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CONTENTS

THE BLACK CREEK — PEEDEE CONTACT

IN SOUTH CAROLINA

By

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ABSTRACT

The upper Black Creek Formation of Late Cretaceous age in the Peedee River valley, South Carolina, consists mainly of laminated sands and clays deposited in a fluviomarine environment. Lenses of clean sand at the top of the formation are littoral and nearshore sand bodies. The overlying Peedee Formation is a muddy shelf sand. The Peedee - Black Creek contact is a ravinement or disconformity cut by the transgressing Peedee sea. Inconclusive evidence suggests that the *Exogyra cancellata* Subzone, found in the lower Peedee of North Carolina, is absent. In South Carolina, therefore, the ravinement process may have been complicated by diastrophism or may simply have occurred at a slightly later time.

INTRODUCTION

The Upper Cretaceous Series of the Carolina Coastal Plain consists, in ascending order, of the fluvial Middendorf Formation (Heron, 1958), the transitional Black Creek Formation, and the Peedee Formation, deposited on the open shelf (Figure 1). The postulated depositional environments render this sequence a transgressive one. Additional evidence for transgression and evidence for a disconformity are found in the peculiar nature of the Peedee - Black Creek contact where exposed in the Pee Dee River valley of South Carolina.

DEPOSITIONAL ENVIRONMENTS OF THE PEEDEE -- BLACK CREEK CONTACT

The significance of the Peedee - Black Creek contact is dependent on the origin of the strata which surround it. Lithosomes adjacent to the contact and their depositional environments are considered below.

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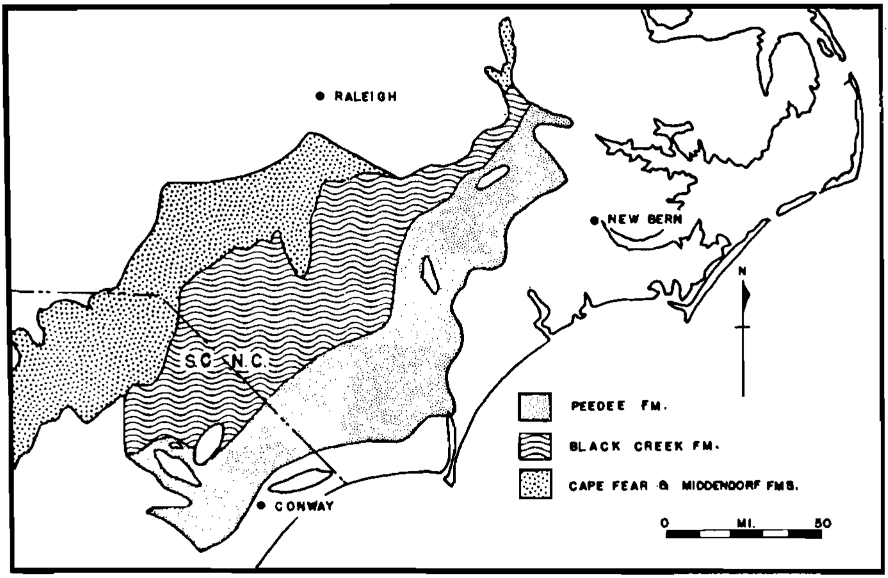

Figure 1. Outcrop areas of the Cretaceous formations. After Stuckey and Conrad (1958) and Cooke (1936).

Fluviomarine Lithosome

The most striking primary structure of this Black Creek lithosome is its complex, rhythmic stratification. The stratification is rhythmic in that there is a semiregular alternation of dissimilar lithologies (Bokman, 1953) and complex in that several orders of stratification are present. Sandy strata sets consist of laminae to thin beds of sand separated by films of clay. Clayey strata sets consist of laminae to thin beds of clay separated by sand laminae. Contacts between strata sets are gradual (zones of strata of equal thickness), but contacts between strata are always sharp. Continuity of these strata is low. Strata pinch, swell, bifurcate, and may not run the length ~~of the outcrop~~ (up to 50 feet).

Accessory structures include a small-scale, asymmetrical planar or trough cross-lamination whose bedding plane expression is current rippling. A medium-scale, planar cross-stratification is also common. Such cross strata sets may be quite lenticular, and their upper contacts may exhibit megaripple profiles.

A rarer, large-scale, planar cross-stratification consists of cross-strata sets up to at least 15 meters long and 3 meters thick. Unlike the preceding varieties of cross-stratification, this large scale variety is heterolithic (cross-strata are alternately sand and clay). While

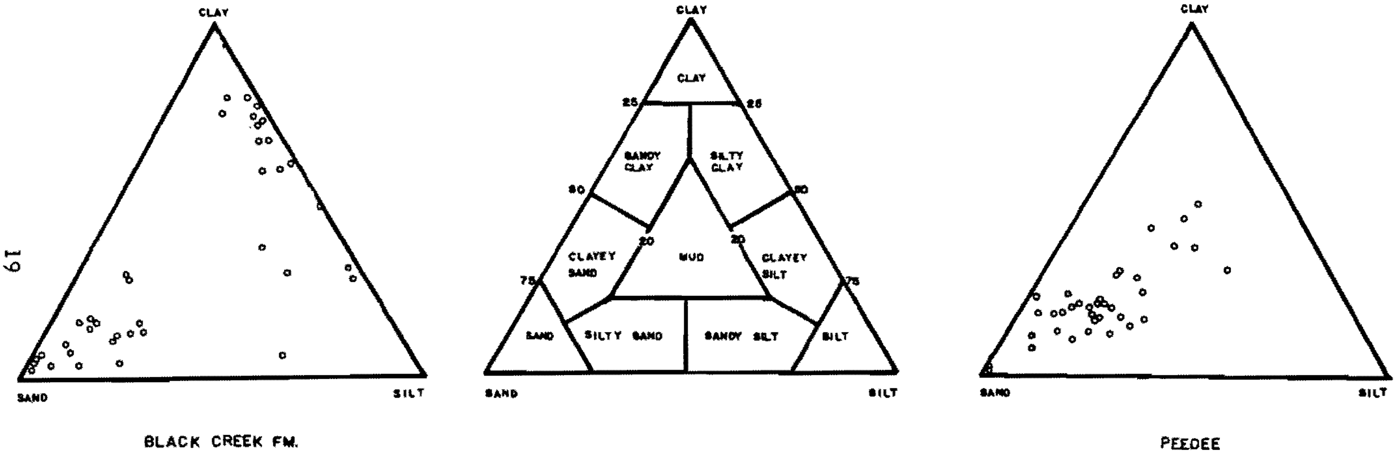

Figure 2. Sand-silt-clay ratios of the Black Creek and Peedee Formations. Nomenclature modified from Shepard, 1954.

sand waves are known to attain this scale, their internal structure is usually homolithic. Allen (1963, p. 102) has described a similar large-scale, heterolithic cross-stratification resulting from the growth of point bars on laterally migrating tide flat channels. However, large scale cross-stratification in the Black Creek Formation is often far more heterogeneous than described by Allen, and many of the large-scale cross-strata sets more probably represent the forset strata of small local deltas, analogous to those noted by McKee (1938, p. 8) in the subaerial topset plain of the Colorado River Delta, or Bates (1953) in the Mississippi River Delta. Bates describes local deltas forming when distributaries crevasse into adjacent lagoons. The fresh water flushes out the lagoon, and a homopycnal delta, with marked topset-forset-bottomset structure, builds rapidly out over the lagoonal sediments.

Other primary structures of this lithosome are horizons of clay wafers and larger clay balls. Peculiar subvertical tubes of clayey sand with warty exteriors may be the trace fossil Callianassa major Say. Weimer and Hoyt (1962) note that this crustacean indicates a littoral or shallow neritic environment.

The sands of the fluviomarine lithosome are characteristically medium to fine grained, light gray, and muddy (contain silt and clay). They may contain 5% glauconite and fragments of shells. They may be conglomeratic, with shark's teeth, reptile bone fragments, mollusc shells, rounded lignite fragments, and clay chips as megaclasts. Clays are medium-dark gray and plastic. Outcrops of the fluviomarine lithosome may be seen at Mars Bluff, McCorkle Ravine and Burches Ferry on the Pee Dee River (Figure 3).

The presence of glauconite, shell fragments and Toredo borings in the sands and clays of this lithosome reveals a marine origin. The extreme fractionation of its sediments and the erratic, discontinuous nature of its stratification indicates that it was deposited in the compartmentalized transition zone with its steep energy gradients, rather than on the open shelf, where conditions are uniform over long distances.

Of the vast variety of modern transition zone deposits described in the literature, the strata of this lithosome most closely resembles the group referred to by Van Straaten (1959) as fluviomarine. These rhythmically stratified sediments are deposited on the tidal upper surfaces of deltas and in estuaries, where fluvial, tidal, and wave-generated currents interact. Shepard (1956) describes laminated sands and muds on the subaqueous topset plain of the Mississippi River Delta. Here stratification would appear to be largely the result of fluctuation in the river regimen. McKee (1939) describes similar rhythmically bedded deposits from the lower Colorado River Delta. His photograph of a 12 foot exposure appears to show the bank of a tidal channel, implying that the rhythmic stratification may, in this case, be produced by the powerful tides of the region.

Oomkens and Terwindt (1960) have described rhythmic stratification from the Haringvleit estuary, Netherlands, one of the drowned distributaries of the Rhine Delta. This is an elongate body of water, 3 to 5

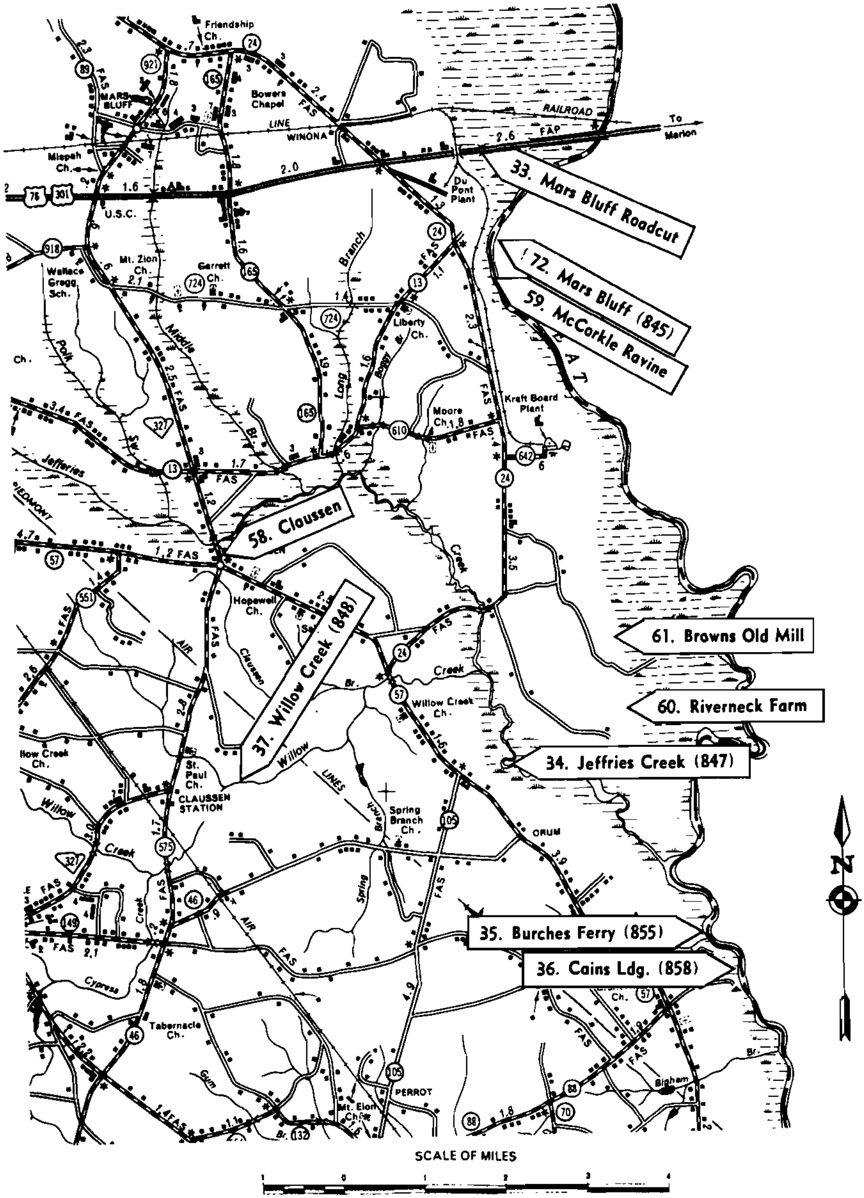

Figure 3. Location of outcrops in Pee Dee River valley, Florence County, South Carolina.

kilometers wide by 30 kilometers long. The seaward portion investigated by the authors, "is characterized by the presence of interlaced channels and elongate shoals (platen). These shoals are usually submerged, but may rise to mean high water level." Sedimentation is mainly accomplished by the lateral migration of tidal channels. These are on the order of 500 meters wide and 20 meters deep, with 3 degree slopes. As the channels migrate, two sets of strata tend to develop on the depositional side of the channel.

1. Horizontally bedded deposits.

   Medium to fine-grained sorted sand alternates with clay (in very thin beds, laminae, and streaks) .... The sand usually shows a relief due to current ripples. A delicate small scale cross-lamination is visible on lacquer peels ... Some glauconite grains, shell debris, and peat detritus are found.

2. Cross-bedded deposits.

   Relatively coarse, poorly sorted sand with very thin clay beds and laminae. Clay pebbles ..., shell beds ..., peat lumps, well rounded pieces of wood, echinoid spines and some glauconite occurs. Forset bedding is common.

This is the ideal sequence: In excavations the authors often found "Several, often incomplete sequences, one above the other."

Haringvleit deposits closely resemble the downdip outcrops of the fluviomarine lithosome. While medium-scale cross-stratification may be lacking in the coarser strata sets of these outcrops, the intraclastic zones are commonly present as Oomkens and Terwindt have described them. The authors attribute the stratification to tidal currents, and cite two theories of origin: slack tide stratification, in which sand strata are deposited during half tide and clay strata during slack tide, and neap tide stratification, in which the strata are correlated with the monthly tidal cycle.

Many updip outcrops of the fluviomarine lithosome are less easily related to modern deposits. Large bodies of yellowish-gray, loose sand in the updip Black Creek commonly lack glauconite and marine fossils. Their lower surfaces are disconformities; clay strata sets are draped over their upper surfaces. Some of these units may be fluvial channels. Many of the large-scale cross-strata sets previously described may be the forsets of local deltas and, therefore, would also reflect river-dominated sedimentation. Brett and Wheeler (1961, p. 114) note the following sequence of characteristics in the Black Creek outcrops of the Cape Fear River, North Carolina:

> Downstream, below Elizabethtown, North Carolina, the Black Creek shales are marine, containing a few foraminifera and considerable glauconite. Upstream towards Fayetteville, the rocks become more and more terrestrial, containing no fauna, no glauconite, and much woody material and pyrite, suggesting stagnant swamp conditions.

Van Veen (1936) has pointed out that three zones may be distinguished in Dutch estuaries.

1. A fluvial-sand zone.
2. A zone with practically no sand.
3. A marine-sand zone.

The updip and downdip portions of the Black Creek may vary in a crudely analogous way.

However, glauconite (Stephenson, 1923, p. 10-11) and foraminifera (LeGrand and Brown, 1955, p. 6-7) have been reported from towards the base of the formation in other areas; hence it is dangerous to specify concerning the extent to which various portions may be marine or non-marine.

While it is probably not possible to resolve fully the respective roles of the several depositional agents, the preceding discussion has presented evidence indicating that tide and river-generated currents have left their imprint on this lithosome; consequently it is referred to as fluviomarine.

Nearshore Lithosome

A second Black Creek lithosome is volumetrically unimportant but sheds much light on the nature of the Black Creek - Peedee contact. Strata in this lithosome are usually simple and non-rhythmic beds of clean, medium to coarse grained, yellowish sand, averaging 75 cms. thick. Continuity is improved; strata usually run the length of the outcrop. When second order stratification is present it tends to consist of textural alternations in sand rather than sand-clay alternations. Some beds contain small-scale cross-lamination which in plan view are current ripples. Others are massive. Still others contain a medium-scale planar cross-bedding or a distinct mottling. The mottles consist of round or ameboid blobs and tubes of discolored sand. Diameters of mottles range from a few millimeters to several centimeters. They may be uniformly colored or may contain cores of clean sand separated from a slightly clayey matrix by a discolored rind. There is always a textural difference between mottles and matrix. In one mottled bed pelecypod casts are present. The mottles are the work of burrowing invertebrates, and correspond to those described by Moore and Scruton (1957, p. 2727) from the nearshore sands of the Gulf Coast.

If the mottled beds are nearshore marine sands, the rippled and cross-stratified beds were probably deposited in the surf zone just landward of the former. Lane (1963, p. 241) states that:

> . . . conditions are favorable in the surf zone for the formation of cross-bedding by the migration of small, dune-like structures . . . many shallow, sub-littoral zones have one or more submerged offshore bars, commonly marked by breaker zones . . . these zones migrated seasonably. Cross-stratification formed in these areas by longshore currents and surf conditions should likewise migrate, causing an interlaying of cross-bedded units.

This lithosome is considered to have been deposited in a nearshore environment composed of the surf zone, the shoal water just seaward of it, and beaches. Some nearshore sequences may have originated as barrier island complexes.

Prior to its grassing over, the Route 301 roadcut (intersection of this highway with the south bank of the Peedee River) exposed a fine section of the nearshore lithosome. Lithologies and structures at this exposure are distinctive enough to permit speculation as to its detailed geologic history. At the roadcut, a lens of yellow-orange, cross-bedded, clean sand rests disconformably on dark, fluviomarine sands and clays (Figure 4, bed A). A similar, smaller lens is perched on top of it (bed A'), to the north are beds B and B', of pale orange to tan medium sand. Rust-colored, irregular clay laminae are abundant in the upper parts of these beds and become more closely spaced upwards. The top few centimeters of each bed is laminated clay.

Thin beds of well sorted, light gray, fine sand wedge out against the southern flank of the structure (C, C', C''). A bed of brown fossiliferous, muddy, medium sand is draped over it (D). Succeeding beds of tan sand are horizontal.

The lenticular, asymmetrical nature of the structure suggests that it is a sand spit, similar to those of modern low coasts. Since the beds C, C', C'' are much better sorted than their northern counterparts, this was presumably the high energy, or seaward side. Beds A and A' of the bar itself have internal laminae dipping north. They can be accounted for as backshore laminae, and indicate that the bar was prograding shoreward.

Beds B and B' may represent a repeated episode of cyclic deposition behind the spit, during which a small lagoonal area filled in to become a clay accumulating marsh or swale. Textural characteristics of bed D suggest that it represents a period of submergence in a larger lagoonal area. Succeeding cross-stratified and mottled beds show that the spit remained submerged, either in the breaker zone, or just seaward of it.

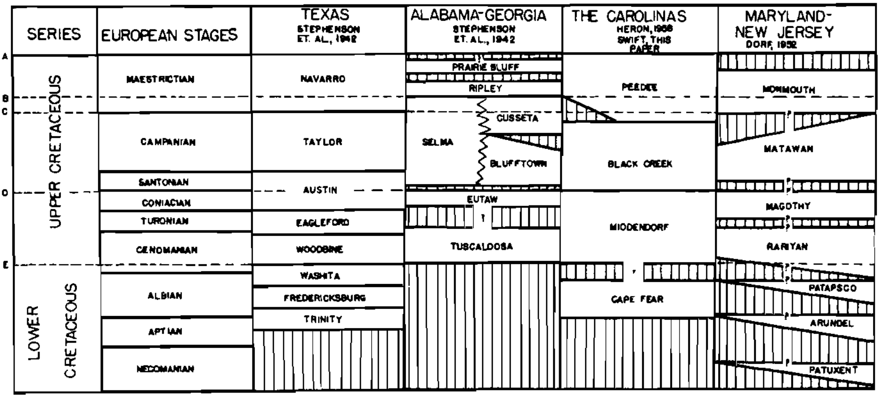

Figure 4. Schematic diagram of nearshore stratification in the Route 301 roadcut, southwest bank of Pee Dee River. (Letter labels are explained in the text.)

Shelf Lithosome

This lithosome, characteristic of the Peedee Formation, most closely resembles the nearshore lithosome. Like the latter, it accumulated in a wave-dominated environment. Bedding is again simple, and non-rhythmic, with a median diameter of 175 cms. Contacts are vaguer than in the nearshore lithosome, being transitional over several centimeters. Continuity is good; beds generally run the length of the outcrop. The shelf lithosome differs from the near shore lithosome mainly in lithology; it is commonly a calcareous, medium dark gray muddy sand (Figure 2). Its only accessory structure is a pervasive, indistinct mottling, again the work of burrowing organisms. Their activity has been so thorough that other primary structures have been destroyed.

This lithosome carries an abundant molluscan fauna indicative of open shelf conditions (Stephenson, 1923). It was deposited seaward of the surf zone where the dense population of burrowing invertebrates homogenized suspensive and tractive loads, and the feebler waves were unable to effect winnowing out and by-passing of the clay. The shelf lithosome is well exposed at the type locality of the Peedee Formation at Burches Ferry on the Peedee River.

SIGNIFICANCE OF THE BLACK CREEK - PEEDEE CONTACT

In the Pee Dee River valley, the shelf lithosome everywhere overlies the fluviomarine lithosome; the nearshore lithosome occurs as lenses between the two. The contact between the two formations is the surface separating the shelf from the other two lithosomes (Figure 5). The succession of lithosomes suggests a simple, conformable sequence, deposited during a marine transgression. However, the physical nature of the contact modifies this picture; and biostratigraphic data tends to contradict it. These data are considered below.

Physical Evidence

Previous writers have suggested that a disconformity separates the Peedee and Black Creek Formations in North Carolina (Brett and Wheeler, 1961, p. 114) and in South Carolina (Siple, 1959, p. 2). The following evidence confirms their statements.

1. The Black Creek - Peedee contact is commonly sharp, occurring over several millimeters.
2. Where the Black Creek strata have a slight initial dip, an angular unconformity is present.
3. Muddy shelf sands and laminated fluviomarine clays are commonly juxtaposed without the intervention of clean nearshore sands.
4. The basal Peedee is commonly conglomeratic. Megaclasts are largely intrabasinal and include clay chips from the underlying Black Creek, abraded lignite and bone fragments, and lenses of mollusc tests.
5. Interfingering between the Black Creek and Peedee Formations is rare.

All features may be observed at the Black Creek - Peedee outcrop at Burches Ferry and at Jeffreys Creek.

L. D. Stamp (1922) has pointed out that the surf zone of a transgressing sea may bevel the surface being transgressed. Stamp called the resulting disconformity a ravinement. Fischer (1961) has shown that the modern New Jersey coast is undergoing ravinement as a consequence of a post-Pleistocene rise in sea level. He states that in the ravinement process the sea destroys part or all of its own marginal record of low energy marsh and lagoon deposits and high energy barrier island sands. On the New Jersey coast, evidence of this destruction is afforded by the mollusc tests found on the outer beaches of the barrier islands. They are a mixture of fresh-appearing surf zone forms and leached, stained, lagoonal forms. The latter are exhumed as the barrier island transgresses the lagoon, and lagoonal deposits become exposed to wave action at the foot of the beach face.

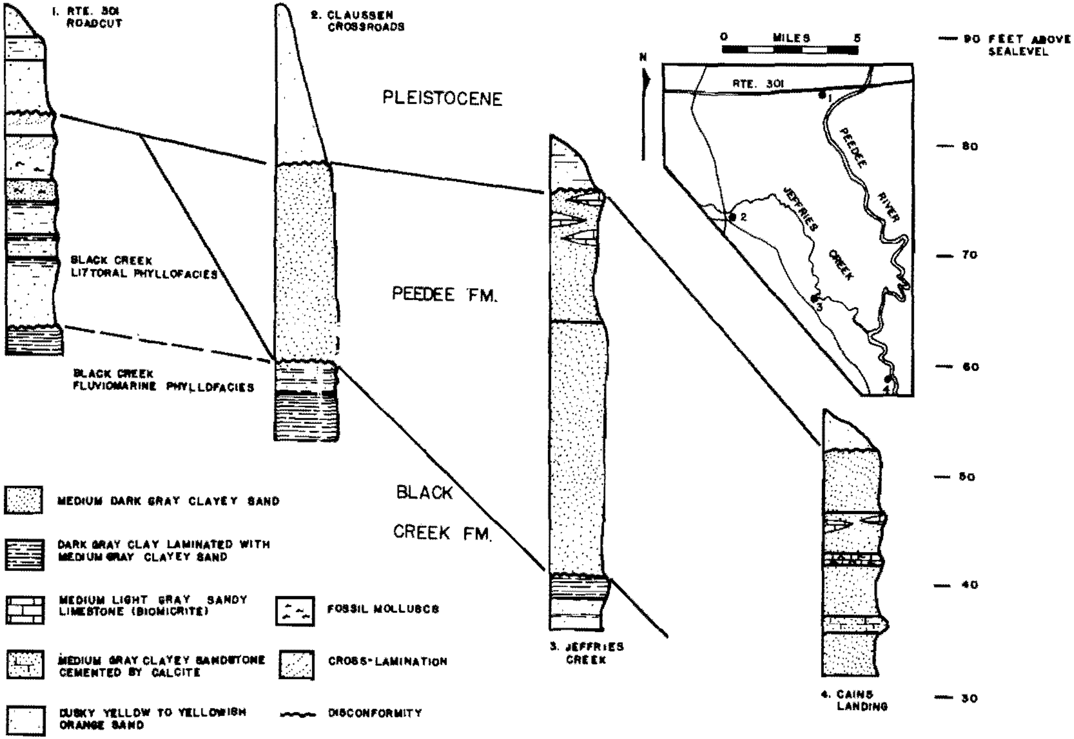

Figure 5. Section through the Black Creek - Peedee contact in the Pee Dee River valley.

The various features suggestive of a disconformity at the base of the Peedee are best explained by the ravinement process. Particularly interesting is the resemblance between Fischer's mechanically mixed fauna and the complex Snow Hill fauna of the basal Peedee. Stephenson (1923) has recorded 140 species in the Snow Hill Assemblage zone, versus 54 for the rest of the Peedee. Brett and Wheeler (1961, p. 117) have determined that the Snow Hill fauna has "open lagoonal" affinities, Its matrix, however, is the shelf lithosome of this paper. The development of open lagoons by the drowning of barriers is in harmony with the concept to be developed here. It is suggested, however, that where the Snow Hill fauna occurs in the basal Peedee its lagoonal component has at least in part been winnowed from the underlying Black Creek Formation and that its diversity is a consequence of the mechanical mixing of the fauna from various shelf and transition zone subenvironments.

Local exceptions to the ravinement process are equally instructive concerning the transgressive nature of the Middendorf-Black Creek-Peedee Formations. These are mainly the lenticular sands of the nearshore lithosome. Their sporadic occurrence along the Black Creek - Peedee contact indicates that the Upper Cretaceous shoreline retreated in the stepwise manner noted in other transgressive deposits (Hollenshead and Pritchard, 1961, p. 101; Curray, 1964, p. 199). The survival of these bodies during the generally destructive ravinement process may be attributed to locally high rates of nearshore sand deposition. Tanner (1961), and Tanner and others (1963) describe areas on the modern Florida coast where the rate of deposition of nearshore sands is anomalously high due to the proximity of rivers or to local reduction of the capacity of the longshore current. Similar phenomena operating during Upper Cretaceous time may have locally immobilized the shoreline during a period of general regional subsidence. When deposition reverted to its normal rate the surf zone would move rapidly over the top of the resulting nearshore lens, and the process of ravinement would resume (Figure 6).

While the rate of sand deposition no doubt varied along the Upper Cretaceous nearshore zone, the ravinement process itself may have contributed to cyclic variation in the rate of sand supply. A portion of the sand lag winnowed by the surf zone out of the underlying Black Creek deposits would tend to move onshore (Shepard, 1963, p. 175-177). Its forward movement might initially keep pace with the rate of sea-level rise. However, if the longshore currents were not capable of removing all of this material, the sand body would start to grow upwards as a barrier island at the expense of its forward creep. The shore face would eventually become mantled with lag. Surf action would cease to excavate it, and the onshore component of the sand supply would fail. The surf zone would overstep the starving barrier to repeat the process further inshore.

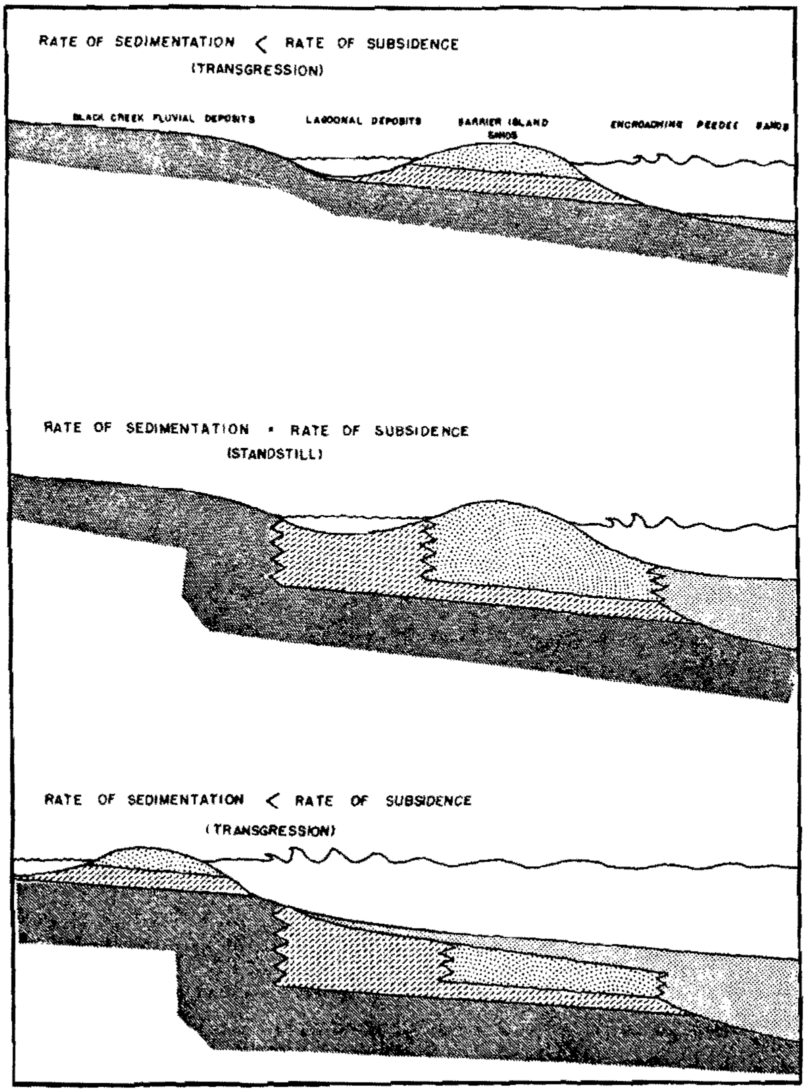

Figure 6. Hypothetical development of a lens of littoral sand during ravinement.

If this hypothesis is correct then the nearshore lithosome would have an origin similar to the destructive phase of delta building (Scruton, 1960). The hypothesis is appealing because it is systematic, and because it offers analogies with the Modern Carolina shelf, which according to Stetson (1938) is floored by basal transgressive sands and relict shoreline ridges.

Curray (1964, p. 199) has presented a different mechanism for the periodic deposition of nearshore sand during a transgression. He has found evidence for drowned Holocene barriers or shore ridges on the floor of the Gulf of Mexico. He suggests that they were overstepped because the enlarged estuaries or lagoons formed by the rise of the sea trapped too much of the river-derived sediment with which the barriers were nourished. However, the ravinement must have been developed to some extent in the Holocene Gulf; Curray (1960, p. 236) describes reworked basal sands with a mixed fauna.

No doubt both rivers and shore face erosion contributed sand to the Peedee sea. Some indication of the relative importance of the ravinement process might be determined by more detailed subsurface information showing whether the nearshore sand bodies were truly planed off or only "partially flattened" (Curray, 1960, p. 264).

On the Black River, North Carolina, and at Huggins Farm, South Carolina, on the Little Pee Dee River two miles upstream from its junction with the Lumber River, the ravinement is absent and the shelf and fluviomarine lithosomes intertongue. Intertonguing bodies tend to be sand deficient and represent low energy coastal regions where the ravinement failed to develop.

While some aspects of the origin of the Peedee - Black Creek contact are open to interpretation, its general nature indicates that it and the Upper Cretaceous section which it transects are the product of transgressive sedimentation.

Biostratigraphic Evidence

The preceding section has shown that the disconformity between the Black Creek and Peedee Formations is a consequence of the ravinement process. The ravinement alone is responsible for the disconformity in North Carolina; Brett and Wheeler (1961, p. 114), noting the physical criteria, have cited the disconformity, while Stephenson (1923, p. 12), concerned more with biostratigraphic data, states that in North Carolina the Peedee rests conformably on the Black Creek. Stephenson (1923, p. 12) does, however, note an unconformity in South Carolina – ". . . in South Carolina there is evidence of an unconformity of appreciable time importance at one locality in Florence County . . ." He refers the reader to page 32 where the description of the Jeffreys Creek outcrop includes an "undulating unconformity" between the Black Creek and Peedee Formations.

On page 51, he states

> . . . the Exogyra cancellata subzone has not been recognized in South Carolina, and there is both paleontologic and physical evidence that it is wanting here, being represented by an unconformity which separates the Black Creek Formation and the beds of the Peedee Formation, which occupy a position about midway of the Exogyra costata Zone.

Paleontologic evidence that the Exogyra cancellata Subzone is wanting appears to consist of the absence of the index fossils Exogyra cancellata and Anomia tellinoides. Correlations based on the absence of index fossils are considered dubious by some authors; Weller (1960, p. 548) states that "the fossils . . . absence does not prove that the strata under consideration occupy a position outside the range of the index fossil."

A decision concerning the presence or absence of the Exogyra cancellata Subzone in the Pee Dee River valley must be based on outcrops which are in the part of section that might be expected to carry the fauna, which are fossiliferous, and in which the fossils have been identified. The only outcrops which satisfy these conditions are:

1. Burches Ferry, Pee Dee River (upper Black Creek and basal Peedee Formation).
2. Jeffreys Creek (upper Black Creek and basal Peedee Formations).
3. Cains Landing, Pee Dee River (basal Peedee Formation).
4. Mars Bluff, Pee Dee River (upper Black Creek Formation).

The fauna of these outcrops and their ranges in the Gulf and Atlantic Coastal Plains are presented in Figure 7. All data is taken from Stephenson (1923). Peedee species, with the possible exception of Trigonia enfaulensis, have, according to Stephenson, a range of at least "Exogyra costata zone". Stephenson reports all but T. enfaulensis from the Selma Formation, and he considers this unit to lie below the top of the Exogyra cancellata Subzone (Figure 8).

While it is possible that the Exogyra cancellata Subzone is missing here, Figure 7 suggests that positive assertion on the subject is carrying the available evidence beyond its limit of resolution. Conceivably, any evidence based on such conservative forms as pelecypods is, in this problem, at the limit of resolution. Weller (1960, p. 558) suggests that under ideal conditions correlation by invertebrate fossils yields an accuracy of about three million years. If the space provided for the Exogyra cancellata Subzone on Stephenson's correlation chart (Stephenson, et al., 1942) approximates its absolute time span then the span is about

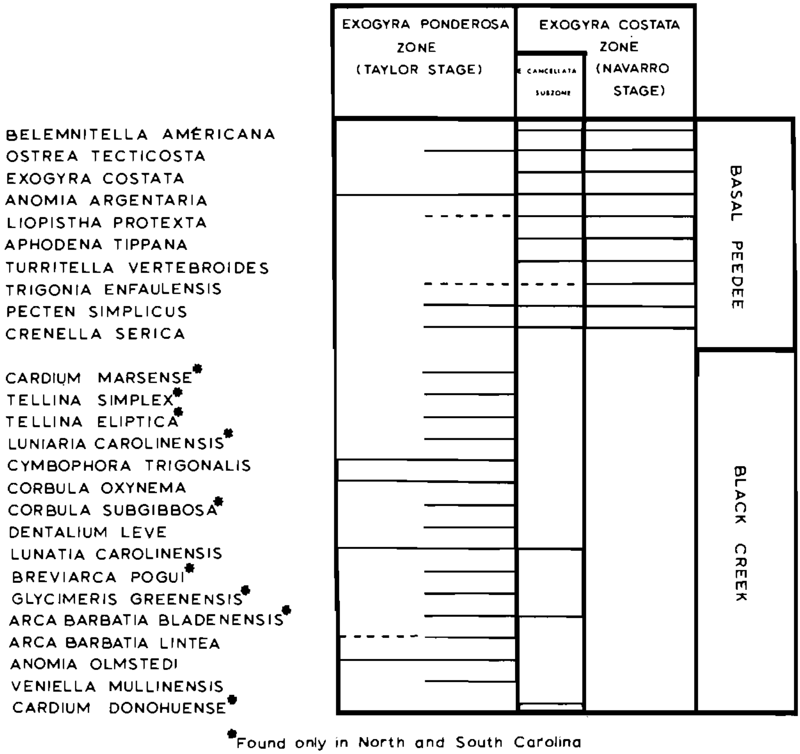

Figure 7. Ranges of fossils from the Peedee - Black Creek contact. All data from Stephenson (1923).

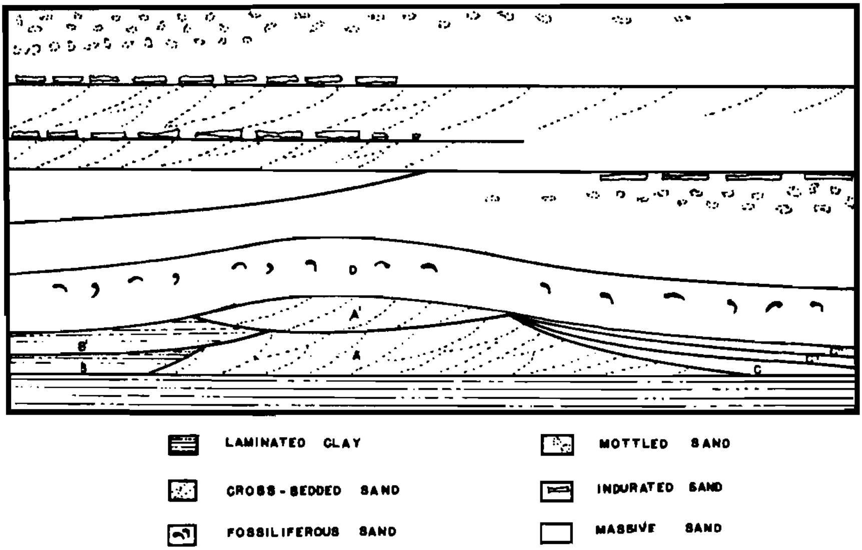

Figure 8. Stratigraphic setting of the Peedee and Black Creek Formations.

three million years. The problem of the *Exogyra cancellata* Subzone awaits detailed quantitative analysis of large samples of fossils collected at carefully determined stratigraphic levels throughout the Carolinas.

Should the *Exogyra cancellata* fauna be in fact missing in the Pee Dee River valley, the following are possible explanations:

1. A congenial environment was not present, subsequent to ravinement.
2. The area was briefly emergent during *Exogyra cancellata* time, subsequent to the main ravinement.
3. The transition zone persisted in this area through *Exogyra cancellata* time; ravinement did not begin until upper *Exogyra costata* time.

Since the environmental requirements of the fauna are known only in a general way, the first explanation cannot be evaluated.

The second explanation is reasonable; the numerous diastems of the Upper Cretaceous section in Georgia and Alabama (Stephenson and Munroe, 1938) are best explained as due to epirogenic movements.

The third explanation is the simplest, and fits what little is known concerning crustal stability in the Carolinas during the Upper Cretaceous. Well data (Swift, 1964, p. 5, 106) suggest that the Navarro Stage thickens over the Cape Fear Arch; the "arch" has apparently been a zone of instability rather than a persistently positive feature and was negative during Navarro time. Transgression, then, may have transpired earlier in North Carolina than in South Carolina; and basal Peedee beds in South Carolina might be expected to contain a slightly later fauna.

If this is the correct explanation for the apparent lack of the *Exogyra cancellata* fauna, then an important segment of the faunal sequence is obscured within the generally barren Black Creek deposits. Should a fossiliferous Black Creek outcrop be found stratigraphically higher than the Mars Bluff outcrop, then it might reveal the missing fauna. It is also possible that the *Exogyra cancellata* forms could tolerate only open shelf conditions; in this case, some modification of the rather provincial Snow Hill fauna might have persisted as long as its transition zone environment was available. It then would have been replaced by the upper *Exogyra costata* fauna and the intermediate *Exogyra cancellata* fauna would be omitted from the paleontologic record. An outcrop worthy of further study in this regard is the Route 301 roadcut, stratigraphically intermediate between the Mars Bluff and Jeffreys Creek outcrops. It contains a fossil assemblage which has not been studied.

SUMMARY

The interstratified sands and clays of the upper Black Creek Formation, Pee Dee River valley are transition zone strata, deposited on the floors and margins of restricted bodies of water dominated by tidal regimens. Lenses of clean sand at the top of the Black Creek are remnants of littoral and nearshore sand bodies. The muddy sands of the overlying Peedee Formation were deposited on the open shelf. The Peedee - Black Creek contact is a ravinement or disconformity cut by the surf zone of the transgressing Peedee sea. In North Carolina its time value is negligible. In South Carolina the Exogyra cancellata subzone of the lower Peedee may be missing; if so, the ravinement process may have been complicated by diastrophism or may simply have occurred at a slightly later time.

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