Recognizing the Bartonian Stage in the Eastern Gulf Coastal Plain of the USA: The Little Stave Creek Section of Alabama

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Abstract

Lutetian and Bartonian strata have long been recognized in the Gulf Coastal Plain. A recent proposal would place the Global Stratotype Section and Point (GSSP) for the Bartonian within the Bottaccione Gorge section near Gubbio, Italy. The primary guide event for correlation is the base of chronozone C18r. The proposal identified a secondary guide event, the lowest stratigraphic occurrence of the calcareous nannofossil *Dictyococcites bisectus*, to facilitate correlation. If accepted, the proposed GSSP may change long-held ideas about the Lutetian and Bartonian stages in the Gulf Coastal Plain. It is the purpose of this study to review the impact of the proposed Bartonian GSSP on the important Middle Eocene section at Little Stave Creek, Clarke County, Alabama.
Many of the important stratigraphic models for the eastern Gulf Coastal Plain incorporated the Little Stave Creek section as foundational data. The Little Stave Creek section is no longer available for direct study but geological data have been added to existing information on the section. Archival samples collected from carefully measured sections with identification of sequence boundaries, transgressive surfaces, and maximum flooding surfaces can allow paleontologists to overlay new data on existing stratigraphic models of the sedimentary sequences in the Little Stave Creek section.

Recognition of the Lutetian-Bartonian transition in the Gulf Coastal Plain is problematic. Traditionally, the base of the Bartonian has been associated with the upper Lisbon Formation at Little Stave Creek. This correlation was based primarily on macroinvertebrate and smaller benthic foraminifera correlation throughout the Gulf Coastal Plain. While both of these groups have well known zonations in the Gulf Coastal Plain, they have not been reliably calibrated to the global geologic time scale. The association of the larger foraminiferan *Lepidocyclina ariana* with the upper Lisbon Formation further supports the Bartonian age assignment of that unit.

Previous studies of calcareous nannofossils identified diverse floras in the Lisbon Formation of Little Stave Creek. The lower Lisbon Formation was correlated with biozone NP 15 while the remainder of the Lisbon was correlated with NP 16. The lowest occurrence of *Nummulites prestwichianus*, the traditional base of the Bartonian Stage in its type area of the Hampshire Basin of southern England, occurs within biozone NP16 (CNE 14) at the Alum Bay section on the Isle of Wight.

In this study, planktonic foraminifera from the Lisbon Formation were reexamined. Three

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distinct assemblages were recognized: an assemblage associated with the lower Lisbon, an assemblage associated with the upper Lisbon, and an assemblage of wide-ranging species common to both the lower and upper Lisbon. The lower Lisbon assemblage contains *Turborotalia frontosa, Globoturborotalia ouachitaensis, Pseudohastergerina wilcoxensis, Jenkinsella triseriata,* and *Igorina broedermanni*. The upper Lisbon assemblage includes *Hantkenina liebusi* and *Dipsidrepella danvillensis*. Taxa common to both the lower and upper Lisbon include *Acarinina bullbrooki, Acarinina rohri, Acarinina topilensis, Morozovelloides crassatus, Subbotina eocaena,* and *Pseudohastergerina micra*. Of the thirteen taxa of planktonic foraminiferans found in the Lisbon Formation at Little Stave Creek, only *Pseudohastergerina wilcoxensis, Jenkinsella triseriata,* and *Igorina broedermanni* are restricted to the Lutetian.

Correlating the Little Stave Creek section to the proposed GSSP at Bottaccione Gorge is challenging. There are no reliable paleomagnetic records from the Little Stave Creek section making recognition of the primary guide event for the Bartonian (the base of magnetic chronozone C18r) impossible. The secondary guide event at Bottaccione is more promising. The lowest stratigraphic occurrence of the calcareous nannofossil *Dictyococcites bisectus* serves as the CNE 14/CNE 15 zonal boundary and occurs above the *Nummulites prestwichianus* bed at Alum Bay and is Bartonian in an historical sense. At Little Stave Creek, the lowest occurrence of *Dictyococcites bisectus* occurs just above the top of the lower Lisbon. This lowers the base of the Bartonian at Little Stave Creek to at least 35 m below the *Lepidocyclina ariana* horizon. While lowering the traditional base of the Bartonian at Little Stave Creek, the correlation is consistent with the planktonic foraminiferal results presented here.

Further work is needed to define correlations between the Lisbon Formation at Little Stave Creek and units such as the Cook Mountain Formation of Mississippi and Louisiana and the Wheelock and Yegua Formations of Texas. Such studies will facilitate the recognition of the Bartonian Stage in those regions.

Keywords: Bartonian, correlation, planktonic foraminifera, Gulf Coastal Plain, Little Stave Creek