

Fossil Cephalopods of Mississippian Age, Central Putnam County, Indiana

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Introduction.—Cephalopods in unusual numbers are localized in limestone of Meramecian age 1 mile west of Greencastle, Indiana, in the NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20 and in the SW $\frac{1}{4}$ sec. 17, T. 14 N., R 4 W. The fossils, which are mainly cephalopods, are packed together in coquina-like masses in light gray limestone, apparently at or near the contact of the Salem and St. Louis formations. Nautiloid cephalopods from this area were reported as early as 1873 (3), and more recently a goniatite from this location has been described (5).

Geologic setting.—Fossils for this study have been collected from two areas about one-fourth of a mile apart in sec. 17 and 20. The fossils are in limestone beds from 12 inches to 18 inches thick located stratigraphically in transition between the Salem and St. Louis formations. Vertically the fossils extend through 4 to 5 feet of rock. A few small straight nautiloids are scattered in limestone at the same horizon one-half of a mile north of Greencastle. Other fossils found sparingly in association with the cephalopod fauna are *Productus* cf. *P. altonensis*, *Spirifer bifurcatus*, *Composita* sp., all brachiopods, and *Straparolus* sp., a gastropod.

The Salem limestone which is exposed low in the valleys is composed of small fossils and small fossil fragments in an oolitic matrix. Above the Salem, the deep gray St. Louis limestone is sparingly fossiliferous, and in beds medium to massive. All beds appear as horizontal, but actually have an average dip of 25 to 35 feet per mile to the southwest. The break between the Salem and St. Louis formations is not sharp. Recurrent fossil lenses of Salem-like limestone extend up for a number of feet into the St. Louis limestone. The fossil-rich cephalopod zones are found in this transition. The cephalopod concentrations may have stood as small biohermal mounds as early St. Louis seas reworked them. As here interpreted these cephalopods are of late Salem age, but have been reworked as early St. Louis sediments.

Lithologic considerations.—The matrix of the cephalopod coquina varies from sublithographic to medium-crystalline limestone, with some oolites. There is no preferred orientation of the cephalopods in the matrix. Many of the small straight forms stand at right angles to the bedding. Crystalline calcite has replaced parts of the fossils, especially along the suture lines of the cephalopods. In the higher parts of the section some of the smaller orthoceratite forms are silicified. On the weathered limestone surfaces the silicified fossils stand out in sharp relief.

A greenish clay film covers some of the fossils and is scattered in solution seams and pockets throughout the rock. This green clay-like mineral was isolated and subjected to powder x-ray diffraction study (Laboratory, National Science Foundation, first Geologic Institute 1957).

Patterns and graphs indicate that the mineral be placed under the general term "glauconite." Electron micrographs concur with the above determination.

Fossil cephalopods.—Nautiloids dominate the fossils. The most abundant of these are gently tapering orthoceracones from 1 to 2 inches long and up to $\frac{1}{4}$ of an inch in diameter near the aperture. One fragment, if extended, would reach at least 1 foot long with a maximum diameter of 1 inch. Siphuncles are sub-central. Most of these straight forms probably belong to the genus *Mooreoceras*.

Coiled nautiloids of the order Rutoceratida are common. These average from 1 to 2 inches in diameter across the complete fossil. They are discoidal, nodose, and slightly involute. Some tests bear a single row of rounded lateral nodes on each side of the conch. Sutures are distinct and form very shallow lobes and saddles. The whorls are subelliptical in cross section and are wider than high. Several specimens show longitudinal lirae at the node lines. Siphuncles are sub-ventral. The genus compares closely to *Tylodiscoceras* (4), and to *Temnocheilus* (2).

A few nautiloids in the collection are slightly curved, rapidly expanded forms from 6 to 8 inches long with a diameter up to 3 inches near the aperture. They compare with those in the genus *Poterioceras*.

A few goniatites have been collected from the locations. They are not common. A recently collected goniatite as well as the associated nautiloid fauna is now being studied by A. K. Miller and W. M. Furnish. A similar specimen from the Greencastle area has been described (5), and named *Prolecanites americanus*. These fossil goniatites vary from 1 to 3 inches in diameter measured across the whorls. They are evolute and discoidal, with sutures which form rounded saddles and linguliform lobes.

The genus *Prolecanites* is a reliable marker in the Upper Visean (Carboniferous limestone) of the British Isles and Europe, and has been used for world-wide correlation for rocks of mid-Mississippian age (1). It is hoped that as collections become more complete, that the usefulness of the fossil goniatites may be established for correlating American Mississippian rocks with the Carboniferous limestone zones of Europe.

Literature Cited

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