



INTRODUCTION

The recent great interest in the petroleum potential of the Atlantic Continental Shelf has prompted a reconnaissance study by the U.S. Geological Survey of the subsurface Mesozoic and Cenozoic sediments of the South Carolina and Georgia coastal margins. This study has significantly increased the available stratigraphic information for this area by providing lithologic data from cores and cuttings, fossils, and (or) geophysical logs from a number of previously undescribed water wells, oil tests, and stratigraphic tests. The purpose of this and related reports (Gohn and others, 1978) is to provide a generalized stratigraphic framework from these data that can serve as a starting point for more detailed stratigraphic studies of both the emergent and submergent parts of the South Atlantic Continental Shelf.

This report describes the distribution of Cenozoic sediments along the South Carolina coastal margin. Cross sections employing in-hole geophysical logs have been drawn to illustrate the distribution of the major stratigraphic units. The units delineated on the cross sections are informal rock-stratigraphic units of approximately formation rank. Formal names have not been used, however, because of the present uncertainty in the relationship between surface and subsurface units and because stratigraphic positions of several of the surface formations are in progress. Ages of the units shown on the cross sections are given where they are known in specific boreholes.

Locations of samples containing stratigraphically significant planktonic foraminifers and (or) calcareous nanofossils are shown for each well log. The location of studied samples containing other fossil groups in borehole 11 were not examined during the present study. Ostracodes from the samples shown in borehole 7 were examined by J. E. Hazel. Names, locations, and other data for each borehole are given in table 1.

STRATIGRAPHIC UNITS

The most obvious feature of the cross sections is the thickening of the pre-Pliocene section from northeast to southwest. This relationship reflects, in large part, the controls exerted upon sedimentation in the area by uplift of the Cape Fear Arch to the northeast and subsidence of the Southeast Georgia Embayment to the southwest.

Unit Tp₁

Sediments assigned to unit Tp₁ are typically calcareous, medium to dark-gray, silty clay or muddy fine-grained sand. Calcium carbonate content typically increases downward in this unit in the form of nodules or thin limestone beds. Microfossils, mollusk fragments, and glauconitic are common constituents of all unit Tp₁ sediments. Based upon calcareous nanofossils (8, 10), foraminifers (8, 10, 11), pollen (8), ostracodes (7b, 8), and dinoflagellates (8), unit Tp₁ is of early Pliocene (Danian, Midwayan) age.

Unit Tp₂

Lithofacies A of unit Tp₂ is a heterogeneous unit consisting of several different lithologies (Tp_{2A}). Dark-colored, calcareous, microfossiliferous silty clay and muddy fine-grained sand predominate in the lower part of the unit. In the upper part of the unit, similar silty clay and muddy sand, macrofossiliferous quartzite limestone, and relatively well-sorted medium-grained sand alternate on a centimeter to decimeter scale. Calcareous nanofossils (9), planktonic foraminifers (8), ostracodes (7b, 8), and pollen (8) indicate a late Paleocene (Therapsid, late Midwayan to early Sabinian) age for unit Tp_{2A}.

Lithofacies B of unit Tp₂ consists primarily of micro- and microfossiliferous, glauconitic, fine- to medium-grained quartz sand or quartzite, fossiliferous limestone (Tp_{2B}). Cuttings from this unit suggest that much of this material is a poorly consolidated and fairly well-sorted sediment. Calcareous nanofossils (10) and foraminifers (11) indicate that unit Tp_{2B} is of late Paleocene (Therapsid, Midwayan to early Sabinian) age.

Units Tp_{2A} and Tp_{2B} undifferentiated

Units Tp_{2A} and Tp_{2B} are undifferentiated in boreholes 1, 2, 3, 4, and 5. A boundary between these two units could not be consistently identified in the cuttings and geophysical logs from these boreholes, and the Paleocene section in these holes is identified as undifferentiated unit Tp₂. Fossil data from borehole 5 and from nearby outcrops (Van Nieuwenhuise and Colquhoun, 1978) indicate that sediments of both Danian and Therapsid (Midwayan and early Sabinian) Age are present in unit Tp₂.

Unit Te₁

Unit Te₁ is a relatively thin but persistent stratigraphic unit. It typically consists of glauconitic, micro- and microfossiliferous calcareous clay or fine-grained limestone. Cuttings from this unit consist almost entirely of glauconite in borehole 11. Calcareous nanofossils (9, 10), planktonic foraminifers (8), and pollen (8) indicate that this unit is of early Eocene (Ipswich, late Sabinian) age.

Unit Te₂

Unit Te₂ is a southward-thickening sequence of limestone that comprises about half of the Cenozoic section in southern South Carolina. A variety of light-colored sediment types is present in this unit including fine-grained, clayey, microfossiliferous limestone, macrofossiliferous limestone, and macrofossiliferous fine- to coarse-grained quartz sand. Calcareous nanofossils (8, 10), foraminifers (8, 11), ostracodes (8), pollen (8), bryozoans (8, 11), and mollusks (7b, 11) indicate both middle and late Eocene (Lutetian to Bartonian, Clabornian to Jacksonian) ages for this unit. The lithologic and similarity of sediments of both ages, plus insufficient fossil data in most studied boreholes, did not allow for lithostratigraphic or temporal subdivisions of unit Te₂.

Unit Tn

Unit Tn is a heterogeneous sequence of sediments as described in boreholes 11, 12, 14, and 15 by Counts and Donsky (1963), McCollum and Counts (1964), and Siple (1969) and in nearby shallow boreholes by Horn and Johnson (1964). As described by these authors, unit Tn contains primarily phosphatic sand and gray-green silty clay. These authors assign a Miocene age to the sediments included here in unit Tn. Abbott (1974, 1975), Ernisee and Abbott (1976), and Ernisee and others (1977) consider the probable outcrop equivalents of unit Tn to be of Miocene age as well.

Unit P

Unit P is an undifferentiated sequence of poorly consolidated surficial sands and clays displaying a variety of textural, mineralogical, and faunal characteristics. This unit is of post-Miocene, principally Pliocene, age.

Numbers in parentheses indicate boreholes in which fossils were found.

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Table 1. Borehole data. Geographical data for the boreholes were originally in unrounded U.S. customary units. In names (see E. projector (see Ch. center) in column 2, other geological logs P, location).

Borehole name	Approximate location	Depth (ft)	Approximate elevation (ft)	Approximate date	Notes
1. Coosawatchie (Hawthorne) No. 1	Georgetown Co., 33°12' N, 79°12' W	844 (245)	15 (4.6)	6,8	
2. Litchfield	Charleston Co., 33°12' N, 79°12' W	762 (230)	10 (3.0)	6,8	
3. Deep Well	Charleston Co., 33°12' N, 79°12' W	814 (248)	15 (4.6)	6,8,9,10,11	
4. Beaufort (Hawthorne)	Charleston Co., 33°12' N, 79°12' W	1935 (590)	18 (5.5)	6,8,9	
5. Beaufort (Hawthorne)	Charleston Co., 33°12' N, 79°12' W	934 (284)	15 (4.6)	6,8	
6. Hole of Pines	Charleston Co., 33°12' N, 79°12' W	2287 (693)	12 (3.7)	6,8	
7a. Charleston (Hawthorne) No. 1	Charleston Co., 33°12' N, 79°12' W	2007 (612)	5 (1.5)	6	Ernisee (1974), data used with slight modification (1975)
7b. Charleston (Hawthorne) No. 2	Charleston Co., 33°12' N, 79°12' W	2078 (634)	10 (3.0)	6,8,9	
8. Clubhouse Crossroads No. 1	Charleston Co., 33°12' N, 79°12' W	2591 (792)	20 (6.1)	6,8,9,10,11	Horn and Johnson (1977) and others (1976) and Abbott (1976)
9. Black Island	Charleston Co., 33°12' N, 79°12' W	2287 (693)	10 (3.0)	6,8,9	Ernisee and Abbott (1976)
10. Ridge Island	Charleston Co., 33°12' N, 79°12' W	3168 (965)	5 (1.5)	6,8,9,10,11	Ernisee and Abbott (1976)
11. Beaufort Head No. 2	Charleston Co., 33°12' N, 79°12' W	3454 (1053)	18 (5.5)	6	Hazel (1981), 9555 data file, 1976-1981, 1984
12. Beaufort No. 1	Beaufort Co., 33°12' N, 79°12' W	600 (241)	17 (5.2)	6,8	McCollum and Counts (1964), Wilson Head I.
13. Wilson Head Island	Beaufort Co., 33°12' N, 79°12' W	2900 (883)	5 (1.5)	6,8,9	Ernisee and Abbott (1976)
14. Wilson Head Island	Beaufort Co., 33°12' N, 79°12' W	763 (231)	12 (3.7)	6,8	Counts and Donsky (1963), McCollum and Counts (1964)
15. Wilson Head Island	Beaufort Co., 33°12' N, 79°12' W	763 (231)	13 (4.0)	6	Counts and Donsky (1963), McCollum and Counts (1964)

PRELIMINARY STRATIGRAPHIC CROSS SECTIONS OF ATLANTIC COASTAL PLAIN SEDIMENTS OF THE SOUTHEASTERN UNITED STATES—CENOZOIC SEDIMENTS ALONG THE SOUTH CAROLINA COASTAL MARGIN

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