Lower Claiborne Regional Stratigraphic Architecture: Southeast Texas to East-Central Louisiana

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Abstract

The lower Claiborne section and its units discussed and illustrated here, of Lutetian age - middle Eocene (Figure 1), are recognized as a series of marine shelf, marginal marine, and deltaic-strandline deposits. Regional closely-spaced well-log cross-sections extending for almost 500 miles from south Texas to eastern Louisiana updip of the Claiborne shelf margins clearly show the regional stratigraphic architecture along depositional strike from southeast-central Texas through east-central Louisiana (Ewing, 1994; Ewing and Vincent, 1997). The obvious internal forms when viewing the lower Claiborne at such great scale are large, very-low-angle, sigmoidal clinoform sets delineated by regional flooding surfaces (see Figure 2 below). The flooding surfaces (FS) are depicted as the flat to sigmoidal lines seen in that cross-sectional diagram – major FS's shown by heavier lines; "lesser" FS's by thin and/or dashed lines. These large downlaps are roughly oriented from NW to SE across coastal Texas and into central Louisiana demonstrating the time-transgressive nature of the entire lower Claiborne – the downlaps proceed from oldest to youngest coming from west to east. (Contrast with Perkins and Hobday, 1980, and Fisher, 1964.)

Basin analysis and subsurface exploration rely on the identification of genetic units (or sequences) because they are time-bounded units which unite all of the co-occurring processes and their resulting deposits. Genetic stratigraphic units are defined and bounded by key flooding surfaces which approximate time lines (genetic sequences of Galloway, 1989a, b). These units, combining progradational and transgressive elements, have the advantage of being bounded by surfaces which – on the shelf, at least – are continuous, are easy to recognize, have associated biozonations, and are verifiably correlatable on well logs. Unconformities which may be detectable in up-dip positions in these dynamic basin-margin settings are, for all practical purposes, difficult-to-impossible to find in the down-dip (conformable?) portions of these units and for simplicity's sake are not shown on the accompanying cross-section (Fig. 2).

Observations

- The Reklaw, Queen City, and Weches depositional episodes in south and central Texas have prograded across the narrower shelf there and are recognized out into slope environments. However, because of distance from sediment supply and a widening shelf coming from southeast Texas into south Louisiana, these formations thin, downlap, and condense as they are traced eastward into western Louisiana. The Queen City and Weches units are readily correlatable as thin but distinctive resistive bedsets that account for about the lowermost third-to-half of the Cane River Marl in western Louisiana (Fig. 2). These thinning beds can be confidently traced as far east as Allen Parish, but eventually become unrecognizable lowermost bedsets fully within the basal Cane River Marl. The Reklaw is questionably traceable into Louisiana but is likely very thin and at the base of the marl.

- The distinctive Cane River Marl of southwest and central Louisiana is a greatly condensed section composed of very thin down-dip time-equivalents of the Reklaw, Queen City, Weches, and, in its upper portions, some of the oldest down-dip Sparta prograding units. This marl unit, which is at the bottom of the Lower Claiborne section, is observed in parts of south-central Louisiana to be comparatively very thin (less than 30 feet total thickness in places) representing something less than 5% of the total section in terms of relative thickness but conversely representing approximately 70 to 75% of Lutetian time! The Cane River Marl sits by regional disconformity on top of the Wilcox Group.

- At least ten cycles (probably 4^{th} – 5^{th} order) of silty-sandy zones within the Sparta genetic stratigraphic unit prograde – downlap – gulfward and eastward in Louisiana. These stacked silty-sandy sections pass down-dip

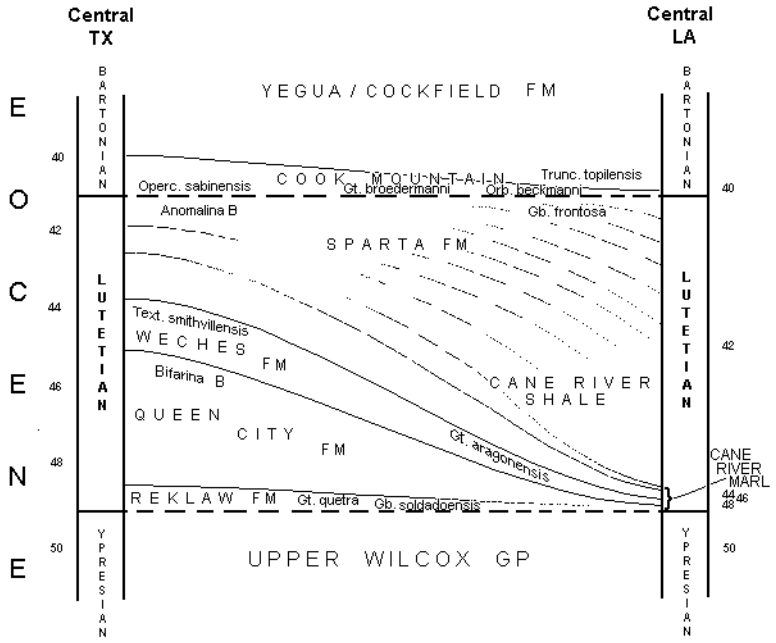

Figure 1. General regional stratigraphic chart for the Lower Claiborne section along mid-dip depositional strike. Foraminferal biozone markers are shown. (Note: Operc. = *Operculinoides*; Gt. = *Globorotalia*; Orb. = *Orbulinoides*; Trunc. = *Truncorotaloides*; Gb. = *Globigerina*; Text. = *Textularia*.)

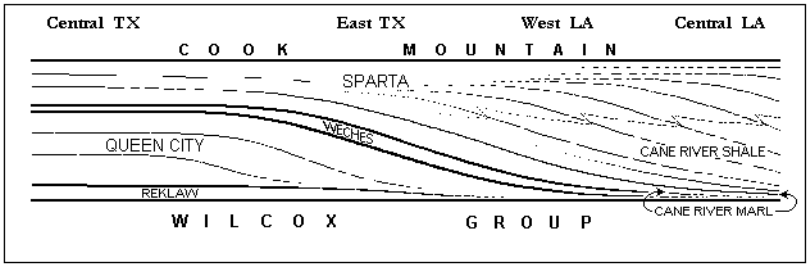

Figure 2. Regional stratigraphic relationships within the lower Claiborne Eocene—approximate mid-dip depositional strike section across coastal Texas and into Louisiana. Line of section is about 300 miles long; total section thickness ranges from about 800 to about 2000 feet; *estimated vertical exaggeration is 150x to 200x*. The flooding surfaces (FS) are depicted as the flat to sigmoidal lines seen in the cross-section—major FS's shown by heavier lines; "lesser" FS's by thin and/or dashed lines.

into deeper-water, finer-grained sediments transitional to what is called lithostratigraphically the Cane River Shale. Older units of the latter themselves pass into, even farther down-dip, the much-condensed upper beds of the Cane River Marl.

- The lower Claiborne section is apparently bounded regionally by major transgressive surfaces of erosion (ravinement surfaces, or regional disconformities): one at the base of the Reklaw – Cane River Marl / top Wilcox Group; and the other at the base of the Cook Mountain / top Sparta. Thus, the lower Claiborne section (the Lutetian spanned approximately 8 – 10 Ma) described here represents a complete 2nd order cycle.

References

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