Trace and Body Fossils from the Cuyahoga Formation (Mississippian), Reynoldsburg, Ohio

A Thesis

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by

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Abstract

Seven trace fossil genera and four body fossil genera have been found in the sandstone facies (Buena Vista Member) of the Cuyahoga Formation (Lower Mississippian) at Pine Quarry Park in Reynoldsburg, Ohio. Ichnogenera identified are *Scalarituba, Gordia, Zoophycos, Helminthoidia, Phycosiphon, Planolites*, and *Laevicyclus*. *Zoophycos* and *Laevicyclus* are found in the lower beds; *Gordia* and *Helminthoidia* are more common in the upper beds. *Scalarituba* and *Planolites* are found throughout the beds. Together, the trace fossils of the upper part of the quarry are indicative of the *Cruziana* ichnofacies. Lower in the section the facies seems to be of the *Skolithos* ichnofacies. Associated body fossils found are *Platycrinities sp.*, *Gilbertsocrinus?* sp., *Dictyoclostus sp.*, *Fenestrellina sp.*, and unidentifiable blastoid fragments. At the Reynoldsburg locality, deposition is interpreted to have taken place in a shallow water setting near an ancient deltaic environment.

Introduction

The purpose of this paper is to describe and interpret trace and body fossils from the former William M. Forrester Quarry in Reynoldsburg, Ohio (Figures 1, 2). This former quarry is now called Pine Quarry Park. The former quarry exposes sanstones of the Lower Mississippian Cuyahoga Formation. The fossils are interpreted to be from the Buena Vista Member of the Cuyahoga Formation (Figure 3). The rocks are rich in trace fossils but body fossils are uncommon. Bryozoans, crinoids, blastoids, and brachiopods are present, as are various trace fossils. Some layers of rock have numerous trace fossils on the undersides of beds.

Stratigraphic Setting

The Buena Vista Member of the Cuyahoga Formation lies just above the Henley Shale and below the Rarden Member in southern Ohio. The unit grades into the Vanceburg Member toward the north (Coogan et. al., 1981). In Pine Quarry Park, 6.2 meters of the Buena Vista Member are exposed (Figures 2,3). The rocks in the Buena Vista member of the Cuyahoga Formation are interbedded fine-grained sandstone and/or siltstone with thin gray shale layers. The fine-grained sandstone layers are tan-brown to blue-gray. The sandstone layers are of varying thickness and have flute marks along the bottoms of some beds. Tracks and trails that seem to resemble *Gordia* can be seen along the bottom of some beds, too. One of the sandstone layers shows convolute bedding. The siltstone layers are tan-gray and are thinly bedded. The shale layers are thin, commonly about 10 centimeters. One shale layer has a dark gray color and has small organic bits in it. Siderite layers, iron concretions, and iron staining are common throughout the quarry. Low in the section the beds, particularly in the stream, show soft sediment deformation structures.

The Buena Vista Member extends from southeastern Ohio to northern Kentucky, where it is contained in the Borden Formation (Coogan et. al., 1981).

The environmental setting of the Buena Vista is interpreted to be a nearshore setting that grades eastward into a barrier bar-deltaic environment (Bork, 1979). This is supported by the fine-grained sandstone/siltstone interbedded with gray shale. These lithologies grade upward into coarser sandstone deposits (Bork, 1979). The trace fossils found in the quarry represent the *Cruziana* in this locality since the traces *Gordia, Scalartuba, and Planolites* were found in Pine Quarry Park along with *Zoophycos* traces. These traces, other than *Zoophycos* normally represent areas that are shallow shelves, not below wave base (Rhoads, 1975). *Zoophycos* cannot always be used as a depth indicator for rocks (Miller, 1991). The body fossils of crinoids, brachiopods, and bryozoans suggest that this environment was a shallow marine setting.

The stratigraphic placement of the Buena Vista Member has been somewhat controversial. Previous work done on the Lower Mississippian rocks was done by Hyde in 1915 and 1921, Stockdale in 1939, Holden in 1942, Fagadau in 1952, and more recently by Coogan et. al. In 1981.

Systematic Paleontology

Trace Fossils

Gordia Emmons, 1844

Figure 4

Remarks.- Gordia includes long slender trails, straight to gently curved having uniform thickness and smooth sides. The trails are found on the underside of the bed as hypichnia. Most specimens from Reynoldsburg are 4 to 5 cm long and are about 2 to 3 mm in diameter. Sediment in the trails seems to be of the same composition as the sediment in the rock. Some trails have an iron staining that is present along the margins of the trails. The trails cross over and through one another but none of the trails seem to branch. *Gordia* has been interpreted as a grazing trail of a worm or worm-like creature (Hantzschel 1975).

Helminthopsis Herr, 1877

Figure 5

Remarks- Simple meandering trails that have a fairly smooth texture are assigned to *Helminthopsis*. Meanders are widely spaced run in a more-or-less straight direction. The meandering trails have diameters ranging from 8 to 11 millimeters for the trails in hyporelief and 5 to 6 millimeters for trails that are in epirelief. Some of the hyporelief trails have small leminscate ridges that run perpendicular along the trails. The hyporelief trails also show sediment "piled" up around the trails. The sediment in the matrix seems to match the sediment that comprises the trails. Both types of trails run parallel along the bedding plane. The hyporelief and the epirelief trails are considered part of the same ichnogenus because they only differ in the mode of preservation. This dosen't mean they are part of the same ichnospecies.

Laevicyclus Quenstedt, 1879

Figure 6

Remarks- Vertical tubes that run perpendicular to the bedding are assigned to *Laevicyclus*. The tubes are marked by concentric lamination around the walls of the tubes. The diameter of the tubes range from 4 millimeters to 13 millimeters. These vertical tubes were probably living or feeding structures of a worm-like animal. These tubes obviously mark an area of higher energy than the other traces since most of the other traces are on the bedding plane and not down inside the sediment.

Phycosiphon- von Fischer-Ooster, 1858

Figure 7

Remarks- Small U-shaped loops that are usually branched and found parallel or oblique to bedding are assigned to *Phycosiphon*. They represent hypichnia and endichinia feeding traces that have diameters of 1 mm. The branching antler-shaped characteristic is not easily recognized. The U-shaped loops seem to be disconnected and there are traces that are several centimeters in length. There is a distinct color difference between the traces and the rock. These traces are thought to be feeding burrows of worm-like animals (Hantzschel 1975).

Planolites Hall, 1847

Figure 8

Remarks- Burrows that are basically straight, smooth walled, and sinuous to obliquely oriented to the surface are assigned to *Planolites*. Commonly the burrows are unbranched but they can be found intersecting one another. The diameter of the burrows ranges from 2 to 4 mm. Many specimens branch from a single point and run oblique to the bedding. They stand out because the burrows are a black gray color against a brown-gray rock. Some samples just show single straight burrows but have the same characteristics of the other burrows. These are thought to be trace of infaunal worm-like animals (Hantzschel 1975).

Scalartuba Weller, 1899

Figure 9

Remarks- Burrows that are subcylindrical and either parallel or oblique to bedding are assigned to *Scalarituba*. Most have prominent scalariform or meniscus ridges. Burrows seem to be 3 to 4 mm in diameter. Length of the trails is variable. The trails do not cross through each other but the trails can be on different planes. Some of the trails seem to branch but none of the specimens show this very well. There is a color contrast between the burrow and the surrounding rock. The burrows are a darker black-gray color against a greenish-gray rock. They are possible internal trail made by a worm of worm-like organism that lived in a shallow marine setting (Hantzschel 1975).

Zoophycos Massalongo, 1855

Figure 10, 11

Remarks-Flat planar spherical markings on tops of bedding planes with a cylindrical tube that is perpendicular to the bedding plane are assigned to *Zoophycos*. The tube is connected to the flat planar spherical marking almost radial design, on the top of the bedding plane. There is a small ridge or point that protrudes from around the center of the structure. Underneath this ridge is a vertical tube that goes down into the rock. These tubes seem to be made of concentric lamination of a dark gray to black very fine grain material that is different from the fine grained, tan-brown sandstone matrix. The radiating structure on the top of the rock is also made of this dark gray to black very fine grained material. The radiating structure can range in size from 3 to 7 cm. The vertical tubes can extend vertically at least 7 cm. The tube has a diameter of about 1 cm. This structure is tentatively interpreted as a feeding structure made by a soft-bodied worm-like animals.

Body Fossils

Phylum Brachiopoda

Class Articulata

Order Strophomenida

Dictyoclostus sp. Muir-wood, 1930

Figure 12

Remarks- One convex valve of a productid brachiopod was found. The valve has continuous radiating ridges that are not interrupted as in *Buxtonia*. *Dictyoclostus* is commonly found elsewhere in the Cuyahoga Formation (Rocque and Marple, 1985).

Phylum Bryozoa

Class Cryptestomata

Fenestrellina sp. D'Orbigny, 1849

Figure 13

Remarks- Bryozoan colonies having branching and net-like forms are interpreted to represent *Fenestrellina*. *Fenestrellina* sp. and related genera are in the Cuyahoga Formation (Rocque and Marple, 1985).

Phylum Echinodermata

Class Crinoidea

Gilbertsocrinus? sp. Phillips, 1836

Figure 14

Remarks- Single circular columnal with crenularium, narrow areola, narrow perilumen, and a circular lumen is assigned to *Gilbertsocrinus*. The identification is questionable because only one columnal was found.

Platycrinites sp.- Miller, 1821

Figure 15

Remarks-Basal and radial plates of the calyx have been found. They are identified as *Platycrinites* because they a fused basal plate instead of three separate unequal basals radials. Oval columnal plates which are characteristic of *Platycrinites*, have not been found.

Class Blastoidea

Undetermined Blastoid

Remarks- A single undetermined radial plate of a blastoid was found.

Conclusions

Pine Quarry Park in Reynodsburg Ohio contains fine-grained sandstone/siltstone interbedded with thin gray shale layers. The traces fossils found represent the *Cruziana* ichnofacies. The environmental setting is interpreted to be a shallow water near shore area. Marine body fossils include brachiopods and echinoderms.

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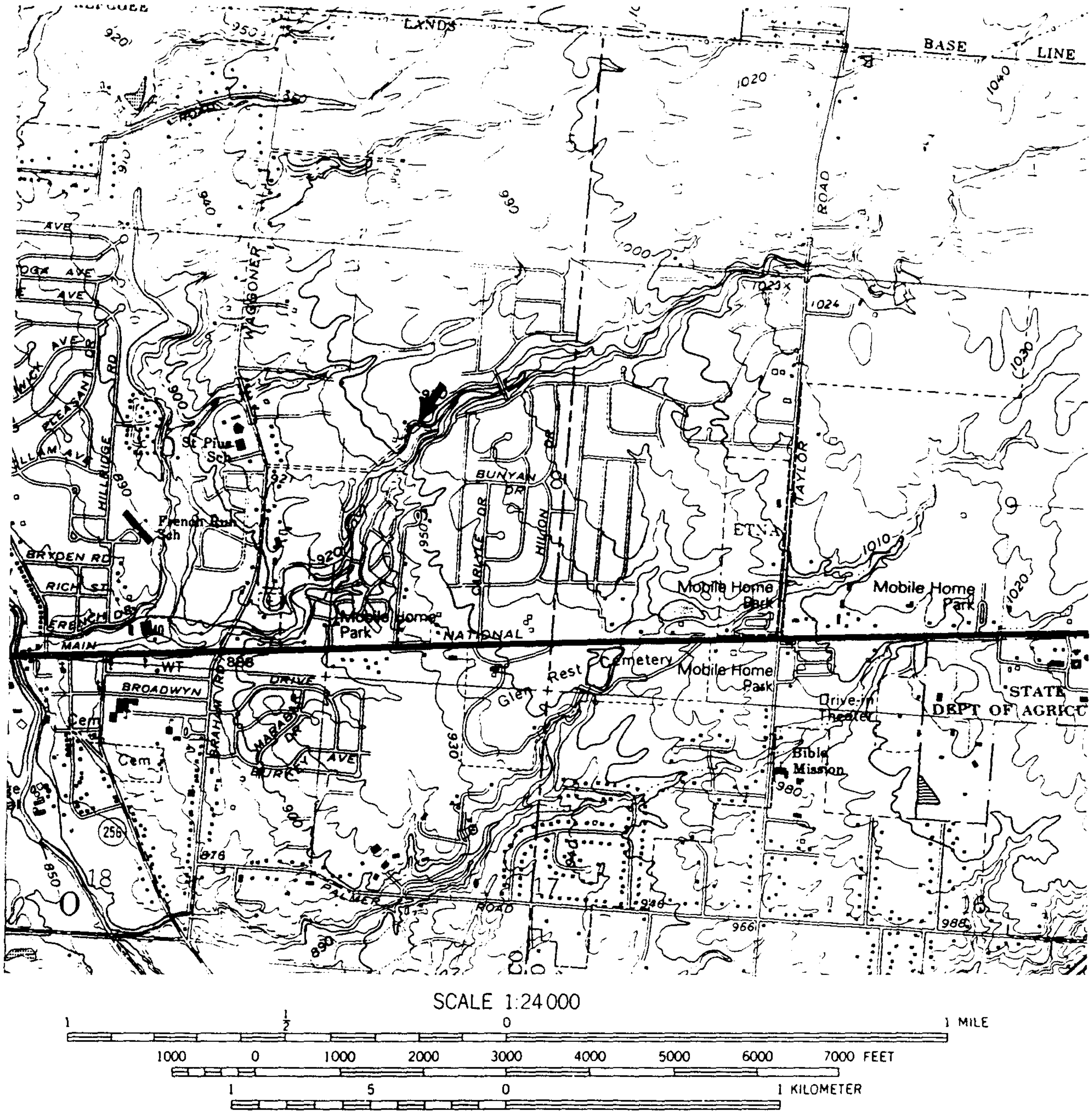
Figure 1 Map of Reynoldsburg, Ohio. The arrow points to the Quarry



CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

ROAD CLASSIFICATION

Primary highway, hard surface	Light-duty road, hard or improved surface
Secondary highway, hard surface	Unimproved road

Interstate Route U S Route State Route

REYNOLDSBURG, OH
39082-H7-TF-024

1964
REVISED 1994
DMA 4463 IV NE-SERIES V852

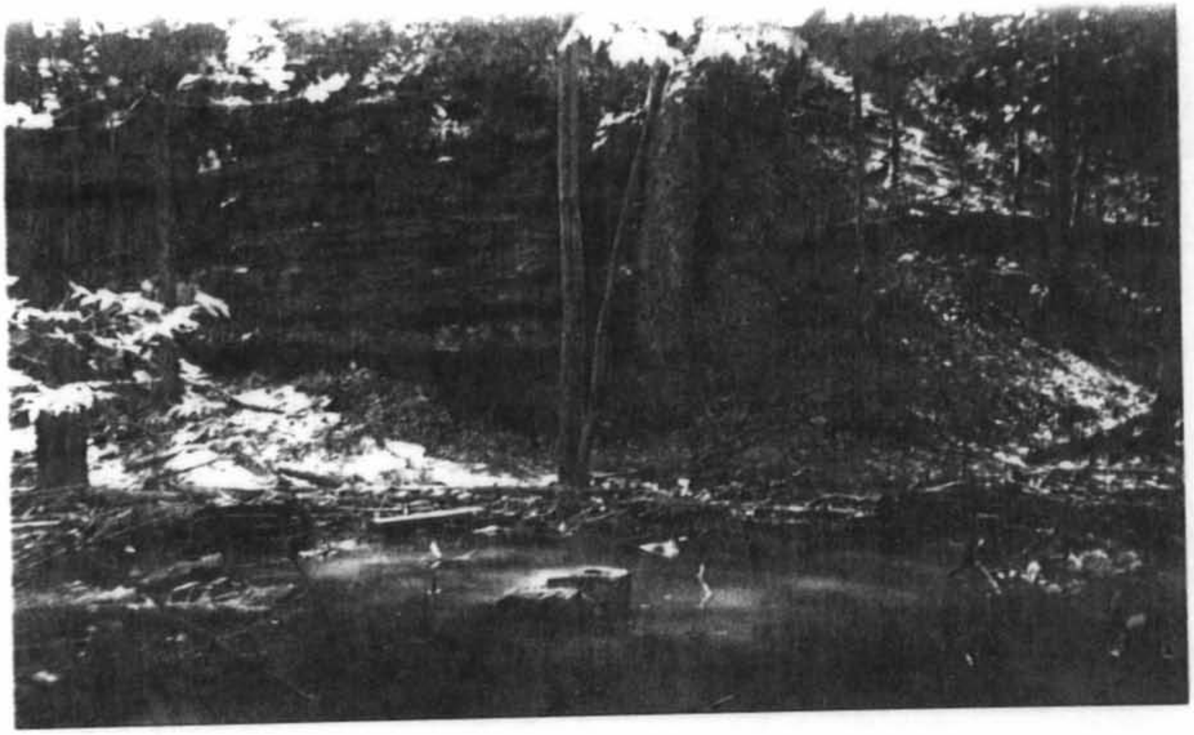


Figure 2. North wall of Pine Quarry Park from where the stratigraphic column (Figure 3) was measured.

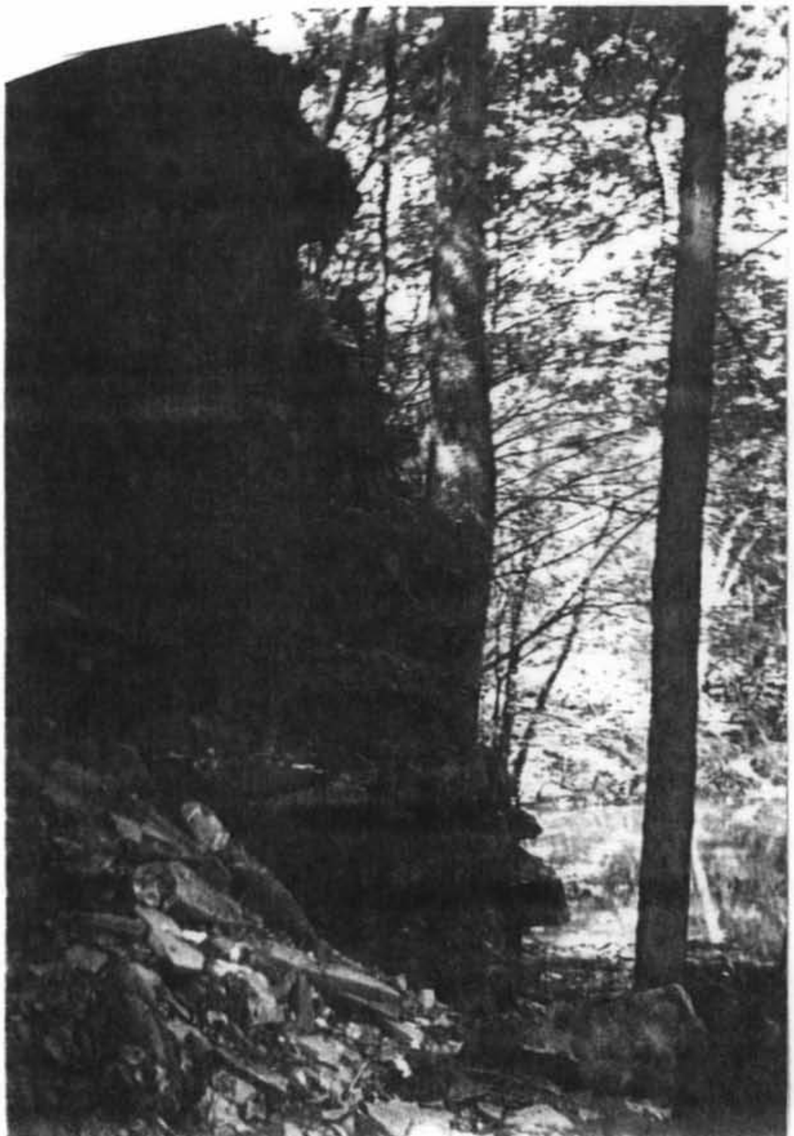
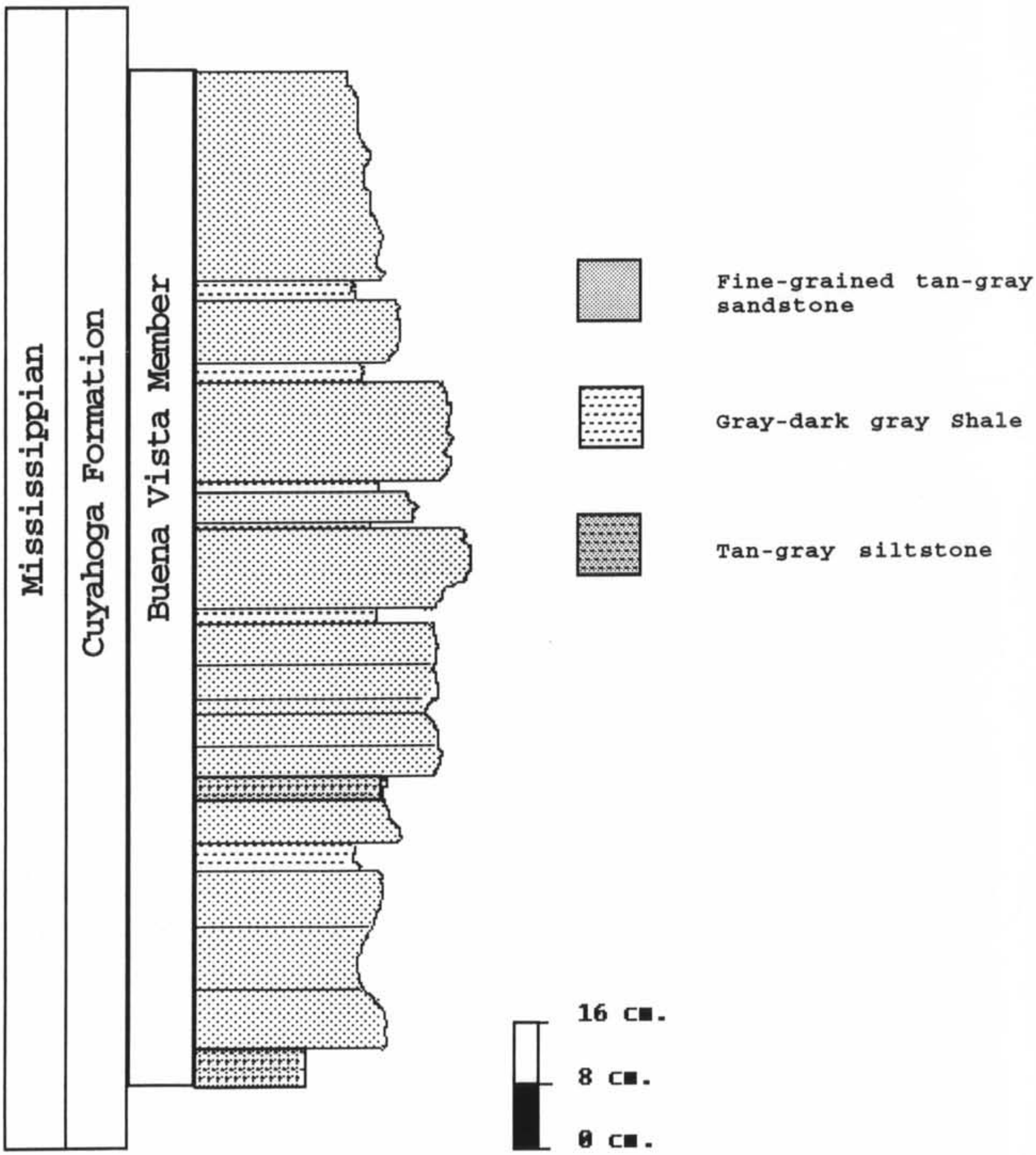


Figure 3. Stratigraphic column from Pine Quarry Park in Reynoldsburg, Ohio



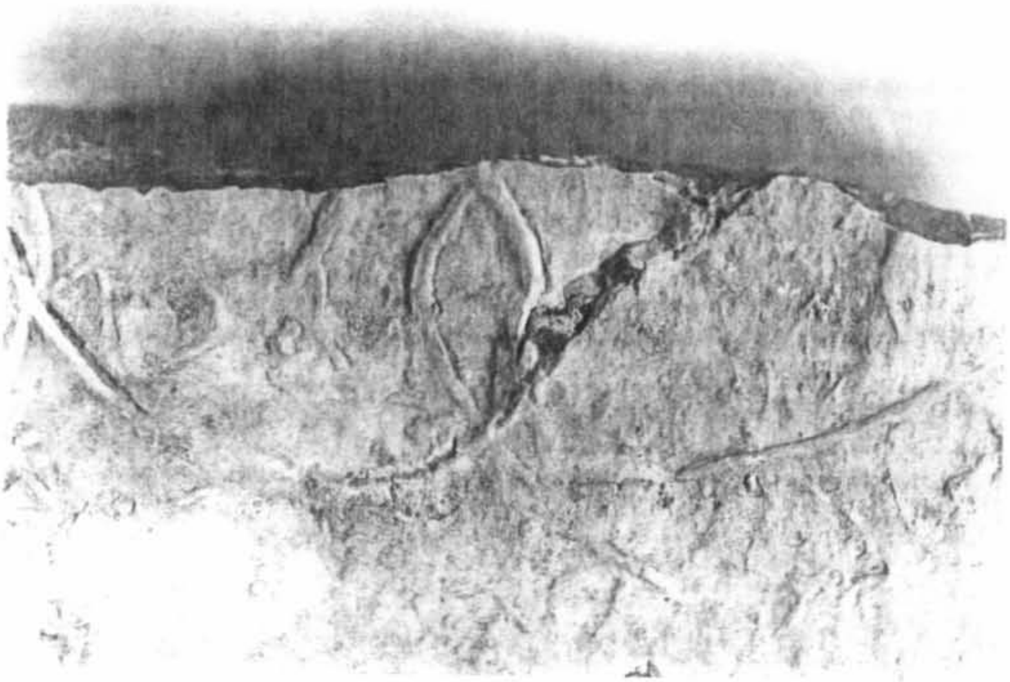


Figure 4. *Gordia*. X.52.

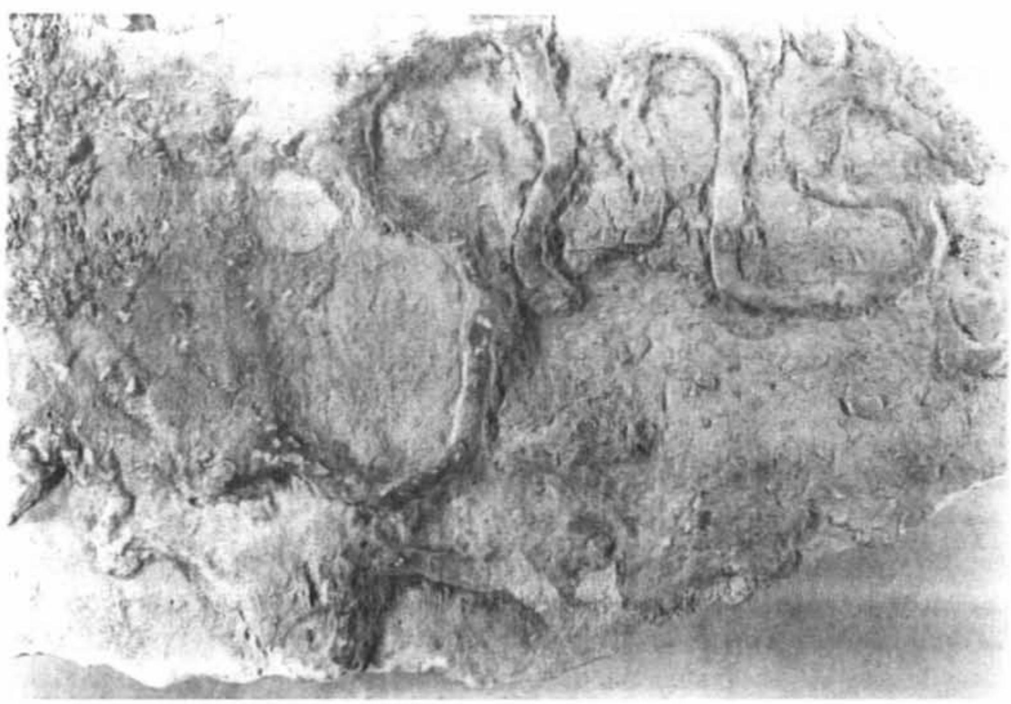


Figure 5. *Helminthopsis*. X.55.

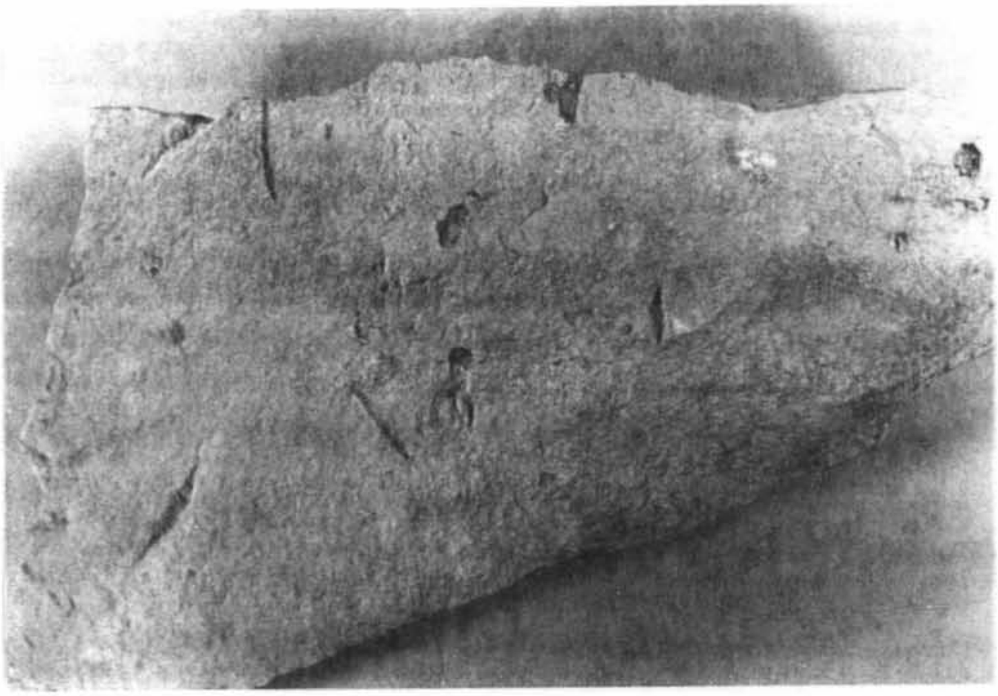


Figure 6. *Laevicyclus.* X.43.

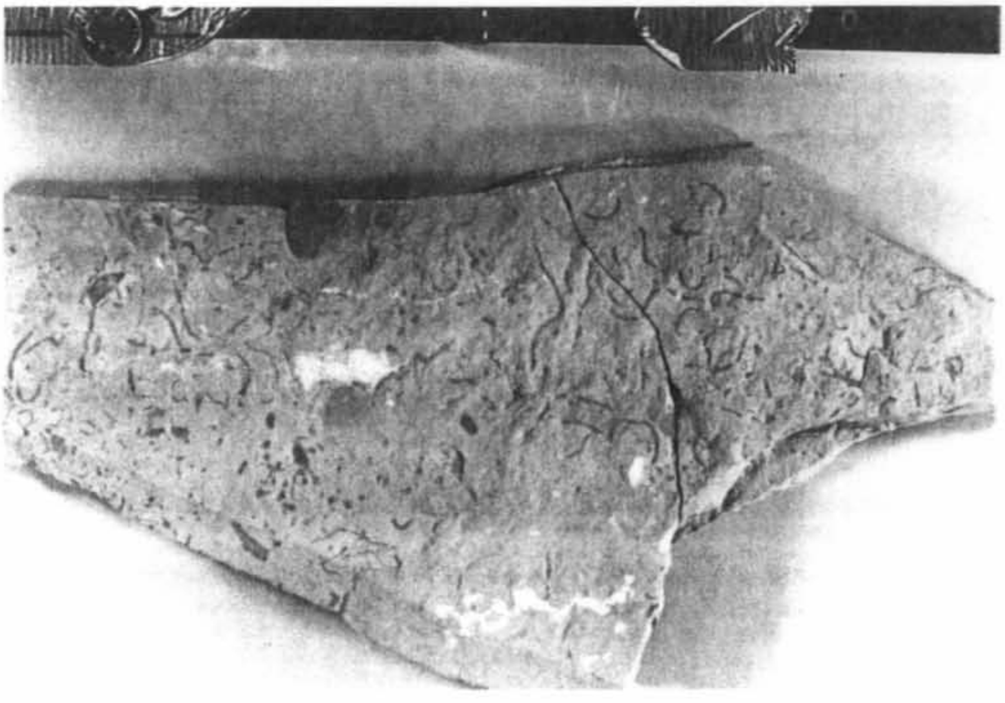


Figure 7. *Phycosiphon.* X.375.

Figure 8. *Planolites*. X 1.875.

Figure 9. *Scalartuba*. X 1.94.

Figure 10. Oblique view of *Zoophycos* trace showing the top and the vertical burrow. X .75.

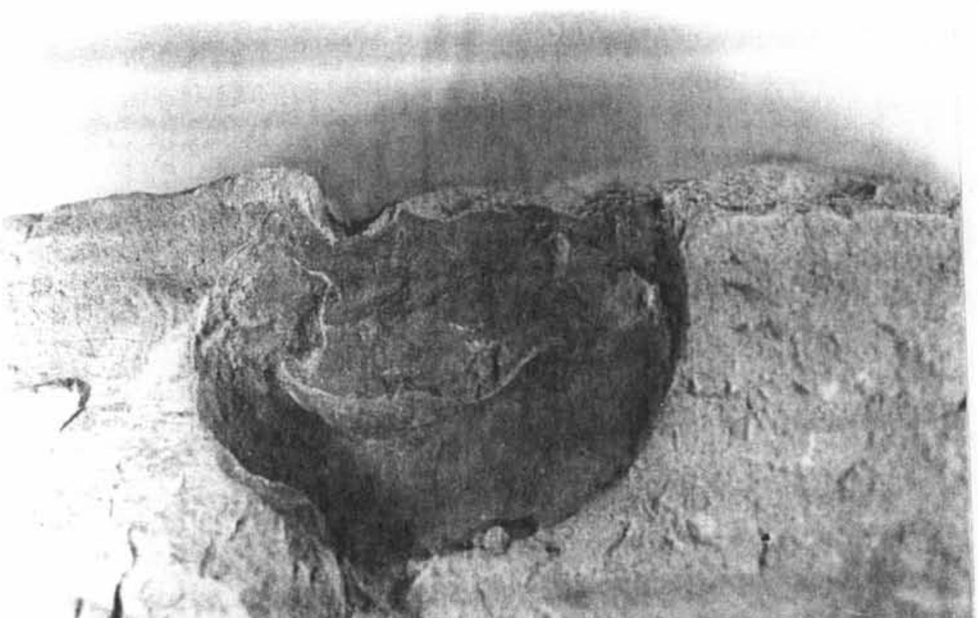


Figure 11. Top view of *Zoophycos* trace. X .91.

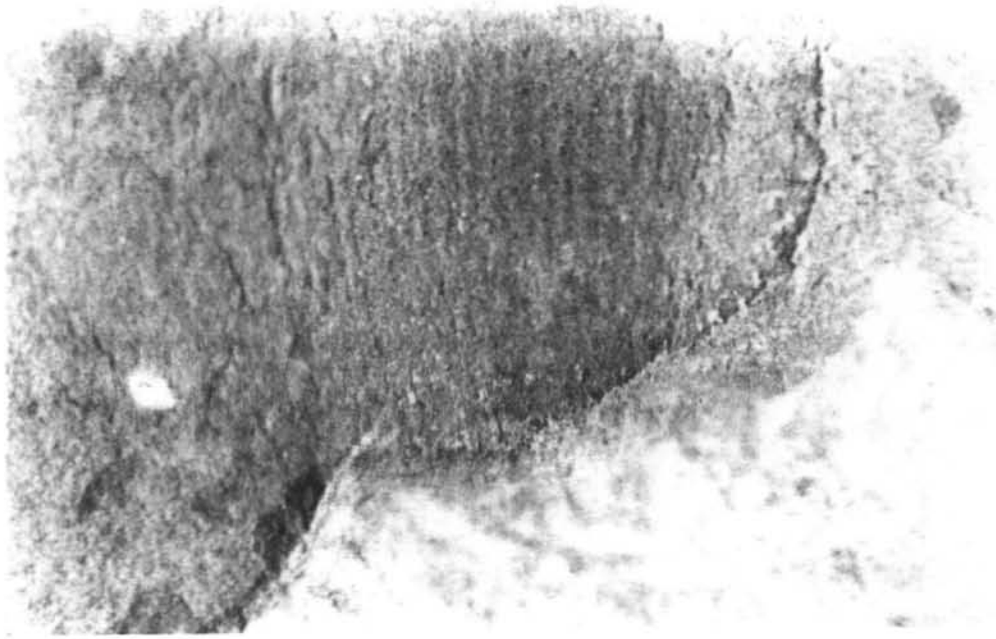


Figure 12. *Dictyoclostus* sp. brachipod found in rock that is shown in Figure 7. X 3.625.

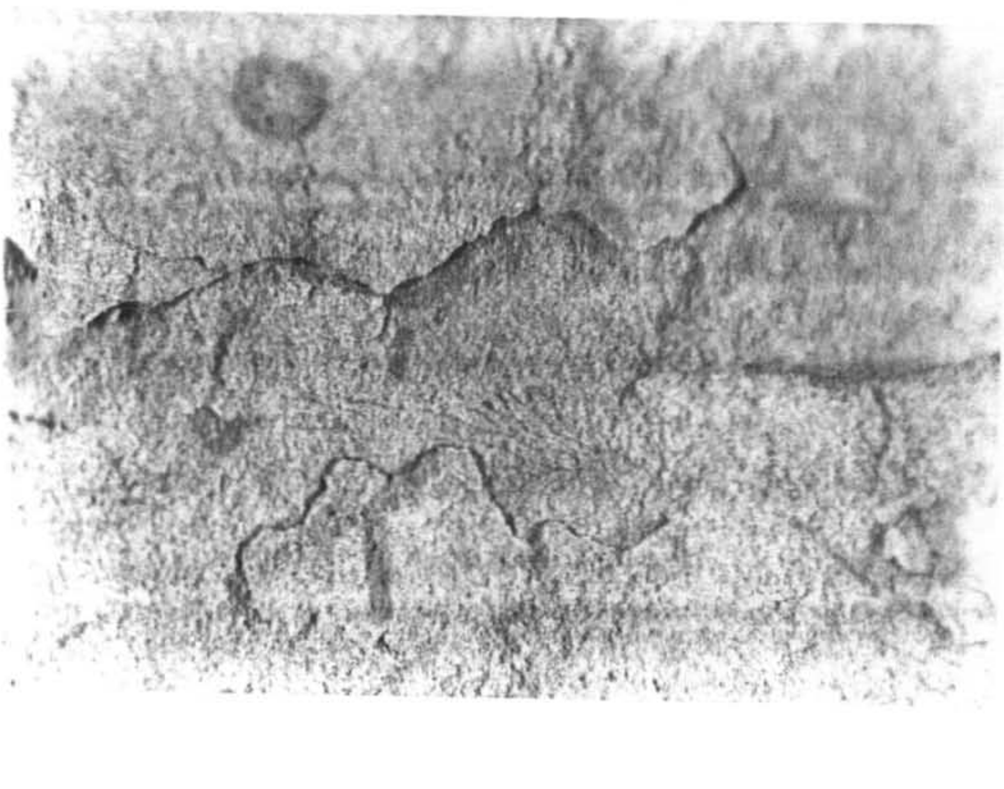


Figure 13. *Fenestrellina* sp. X 3.08.

Figure 14. *Gilbertsocrinus?* sp. single columnal of a crinoid. X 4.00.

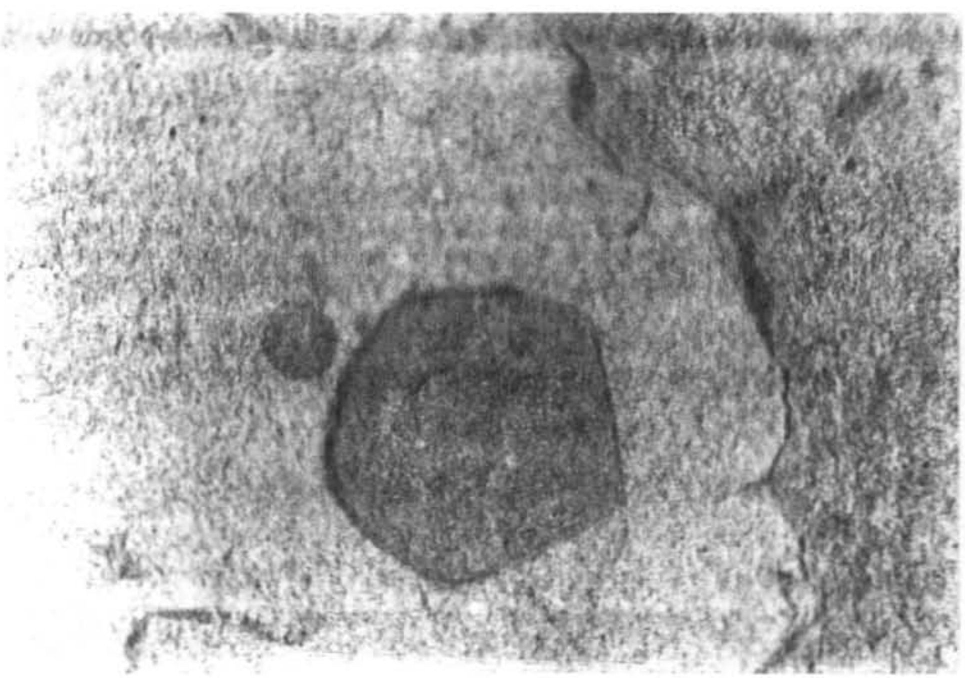


Figure 15. Fused basal plate of *Platycrinites* sp X 3.55.

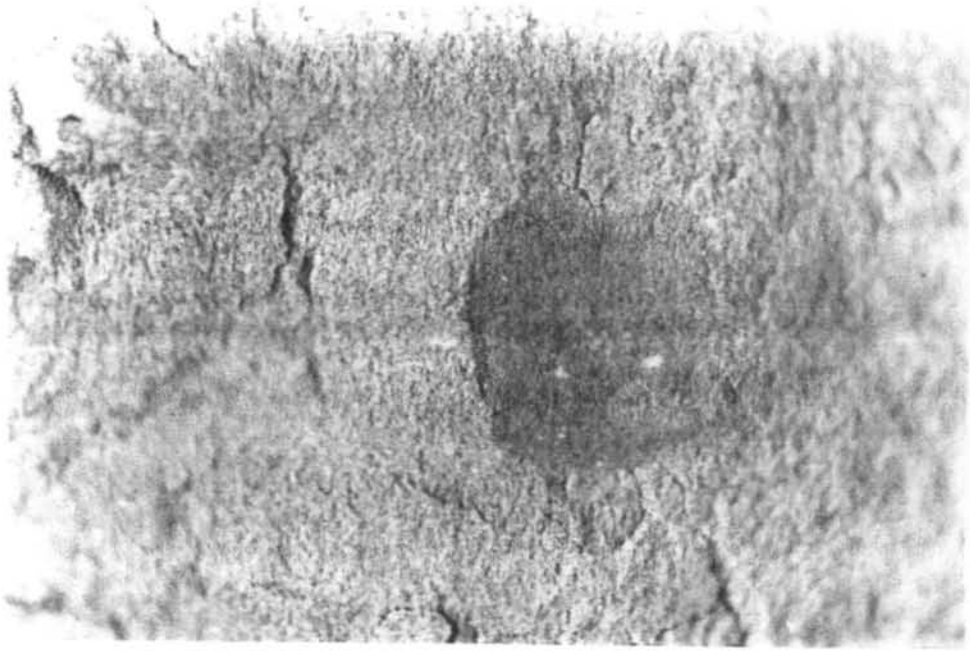


Figure 16. Radial plate of *Platycrinites* sp. X 3.56.

Figure 17. Radial plate of an unidentifiable blastoid. X 3.5.