

# THE POSITION AND AGE OF THE SCIOTOVILLE BAR LOCALITY, SOUTHERN OHIO<sup>1</sup>

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## ABSTRACT

The Sciotoville Bar was a rock ledge exposed along the northeast bank of the Ohio River between the Little Scioto River and Wolfred Run (NE $\frac{1}{4}$ , sec. 8, T2N, R20W, Scioto County, Ohio). This well-known fossil locality yielded an abundant fauna from concretions in a shale which formed a portion of the ledge. Since 1920, however, the locality has been flooded by the pool created first from construction of Lock and Dam 31, and later by the Captain Anthony Meldahl Locks and Dam.

Information assembled from various sources indicates that the main concretionary horizon represents the upper portion of the Portsmouth Member of the Cuyahoga Formation. In addition, a previously unpublished measured section of this locality by Hyde is now available which describes the location of the concretionary fossil-bearing horizon. The combined ammonoid fauna from the upper Cuyahoga and the overlying lower Logan Formation suggests a Kinderhookian rather than Osagean age for the concretionary horizon.

## INTRODUCTION

A rock ledge extending into the Ohio River near Sciotoville, Ohio, was a well-known fossil locality for a period of at least 50 years. Local and professional collectors obtained hundreds and perhaps thousands of brachiopods, mollusks, and other fossils from concretions in a shale which formed a part of this ledge. During 1912, a project calling for the construction of a lock and dam below Portsmouth, Ohio, was initiated by the U.S. Army Corps of Engineers, and in 1920, Lock and Dam 31 were opened to navigation (R. A. Dunkerley, personal communication, 1970). The pool created by this dam covered the Sciotoville locality to a depth of approximately eight feet. In August, 1964, the Captain Anthony Meldahl Locks and Dam were opened below Maysville, Kentucky, to replace Lock and Dam 31. This new facility raised the pool level an additional two feet over the Sciotoville Bar and maintains this level at the present time (R. A. Dunkerley, personal communication, 1970).

Prior to the inundation and consequent loss of the locality, considerable speculation was raised concerning its age and stratigraphic position. Well-known names in Ohio geology, such as C. L. Herrick, E. Orton, and J. E. Hyde, initially debated whether this horizon was Devonian or Mississippian and later whether it was of a Kinderhookian or Osagean age. Much of this discussion was based on only a superficial familiarity with the locality and its fauna, and provided little clarification of the problem. Interpretation was hindered by the lack of a detailed measured section showing the location of the fossil horizon. Submergence of the locality ended the debate for the most part and, with the exceptions of the posthumous publication of Hyde's work (1953) and a few theses (notably Fagadau, 1952), there has been little investigation of the horizon since that time.

The present writer became interested in the problem while researching a thesis on the Logan Formation (Manger, 1969). The following discussion summarizes locality data available from Hyde's unpublished master's thesis (1907), a 1914 navigation chart of the Ohio River, and a note from Wilber Stout. The purpose of the present discussion is to provide information about this locality as a useful reference toward understanding the Cuyahoga-Logan interval in Ohio.

## LOCATION AND DESCRIPTION

Shortly before his death, Wilber Stout prepared a note on the Sciotoville locality for Dr. A. K. Miller of the University of Iowa. In his description of the

<sup>1</sup>Manuscript received November 9, 1970.

area, Stout states that the main fossiliferous horizon was exposed along the northeast shore of the Ohio River for almost one-half mile, between the mouth of the Little Scioto River and Wolfred [?Wolfer] Run (fig. 1,A). This area occupies a portion of the northeast quarter of section 8, Porter Township (T2N, R20W), Scioto County, Ohio. During times of very low water, the fossil bed formed part of a ledge that extended into nearly the middle of the river. Weathering and winnowing removed the finer shale and concentrated the heavier, more resistant concretions on the bank and ledge. These concretions were the principal source of fossils, although a few specimens were collected from localized ferruginous lenses.

Hyde's earlier statement (1907, p. 12) corroborates Stout's description, and emphasized that the exposure could only be worked during a low stage of the river. The following section of this locality is quoted from Hyde's thesis (1907, p. 14):

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|----|---|-------|
| 5. | Gray fine-grained sandstones weathering buff: <i>Spirophyton</i>  | 2'    |
| 4. | Bluish gray sandy shales with a few thin sandstones of one or two inches thickness  | 8'    |
| 3. | Bluish gray argillaceous and arenaceous shales with a few thin gray sandstones and several layers of hard dark gray to reddish concretions with considerable iron. Concretions seldom more than 2 to 4 inches thick and sometimes two to three feet in diameter. It is from these that the fossils are mostly obtained, the ones occurring in the shales being poorly preserved and hard to obtain. The entire horizon is fossiliferous, the upper two feet not so much so. | 12'   |
| 2. | Fine-grained concretionary sandstone buff to gray in outcrop, few fossils   | 2"-6" |
| 1. | Thin, lenticularly bedded, shaly sandstones, fine-grained; bluish gray in color, yellowish to buff on weathered surface. Fossils very rare but occasional hard concretions are found which contain a few. <i>Spirophyton</i> impressions abundant; possibly two feet more exposed at lower stage of river.  | 3'    |

Hyde (1907, p. 13-14) described an additional exposure approximately one-half mile below the mouth of the Little Scioto River (Fig. 1,B). There, a fossiliferous horizon was exposed between the river and the railroad tracks, as well as in the pit of the Scioto Fire Brick Company. A fauna similar to that of the main horizon was obtained from concretions in a gray, fine-grained sandstone. A local reversal of the regional dip, at this point, left some question as to the relationship of this locality to the main exposure farther upstream. However, Hyde (1907, p. 12) expressed certainty that the section near the brick works was stratigraphically higher than that at the main locality. Consequently, he did not treat this higher fauna in his thesis. The following section describing the exposure (fig. 1,B) measured on the hill near the Scioto Fire Brick Company workings below Sciotoville is quoted from Hyde's thesis (p. 13-14).

The *Black Hand*—*Logan Formation*

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|-----|---|------|
| 10. | Moderately fine-grained yellow sandstones forming ledges; layers from a few inches to one or two feet in thickness, alternating with sandy shales; outcrops resemble closely those seen a few miles to the west. Measurements not carried to the top of section. Probably the top of the Cuyahoga, the upper part of which is much more arenaceous than farther west. | 100' |
| 9.  | Mostly covered but apparently consisting of shales and sandstones like those below, by barometer  | 50'  |
| 8.  | Shales, quite sandy with numerous thin sandstone, lower part seen in clay pit   | 36'  |

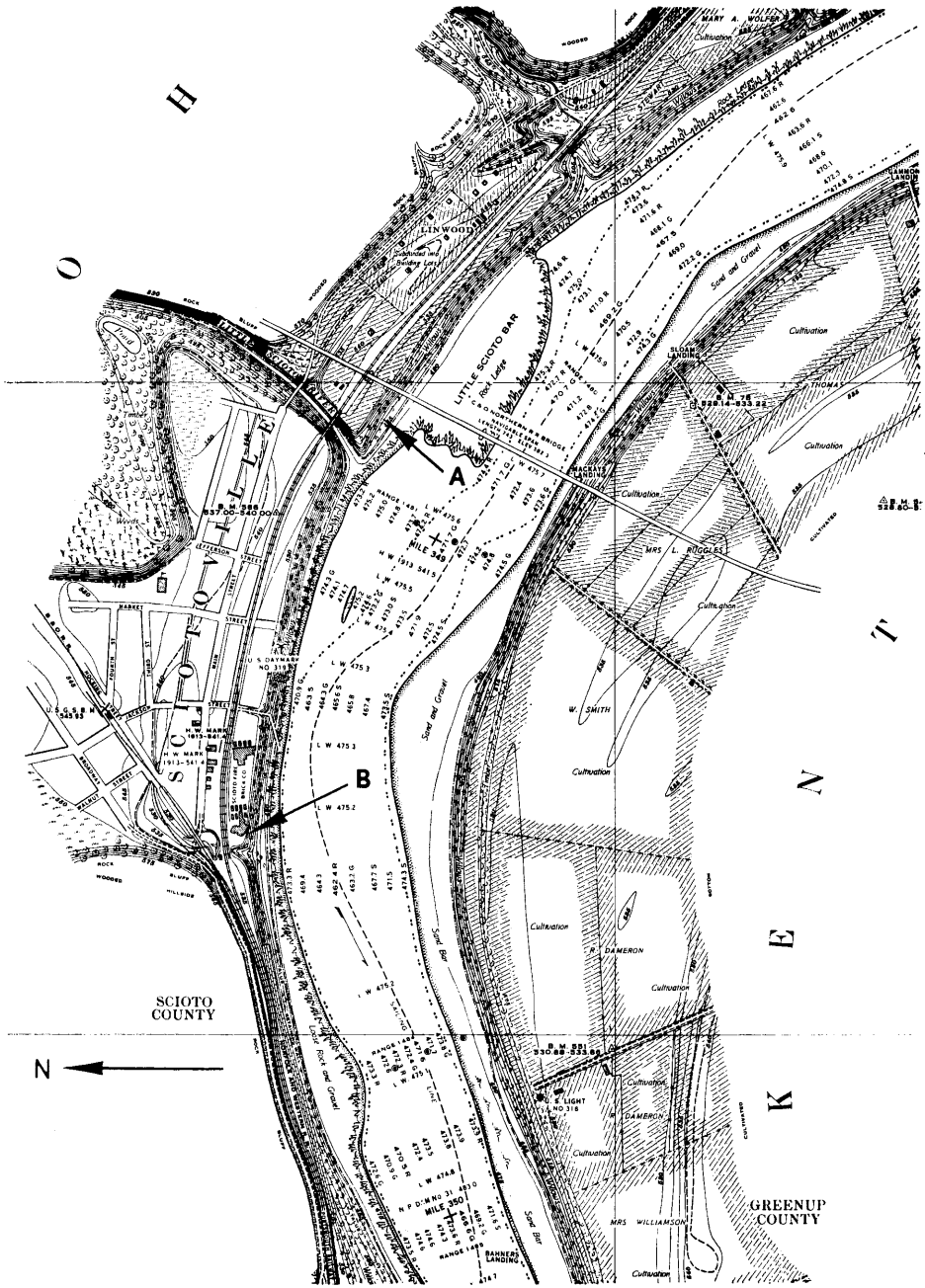


FIGURE 1. Location of fossiliferous horizons in the vicinity of Sciotoville, Ohio prior to construction of Lock and Dam 31. A.—Main concertionary horizon; B.—Section near Scioto Fire Brick Company (from U.S. Army, Corps of Engineers, Ohio River Chart No. 97).

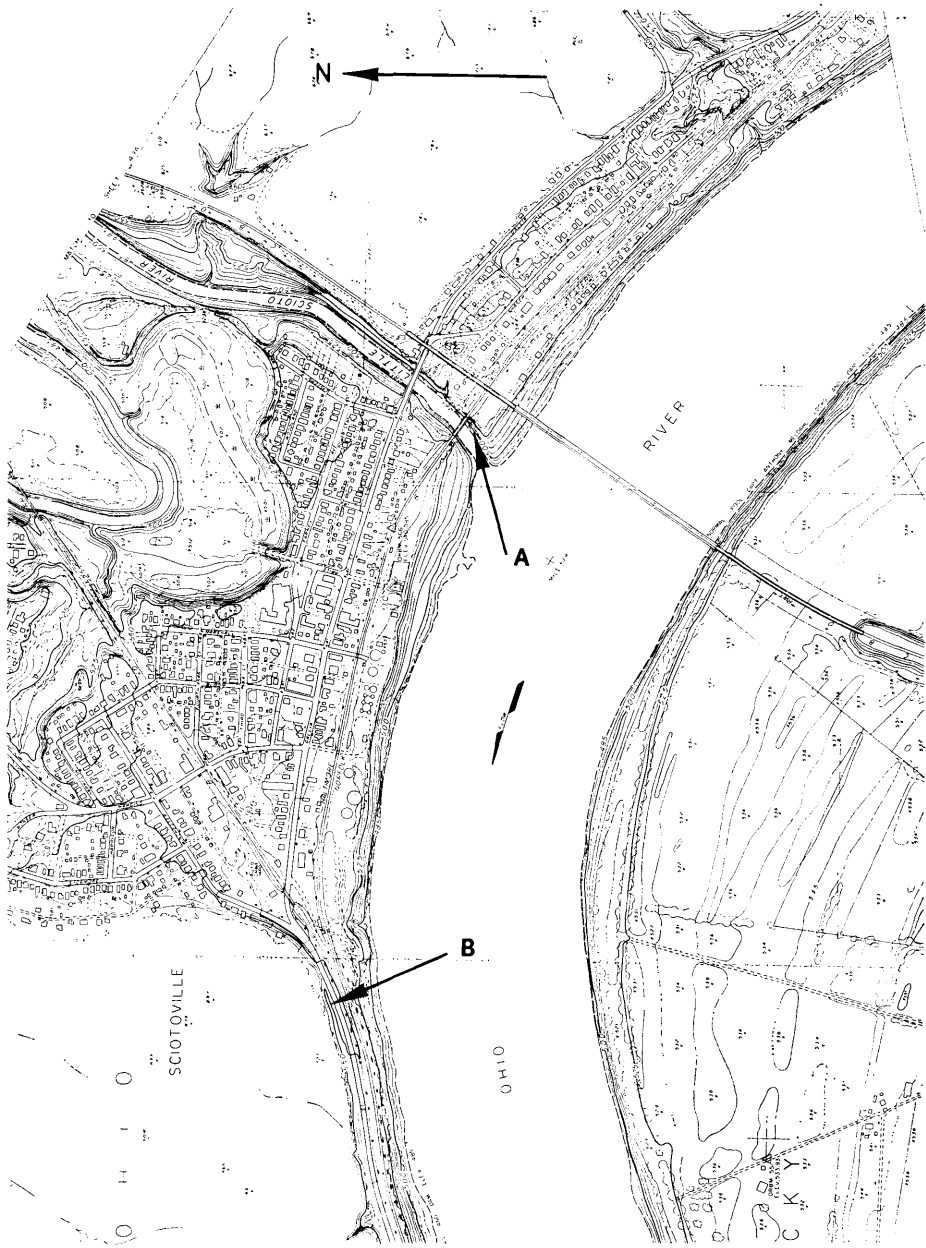


FIGURE 2. Location of sections presently available in the vicinity of Sciotoville, Ohio. A.—Mouth of Little Scioto River; B.—U.S. Highway 52 roadcut (from U.S. Army, Corps of Engineers, Captain Anthony Meldahl Locks and Dam, Topographic Survey, Sheet 49).

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|---|--------|
| 7. Yellowish argillaceous sandstones with sandy shales seen in opening  | 10'    |
| 6. Hard bluish argillaceous shales with very little grit dug for brick plants, coming from the pit in large blocks which soon weather into conchoidal fragments   | 36'    |
| 5. Covered interval at railroad tracks  | 13' 6" |
| 4. Grayish to buff moderately fine-grained coarse sandstones which weather into fragments on exposure; numerous hard red or gray ironstone concretions which together with the sandstones, contain an abundant fauna, similar to that in the bed farther up the river but with more pelecypods  | 5'     |
| 3. Very sandy gray shales, portions better described as a shaly sandstone, with three or four persistent concretionary layers one of which, occurring 5 feet below the top, is one to two feet thick. The contact with the overlying zone is not sharp. Fossils occur rarely, single specimens of <i>Athyris lamellosa</i> and <i>Spirifer stratiformis</i> being the only ones seen. | 24' 9" |
| 2. Gray shaly sandstones, a <i>Productus</i> and an <i>Orthocheles</i> noted  | 6'     |
| 1. Gray sandy shales with one or two streaks of sandstone two to four inches thick  | 3'     |

Level of the River.

There is no present indication of the previous existence of either of these localities described by Stout and Hyde. Two exposures are now present in the general area of Hyde's localities, but neither contains the fossiliferous concretionary horizons. One of these is a section exposed on the east bank of the Little Scioto River between river level and the top of the bluff overlooking the railroad (fig. 2,A). There, beneath the bridge of the Baltimore and Ohio and Norfolk and Western Railroads, a light-gray-brown, shaly siltstone contains scattered concretions to an elevation of approximately ten feet above the river. However, no fossils were observed in them. An additional thick exposure was created by the widening of U.S. Highway 52 in the Sciotoville area (fig. 2,B). The strata revealed at this locality presumably represent a portion of Hyde's section near the Scioto Fire Brick Company workings, but they lie above the principal fossil beds. Figure 3 diagrammatically presents Hyde's measured section. The pool created successively by Lock and Dam 31 and by the Captain Anthony Meldahl Locks and Dam flooded the main fossil horizon. The remainder of the section that would have been available has been covered with fill in maintenance of the river bank. Houses and a growth of brush and trees obscure any remaining traces of outcrop along the river bank. The site of the Scioto Fire Brick Company, which ceased operation during the 1920's, has also been completely obliterated. The area was filled and grassed, and is now occupied by petroleum storage tanks (fig. 2,B).

#### STRATIGRAPHY

The strata exposed in the vicinity of Sciotoville, Ohio, represent the upper portion of the Portsmouth Member of the Cuyahoga Formation and the Logan Formation Undifferentiated. In southern Ohio, the Cuyahoga Formation has been subdivided, in ascending order, into the Henley, Buena Vista, and Portsmouth Members (Hyde, 1915). The Portsmouth Member is typically a gray, argillaceous shale with a few thin sandstone interbeds. In this, its type area, the Portsmouth Shale reaches a maximum thickness of approximately 250 feet (Hyde, 1915). Fine sandstone and siltstone interbeds become increasingly common toward the top of the unit. As a result, the contact with the overlying Logan

Formation is gradational; it is usually placed at the base of the first massive, persistent siltstone.

In central Ohio, the Logan Formation has been subdivided into four members by reference to two persistent, coarse, clastic units, the Berne and Allensville Members (Hyde, 1915). In ascending order, the four members of the Logan Formation are the Berne, Byer, Allensville, and Vinton Members. Both the Berne and Allensville Members pinch out southward, prior to reaching the exposures along the Ohio River. Lacking these coarse clastic units, differentiation of the Byer and Vinton Members is precluded. Consequently, no subdivisions of the Logan Formation are recognized in this area (Manger, 1969).

Initially, Hyde (1907, p. 13-14) referred the Sciotoville beds to the Cuyahoga Formation. Based on both faunal and lithologic correlation, he stated that the fossil horizon at Sciotoville lay approximately 175 feet below the base of the Black Hand Member in central Ohio (1907, p. 31). Subsequently Hyde (1953) placed the beds within the Byer Member of the Logan Formation, but did not discuss this age assignment.

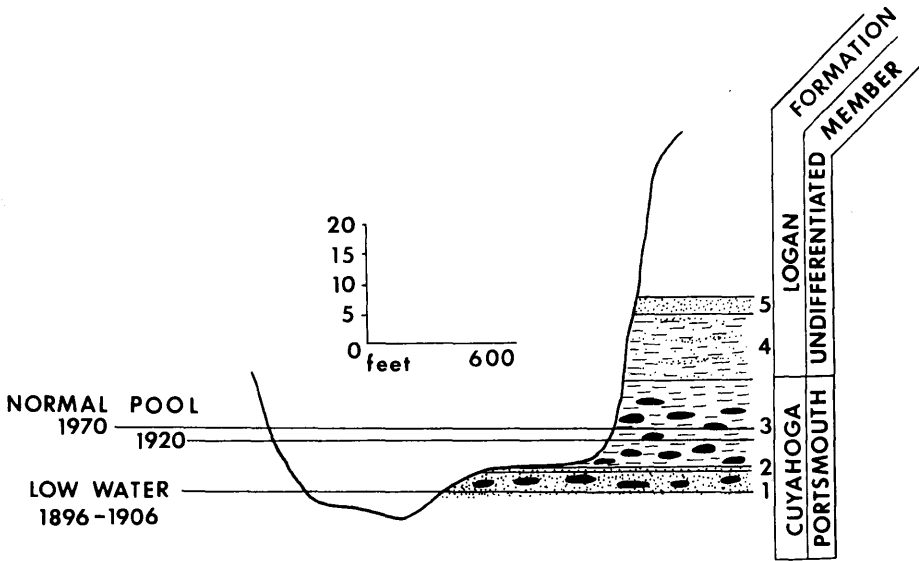


FIGURE 3. Diagrammatic representation of J. E. Hyde's measured section through the main concretionary horizon at Sciotoville, Ohio.

Loss of the exact locality description and the gradational nature of the contact between the Logan and Cuyahoga Formations unfortunately make a detailed stratigraphic assignment difficult. However, evidence from Hyde's thesis, as presented in the present study, suggests that the principal fossiliferous horizon at Sciotoville (fig. 1,A) represents the upper portion of the Portsmouth Member of the Cuyahoga Formation. In particular, the shale lithology of the fossil bed, as described by Hyde, closely resembles that of the Portsmouth Member and would be regarded as atypical for the Logan Formation. In addition, the upper siltstone beds of Hyde's section compare more favorably with those of the Logan Formation, as presently exposed near the mouth of the Little Scioto River (fig. 2,A). Following present practice, the Cuyahoga-Logan contact is drawn at the first persistent siltstone and would lie approximately at the top of bed three in Hyde's measured section.

In contrast, it is difficult to reconcile Hyde's section near the Scioto Fire Brick works with observable outcrops in that area. The U.S. Highway 52 roadcut (fig. 2,B) exposes almost 300 feet of characteristic Logan Formation lithologies. Hyde's section contained a total thickness of 284 feet, which must encompass a portion of the sequence in this roadcut. Yet, by using the pre-construction river level as a reference point, there is only slight correlation between the stratigraphy of the former description and that of the present cut. For example, the 36-foot interval of hard, bluish, argillaceous shale in Hyde's bed 6 is not present in the roadcut. With the elevation at the top of bed 6 taken as the Cuyahoga-Logan contact, almost 90 feet of characteristic Logan siltstones exposed in the area would fall within the Portsmouth Member. The two existing exposures provide little explanation for these discrepancies. As previously mentioned, Hyde noted a peculiar reversal of regional dip at this section, in comparison to the horizontal attitudes at the main locality. This reversal may have resulted from channeling, differential compaction, or a combination of both. The Portsmouth-Logan contact is interpreted as lying approximately 50 feet lower at Sciotoville than in the Portsmouth area, but exposures of this contact are too sporadic to allow a confident interpretation. Since it seems improbable that Hyde's measured section could be as grossly inaccurate as required by present observations, the problem remains unresolved. Regardless, there is good agreement of the main fossil horizon as described by Hyde and observed in present exposures. Consequently, assignment of this horizon to the upper portion of the Portsmouth Member of the Cuyahoga Formation seems to be consistent with the present study.

#### AGE RELATIONSHIPS

A collection of more than 700 individual fossil specimens, particularly brachiopods, were collected from the entire Sciotoville Bar exposure by J. E. Hyde and his father, Eber Hyde, during a period of about 30 years. Although no definite statement is available, it appears that the main concretionary horizon is probably Hyde's bed 1, from which the bulk of his material was obtained (Hyde, 1953). In his discussion of the fauna and in the summary, Hyde (1907, p. 27-33) concluded that the Sciotoville fauna is essentially similar to the "Waverly" faunas of central and northern Ohio. His analysis (1907, p. 32) suggests an Osagean age and a general correlation with the Keokuk Limestone of the type region. However, he also noted the presence of a Kinderhookian element in the Sciotoville fauna. As an explanation for this element, Hyde visualized the retreat of a Kinderhookian fauna into the Ohio Basin, from the north, as contemporaneous with the invasion of an Osagean fauna from the south. The Sciotoville bed was a site of intermingling of the two faunas, and the Osagean fauna apparently never advanced much beyond the Ohio River.

Subsequent correlations (Rodriguez *in* Root, *et al.*, 1961) have considered the upper Cuyahoga Formation as Osagean in age and correlative with the Fern Glen Formation in the type region. The Logan Formation is also considered Osagean and equivalent to the Burlington Limestone (Rodriguez *in* Root, *et al.*, 1961, p. 56) and possibly to the lower portion of the Keokuk Limestone (Fagadau, 1952, p. 131-150).

Restudy of the ammonoid fauna from the upper Cuyahoga and lower Logan Formations (Manger, 1969), indicates a slightly older age assignment than that previously suggested for this interval. The ammonoids of the upper Cuyahoga Formation include *Imitoceras sciotoense* (Miller & Faber, 1892) and *Muensteroceras oweni* (Hall, 1860), which were collected by Hyde from the concretions at the main locality. In addition, he obtained numerous *Kazakhstania colubrella* (Morton, 1836) from the upper Portsmouth Shale at the famous "Two Mile Hill" locality, two miles north of Portsmouth. The Berne and Byer Members of the Logan Formation have yielded *Imitoceras sciotoense*, *Kazakhstania colubrella*, *Protocanites lyoni* (Meek & Worthen, 1860), *Gattendorfia andrewsi* (Winchell,

1870), and *Karagandoceras bradfordi* Manger, 1971. This upper Cuyahoga-Logan ammonoid assemblage may be regarded as a single fauna, and is similar to previously described Kinderhookian associations from the United States, Soviet Union, and Australia (Manger, 1971). A full treatment of the ammonoids is not presented here, as this fauna is presently being prepared for publication (Manger, in preparation). However, with the exception of the fauna from the Marshall Sandstone and Coldwater Shale of Michigan, as described by Miller and Garner (1955), which may be mixed, the association of *Gattendorfia* and *Protocanites* appears to characterize Late Kinderhookian ammonoid assemblages.

#### ACKNOWLEDGMENTS

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#### REFERENCES CITED

- Fagadau, S. P.** 1952. Paleontology and stratigraphy of the Logan Formation of central and southern Ohio. Unpublished doctoral dissertation, Ohio State University. 425 p.
- Hyde, J. E.** 1907. The Sciotoville (Ohio) fauna. Unpublished master's thesis, Columbia University. 33 p.
- 1915. Stratigraphy of the Waverly formations of central and southern Ohio. *Jour. Geology* 23: 655-682, 757-779.
- 1953. The Mississippian formations of central and southern Ohio (Marple, Mildred F., ed.). *Ohio Div. Geol. Survey Bull.* 51: 354 p.
- Manger, W. L.** 1969. The stratigraphy of the Logan and adjacent formations (Mississippian) of Ohio. Unpublished master's thesis, University of Iowa. 188 p.
- 1971. The Mississippian ammonoids *Karagandoceras* and *Kazakhstania* from Ohio. *Jour. Paleontol.* 45: 33-39.
- Miller, A. K. and Garner, H. F.** 1955. Lower Mississippian cephalopods of Michigan, Part 3, Ammonoids and Summary. *Mich. Univ. Mus. Paleontol. Contr.* 12: 113-173.
- Ohio River Board of Engineers on Locks and Dams.** 1914. Ohio River. Chart 97.
- Root, S. I., Rodriguez, J., and Forsyth, Jane L.** 1961. Geology of Knox County. *Ohio Div. Geol. Survey Bull.* 59: 232 p.
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