The Monteagle Limestone of South-Central Kentucky

By RICHARD Q. LEWIS, Sr.

CONTRIBUTIONS TO STRATIGRAPHY

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Stratigraphic terminology is given for rocks of Late Mississippian age in south-central Kentucky, and a new name, the Kidder Limestone Member, is introduced

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By RICHARD Q. LEWIS, SR.

ABSTRACT

Geologic mapping and stratigraphic studies show that nomenclature for rocks of Late Mississippian age in Alabama and Tennessee is generally applicable in south-central Kentucky and that the Monteagle Limestone of Late Mississippian age is divisible into two mappable members. These are, in ascending order, the Ste. Genevieve Limestone Member and the Kidder Limestone Member (new name).

INTRODUCTION

Geologic mapping and stratigraphic studies show that the Monteagle Limestone of Late Mississippian age is divisible into two mappable members. This paper describes those members and proposes a name for the upper member.

The St. Louis Limestone and other underlying rocks of Mississippian age can be traced into south-central Kentucky from western Kentucky in nearly continuous outcrop. The Ste. Genevieve Limestone Member—the lower part of the Monteagle Limestone—crops out in small isolated areas across the Cincinnati arch and can be traced into south-central Kentucky from the western part of the State. Upper Mississippian strata overlying the Ste. Genevieve Limestone Member of the Monteagle Limestone cannot be physically traced into the area from western Kentucky.

The Upper Mississippian rocks in south-central Kentucky east of the Cincinnati arch are represented by a thick sequence of limestone interbedded with lesser amounts of sandstone and shale. Though these are similar to the Upper Mississippian rocks of western Kentucky, correlation between the two areas is difficult. Several Upper Mississippian sandstone units that belong to the Chester Series of western Kentucky and Indiana are missing in south-central Kentucky. Most of the previous workers in south-central Kentucky have applied formation names of the Chester Series to Upper Mississippian strata in the south-central part of the State, correlating the previously mentioned thin beds of shale in south-central Kentucky with the sandstone formations of the Chester Series. The tenuous nature of these correlations is indicated by the several names applied to the same units (Stokley and McFarlan, 1952, p. 48; McFarlan and Walker, 1956, p. 13).

The Upper Mississippian rocks of south-central Kentucky can be traced in continuous outcrop into Tennessee and Alabama where geologists have developed a nomenclature for the Upper Mississippian rocks independent of the names used in western Kentucky, Indiana, and Illinois. In Tennessee, the Upper Mississippian limestones have been referred to by a variety of names including the "Mountain Limestone" (Safford, 1869), Bangor Limestone (Hayes, 1892; Campbell, 1893), Newman Limestone (Campbell, 1894, 1899; Keith, 1896), Monte Sano Limestone (Ulrich, 1911; Bassler, 1932), and the Ste. Genevieve and Gasper Limestones (oolite) (Butts, 1919, 1922). A complete history of the names applied to the rocks of Late Mississippian age in Tennessee and adjacent areas is in a report by Stearns (1963).

ACKNOWLEDGMENTS

This report is based in large part on the geologic quadrangle mapping of south-central Kentucky by the U.S. Geological Survey in cooperation with the Kentucky Geological Survey. Unmapped quadrangles have been reconnoitered by the author during the period from 1966 to 1969, and sections were measured during the spring and summer of 1969. Of special help were the contributions of A. R. Taylor, G. W. Weir, J. H. Smith, and E. G. Sable of the U.S. Geological Survey and Preston McGrain of the Kentucky Geological Survey.

MONTEAGLE LIMESTONE

The name Monteagle Limestone was used by Vail (1959) in an unpublished report that describes the rocks between the top of the St. Louis Limestone and the base of the Hartselle Formation in the Cumberland Plateau of Tennessee and Kentucky. Stearns (1963) redefined the names Hartselle Formation and Bangor Limestone previously used extensively in Tennessee and Alabama and proposed that the name Monteagle Limestone, as defined by Vail (1959), be adopted. Lewis and Thaden (1965, 1966) adopted the name Monteagle Limestone for rocks exposed in Wayne and Clinton Counties, south-central Kentucky, in the Cumberland City and Albany quadrangles (fig. 1).

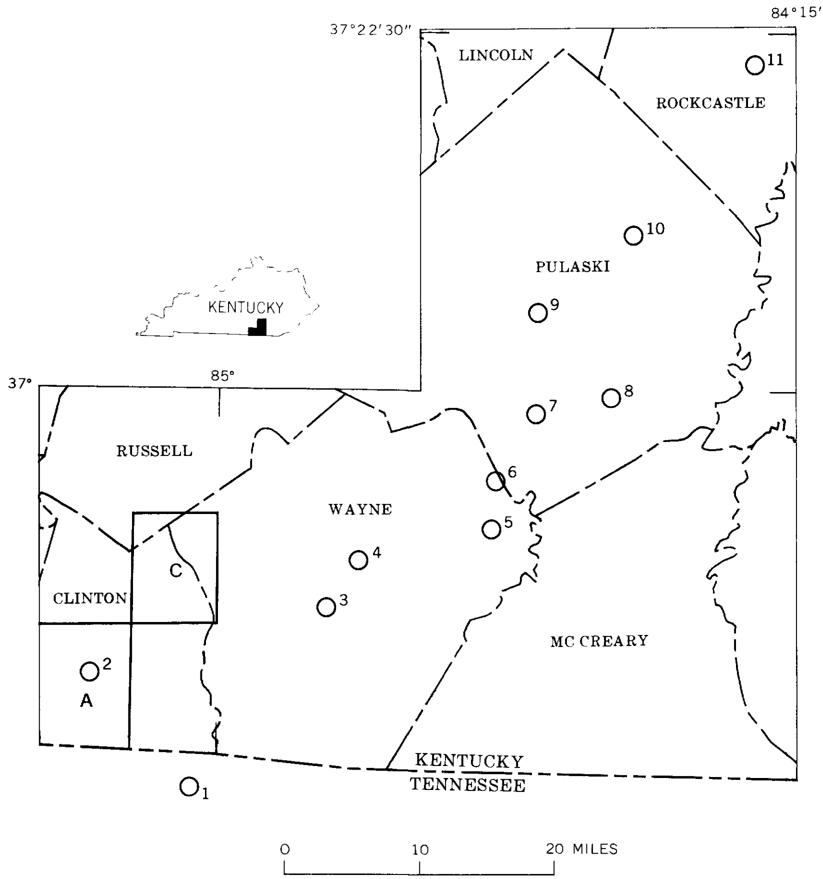

FIGURE 1.—Index map of Kentucky showing the location of the area and the measured sections (locations 1-11) referred to in text. A, Albany quadrangle; C, Cumberland City quadrangle.

The Monteagle Limestone can be lithologically divided (fig. 2) into two members, mappable over a large part of south-central Kentucky. The lower unit is the Ste. Genevieve Limestone Member of the Monteagle Limestone; the upper unit, which was informally referred to by Lewis and Thaden (1965, 1966) as the upper limestone member, is here named the Kidder Limestone Member.

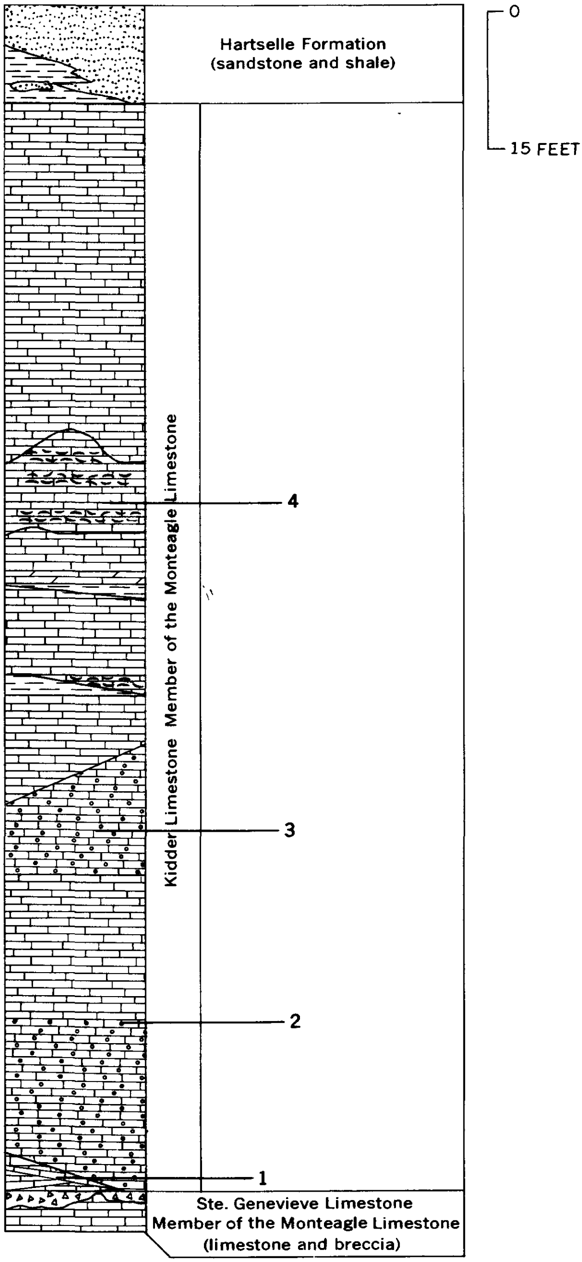

FIGURE 2.—Generalized section of the Kidder Limestone Member of the Monteagle Limestone showing the position of the recognizable subunits (1-4).

During 1968 and 1969, the author measured sections along a line extending from Golman Mountain, Tenn., just south of the Tennessee State line, northeastward to Mount Vernon, in the central part of Rockcastle County, Ky. (fig. 1). Within this distance the lithology of the Monteagle Limestone remains consistent: individual beds and subunits are recognizable throughout the line of sections, and the Ste. Genevieve and Kidder Limestone Members can be differentiated.

STE. GENEVIEVE LIMESTONE MEMBER

The Ste. Genevieve Limestone Member is 87 feet thick at Golman Mountain, Tenn., and averages about 80 feet in thickness throughout Clinton County, Ky. It thins eastward to about 50 feet in Pulaski County near Somerset and near Mount Vernon in Rockcastle County.

The Ste. Genevieve is composed of limestone having a few 2- to 4-inch-thick clay-shale beds. The limestone is commonly medium gray to bluish gray and weathers light gray. Beds range from a few inches to several feet in thickness and contain planar cross-beds which range from 2 to 18 inches in thickness. Sets are commonly thick bedded (described according to terminology proposed by McKee and Weir, 1953). Oolitic limestone is interbedded with fine- to medium-grained calcarenite, coarsely crystalline limestone, and fine- to medium-grained calcilutite (described according to terminology proposed by Folk, 1962, p. 4).

Sparsely scattered megafossils consist of horn corals, blastoid heads, crinoid stem fragments, small brachiopods, and a colonial coral commonly referred to by previous workers as *Lithostrotion harmodites*. Helen Duncan (written commun., 1966) of the U.S. Geological Survey examined specimens of the coral and suggested that they be referred to *Siphonodendren*? aff. *S. genevievensis* Easton. The corals are commonly concentrated in a single layer about 30 feet above the base of the Ste. Genevieve Limestone Member, and a few individual corals are scattered elsewhere in the member. Although the corals are abundant in the eastern part of Pulaski County, they are absent or rare to the south and west where the Ste. Genevieve is thicker. Isolated stem segments of the crinoid referred to *Platycrinites* are common throughout the area, but they are less abundant in the north near Mount Vernon. These segments, restricted primarily to the oolite beds, are rare or absent in calcilutite.

The contact with the underlying St. Louis Limestone is a sharp lithologic boundary which, throughout most of Pulaski County and to the north in Lincoln and Rockcastle Counties, is marked by a breccia zone 1 to 6 feet thick. The zone consists of angular black and gray chert fragments, ¼ to ½ inch in diameter, and well-rounded clear quartz grains, 1/16 to 4 millimeters in diameter, in a matrix of oolite.

The chert breccia, believed to be composed of fragments of reworked material from the underlying St. Louis Limestone, has been mapped as the lowermost bed of the Ste. Genevieve Limestone Member. The breccia is not in Clinton and Wayne Counties nor at the Buck Creek section in Pulaski County (fig. 1, location 8). In areas where the basal breccia is missing, location of the contact is facilitated by a bed of replacement chert, commonly 2 to 4 feet thick at or a few feet above the base of the Ste. Genevieve. Where the chert is above the base, the contact is placed below the lowest light-gray oolite. The chert, commonly medium to dark-gray, dense cryptocrystalline quartz, contains molds and casts of bryozoans, brachiopods, and crinoid stems. Weathered chert is white to gray, somewhat friable, and porous. The lithology and geographic extent of the chert has been discussed by McGrain (1969), who stated that the chert bed is equivalent to the Lost River Chert described by Elrod (1899) in Orange County, Ind.

McFarlan and Walker (1956) place the contact between the Ste. Genevieve Limestone Member and the overlying Kidder Limestone Member at the top of a thin breccia zone, referred to by Patton (1949) as the Bryantsville Breccia. The contact is well exposed only in roadcuts, quarries, and other manmade outcrops. The breccia is composed of angular limestone and chert fragments in a fine-grained oolitic matrix and, in most exposures, is a single layer, 6 inches to 3 feet thick. Locally the breccia is in two or three thin layers intercalcated with thin-bedded oolitic limestone in a subunit set 1 to 3 feet thick. The breccia is apparently widespread and has been described by McGrain (1943) as present in the top of the Ste. Genevieve Limestone in Indiana, Illinois, and western Kentucky.

KIDDER LIMESTONE MEMBER

The upper part of the Moneagle Limestone overlying the Ste. Genevieve Limestone Member in south-central Kentucky is named the Kidder Limestone Member after the village of Kidder (Frazer

7½-minute quad.), Wayne County, Ky. The Kidder Limestone Member is well exposed along State road 790 at Kidder, between Doublehead Gap and the bridge over Sinking Creek.

The Kidder Limestone Member crops out nearly continuously throughout the area of study and extends southward into Tennessee. It ranges in thickness from 190 feet at Golman Mountain, Tenn., and 186 feet at Albany, Ky. (fig. 1, locations 1 and 2) to about 115 feet in Pulaski and Rockcastle Counties, Ky. (locations 7–11). Most of the thinning occurs between Golman Mountain (location 1) and Monticello, Ky. (location 4), where the Kidder thins from 190 feet to 115 feet in a distance of about 22 miles. The thickness, remarkably uniform over the rest of the area, ranges from 110 to 120 feet between Monticello (location 4) and Mount Vernon (location 11).

The following is a generalized description of the member and its distinctive subunits, recognizable throughout the area of study:

A layer, less than 8 feet thick, of crossbedded medium-gray medium-grained partly oolitic limestone is common as the lowermost unit above the contact (fig. 2, subunit 1). It is overlain by 15 to 20 feet of very fine grained partly oolitic even-bedded thin-bedded light-gray to yellowish-brown calcilutite. This unit weathers readily to small irregular slabs on hill slopes and is poorly exposed except in quarries and roadcuts (fig. 2, subunit 2).

The lowest rock to crop out well within the member is a very thick bedded oolite that is about 20 to 30 feet above the base of the member and contains scarce to abundant plates of the crinoid *Talarocrinus*. The oolite, cemented by sparry calcite, is more resistant to weathering than adjacent units and is well exposed in most areas (fig. 2, subunit 3).

A very fossiliferous medium- to coarse-grained fossil fragmental calcarenite is about 70 feet above the base of the member. The unit, ranging from about 6 to 12 feet in thickness, is thick bedded and is more resistant to weathering than adjacent strata. It is characterized by abundant large crinoid stem segments as much as 1 inch in diameter (fig. 2, subunit 4). The unit is commonly underlain by olive-green to gray clay 1 to 4 feet thick and underlies thin- to thick-bedded fine- to medium-grained limestone which makes up the remainder of the Kidder to the base of the overlying Hartselle Formation.

TYPE SECTION OF THE KIDDER LIMESTONE MEMBER

[*Section measured July 1969 along State road 790 at Kidder, between Doublehead Gap and bridge over Sinking Creek, Frazer quad., Wayne County, Ky.*]

	Thickness (feet)	*Accumulative thickness (feet)*
Hartselle Formation (incomplete):		
Shale, calcareous, clayey, greenish-gray; weathers papery; top not exposed	7.7	0.3-8
Shale, very calcareous, greenish-gray; contains abundant thin-shelled productid brachiopods; grades into more clayey shale above	.3	0-0.3
Monteagle Limestone:		
Kidder Limestone Member:		
Limestone, dark- to medium-gray, fine- to medium-grained; beds 4 to 10 inches in thickness, thicker in upper part	21	95-116
Covered	5	90-95
Limestone, light-gray, thin- to medium-bedded, sparsely fossiliferous, partly oolitic	4	86-90
Limestone, light- to medium-gray, medium-grained, thick-bedded; few scattered small crinoid stems	5	81-86
Limestone, light- to medium-gray, thin- to medium-bedded, partly oolitic; contains sparse scattered crinoid stem fragments	4	77-81
Limestone, light- to medium-gray, thick-bedded, medium-grained; contains abundant large (1-inch diameter) crinoid stem fragments	6	71-77
Limestone, dark- to bluish-gray, fine- to medium-grained, thin- to medium-bedded; contains abundant blastoid heads	15	56-71
Shale, green to olive-green and olive-gray, clayey	2	54-56
Limestone, dolomite(?), yellowish-gray; very fine grained calcilutite, massive, thick-bedded; contains irregular masses ½ to 2 inches in diameter of clear, coarsely crystalline calcite	6	48-54
Limestone, light-gray; very fine grained calcilutite, massive, irregularly fractured	11	37-48
Limestone, dark- to medium-gray; calcarenite, crossbedded, thick-bedded; contains abundant small brachiopods; nearly coquinoid in part	2	35-37
Limestone, light-gray, very fine grained; calcilutite	9	26-35

	Thickness (*feet*)	*Accumulative thickness* (*feet*)
Monteagle Limestone—Continued		
Kidder Limestone Member—Continued		
Limestone, blue-gray to medium-gray, very fine grained, massive; in part brecciated with limestone fragments in limestone cement. Green clay-shale 2 inches thick at base	4	22-26
Limestone, light- to medium-gray, medium- to thick-bedded, fine- to very fine grained, partly oolitic, very fossiliferous; contains blastoid and crinoid stem fragments, scattered *Talarocrinus*	19	3-22
Limestone, medium- to light-gray, fine- to medium-grained, sparsely fossiliferous; contains some thin green clay-shale partings; partly covered	3	0-3
Total Kidder Limestone Member	116	
Top Ste. Genevieve Limestone Member:		
Breccia; composed of black and gray angular chert fragments and fragments of yellowish-brown calcilutite in matrix of poorly cemented oolite	0.4	0.1-0.5
Base of measured section.		

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