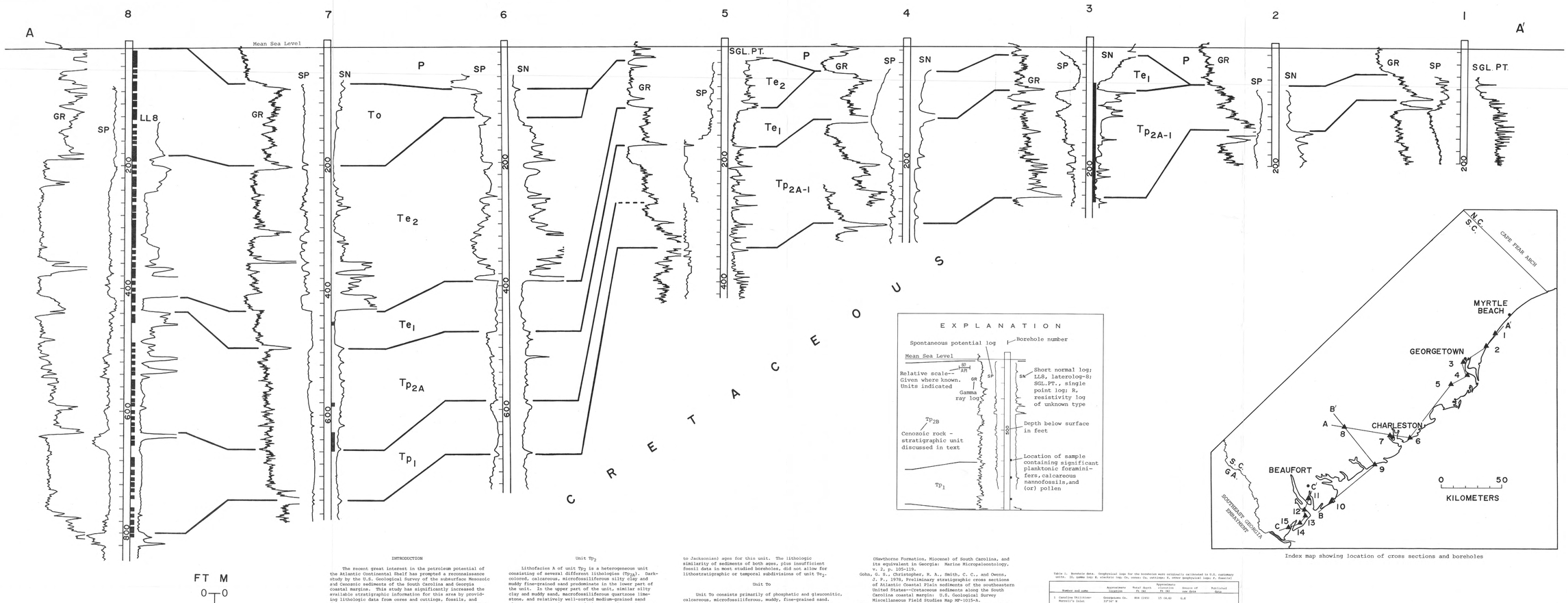
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE SOUTH CAROLINA GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF–1015 B
GOHN AND OTHERS–CENOZOIC SEDIMENTS,
SOUTH CAROLINA COASTAL MARGIN
SHEET 1 OF 2



Index map showing location of cross sections and boreholes

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 formational rank. Formational names have not been used, however, because of the present uncertainty in the relationship between surface and subsurface units and because stratigraphic revisions 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 nannofossils are shown for each well log. The location of studied samples containing other fossil groups in borehole 8 are not shown. Fossiliferous samples shown 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 Tp_1

Sediments assigned to unit Tp_1 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 glauconite are common constituents of all unit Tp_1 sediments. Based upon calcareous nannofossils (8, 10)[1], foraminifers (8, 10, 11), pollen (8), ostracodes (7b, 8), and dinoflagellates (8), unit Tp_1 is of early Paleocene (Danian, Midwayan) age.

Lithofacies A of unit Tp_1 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 quartzose limestone, and relatively well-sorted medium-grained sand alternate on a centimeter to decimeter scale. Calcareous nannofossils (8), planktonic foraminifers (8), ostracodes (7b, 8), and pollen (8) indicate a late Paleocene (Thanetian, late Midwayan to early Sabinian) age for unit Tp_{2A}.

Lithofacies B of unit Tp_1 consists primarily of macro- and microfossiliferous, glauconitic, fine- to medium-grained quartz sand or quartzose, fossiferous limestone (Tp_{2B}). Cuttings from this unit suggest that much of this material is a poorly consolidated and fairly well-sorted sediment. Calcareous nannofossils (10) and foraminifers (11) indicate that unit Tp_{2B} is of late Paleocene (Thanetian, Midwayan to early Sabinian) age.

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

Units Tp_{2A} and Tp_1 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 Tp_{2A-1}. Fossil data from borehole 3 and from nearby outcrops (Van Nieuwenhuise and Colquhoun, 1978) indicate that sediments of both Danian and Thanetian (Midwayan and early Sabinian) Age are present in unit Tp_{2A-1}.

Unit Te_1

Unit Te_1 is a relatively thin but persistent stratigraphic unit. It typically consists of glauconitic, macro- and microfossiliferous calcareous clay or fine-grained limestone. Cuttings from this unit consist almost entirely of glauconite in borehole 11. Calcareous nannofossils (8, 10), planktonic foraminifers (8), and pollen (8) indicate that this unit is of early Eocene (Ypresian, late Sabinian) age.

Unit Te_2

Unit Te_2 is a southwestward-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, macro-fossiliferous limestone, and macrofossiliferous fine- to coarse-grained quartz sand. Calcareous nannofossils (8, 10), forminifers (8, 11), ostracodes (8), pollen (8), bryozoans (8, 11), and mollusks (7b, 11) indicate both middle and late Eocene (Lutetian to Bartonian, Claibornian to Jacksonian) ages for this unit. The lithologic similarity of sediments of both ages, plus insufficient fossil data in most studied boreholes, did not allow for lithostratigraphic or temporal subdivisions of unit Te_2.

Unit To

Unit To consists primarily of phosphatic and glauconitic, calcareous, microfossiliferous, muddy, fine-grained sand. The stratigraphic and geographic distribution of this unit in boreholes 10-15 is poorly understood. Calcareous nannofossils, planktonic foraminifers, ostracodes, and pollen indicate a late Oligocene age for this unit in borehole 8.

Unit Tm

Unit Tm 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 Heron and Johnson (1966). As described by these authors, unit Tm contains primarily phosphatic sand and gray-green silty clay. These authors assign a Miocene age to the sediments included here in unit Tm. Abbott (1974, 1975), Ernissee and Abbott (1976), and Ernissee and others (1977) consider the probable outcrop equivalents of unit Tm 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, mineralogic, and faunal characteristics. This unit is of post-Miocene, principally Pleistocene, age.

[1] Numbers in parentheses indicate boreholes in which fossils were found.

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Table 1. Borehole data. Geophysical logs for the boreholes were originally calibrated in U.S. customary units. (U) gamma log; K, caliper log; Co, sonic; Co, antisonic; R, other geophysical logs; r, fossils]

Number and name	Approximate location	Total depth Ft (m)	Approximate elevation Ft (m)	Source of new data	Published data
1 Caroline Hilliton-Morrell's Inlet	Georgetown Co. 33°16' N 79°52' W	804 (245)	15 (4.6)	G,K	
2 Litchfield	Georgetown Co. 33°13'30" N 79°12' W	782 (238)	10 (3)	G,R	
3 Posey Rural	Georgetown Co. 33°23'17" N 79°13'47" W	814 (248)	15 (4.6)	G,K,Co,F	
4 Detarville Plantation	Georgetown Co. 33°19'30" N 79°16'24" W	1835 (560)	18 (5.5)	G,R,K	
5 Hampton Plantation	Charleston Co. 33°07'00" N 79°23'53" W	834 (254)	15 (4.6)	G,K	
6 Isle of Palms	Charleston Co. 32°47'25" N 79°47'00" W	2267 (691)	12 (3.7)	G,K	
7a Charleston Cosmoldated Railway and Lighting	Charleston Co. city of Charleston	2067 (631)	5 (1.5)	F	Stephenson (1914) data combined with logs from nearby (7b)
7b Charleston Medical Center	Charleston Co. 32°46'45" N 79°56'15" W	2078 (634)	10 (3.0)	G,K,X	
8 USGS Clubhouse Crossroads No. 1	Dorchester Co. 32°52'12" N 80°11'35" W	2599 (792)	20 (6.1)	G,K,X,Co,F	Hazel and others, (1977) Gohn and others, (1977)
9 Kiawah Island	Charleston Co. 32°35'40" N 80°05'50" W	2287 (698)	10 (3.0)	G,K,X	Zupan and Abbott (1976)
10 Fripp Island	Beaufort Co. 32°19'38" N 80°22'42" W	3168 (966)	5 (1.5)	G,K,Co,F	Zupan and Abbott (1976)
11 Parris Island No. 2	Beaufort Co. 32°18'00" N 80°41'40" W	3454 (1053)	16 (5.5)	K	McLean (1960), USGS data files, Siple (1965, 1969)
12 USGS BFD-315	Beaufort Co. north end Hilton Head I.	600 (244)	17 (5.2)	G,K	McCollum and Counts (1964)
13 Hilton Head Island	Beaufort Co. south end Hilton Head I.	2900 (885)	5 (1.5)	G,K,X	Zupan and Abbott (1976)
14 USGS BFD-101	Beaufort Co. 0.8 km west of old lighthouse on Hilton Head I.	740 (225)	12 (3.7)	G,K	Counts and Donsky (1963), McCollum and Counts (1964)
15 USGS BFD-304	Beaufort Co. north end Daufuskie I.	746 (227)	13 (4.0)	K	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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