Gastropods and Rostroconchs (Mollusca) from the Maxville Limestone (Upper Mississippian) in Ohio[1]

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ABSTRACT. The gastropod fauna is abundant and more diverse in the Upper Mississippian Maxville Limestone than previously described. Seventeen species, including 6 reported for the first time, are known and fragments of several others indicate a still larger fauna is present. A taxonomic update of earlier work includes the new species *Platyceras* (*Orthonychia*) *morsei, Stegocoelia* (*Hypergonia*)? *jonathanensis*, and *Acteonina hanseni*. Small, poorly preserved specimens of rostroconchs represent the genus *Oxyprora*.

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INTRODUCTION

The Mississippian (Chesterian) Maxville Limestone was named by E. B. Andrews (1870). Morse (1910) gave a historical record of the studies made on the unit and in 1911 published an updated study of the fauna relying in large part upon the work of Whitfield (1882, 1891, 1893). The location of specimens collected by Whitfield is unknown with the exception of a gastropod, *Bellerophon alternodosus*, located in the collections of the University of California (1530/34299). Large collections of Maxville invertebrates were obtained from Ohio University and Indiana University, which supplemented collections made by the author from localities in Perry and Muskingum counties, east-central Ohio. A number of specimens present in the collections at The Ohio State University, including several collected by Morse, were made available for study, and two specimens were loaned by the Cleveland Museum of Natural History. Several taxa were found which have not been previously reported from the Maxville Limestone. The purpose of this study is to describe and illustrate these taxa and to update the taxonomic assignment of previously described taxa.

MATERIALS AND METHODS

Most of the collections consist of specimens broken from the limestone by use of hammer and sledge. These were further excavated by vibratool and fine needles, a time consuming process. Samples of the softer layers and weathered material were boiled in a solution of water and Quaternary O which provided some small specimens, mainly as internal molds, and fragments of shell material. These are not well enough preserved for the most part to allow identification but do indicate that some additional taxa are present. Specimens were coated with magnesium oxide before being photographed with a Leica camera. Specimens have been placed in the Orton Geological Museum, The Ohio State University (OSU).

PREVIOUS WORK

More recent studies on invertebrates from the Maxville Limestone include rostroconchs (Hoare 1990), ostracodes (Hoare 1991, 1993), smaller foraminifera (Hoare and Skipp 1995), trilobites (Babcock 1996), and brachiopods (Hoare 2003). One small paper on bivalve mollusks has been published (Hoare and others 1988).

Whitfield (1882, 1891, 1893) described 7 species of gastropods from the Maxville:

Straparollus similis Meek and Worthen = *Straparollus* (*Euomphalus*) *planidorsatus* Meek and Worthen, 1861
Holopea newtonensis Whitfield = *Leptoptygma newtonensis* (Whitfield 1882)
Polyphemopsis melanoides Whitfield = *Bulimorpha melanoides* (Whitfield 1882)
Macrocheilus subcorpulentis Whitfield = *Strobeus subcorpulentis* (Whitfield 1882)
Naticopsis ziczac Whitfield = *Naticopsis* (*Naticopsis*) *ziczac* Whitfield, 1882
Bellerophon alternodosus Whitfield = *Bellerophon* (*Bellerophon*) *alternodosus* Whitfield, 1882
Bellerophon sublaevis Hall = *Bellerophon* (*Bellerophon*) *sublaevis* Hall, 1856

To this list Morse (1911) added 4 species of gastropods:

Bulimorpha canaliculata Hall = *Acteonina hanseni* n. sp.
Orthonychia acutirostra (Hall) = *Platyceras (Orthonychia) morsei* n. sp.
Strophostylus carleyana Hall = *Naticopsis* (*Naticopsis*) sp.
Murchisonia vermicula Hall = *Stegocoelia* (*Hypergonia*)? *jonathanensis* n. sp.

He also assigned *Macrocheilus subcorpulentis* to *Sphaerodoma* Keyes, 1889 = *Strobeus deKoninck*, 1881, and *Polyphemopsis melanoides* to *Bulimorpha* Whitfield, 1882

RESULTS

The gastropod fauna in the Maxville Limestone is much more diverse than previously determined. An additional 6 species are described herein including:

Platyceras (*Orthonychia*) *chesterense*? Meek and Worthen, 1867
Strophostylus cf. *S. wortheni* (Weller 1916)
Naticopsis (*Naticopsis*) *genevievensis* Meek and Worthen, 1867
Palaeozygopleura sp.
Meekospira bambooformis Thein and Nitecki, 1974
Donaldina pygmaea? (Weller 1916)

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Numerous small fragments of specimens, impossible to identify, indicate a much larger fauna to be present.

SYSTEMATIC PALEONTOLOGY

Genus *Bellerophon* Montfort, 1808
Subgenus *Bellerophon* Montfort, 1808
Bellerophon (*Bellerophon*) spp.
(Fig. 1.1, 1.2)

Discussion

Specimens of *Bellerophon* (*Bellerophon*) are very common in the Maxville Limestone. On weathering out of the limestone and in breaking out with a hammer, the shell is invariably lost leaving an internal mold. Whitfield and Morse described *Bellerophon alternodosus* Whitfield, 1882, and *Bellerophon sublaevis* Hall, 1856. The former species was described as having a row of nodes that joined latterly along the dorsal midline, and the latter species with a keel along the dorsal midline apparently referring to the presence of a selenizone, which was not figured. An internal mold showing the presence of a selenizone (Fig. 1.1) and another specimen (Fig. 1.2) shows no indication of a selenizone with the dorsal margin of the aperture straight or slightly concave. Without the shell it is difficult to impossible to assign these specimens specifically or to compare them with other species.

Material

Numerous specimens including OSU 12211, 22893, 51851, 51852 from localities 1-4. Size ranges from 18.7 mm long, 16.7 mm wide to 10.5 mm long, 11.5 mm wide.

Genus *Straparollus* Montfort, 1810
Subgenus *Euomphalus* J. Sowerby, 1814
Straparollus (*Euomphalus*) *planidorsatus* (Meek and Worthen 1861)
(Fig. 1.3-1.5)

Euomphalus planidorsatus Meek and Worthen, 1861, p. 462.
Straparollus similis Whitfield, 1891, p. 589, pl. 14, Figs. 9-11; Whitfield, 1893, p. 476, pl. 16, Figs. 9-11; Morse, 1911, p. 396, Fig. 22a-c.
Straparollus (*Euomphalus*) *planidorsatus* Thein and Nitecki, 1974, p. 64, Fig. 17.

Description

Medium sized shells with low spire; strong angulation on outer edge of flattened upper whorl surface; outer whorl surface slightly concave below angulation then curving convexly onto base of whorl to angulation near midline of base of whorl; surface convex from angulation into open umbilicus; ultimate whorl subpentagonal in cross section; growth lines slightly prosocline on upper whorl surface, curving convexly forward on lateral surface before curving backwards on basal surface into umbilicus.

Discussion

Straparollus (*E.*) *planidorsatus* differs from *S.* (*E.*) *similis* Meek and Worthen, 1861, by having a lower spire and narrower umbilicus. There appears to be little difference between the two species. Size is not a valid differentiation as stated by Thein and Nitecki (1974, p. 66). Most of the Maxville specimens are depressed to varying degrees but when undistorted better fit the shape of *S.* (*E.*) *planidorsatus*. The illustrations of Whitfield, repeated by Morse, show a specimen with the ultimate whorl compressed forming an irregular ridge near the middle of the lateral surface of the whorl distorting the shape, which is common in Maxville specimen.

Material

Numerous specimens including OSU 12204, 22861, 51853 from localities 2, 3, 4. Sizes range from 9.8 mm high and 17.8 mm wide to 3.1 mm high and 6.2 mm wide.

Genus *Platyceras* Conrad, 1840
Subgenus *Orthonychia* Hall, 1843
Platyceras (*Orthonychia*) *chesterense*? Meek and Worthen, 1867
(Fig. 1.6-1.8)

Platyceras (*Orthonychia*) *chesterense* Meek and Worthen, 1867, p. 265; Thein and Nitecki, 1974, p. 125, Figs. 53, 54, 59 (see for synonymy to this date).

Description

Small, disjunct shell with one whorl expanding into a narrow, elongate form; surface smooth lacking spiral and collabral ornament and longitudinal folds; margin of aperture uniform.

Discussion

The specimens appear to be immature based upon their size and lack of salients on the aperture margin. Thein and Nitecki (1974) described and figured three variants of *P.* (*O.*) *chesterense* from the Mississippian of Illinois, within which a considerable amount of variation occurs. Their illustrations of a specimen included in variant 1 (Figs. 54a,b) appear most similar to these smaller Maxville specimens.

Material

Two specimens, OSU 58154, 58155 from localities 2 and 4. Size ranges from 9.5 mm high and 5.2 mm wide to 6.8 mm high and 2.9 mm wide.

Platyceras (*Orthonychia*) *morsei* n. sp.
(Fig. 1.9, 1.10)

Orthonychia acutirostris Morse, 1911, p. 406, Fig. 30.

Diagnosis

Broadly conical shell with subcircular aperture; one prominent flat ridge dorsally; prominent re-entrant at position of major ridge bordered by salients.

Description

Small, broad, obliquely conical shell; apex missing; dorsal surface with a prominent, narrow, flat ridge extending from apex bordered by narrow, deep sulci; two faint longitudinal ridges on lateral surfaces; ventral surface without ridges; aperture subcircular with deep re-entrant in margin at prominent dorsal ridge; comarginal growth lines present.

FIGURE 1. 1, *Bellerophon* sp., dorsal view of internal mold showing presence of selenizone, OSU 51851, ×2.5; 2, *Bellerophon* sp., dorsal view of internal mold with no indication of selenizone, OSU 51852, ×2.5; 3-5, *Straparollus* (*Euomphalus*) *planidorsatus*, umbilical, apertural, and apical views, OSU 51853, ×2; 6-8, *Platyceras* (*Orthonychia*) *chesterense*?, 6-7, dorsal and left lateral views, OSU 51854, ×6; 8, dorsal view, OSU 51855, ×8; 9-10, *Platyceras* (*Orthonychia*) *morsei*, holotype, dorsal and right lateral views, OSU 12212, ×5; 11-15, *Strophostylus* cf. *S. wortheni*; 11-12, apical and apertural views, OSU 51856, ×8; 13-15, apical, umbilical, and apertural views, OSU 51857, ×2; 16-19, 21-23, *Naticopsis* (*Naticopsis*) *genevievensis*; 16-17, abapertural and apertural views, OSU 51858, ×2.5; 18-19, abapertural and apical views, OSU 51859, ×2; 21-23, abapertural, apertural, and apical views, OSU 12210, ×2; 20, *Naticopsis* (*Naticopsis*) sp., apertural view, OSU 12213, ×6; 24, *Palaeozygopleura* sp., abapertural view, OSU 51860, ×8; 25-26, *Stegocoelia* (*Hypergonia*)? *Jonathanensis*; 25, holotype, apertural view, OSU 12212; 26, abapertural view, OSU 51861, ×10; 27-28, *Bulimorpha melanoides*, apertural and abapertural views, OSU 12207, ×2; 29-30, *Acteonina hanseni*; 29, abapertural view, OSU 51862, ×10; 30, holotype, abapertural view, OSU 12208, ×10.

Etymology

Named for William C. Morse who collected and first described the specimen.

Discussion

Morse (1911, p. 406) described this specimen, labeled as *O. acutirostris* (Hall 1856), but his illustration does not show the characteristics well in terms of exaggeration of the longitudinal ridges and lack of salients and re-entrants of the margin of the aperture. The shell of *P.* (*O.*) *acutirostris* and *P.* (*O.*) *compressum* Girty, 1910, are much narrower with a smaller aperture, raised convex ridge on the dorsal surface, and a salient at the position of the ridge as described for the former species [for example, Whitfield (1882); Hall (1883); Cummings (1906)], and by Yochelson (1969) for the latter species. *Platyceras* (*O.*) *lodiensis* Meek, 1871, has a similar shape but lacks the flattened ridge bordered by sulci on the dorsal surface as in *P.* (*O.*) *morsei*.

Material

Holotype, OSU 12212, from locality 3. Specimen is 7.5 mm wide and 8.0 mm high.

Genus *Strophostylus* Hall, 1859
Strophostylus cf. *S. wortheni* (S. Weller, 1916)
(Fig. 1.11-1.15)

Strophostylus wortheni S. Weller, 1916, p. 259, pl. 19, Figs. 1,2; Thein and Nitecki, 1974, p. 139, Fig. 60.

Description

Flatly coiled with 3.5 rapidly expanding whorls; suture deeply impressed; whorl profile narrowly rounded laterally; umbilical area shallow; aperture elliptical in shape; shell material thin; numerous, closely spaced, subsutural, lirae, extent across whorl surface unknown.

Discussion

The Maxville specimens are slightly depressed and lack shell material except for a small portion on the ultimate whorl of the larger specimen (Fig. 1.13-1.15). The disfiguration gives a larger height-width ratio and distorts the shape of the aperture. Otherwise the specimens agree closely with *S. wortheni*.

Material

Two specimens, OSU 51856, 51857, from locality 2. Size ranges from 2.3 mm high and 4.4 mm wide to 8.9 mm high and 14.0 mm wide.

Genus *Naticopsis* M'Coy, 1844
Subgenus *Naticopsis* M'Coy, 1844
Naticopsis (*Naticopsis*) *genevievensis* Meek and Worthen, 1867
(Fig. 1.16-1.19, 1.21-1.23)

Naticopsis littonana var. *genevievensis* Meek and Worthen, 1867, p. 268.

Naticopsis (*Naticopsis*) *genevievensis* Gordon and Yochelson, 1982, p. 217, text-Fig. 1 (see for synonymy up to this date); Jeffery, Hoare, Mapes, and Brown, 1994, p. 73, Fig. 8.19-8.23.

Description

Shell globose with rapidly expanding whorls; spire elevated; sutures not deeply impressed; aperture suboval to subrounded; thin inductura on parietal lip; ornament of short, prosocline lirae extending from suture on upper whorl surface; rest of surface smooth except for faint growth lines; apical angle 101 to 109 degrees.

Discussion

Naticopsis (*N.*) *genevievensis* has been well described by Gordon and Yochelson (1982) and Jeffery and others (1994). The globose shape, relatively low spire, subsutural lirae, and well-developed inductura on the parietal lip are diagnostic. The Maxville specimens have the spire and ultimate whorl somewhat distorted by compression and the shell material is partially missing. A specimen collected by Morse (1911), labeled *Naticopsis ziczac* Whitfield, 1882 (OSU 12210), represents *N.* (*N.*) *genevievensis*. The spire has been depressed and the shell of the ultimate whorl rides up over the penultimate whorl giving the impression that the lirae occur on the lower half of the whorl. There is no indication of the lirate pattern described by Whitfield (1891, p. 590, pl. 14, Figs. 15,16.

Material

Three specimens, OSU 12210, 51858, 51859, from localities 3 and 5. Sizes range from 14.0 mm high and 10.7 mm wide to 20.0 mm high and 17.6 mm wide.

Naticopsis (*Naticopsis*) sp.
(Fig. 1.20)

Strophostylus carleyana Morse, 1911, p. 408, Fig. 31.

Discussion

A small (6.1 mm high, 6.2 mm wide), partially embedded, globose shell was designated as *Strophostylus carleyana* by Morse (1911). The specimen differs from that species in having a higher spire, less flat upper whorl surface, and a narrower globose shape. *Naticopsis* (*N.*) *genevievensis* Meek and Worthen, 1867, differs in having a lower spire and broader globose shape. The specimen may represent a new species but the lack of additional larger specimens giving a better indication of the characteristics precludes such an assignment.

Material

OSU 12213, from locality 3.

Genus *Palaeozygopleura* Horný, 1955
Palaeozygopleura ? sp.
(Fig. 1.24)

Description

Small, partially embedded, conical shell of 5 whorls; first 1.5 to 2 whorls smooth, later whorls with strong, orthocline to slightly prosocline ribs; suture impressed; spire angle of 52 degrees; aperture not observed.

Discussion

The juvenile nature of the specimen leaves the assignment questionable. The smooth protoconch and

nature of the ribs appear to be that of *Palaeozygopleura*.

Genus *Stegocoelia* ? Donald, 1889
Subgenus *Hypergonia* ? Donald, 1892
Stegocoelia (*Hypergonia*)? *jonathanensis* n. sp.
(Fig. 1.25, 1.26)

Murchisonia vermicula Morse, 1911, p. 409, Fig. 32a,b.

Diagnosis

Small, gradually tapering murchisonid; five spiral threads with three middle threads coarser than top and bottom threads.

Description

Small shell of 10 to 11 whorls with gradually tapering spire; whorls evenly rounded; sutures impressed; one fine, spiral thread just below suture and one fine thread just above suture; three larger, evenly spaced threads on central portion of whorl; interspaces wider than threads; apical angle of 26 degrees; aperture and slit not observed.

Etymology

Named for Jonathan Creek in Muskingum County, OH.

Discussion

Stegocoelia (*H.*)? *jonathanensis* differs from other species of the genus by being wider, tapering more uniformly, and having more and coarser spiral threads. Species assigned to *Murchisonia* have spiral ornament associated only with the selenizone. The Maxville specimens are eroded and growth lines are obscured giving no indication of the selenizone which causes the assignment to be questionable. The illustration of Morse (1911, Fig. 32a) is an outline drawing of the holotype (Fig. 1.25) while Figure 1.26 is of the paratype, which is more complete than he showed (Fig. 32b).

Material

Holotype, OSU 12214; paratype. OSU 51861, from locality 3. Most complete specimen is 5.0 mm high and 1.7 mm wide.

Genus *Bulimorpha* Whitfield, 1882
Bulimorpha melanoides (Whitfield, 1882)
(Fig. 1.27, 1.28)

Polyphemopsis melanoides Whitfield, 1882, p. 224; Whitfield, 1891, p. 591, pl. 14, Fig. 12; Whitfield, 1893, p. 477, pl. 10, Fig. 12.
Bulimorpha melanoides Morse, 1911, p. 398, Fig. 23.

Discussion

The specimen illustrated herein was collected by Morse. It is slightly compressed giving a wider appearance than is normal.

Material

OSU 12207, from locality 5. It is 26.8 mm high and 15.6 mm wide.

Genus *Acteonina* d'Orbigny, 1850
Acteonina hanseni n. sp.
(Fig. 1.29, 1.30)

Bulimorpha canaliculata Morse, 1911, p. 400, Fig. 25.

Diagnosis

Small cylindrical shell with short spire; whorls sharply shouldered; ramp flat to slightly inclined; surface smooth.

Description

Small, cylindrical shell of 5 to 6 whorls; protoconch smooth, depressed; ultimate whorl three times length of spire, tapering convexly to base; whorls gradate, sharply shouldered with flat to slightly inclined ramps; surface smooth; apical angle of 80 degrees.

Etymology

Named for Michael C. Hansen, Ohio Geological Survey.

Discussion

Morse (1911, Fig. 25) presented a composite illustration of this species based upon two specimens on the same slab of limestone. The holotype (Fig. 1.30) has a complete ultimate whorl and 2.5 whorls of the spire. The paratype (Fig. 1.29) has a complete spire but the ultimate whorl is crushed. Both specimens are partially embedded and neither shows the aperture, which is probably narrowly elongate.

Thein and Nitecki (1974, p. 218) included *Bulimorpha canaliculata* Morse in the synonymy for *Girtyspira canaliculata* (Hall 1856), which is erroneous. *Girtyspira canaliculata* has a fusiform shape with a wider and extended aperture and Morse's specimen cannot be conspecific. *Acteonina carbonaria* (d'Koninck 1843), from the Lower Carboniferous of Belgium, has fine spiral striations on the whorl surface but otherwise is closely similar to *A. hanseni*. Knight (1932, pl. 28, Fig. 1a) repeated d'Koninck's figure.

Material

Holotype, OSU 12208; paratype, OSU 51862, from locality 3. The holotype is 4.3 mm high and 2.5 mm wide.

Genus *Meekospira* Ulrich *in* Ulrich and Scofield, 1897
Meekospira bambooformis Thein and Nitecki, 1974
(Fig. 2.3)

Meekospira bambooformis Thein and Nitecki, 1974, p. 198, Fig. 90.

Description

Small, slender shell with 8.5 whorls; whorl profile flatly convex; sutures not deeply impressed; surface smooth, aperture not visible; apical angle of 24 degrees.

Discussion

A well-preserved and partially exposed specimen of this species is present on the underside of the slab containing the specimens of *Acteonina hanseni*, which Morse evidently did not recognize. It agrees in all respects with the excellent description given by Thein and Nitecki.

Material

OSU 51863, from locality 3. Specimen is 8.0 mm high

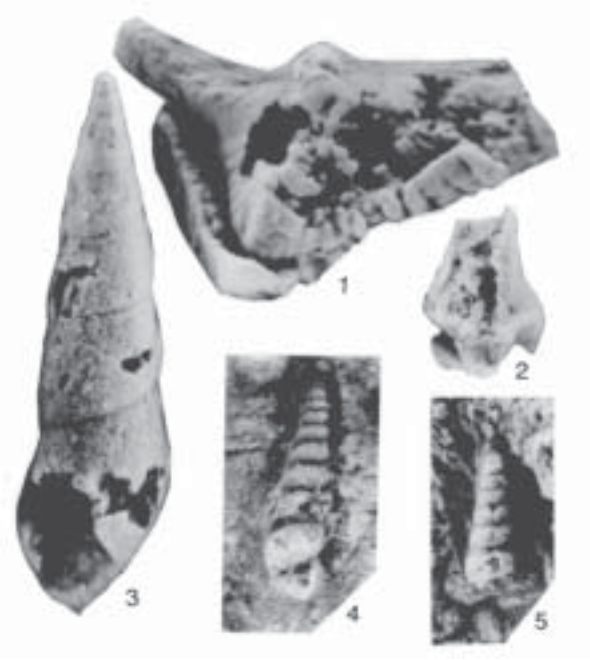

FIGURE 2. 1-2, *Oxyprora* sp., right lateral and dorsal views, OSU 51866, 51867, × 10; 3, *Meekospira bambooformis*, abapertural view, OSU 51863, × 10; 4-5, *Donaldina pygmaea*?, apertural and abapertural views, OSU 51864, 51865, × 10.

and 2.0 mm wide.

Genus *Donaldina* Knight, 1933
Donaldina pygmaea ? (S. Weller, 1916)
(Fig, 2.4, 2.5)

Solenospira pygmaea S. Weller, 1916, p. 256, pl. 18, Figs. 1-5, 6?
Donaldina pygmaea Thein and Nitecki, 1974, p. 22l

Description

Small, slender shell of 8 to 9 whorls; whorl profile evenly convex; sutures impressed; ornament of at least 4 spiral lirae; apical angle of 22 degrees

Discussion

Thein and Nitecki (1974, p. 221) provided additional information related to Weller's specimens. The Maxville specimens are partially exfoliated and the distribution of the spiral threads cannot be exactly determined, particularly on the base of the whorls, which does not allow specific comparisons. The whorl shape, shell form, and size agree well with *D. pygmaea*.

Material

Two specimens, OSU 51864, 51865, from locality 3. Largest specimen is 3.2 mm high and 0.9 mm wide.

Genus *Oxyprora* Hoare, Mapes and Yancey, 2002
Oxyprora sp.
(Fig. 2.1, 2.2)

Description

Small bransonid with prominent rostrum; rostral face produced, convex; rostrum and hinge axis not colinear with rostrum angled dorsally at 27 degrees; inner shell layer with relatively coarse costae; outer shell layer missing except for rostral face fragment showing fine comarginal lirae; anterior portion of shell incomplete; ventral gape not visible.

Discussion

The characteristics of the specimen described above are different from other known upper Paleozoic rostroconchs in terms of the angled rostrum, coarseness of the costae, overall shape of the shell, and the fine lirae on the outer shell layer of the rostral face. This probably represents a new species but the specimen is too incomplete to make such an assignment. The smaller specimen (Fig. 2.2) may represent the same species although it is also poorly preserved and much smaller.

Material

OSU 51866, 51867, from locality 3. The larger specimen is 6.4 mm long and 3.2 mm wide.

LOCALITIES

1. Maxville Stone Co. quarry on west side of Ohio Rte. 668, approx. 1.1 km north of Maxville, Monday Creek Twp., Perry Co., SW 1/4, sec. 9, T14N, R16W, Junction City 7.5 minute quadrangle.
2. Former Somerset Cut Limestone quarry (abandoned) on east side of County Road 96, 2.1 km north of Ohio Rte. 13, Hopewell Twp., Perry Co., NW1/4SW1/4, sec. 32, T17N, R16W, Somerset 7.5 minute quadrangle.
3. Exposure in railroad cut along Jonathan Creek, Madison Twp., Perry Co., sec. 15, T17N, R15W, Fultonham 7.5 minute quadrangle.
4. Exposure in railroad cut near Wortman Iron Bridge over Jonathan Creek, Newton Twp., Muskingum Co., SE1/4, sec. 14, T17N, R15W, Fultonham 7.5 minute quadrangle.
5. Exposure below the Kroft Bridge at White Cottage, Newton Twp., Muskingum Co., NE1/4, sec. 17, T15N, R14W, Crooksville 7.5 minute quadrangle.

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