaternary geologic evolution of the Croatan Beach Ridge Complex, Bogue Sound, and Bogue Banks. The Croatan Beach Ridge Complex is a beach ridge feature located on the mainland of Carteret County, NC. It is separated from the adjacent barrier island, Bogue Banks, by Bogue Sound. Seventeen geoprobe and vibracores were collected along four shore-normal and shore-parallel transects from within the beach ridge complex, on the sound side of Bogue Banks, and in Bogue Sound. Seven depositional facies representing various coastal paleoenvironments were identified using sedimentological data and a cluster analysis of foraminiferal samples taken from core material. Three of these depositional facies were determined to be of normal marine salinity (high energy normal marine salinity, low energy normal marine salinity, and shallow inner shelf) and comprise the basal units of the Croatan Beach Ridge Complex, Bogue Banks, and Bogue Sound. The high energy normal marine salinity depositional facies is characterized by *Buccella inusitata*, *Cibicides lobatulus*, *Elphidium galvestonense*, *Eponides repandus*, *Hanzawaia strattoni*, *Nonionella atlantica*, *Quinqueloculina* spp., and *Textularia* cf. *T. gramen*. The low energy normal marine salinity depositional facies is characterized by *Bolivina lowmani*, *Bolivina paula*, *Eponides repandus*, *Gavelinopsis praegeri*, *Quinqueloculina seminula*, and *Rosalina floridana*. The shallow inner shelf depositional facies is characterized by *Bolivina*

lowmani, *Buliminella elegantissima*, and *Quinqueloculina bosciana*. The flood tide delta depositional facies contains a diverse foraminiferal assemblage with abundant *Elphidium excavatum*, *Ammonia parkinsoniana*, and *Elphidium mexicanum* and is found in the older sediments underlying Bogue Sound. The high salinity estuary depositional facies, restricted to basal units of Bogue Sound and Bogue Banks, is characterized by *Ammonia tepida*, *Elphidium poeyanum*, *Haynesina germanica*, and *Trochammina* sp. The high energy back-barrier lagoon depositional facies comprises the modern sediment of Bogue Sound and contains the shelf taxa typical of assemblages South of Cape Hatteras (such as *Ammonia* cf. *A. beccarii* and *Elphidium gunteri*) as well as agglutinated species (*Ammotium salsum*).

Chronostratigraphic data combined with foraminiferal, sedimentological, and geophysical data suggest that the Croatan Beach Ridge Complex formed and prograded south during MIS 5a (~80-95 ka), producing a cape structure at the southern end of the Suffolk Scarp. Similar data suggest aeolian reactivation of the upper segments of the Croatan Beach Ridge Complex during MIS 2 (~18 ka). OSL and radiocarbon age estimates and the occurrence of flood tide delta deposits indicate the formation of Bogue Banks approximately 6 ka. Seaward and westward spit progradation of Bogue Banks began in the Pine Knoll Shores area ca. 1.7 ka and continued to the eastern tip of Salter Path until ca. 1.3 ka. This corresponds to a spit progradation rate of ~16 m/yr, a rate similar to those found at Oregon Inlet. Normal marine salinity conditions were present in Bogue Sound ca. 1.1 ka, suggesting removal of at least the narrowest parts of Bogue

Banks, coincident with the collapse of segments of the barrier islands along the Outer Banks.

Quaternary Geologic Evolution of the Croatan Beach Ridge Complex, Bogue Sound, and
Bogue Banks, Carteret County, NC.

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TABLE OF CONTENTS

LIST OF TABLES.....	xiii
LIST OF FIGURES.....	xiv
CHAPTER ONE: INTRODUCTION.....	1
PURPOSE OF STUDY.....	1
OBJECTIVES.....	5
CHAPTER TWO: PREVIOUS WORK.....	6
REGIONAL GEOLOGIC FRAMEWORK.....	6
The Suffolk Scarp.....	8
Croatan Beach Ridges.....	9
Bogue Banks.....	12
Geomorphology of Beach Ridges.....	24
FORAMINIFERA.....	26
Foraminifera as Paleoenvironmental Indicators.....	26
Modern United States Atlantic Coast Foraminiferal Assemblages.....	27
<i>Estuaries, Sounds, and Lagoons</i>	29
<i>Overwash and Inlets</i>	34
<i>Salt Marshes</i>	36
Modern United States Atlantic Continental Shelf Foraminiferal Assemblages.....	38
.....	38
<i>Murray (1969)</i>	39
<i>Schnitker (1971)</i>	41

<i>Workman (1981)</i>	42
CHRONOSTRATIGRAPHY.....	45
Optically Stimulated Luminescence.....	45
Radiocarbon Dating.....	48
GEOPHYSICAL DATA.....	50
SEA LEVEL CURVES FOR NORTH CAROLINA.....	55
CHAPTER THREE: METHODOLOGY.....	62
GEOPROBE CORING.....	62
VIBRACORING.....	64
LITHOLOGY AND SEDIMENTOLOGY.....	64
FORAMINIFERAL ANALYSES.....	65
CLUSTER ANALYSIS.....	67
OPTICALLY STIMULATED LUMINESCENCE (OSL) CORE COLLECTION.....	67
RADIOCARBON DATING SAMPLE COLLECTION AND PROCESSING.....	69
GEOPHYSICAL DATA ACQUISITION.....	69
Ground Penetrating Radar.....	69
Seismic Surveys.....	69
CHAPTER FOUR: RESULTS AND INTERPRETATION.....	71
LITHOFACIES DESCRIPTIONS.....	71
Sand (S).....	71
Organic-rich Sand (orgS).....	76
Muddy Sand (mS).....	76

Shelly, Muddy Sand (shmS).....	76
Shelly Sand (shS).....	78
Gravelly Sand (gS).....	78
Mud (M).....	78
Sandy Mud (sM).....	78
Shelly Mud (shM).....	81
Shelly, Sandy Mud (shsM).....	81
Interbedded Mud and Sand (I).....	81
Interbedded Mud and Sand with Shells (shI).....	84
Large Shells (Sh).....	84
BIOFACIES DESCRIPTIONS.....	86
Biofacies A.....	91
Biofacies B.....	91
Biofacies C.....	92
Biofacies D.....	93
Biofacies E.....	94
Biofacies F.....	94
DEPOSITIONAL FACIES DESCRIPTIONS.....	96
Depositional Facies I: Shallow Inner Shelf.....	96
Depositional Facies II: Low Energy Normal Marine Salinity.....	97
Depositional Facies III: High Energy Normal Marine Salinity.....	97
Depositional Facies IV: Flood Tide Delta.....	98

Depositional Facies V: High Salinity Estuary.....	100
Depositional Facies VI: High Energy Back Barrier Lagoon.....	101
Depositional Facies VII: Aeolian Sand.....	102
CHRONOSTRATIGRAPHY.....	103
OSL Age Estimates.....	103
<i>Croatan Beach Ridge Complex</i>	103
<i>Bogue Sound</i>	104
<i>Bogue Banks</i>	106
AMS ¹⁴ C Estimates.....	107
GEOPHYSICAL DATA INTERPRETATION.....	109
Ground Penetrating Radar.....	109
Seismic.....	122
PALEOENVIRONMENTAL RECONSTRUCTION.....	135
Transect A.....	135
Transect B.....	144
Transect C.....	148
Transect D.....	150
CHAPTER FIVE: DISCUSSION.....	154
LATE QUATERNARY DEPOSITS RELATED TO SEA-LEVEL CHANGE.....	154
MIS 6 to MIS 5e (150-120 ka).....	156
MIS 5c to 5a (110-70 ka).....	156
MIS 3 (60-40 ka).....	160

MIS 2 to 1 (30 ka to present).....	162
CHAPTER SIX: SUMMARY.....	172
REFERENCES.....	174
PLATES.....	197
APPENDIX A: Geoprobe and Vibracore Location, Elevation, and Length.....	201
APPENDIX B: Core Logs Including Foraminiferal and Grain Size, OSL, and AMS ¹⁴ C Sample Locations.....	203
APPENDIX C: GRADISTAT Statistics of Geoprobe Cores and Vibracores.....	222
APPENDIX D: Mud/Sand/Gravel Percentages for Foraminiferal Samples.....	226
APPENDIX E: Raw Census Data of Foraminiferal Assemblages.....	229
APPENDIX F: Relative Abundance Data of Foraminiferal Assemblages.....	233
APPENDIX G: Transformed Abundance Data of Foraminiferal Assemblages.....	236
APPENDIX H: Alphabetical List of Foraminiferal Taxa Identified to the Species Level with Original References.....	240
APPENDIX I: OSL and AMS ¹⁴ C Sample Information.....	245