HISTORY OF TERMINOLOGY AND CORRELATIONS
OF THE BASAL CRETACEOUS FORMATIONS OF THE
CAROLINAS

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INTRODUCTION

Several years ago the author undertook
a study of the stratigraphy of the outcrops-
ing basal Cretaceous formations as exposed
in an area between Fayetteville, North Caro-
line, and McBee, South Carolina. As a part
of this project the literature concerning
the basal Cretaceous formations of the Caro-
linas and adjacent states was reviewed and
a composite correlation chart prepared (Chart
1). This information is presented here as
an illustration of the complexity of termin-
ology, and to show the various stages in the
history of the correlations. In addition a
selected bibliography of the important work
done on the Coastal Plain deposits of the
Carolinas is included. Many references con-
cerning the downdip portions of the basal
Cretaceous have been omitted.

History of Terminology and Correlations

Prior to 1900, there were no serious
attempts to describe and subdivide the
Coastal Plain formations of the Carolinas.
Local descriptions and correlations were
made by various writers. Fontaine (1890,
p. 174) described supposed Potomac strata
near Haywood, North Carolina. Holmes (1894,
p. 33–34) described the Cretaceous deposits
of the North Carolina Sandhills and the
"Potomac" clays on the Cape Fear River,
(1896, p. 934). Darton (1896) wrote about

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THE BASAL COASTAL PLAIN FORMATIONS IN SOUTH CAROLINA. THESE PAPERS WERE MERELY SHORT DESCRIPTIONS OF ECONOMIC MATERIALS OR DESCRIPTIONS OF YOUNGER CRETACEOUS MARINE FOSSILS.


Further collections from the one fossil plant locality of the Alabama "Lower Cretaceous" were said by Berry (1923, p.434) to be Upper Cretaceous. On this note, Cooke (1926) revised the terminology and correlation of the basal Cretaceous beds of the Carolinas. He raised the Middendorf to formational rank and lowered its base so as to include the Patuxent (Hamburg) formation of South Carolina and the beds previously called Lower Cretaceous found east of the Flint River in Georgia. Cooke discarded the name Patuxent in North Carolina and replaced it by Stephenson's name, Cape Fear. Both the Cape Fear and Middendorf were correlated with the Tuscaloosa formation and were considered to be basal Upper Cretaceous.

As to the Patuxent or Hamburg of South Carolina, Cooke wrote:

There seems to be no valid distinction between the so-called Lower Cretaceous or 'Hamburg beds' of Sloan and the typical Middendorf beds, which contain a large flora of Upper Cretaceous age. Middendorf lies in the midst of uniform sand hills that extend from the North Carolina line along the southeastern border Piedmont upland to the valley of Congaree River at Columbia. No one has succeeded in separating the 'Hamburg' from the Middendorf in this area ... the 'Hamburg' is ... obviously the continuation of the so-called Lower Cretaceous of Georgia (Cooke, 1926, p. 138).
Cooke discounted Berry's correlation of the Middendorf with the Black Creek and stated that "in my opinion the difference in the floras are more significant than the resemblances" (p. 138). He added that the lithology of the Black Creek and Middendorf contrast sharply, the two are separated by a pronounced unconformity, the area of outcrop of the Middendorf is greater than that of the Black Creek, and the type of the Middendorf is 20 miles from the nearest exposed Black Creek.

Cooke regarded the Cape Fear and Middendorf as very similar in age, but he was reluctant to extend the name Middendorf into North Carolina because of Stephenson's belief that the Cape Fear may include beds older than the Middendorf of South Carolina; however, he felt that the name Middendorf would eventually be applied in the North Carolina area.

In 1936, Cooke dropped the term Middendorf in favor of Tuscaloosa because:

Field work done in Georgia in 1930 shows that the Middendorf there is quite different from the Eutaw formation, but apparently identical with the Tuscaloosa. A local name for the beds in Georgia and South Carolina is therefore unnecessary... (Cooke, 1936, p. 17).

(In this connection, it is interesting to note that Eargle [1955, p. 83-84] believes that most of the beds in eastern Georgia mapped as Tuscaloosa are actually of a much younger Cretaceous age). Cooke extended the Tuscaloosa into North Carolina with the reservation that the Tuscaloosa of North Carolina

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Might actually contain beds older than the typical Tuscaloosa.

The correlation chart for the outcropping Cretaceous of the Atlantic and Gulf Coasts prepared by the committee on stratigraphy of the National Research Council (Stephenson et al., 1942) raised the base of the Black Creek formation in North Carolina and South Carolina to slightly above the base of the Taylor (base of Companian). Almost all previous authors had referred the lower Black Creek to the Austin (Turonian or lower Senonian). No reason for this change was mentioned in the text. Spangler and Peterson (1950) correlated the Tuscaloosa beds of North Carolina with their combined Potomac-Raritan beds of Maryland and Delaware and with the Raritan formation of New Jersey. The Patuxent formation was correlated with the lower part of the North Carolina Tuscaloosa. The latter was considered to be in part Lower Cretaceous and in part Upper Cretaceous (Spangler and Peterson, 1950, p. 69 and 8). They believe that it is not possible to justify a Tuscaloosa formation in North Carolina entirely of Upper Cretaceous age with a Lower Cretaceous Patuxent formation in Virginia, because the two formations occupy the same stratigraphic position; in fact, to satisfy such a correlation:

... it becomes necessary arbitrarily to pinch out the non-marine Upper Cretaceous unit northward in order to allow an identical non-marine unit of Lower Cretaceous age to appear.... To accept this interpretation... as being correct involves the adjustments of the Coastal Plain during Lower and early Upper Cretaceous time:....If this explanation is correct it must be based on-
TIRELY ON FLORAL DETERMINATION....
THE PROBLEM CAN NOT BE SOLVED BY
SAYING THE SEDIMENTS WERE DEPOSITED
IN A TRANSGRESSING SEA BECAUSE THEY
ARE ALL NON-MARINE.... THIS LEAVES
TWO POSSIBLE ANSWERS.... THERE ARE
TWO IDENTICAL UNITS OF DIFFERENT
AGE, OR THE AGE DETERMINATIONS BY
BERRY AND OTHERS ARE MISLEADING AND
ONLY ONE UNIT EXISTS.... (SPANGLER
AND PETERSON, P. 69).

SPANGLER (1950) WROTE ABOUT THE INFOR-
MATION OBTAINED FROM SEVERAL DEEP OIL TESTS
IN EASTERN NORTH CAROLINA. ABOUT THE BEDS
OF LOWER CRETACEOUS IN THE SUBSURFACE SPANG-
LER SAID:

... THE SEDIMENTS IN OUTCROP THAT
PREVIOUSLY HAVE BEEN REFERRED TO THE
TUSCALOOSA FORMATION ARE THOUGHT TO
CONTAIN, AT THEIR BASE, BEDS OF LOWER
CRETACEOUS AGE. THESE UPPER AND LOWER
CRETACEOUS BEDS CAN NOT BE DIFFERENTIATED
IN THE EXPOSURES. HOWEVER, IN THE SUB-
SURFACE, WHERE THEY CAN BE SEPARATED,
THE NAME TUSCALOOSA IS APPLIED ONLY TO
THE BEDS OF EAGLE FORD-WOODBINE AGE
(SPANGLER, 1950, P. 123 AND 130).

IN EASTERN NORTH CAROLINA THE BEDS EQUI-
VALENT TO THE LOWER UNNAMED MEMBER OF THE
BLACK CREEK FORMATION ARE DESIGNATED BY SPANG-
LER (P. 130) AS THE EUTAW FORMATION AND COR-
RELATED WITH THE AUSTIN OF TEXAS BECAUSE OF
THE CONTAINED AUSTIN FORAMINIFERA. HE COM-
MENTED THAT "HERETOFORE, BEDS REPRESENTATIVE
OF AUSTIN AGE WERE BELIEVED TO BE ABSENT IN
NORTH CAROLINA" (P. 130). BUT EVERY AUTHOR
PRIOR TO SPANGLER, EXCEPT STEPHENSON ET AL,
CORRELATION CHART (1942), HAD REFERRED THE
LOWER UNNAMED MEMBER OF THE BLACK CREEK
EITHER DIRECTLY OR INDIRECTLY TO THE AUSTIN

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Spangler (1950, p. 130) restricted the name Black Creek to those beds in eastern North Carolina of Taylor age and equivalent to the Snow Hill member at outcrop.

The correlations and interpretations of Stephenson (1942), Spangler (1950), and Cooke (1925, 1936) were analyzed and criticized by Dorf (1952). He found that the wider time interval between the Tuscaloosa of South Carolina and the lower unnamed member of the Black Creek as proposed by Stephenson et al. (1942) is unjustified, because the paleobotanical evidence supports "the essential age equivalence" (Dorf, 1952, p. 2183) of the two. Dorf resurrected the Middendorf member of the Black Creek formation for South Carolina. He suggests that the subsurface deposits of Eagle Ford age (referred by Spangler to a part of the outcropping Tuscaloosa formation) are equivalent to the plant-bearing beds of the lower Black Creek. About the Lower Cretaceous Dorf said:

The subsurface beds referred to the 'Lower Cretaceous' by Spangler are... more likely the equivalent of Cooke's 'Tuscaloosa' formation, which in North Carolina includes only the beds previously called the 'Patuxent' or 'Cape Fear' formation. Since these beds have not yielded datable fossils their reference to the Lower Cretaceous is here queried... The lower part of Cooke's Tuscaloosa formation (South Carolina) is here referred to as 'Lower Cretaceous?' (undifferentiated), as previously designated by Stephenson (Dorf, 1952, p. 2184).
A generalized geologic map of the North Carolina Coastal Plain published in a guidebook by LeGrand and Brown (1955) shows some revisions of the Black Creek and Tuscaloosa contacts. In general, the Black Creek-Tuscaloosa contact is pushed westward at the expense of the Tuscaloosa. Beds along Contentnea Creek and Tar River called Patuxent by Stephenson, and Tuscaloosa by most authors writing after 1936, are not shown or else are in part included within the Black Creek formation. The correlations given (LeGrand and Brown, 1955, between p.5 and 6) essentially agree with those of Spangler (1950), except that the Tuscaloosa formation is restricted to the Upper Cretaceous. The Lower Cretaceous is referred to deep wells only. In the same guidebook, the author reported the discovery of "micro-fossils in well cuttings deeper than 100 feet" (LeGrand and Brown, 1955, p. 6) within the lower unnamed member of the Black Creek formation.

Siple, Brown, and LeGrand (1956, p. 1757, 1758) reported the discovery of the first microfauna from the outcropping Tuscaloosa formation of South Carolina (in fact, "the first microfauna from outcropping basal Cretaceous strata east of the Mississippi," p. 1757). All of the species are Foraminifera and appear to be new, but the authors believe that they "indicate strata of either basal Austin or Eagle Ford and Woodbine age" (Siple, Brown, and LeGrand, 1956, p. 1757). In a personal communication (1955), Brown suggested that the fossils indicate an early Austin or Pre-Austin age.

The geologic map of North Carolina (Stuckey and others, 1958) refers the basal Coastal Plain beds to the Tuscaloosa formation. The overlying Cretaceous beds are
are called Black Creek.

The author's views regarding the correlation and stratigraphic interpretation of the basal Cretaceous beds in the outcrop area of the Cape Fear and Pee Dee Rivers are given in the last two columns of Chart 1. This is based largely on work as yet unpublished (Heron, 1958). No attempt to justify these interpretations will be presented here. Stephenson's (1907, p. 95) term "Bladen" is here applied to the lower unnamed member of the Black Creek formation. He coined the name "Bladen formation" for "exposures . . . in the bluffs of the Cape Fear River in Bladen County" (1907, p. 98). He included the uppermost "transition beds" in the Bladen formation, but those beds are now excluded by virtue of Stephenson's later designation of the "transition beds" as the Snow Hill member (1923, p. 9).

References


— 1907, GEOLOGY AND MINERAL RESOURCES, IN HANDBOOK OF SOUTH CAROLINA, STATE DEPT. OF AGRICULTURE, COMMERCE AND IMMIGRATION, COLUMBIA, S.C., P. 77-145.


