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Comparative Analyses of Piped-Zone Ichnofabrics in Cretaceous-Paleocene Shelf Sea Chalk-Marl Sequences, U.S. Gulf Coastal Plain

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To date, work by the principal investigator, one graduate (MS) student and three undergraduate assistants has focused on Upper Cretaceous (Maastrichtian) and Lower Paleocene (Danian) strata exposed at Moscow Landing along the Tombigbee River, western Alabama. This work has four objectives: (1) to create a detailed geologic strip map of this ~1.5-km-long exposure that provides context for remaining objectives; and to characterize the ichno-sedimentology of (2) marl-limestone couplets in lower parts of the Paleocene Clayton Formation, (3) a marl-chalk-marl sequence in the upper part of the Clayton Formation, and (4) rhythmically bedded chinks and marly chinks in the upper part of the Cretaceous Prairie Bluff Chalk.

Although some refinements may be made, objective 1 has been met. A geologic map consisting of nine narrow, partly overlapping strips that depict the distribution of formal lithostratigraphic units, key marker beds, and structural features has been prepared and was presented in poster format by the PI, MS student, and two undergraduate assistants at the April 2018 SE sectional meeting of GSA in Knoxville. Once finalized, the map will be part of the MS student's thesis (to be completed by May 2019) and will be posted in PDF format on the Auburn University Department of Geosciences web page for research and/or instructional use by others.

Studies directed towards objective 2 have focused on the characterization of extensive networks of large branched burrows (identified as *Spongiomorpha* and *Thalassinoides*) and the ichnology and sedimentology of their host marls and limestone source beds. Background ichnofabrics in both host and source beds reflect softground conditions and are diagnostic of the Zoophycos ichnofacies. Features, including pervasive wall bioglyphs, of large burrow systems piping from limestones into marls indicate production by crustaceans, probably shrimp, in overly consolidated substrates (firmground Glossifungites ichnofacies). Stratigraphic horizons from which these large burrow systems emanate likely are parasequence-bounding marine flooding surfaces. Observations have been and will be presented in poster format, by the MS student and undergraduate co-authors, at the 2018 SE section and national GSA meetings and also will be included in the MS student's thesis.

Work related to objective 3 is being completed by the aforementioned MS student, who will incorporate results in his thesis. Following field observations, multiple blocks of chalk and subjacent marls have been collected and are being slabbed and photographed for ichnofabric analysis. General observations to date reveal ichnofabrics similar to that observed in the Cretaceous Demopolis Chalk, which suggest deposition in outer shelf settings. Ongoing studies will address infaunal tiering relationships manifest in piped zone ichnofabrics and the behaviors of trace makers via petrographic analysis of sedimentary fills of select ichnotaxa. An abstract summarizing preliminary results of this project component will be submitted for the 2019 SE section meeting of the GSA.

Objective 4 is being addressed by the PI and a new undergraduate assistant. Preliminary field descriptions of Prairie Bluff Chalk ichnofabrics have been made, and samples for sedimentological analyses have been collected. The student assistant is currently characterizing Prairie Bluff depositional rhythms via carbonate analyses and thin-section petrographic studies, and he likely will present results of his work in poster format at the 2019 SE GSA meeting.

This ongoing project has helped the two undergraduates involved with objectives 1 and 2 prepare for the MS degree programs in geosciences that they began at different institutions in Fall 2018, is providing the foundation for a graduate student's MS thesis, and is facilitating the PI's efforts to better understand carbonate cyclicity as well as to provide hands-on experiences for future geoscientists.