

Structural Mapping by Means of Mississippian Corals in West-Central Indiana

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The regional structural pattern of West-Central Indiana is characterized by middle Mississippian limestones dipping gently at approximately 30 ft./mile southwesterly towards the Illinois Basin. This pattern is established by limited deep-bores, magnetic charts (which probably reflect the basement complex) and other geophysical data, and surface mapping. Marker horizons to serve reliably for mapping structural detail in the Mississippian sequence from lower Harrodsburg limestone upward through the Ste. Genevieve limestone are difficult to establish. Some of these markers are set forth in the following paragraphs, and one of them is singled out as an example.

A lithologic break in the Upper St. Louis limestone can generally be recognized in Putnam County. Here thin-bedded, sometimes cherty, bryozoan-rich beds stand in contrast to the massive light gray Ste. Genevieve limestone above. However, recurring fossiliferous zones above or below this lithologic break may locally hide the true horizon.

Chert layers are common to the St. Louis limestone. The cherts are more rounded below, while above they are flat-lying fossiliferous replacement types. The cherts are not uniformly placed laterally or vertically and thus are not reliable as mapping markers. Intraformational conglomerates are likewise widely scattered both vertically and horizontally (1). Colors of the various formations also fail, though the lower St. Louis limestone is mostly darker gray as compared to the monotonous light grays above and below.

Fossils hold some hope as being useful in establishing mapping horizons, since they are plentiful and of great variety. Brachiopods and crinoid fragments are fairly abundant, but not diagnostic. Parts of columnals of crinoids such as those of *Platycrinus penicillus* are confined mainly to the Ste. Genevieve limestone but are of too great a vertical range to be useful for markers in detailed mapping. The abundant fossil bryozoans of the upper St. Louis limestone make an horizon about 10 to 15 ft. thick. This horizon is useful, but again other bryozoan layers may occur through the sequence to mislead even the careful observer. A small sub-planispiral gastropod (cf. *Straparolus*) is fairly reliable for Salem horizons, as is the protozoan *Endothyra baleyi*. *Endothyra* is not abundant in many outcrops in Putnam County.

Fossil corals are scattered consistently through the limestone sequence. Cup corals, because of their great similarity one to another, need more detailed study before being usable for mapping. Large coral heads of *Syringopora* are common in middle Mississippian limestones of this area, especially in the St. Louis and Ste. Genevieve limestones. *Lithostrotionella proliferum*, finger-like rugose corals, are common to St. Louis horizons. These corals may be so thickly congregated (as near Greencastle)

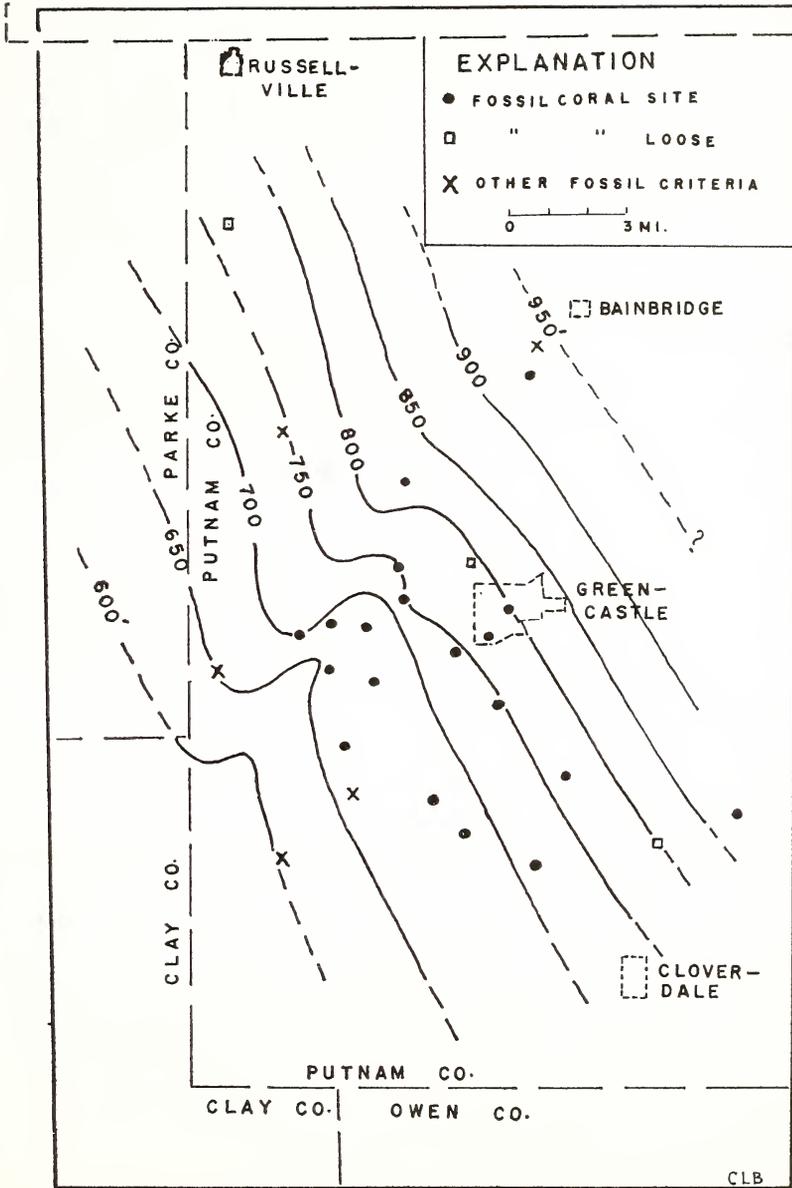


Figure 1. Fossil coral sites in Putnam County, Indiana.

in one bed as to constitute a biostrom. *L. proliferum* is confined to the St. Louis limestone. Fragments of the corallites, often silicified, are commonly scattered through the upper 50 ft. of the formation.

The fossil coral of greatest use as a stratigraphic and structural marker is *Lithostrotionella canadense* (3). Though close relatives of this fossil are widespread (2), and range through several geologic periods, *L. canadense* is narrowly confined in this area. Coral heads of this species are closely packed to sparingly scattered 2 to 10 ft. above the bryozoan-rich layers of the St. Louis limestone (actually in the lowest Ste. Genevieve, on the basis of lithology). This coral is considered reliable in position as interpreted from the locations of "in place" collections. The vertical range is but a few feet in Putnam County. This fossil coral is difficult to spot if both fossil and matrix are of crystalline limestone. However, if the fossil is silicified or partly so, which is often the case, the darkness of the silicification provides a color contrast. Too, weathering of the limestone surface may provide enough contrast to lead to discovery of the geometric cross section pattern of the corallites. Careful scrutiny of the under edges of limestone ledges may help in location of the fossil. Rocks associated with the fossil coral are fine to medium light gray limestones.

A sample map interpretation has been prepared (Fig. 1). Nineteen different locations of *Lithostrotionella canadense* found in place have been mapped. Elevations for these locations were estimated from contours on topographic maps of the area. On these estimated elevations structural contours have been drawn on the *L. canadense* horizon, which represents the approximate base of the Ste. Genevieve limestone.

If future work proves this fossil coral, *Lithostrotionella canadense*, to be confined to as narrow a vertical range as present field work suggests, further work with this fossil may be useful in mapping structural detail.

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