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## Gastropods from the Lower Mississippian Wassonville Limestone in Southeastern Iowa<sup>1</sup>

HAROLD B. ROLLINS<sup>2</sup>

### ABSTRACT

A Lower Mississippian (Kinderhookian) gastropod fauna is described from the Wassonville Formation in southeastern Iowa. This represents one of the few well-preserved Lower Mississippian gastropod faunas known from North America and, as such, contributes to our understanding of a rather critical time in the evolution of Paleozoic gastropods.

Twenty-eight species are described, eight of which are new. The new taxa are: *Sinuitina nudidorsa*, *Platyschisma laudoni*, *Trepostira* (*Angyomphalus*) *penelenticulata*, *Baylea angulosa*, *Glabrocingulum* (*Glabrocingulum*) *minutum*, *Glyptotomaria* (*Dictyotomaria*) *quasicapillaria*, *Cerithioides judiae*, and *Baylea trifibra*.

An unexpected aspect of the Wassonville gastropod fauna is that it shows greater taxonomic affinity with the European Carboniferous than with other North American Carboniferous faunas. This probably reflects the paucity of described North American Mississippian gastropod faunas and the increased understanding, through recent study (notably Batten, 1966), of British and Belgium Tournaisian and Visean gastropods.

The genus *Cerithioides*, long known from the Upper Paleozoic of Europe, is recognized for the first time in the Carboniferous of North America.

### INTRODUCTION

The Kinderhookian Wassonville Formation in southeastern Iowa contains several weathered chert zones that are very fossiliferous. The present paper is a taxonomic study of the prolific gastropod fauna of the type Wassonville section near Daytonville, Iowa.

Twenty-eight gastropod species are described, eight of which are new. Many of the Wassonville gastropods have distinct affinities with species from the European Carboniferous. Of the 28 spe-

cies, at least 10 are conspecific or closely related to European forms.

Well-preserved gastropod faunas are rare in the Mississippian of North America, hence an adequate understanding of the phylogenies of many gastropod taxa between the Lower and Upper Paleozoic is lacking. I hope that the present study will contribute to our knowledge of this critical period of gastropod evolution.

The pleurotomariaceans are the dominant gas-

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tropods in the Wassonville chert zones but are closely challenged, in abundance, by the bellerophontaceans. Moreover, the Wassonville gastropod fauna is more diverse than most previously described from the Lower Mississippian. An analysis, by superfamily, of the 28 described Wassonville species is presented in table 1.

The Wassonville gastropod fauna has never been described, although faunal lists were compiled by Van Tuyl (1921, pp. 74-75) and Laudon (1931, pp. 380-382).

#### ACKNOWLEDGMENTS

The present paper is adapted from a Master's thesis prepared in 1963 at the University of Wisconsin. I am grateful to Dr. Roger L. Batten of the American Museum of Natural History for his help and guidance in the preparation of the original manuscript, and for his critical review of the revised manuscript. Dr. Niles Eldredge, also of the American Museum of Natural History, provided many stimulating discussions regarding elements of this fauna.

I thank Dr. Lowell Laudon of the University of Wisconsin for originally suggesting the study of the Wassonville gastropods and for making his extensive collections available to me.

Mr. Harrell L. Strimple of the State University of Iowa very generously made available Wassonville gastropod specimens from the Belanski collection.

Mr. G. Robert Adlington of the American Museum of Natural History made the excellent photographs for this paper.

Finally, but no less gratefully, my thanks to Mrs. Judi Rollins for typing and editing the manuscript.

#### STRATIGRAPHY

In southeastern Iowa, the Kinderhookian is represented by the McCraney Formation, the Prospect Hill Formation, and the Wassonville Formation. An excellent historical summary of the stratigraphic nomenclature and correlation of these units can be found in Straka (1968).

The Wassonville Formation, first named by Bain (1895) as the Wassonville Limestone of the Maple Mill Formation, was studied in detail by

TABLE 1  
Superfamily Analysis of Wassonville Gastropods

Superfamily	Number of Species
Pleurotomariacea	9
Bellerophontacea	7
Euomphalacea	1
Platyceratacea	2
Microdomatacea	1
Anomphalacea	1
Neritacea	1
Murchisoniacea	4
Loxonematacea	2

Van Tuyl (1921) and Laudon (1931). Laudon considered the Wassonville fauna to be late Kinderhookian and correlated the Wassonville Formation with portions of the Chouteau of Missouri.

Straka (1968) concluded that the conodont fauna of the upper Prospect Hill and Wassonville formations resembled the *Siphonodella isoticha-S. cooperi* Assemblage Zone of Collinson, Scott, and Rexroad (1962) and thus correlated this interval with the uppermost  $\text{cull}^{\alpha}$  zone in Germany (Tournasian).

Nearly all the gastropods described in this study were collected from chert zones in the Wassonville Formation at its type locality on the south bank of the English River about 1 mile north of Daytonville, Iowa, SW 1/4, SW 1/4, sect. 7, R. 8 W, T.77 N, Washington County, Iowa (see fig. 1). At this locality, the Wassonville is a massive brown dolomite about 17 feet thick. Four distinct chert zones are present and the middle two zones contain the most abundant molluscan fossils.

#### PREPARATION AND MEASUREMENTS

Generally, specimens were easily obtained from the highly weathered chert nodules by careful use of a hydraulic rock trimmer. In order to preserve delicate ornament patterns, many specimens were coated with a solution of "Alvar" in acetone.

All measurements were made with the aid of a micrometer eyepiece and a modified goniometer attached to a microscope ocular. Specimens were

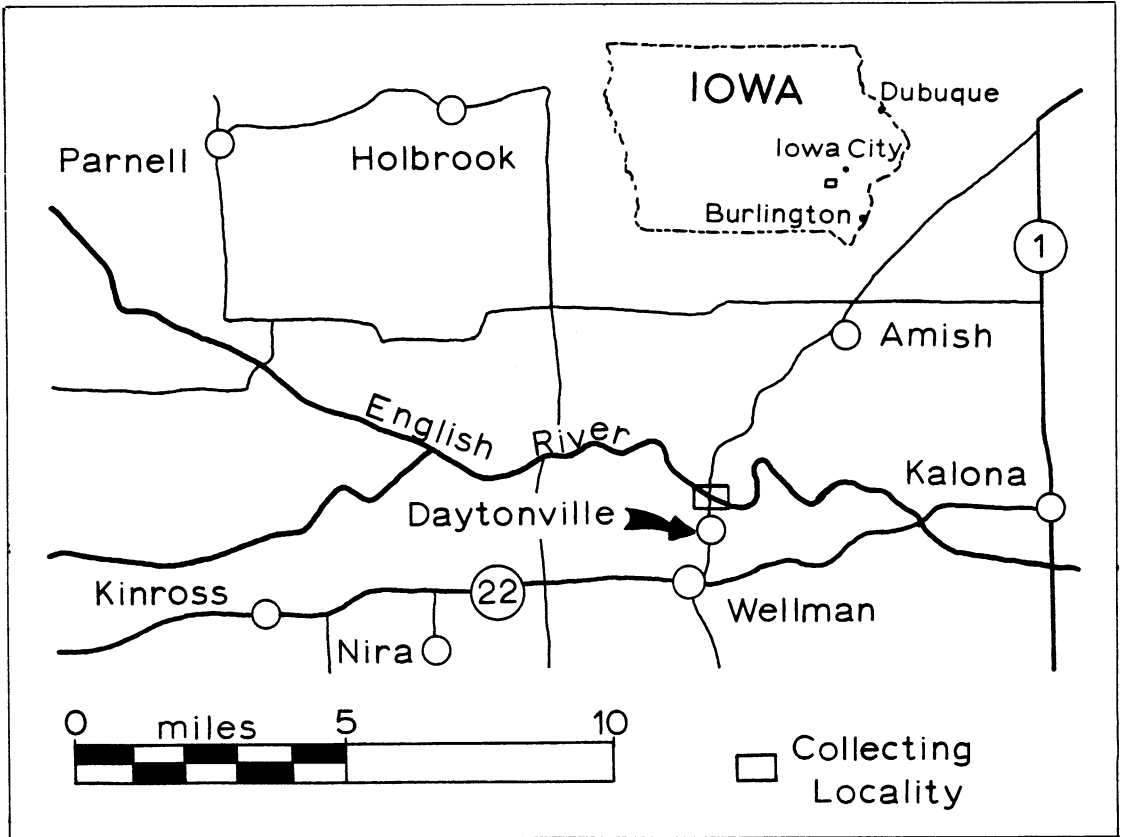


FIG. 1. Map showing collecting area for the chert zones of the Wasonville Limestone in southeastern Iowa.

measured with the axis of coiling nearly perpendicular to the line of vision and, unless otherwise noted, all measurements were taken on the last or basal whorl.

#### SYMBOLS AND ABBREVIATIONS

The following institutional abbreviations are used in connection with specimen catalogue numbers:

AMNH, the American Museum of Natural History  
SUI, the University of Iowa, Iowa City

The following symbols are used in the measurements:

CAS, number of spiral cords above the selenizone

CBS, number of spiral cords below the selenizone  
CS, distance from upper selenizone margin to first major spiral element above selenizone

H, height

HA, apertural height

MBW, minimum width of exposed whorl (used in measuring bellerophontaceans)

PA, pleural angle

PD, diameter measured perpendicular to the height (used in measuring bellerophontaceans)

SS, distance from suture to upper selenizone margin

SW, width of selenizone

W, width

WA, apertural width

WH, height of basal whorl

WW, width of basal whorl

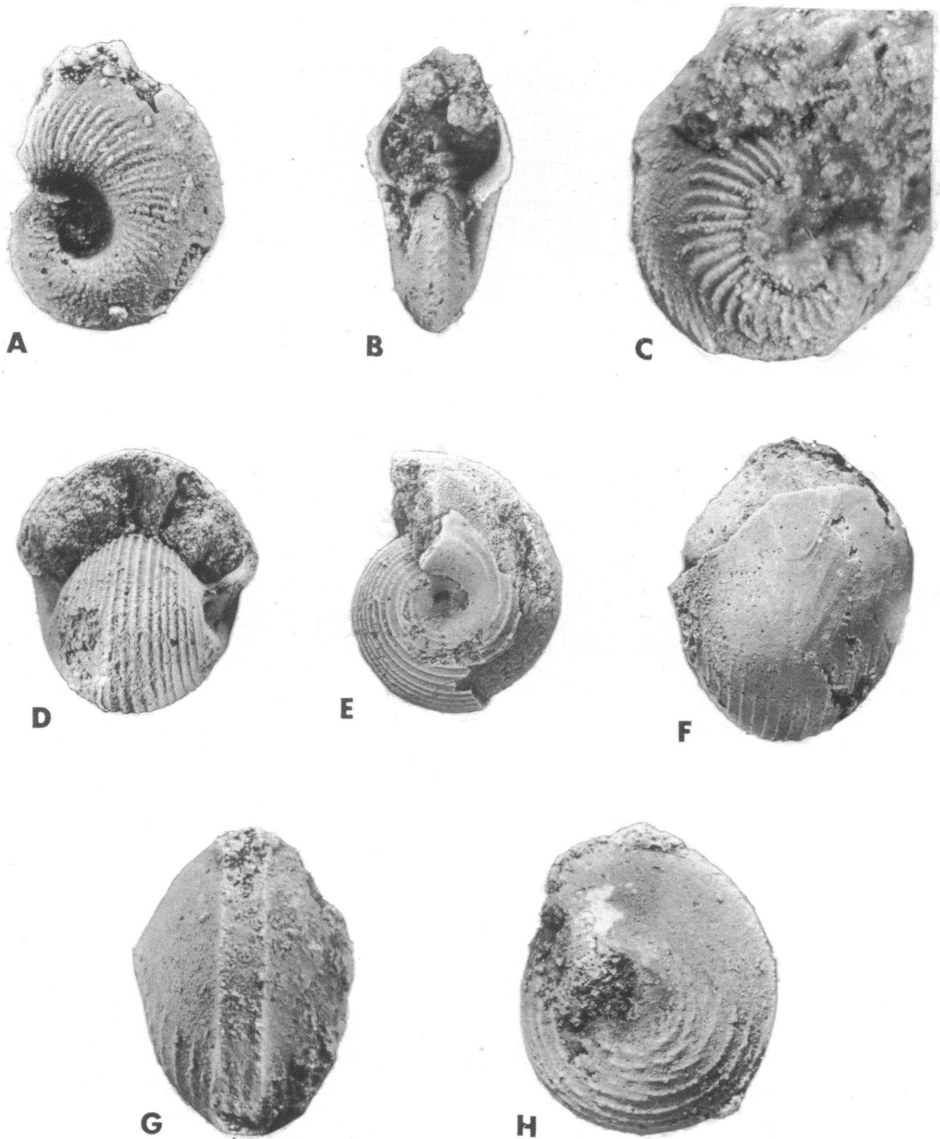


FIG. 2. A-C. *Sinuitina nudidorsa*, new species. A. Umbilical view, AMNH 29322.  $\times 5.0$ . B. Apertural view of holotype, AMNH 29322.  $\times 5.0$ . C. Umbilical view of paratype, AMNH 29323.  $\times 8.0$ . D-F. *Euphemites* sp. cf. *E. urii* (Fleming). D. Apertural view, AMNH 29324.  $\times 2.5$ . E. Umbilical view, AMNH 29324.  $\times 2.5$ . F. Dorsal view, AMNH 29325, showing sinus.  $\times 3.0$ . G, H. *E. lentiformis* (Weller). G. Dorsal view, AMNH 29326.  $\times 7.0$ . H. Umbilical view, AMNH 29326.  $\times 7.0$ .

## SYSTEMATIC PALEONTOLOGY

## CLASS GASTROPODA

## ORDER ARCHAEOGASTROPODA

## SUPERFAMILY BELLEROPHONTACEA

## FAMILY SINUITIDAE DALL, 1913

## SUBFAMILY BUCANELLINAE KOKEN, 1925

GENUS *SINUITINA* KNIGHT, 1945

*Type Species. Tropidocyclus cordiformis*  
Newell, 1935.

*Sinuitina nudidora*, new species  
Figure 2A-C

*Diagnosis.* *Sinuitina nudidora* is readily distinguished from all other Carboniferous species of *Sinuitina* by its restricted lateral ornament. *Sinuitina brevilineatus* (Conrad), a middle Devonian species, appears closest to *S. nudidora*, but possesses a lirate dorsal periphery.

*Description.* Shell small, compressed, with subcordate whorl profile; moderately phaneromphalous; subacute dorsal periphery grading smoothly, with slight concavity, into gently convex lateral whorl surfaces; whorl profile forming shoulder at umbilical margins; flangelike circumumbilical carinae; aperture slightly higher than wide; anterior apertural lip with moderately narrow and deep V-shaped sinus; inductura thin; sharp subequally spaced collabral costae on convex lateral whorl surface, becoming weaker near umbilical shoulder and obsolete dorsally, giving rise to abaperturally reflexed growth lines, becoming costate again over dorsal periphery; shell structure and muscle scars unknown.

*Distribution.* This species is known from only five specimens obtained from the Wassonville chert, zone no. 2.

*Figured Specimens.* Holotype, AMNH 29322; paratype, AMNH 29323.

*Etymology.* The trivial name *nudidorsa* is derived from the Latin *nudus*, naked, and *dorsum*, back.

*Discussion.* Other Lower Carboniferous species of *Sinuitina* are quite distinct from *S. nudidora*.

*Bellerophon cyrtolites* Hall, probably referable to *Sinuitina*, is a poorly understood species

TABLE 2  
Measurements (in Millimeters) of *Sinuitina nudidora* Rollins, New Species

	MBW	HA	WA	H	PD
Holotype, AMNH 29322	1.40	4.20	4.00	7.80	5.60
Paratype, AMNH 29323	—	—	—	5.00 <sup>a</sup>	—
SUI11203	1.60	3.80	3.60	7.60	5.20

<sup>a</sup>Estimated.

that has been reported from the Mississippian of Michigan, Ohio, Indiana, and Iowa. I have examined the specimens described by Hyde (1953, pl. 46, fig. 32) as *Tropidodiscus cyrtolites* (Hall) from the Byer sandstone of Ohio. These specimens are much larger than *S. nudidora*, the collabral costae are uninterrupted on the lateral whorl surface and faint spiral lira occur low on the lateral whorl surface.

*Sinuitina annea* Conkin, 1957, from the New Providence Shale in Kentucky also has uninterrupted lateral ornament that forms a noticeable chevron-shaped angle near the middle of the lateral whorl face.

*Sinuitina venata* (Girty), from the Fayetteville Shale of Arkansas and Oklahoma, was described but unfigured by Girty (1910). Yochelson (1969a, pp. 26-27, pl. 5, figs. 38, 43) restudied Girty's Fayetteville gastropod material and redescribed the only known specimen from the type lot. *Sinuitina venata*, like the previously mentioned species, does not have restricted lateral ornament.

A few species of *Sinuitina* have been described from the Carboniferous rocks of Europe. These include *Tropidocyclus duchastelii* de Koninck, *Bellerophon oldhami* Portlock, and *Tropidocyclus oldhami caledonicus* Weir. None of these species is very close to *S. nudidora*, but the latter two possess faint spiral ornament like that of *S. annea* and *S. cyrtolites*.

*Sinuitina nudidora* most closely resembles *Bellerophon brevilineatus* Conrad from the middle Devonian of New York. On the basis of well-preserved specimens from the middle Devonian Marcellus Formation of central New York, Rollins, Eldredge, and Spiller (1971, pp. 142-143)

unquestionably assigned *B. brevilineatus* to the genus *Sinuitina*. Although the original description of *S. brevilineatus* specifically referred to the restricted lateral ornament (Conrad, 1842), later workers enlarged the conception of the species to include some Devonian forms with continuous collabral costae on the lateral whorl surface. Rollins, Eldredge, and Spiller (1971, p. 143) suggested that *S. brevilineatus* should be restricted to forms possessing discontinuous collabral costae.

*Sinuitina nudidorsa* is more laterally compressed and has a narrower sinus than *S. brevilineatus* (Conrad). The former also apparently has a nonlirate dorsal periphery.

#### FAMILY EUPHEMITIDAE HORNÝ

##### GENUS *EUPHEMITES* WARTHIN, 1930

*Type Species. Euphemites urii* (Fleming), 1828.

*Euphemites* sp. cf. *E. urii* (Fleming), 1828  
Figure 2D-F

*Description.* Shell medium-sized and subglobular; neanic individuals narrowly phaneromphalous, adults usually anomphalous; whorl profile smoothly rounded, with slight dorsal flattening; aperture low and arcuate, with lateral lips slightly flaring and joining gently convex anterior lip at blunt angles; wide, deep U-shaped sinus; costate inductura overlying perinductura and reaching adaperturally within about one-half volution of outer lip margin; coinductura absent or

indistinguishable; ornament very faint growth lines and 20-25 coarse spiral lirae; shell structure and muscle scars unknown.

*Distribution.* This species is known from all the Wassonville chert zones, but is never abundant.

*Figured Specimens.* AMNH 29324 and AMNH 29325.

*Discussion.* *Bellerophon urii* and *Bellerophon carbonarius* (Cox) were convenient depositories for early authors describing North American species of *Euphemites*. This unfortunately resulted in the assignment of many distinct Mississippian and Pennsylvanian species of *Euphemites* to one or the other of these groups. King (1940, p. 150), after a thorough review of the literature, stated that "no American species is identical with *Euphemites urii* (Fleming, 1842)" and that "*Euphemites carbonarius* (Cox) is not a valid species."

*Euphemites* sp. cf. *E. urii* from the Wassonville chert, does not closely resemble any previously described *Euphemites* species from the Lower Mississippian of North America. *Euphemites subglobosus* Hyde, from the Logan Formation (Osagian) of Ohio, has an elevated selenizone with a median ridge and is much more involute. *Euphemites nautiloides* (Winchell), from the Lower Mississippian Marshall Sandstone of Michigan, is much smaller and more lenticular and possesses fewer spiral lirae. *Euphemites gale-riculatus* (Winchell), also from the Marshall Sandstone, has fewer spiral lirae and a smaller average size. *Euphemites* sp. cf. *E. urii* is more umbilicate than *E. sedaliensis* (Miller and Gurley) from the

TABLE 3  
Measurements (in Millimeters) of *Euphemites* sp. cf. *Euphemites urii*

	SW	MBW	HA	WA	H	PD
SUI11202	—	7.50	7.00	14.60	19.50	14.00
AMNH 29324	—	6.50	4.20	10.10	12.70	9.10
SUI11202	—	—	—	—	23.00	17.20
SUI11202	—	3.90	2.40	7.60	9.70	8.20
SUI11202	—	2.90	2.00	6.00	6.60	5.50
SUI11202	—	6.50	4.10	—	—	—
SUI11202	—	—	—	—	5.80	4.90
SUI11202	—	3.00	2.50	5.20	6.60	5.00
SUI11202	—	3.10	—	—	6.90	5.40
AMNH 29325	—	7.10	—	—	14.50	12.10



Chouteau Limestone and lacks the angular dorsal area characteristic of that species.

Batten (1966, pp. 7-8, pl. 1, fig. 4) figured the recently discovered holotype of *E. urii* (Fleming). The Wassonville species is comparable with *E. urii* in nearly every detail. The two species are certainly not separable on the basis of shape or on number, strength and spacing of lirae. The Wassonville species is perhaps less phaneromphalous and has more abruptly flaring lateral apertural lips. I am reluctant to assume that these forms are conspecific pending detailed study of the North American euphemitids.

*Euphemites lentiformis* (Weller)

Figure 2G, H

*Euphemus lentiformis* Weller, 1916, p. 258, pl. 19, figs. 9, 10.

*Euphemites lentiformis* (Weller): Knight, 1944, p. 445, pl. 179, figs. 27, 28.

*Euphemites angustus* Netschajew: Licharew and Netschajew, 1956, pl. 14, figs. 7a-c.

**Discussion.** A single, possibly immature, specimen from the Wassonville chert can unquestionably be assigned to the genus *Euphemites*, but is far outside the morphological range of *Euphemites urii*. The specimen closely resembles, and is probably conspecific with, *E. lentiformis* (Weller) from the Ste. Genevieve Limestone of Illinois (Weller, 1916, pl. 19, figs. 9, 10). The individual is nearly quadrate in outline, due to a very wide, flat dorsal area and unexpanded whorls. The prominent selenizone is ornamented by at least one faint spiral lira. The inductura is ornamented by approximately 17 spiral costae, and extends adaperaturally over one-half the distance to the outer lip margin. The aperture is wedge-shaped due to the rather high dorsal keel.

The Ste. Genevieve specimens of *E. lentiformis* (Weller) are slightly more lenticular than the Wassonville form and reported to usually have a selenizone ornamented by two distinct spiral lirae. *Euphemites angustus* Netschajew from the Ferghana Basin is probably conspecific with *E. lentiformis* (Licharew and Netschajew, 1956, pl. 14, fig. 7a-c). *Euphemites randolphensis* (Weller), from the Mississippian Okaw and Gogonda formations of Illinois, also resembles the Wassonville specimen, but is more rounded dorsally (Weller et al., 1920, pl. 9, figs. 7-10).

TABLE 4  
Measurements (in Millimeters) of *Euphemites lentiformis* (Weller)

	SW	MBW	HA	WA	H	PD
AMNH 29326	0.50	2.10	2.65	4.30	6.20	5.00

**Distribution.** A single specimen is available from the Wassonville chert, zone unknown.

**Figured Specimen.** AMNH 29326.

FAMILY BELLEROPHONTIDAE M'COY

SUBFAMILY BELLEROPHONTINAE M'COY

GENUS *BELLEROPHON* MONTFORT, 1808

SUBGENUS *BELLEROPHON* (*BELLEROPHON*)  
KNIGHT ET AL., 1960

**Type Species.** *Bellerophon vasulites* Montfort, 1808.

*Bellerophon* (*Bellerophon*) *tangentialis*  
(Phillips)

Figure 3A-C

*Bellerophon tangentialis* Phillips, 1836, p. 230, pl. 17, figs. 6, 7, 14.

*Bellerophon costatus* d'Orbigny, 1840 (in part), pl. 6, figs. 3-5.

*Bellerophon cornu-arietis* d'Orbigny, 1850, p. 126.

*Bellerophon lohestoe* deKoninck, 1883, p. 142, pl. 36, figs. 7-9; pl. 39, figs. 1-3.

*Bellerophon excavatus* deKoninck, 1883, p. 143, pl. 37, figs. 6-8.

*non Bellerophon tangentialis* deKoninck, 1883, p. 144, pl. 42, figs. 14-18.

*Bellerophon panneus* White: Keyes, 1894b, p. 147, pl. 50, fig. 6

**Description:** Large, angular, narrowly phaneromphalous bellerophontacean; whorl profile gently rounded over broad dorsal region, interrupted by raised selenizone, and strongly rounded laterally near umbilici; whorl profile of immature individuals slender and more regularly rounded; aperture laterally flattened, but uninflated; anterior lip gently convex, becoming slightly concave on either side of moderately deep V-shaped slit; parietal inductura unornamented, thickest in columellar areas and usually rather extensive over dorsal portion of previous

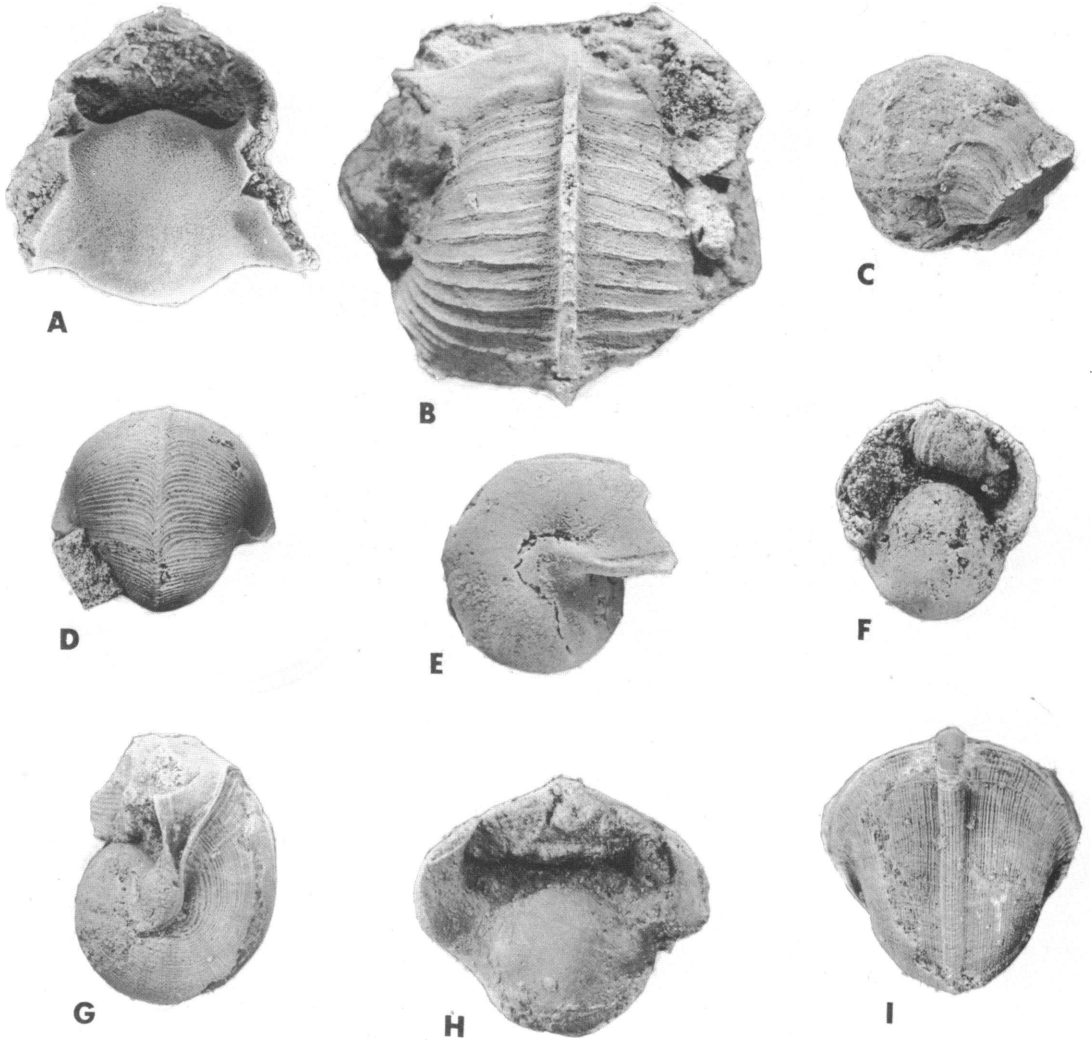


FIG. 3. A-C. *Bellerophon (Bellerophon) tangentialis* (Phillips). A. View of fragmented specimen, AMNH 29327, showing smooth thickened parietal inductura.  $\times 3.0$ . B. Dorsal view of large individual, AMNH 29328.  $\times 3.0$ . C. Oblique umbilical view of young specimen, AMNH 29329, showing striated plug.  $\times 3.0$ . D-F. *B. (B.) sowerbyi?* d'Orbigny. D. Dorsal view, AMNH 29332.  $\times 3.0$ . E. Umbilical view, AMNH 29331.  $\times 4.0$ . F. Apertural view, AMNH 29330.  $\times 3.0$ . G-I. *Retispira tenuilineata?* (Gurley). G. Umbilical view, AMNH 29334.  $\times 3.5$ . H. Apertural view, AMNH 29333.  $\times 4.5$ . I. Dorsal view, AMNH 29334.  $\times 3.5$ .

whorl; immature individuals may have lined umbilical plugs; selenizone narrow, highly elevated, corrugated in mature individuals at intersections with collabral costae; immature specimens with relatively wider, nonelevated seleni-

zones; ornament of widely spaced collabral costae with intercalated growth lines; shell structure and muscle scars unknown.

*Distribution.* Common in zone no. 2 and present in zone no. 3 of the Wasonville chert; re-

TABLE 5  
Measurements (in Millimeters) of *Bellerophon (Bellerophon) tangentialis* (Phillips)

	SW	MBW	HA	WA	H	PD
SUI11204	0.60	9.00	—	—	22.50	18.50
SUI11204	0.50	6.30	—	—	—	—
SUI11204	—	7.00	6.20	14.30	16.20	14.30
AMNH 29327	—	5.10	—	—	11.20	10.00
SUI11204	0.50	6.00	5.50	12.50	15.00	10.70
SUI11204	0.25	3.90	3.50	8.90	9.80	8.60
SUI11204	—	2.70	—	—	6.80	5.30
SUI11204	0.20	2.40	2.10	5.20	6.20	4.60
SUI11204	0.40	5.60	5.40	14.00	—	—
SUI11204	0.30	4.20	—	—	—	—
AMNH 29328	0.50	7.00	—	—	—	—

ported from the Kinderhook of North America and Lower Carboniferous of Europe.

*Figured Specimens.* AMNH 29327, AMNH 29328, and AMNH 29329.

*Discussion.* The Wassonville specimens of *B. (Bellerophon) tangentialis* display striking ontogenetic changes in morphology. In contrast to the robust mature forms, juvenile specimens possess slender rounded whorls and wide subdued selenizones. Occasionally, an adult specimen has fine closely spaced collabral lirae.

Weller (1900, p. 114) stated that the specimen illustrated by Keyes (1894b, pl. 50, fig. 6) is definitely not *B. (Bellerophon) panneus*. In fact, Keyes (1889, p. 297) later noted that his specimen of *B. (Bellerophon) panneus* strongly resembled *B. (Bellerophon) tangentialis* from the Lower Carboniferous clays of Tournai, Belgium. I have examined in the collections of Carnegie Museum topotype specimens of *B. (Bellerophon) tangentialis* from the region of Tournai, Belgium, and am confident that Keyes's specimen and the Wassonville sample are conspecific with *B. (Bellerophon) tangentialis*.

*Bellerophon (Bellerophon) manfieldianus* Girty, from the Mississippian Madison Limestone of Idaho (Girty, 1927, pl. 22, figs. 40, 41) was considered by Weir (1931, p. 808) to be indistinguishable from immature specimens of *B. (Bellerophon) tangentialis*. However, conclusions regarding the relationship of these species should await a detailed examination of the types of *B. (Bellerophon) mansfieldianus*.

*Bellerophon (Bellerophon) sowerbyi?*  
d'Orbigny, 1840

Figure 3 D-F

*Bellerophon sowerbyi* d'Orbigny, 1840, p. 202, pl. 5, figs. 14-23; 1850, p. 126; Weir, 1931, pl. 2, figs. 1-12. Batten, 1966, pl. 1, fig. 9.

*Description.* Medium-sized, globular, cryptomphalous bellerophontaceans; whorl profile broadly arched dorsally, strongly rounded laterally, turning sharply into umbilical areas; aperture broadly crescentic, margins slightly flaring, reflexed somewhat near umbilici; anterior lip gently convex on either side of moderately deep slit; parietal inductura best developed in umbilical areas, extending slightly upon dorsal whorl surface; selenizone narrow, lunulate, slightly elevated; ornament of delicate, closely spaced collabral threads, stronger and sometimes intercalated in dorsal area, but obsolete near umbilici; muscle scars and shell structure unknown.

*Distribution.* Twelve fragmented specimens from zones no. 2 and no. 3 of the Wassonville chert.

*Figured Specimens:* AMNH 29330, AMNH 29331, and AMNH 29332.

*Discussion:* This species resembles *B. (Bellerophon) sublaevis* Hall, from the Salem Limestone, but has a slightly narrower, more elevated selenizone and stronger collabral ornament. On the other hand, the selenizone and ornament of the Wassonville species are reminiscent of *B. (Bellerophon) bilabiatius* White and Whitfield, a spe-

TABLE 6  
Measurements (in Millimeters) of *Bellerophon* (*Bellerophon*) *sowerbyi*? d'Orbigny

	SW	MBW	HA	WA	H	PD
SUI11205	0.30	5.00	—	—	—	—
SUI11205	0.10	2.40	—	—	5.20	4.80
SUI11205	0.30	7.30	6.50	14.40	15.50	13.50
AMNH 29330	—	4.70	3.65	9.25	10.10	8.10
AMNH 29331	—	4.30	3.00	8.50	9.00	6.70
SUI11205	—	1.90	1.80	4.15	5.30	4.20
AMNH 29332	0.20	—	4.50	10.00	11.00	8.70

cies quite widespread in the Kinderhookian of the western United States. The aperture of the Wassonville species, although poorly preserved in all specimens examined, apparently lacks the pronounced bilobed outline characteristic of *B. (Bellerophon) bilabiatus*.

This Wassonville species appears morphologically closer to some illustrated specimens of *B. (Bellerophon) sowerbyi* d'Orbigny from the Lower Carboniferous of Europe than to any described North American species. The specimens illustrated by Weir (1931, pl. 2, figs. 1-12) and attributed to *B. (B.) sowerbyi* display vast morphological variation; certainly enough to encompass the Wassonville form. The specimen of *B. sowerbyi* illustrated by Batten (1966, pl. 1, fig. 9) from the Compton Martin Hotwells Limestone, displays a nearly lamellose collabral ornament, not seen in any specimen from the Wassonville Limestone. Batten (1966, p. 9), in spite of repeated efforts, was unable to locate the type specimens of *B. (B.) sowerbyi*. Since we lack an adequate understanding of *B. (B.) sowerbyi*, I am reluctant to unquestionably assign the Wassonville form to that species.

SUBFAMILY KNIGHTITINAE KNIGHT, 1956

GENUS *RETISPIRA* KNIGHT, 1945

*Type Species. Retispira bellireticulata* Knight, 1945.

*Retispira tenuilineata*? (Gurley)

Figure 3G-I

*Bellerophon tenuilineatus* Gurley, 1884, p. 10.

*Bucanopsis meekiana*: Girty, 1915, p. 169-172, pl. 20, figs. 4-6.

*Bucanopsis tenuilineata*: Weller, 1929, pp. 320-322, pl. 1, figs. 4-5b.

*Bucanopsis marcouiana*: Sturgeon, 1937, p. 357.

*Bucanopsis lineatocarinatus* (Romanovsky): Licharew and Netschajew, 1956, pl. 9, figs. 4-12.

?*Knightites (Retispira) tenuilineata*: Yochelson, 1960, p. 227.

*Knightites (Retispira) tenuilineata*: Hoare, 1961, p. 145, pl. 19, figs. 9, 10; Mudge, et al., 1962, p. 92, pl. 16, figs. 23, 24; Sturgeon, 1964, pl. 31, figs. 15-18.

*Description.* Small, subglobose, and minutely planeromphalous bellerophontaceans; whorl profile gently rounded dorsally, but steeply inclined near umbilici; aperture uninflated, but slightly flaring laterally; anterior lip gently convex forward on either side of selenizone and slightly convex backward approaching moderately wide, shallow slit; thin parietal inductura, most noticeable in area of columellar lip, where lobe-like extensions nearly obscuring umbilici, extending short distance upon dorsal portion of previous whorl, obliterating ornament; moderately wide convex selenizone distinctly lunulate and ornamented by variable number of very fine spiral threads; spiral ornament numerous closely, but unequally, spaced threads of varying thicknesses; collabral ornament restricted to closely spaced growth lines locally bunched and thickened in mature portions of whorl and forming reticulate pattern upon intersecting spiral threads.

*Distribution.* Common in zones no. 2 and no. 3 of Wassonville Limestone.

*Figured Specimens.* AMNH 29333 and AMNH 29334.

*Discussion.* This form exemplifies a com-

TABLE 7  
Measurements (in Millimeters) of *Retispira tenuilineata?* (Gurley)

	SW	MBW	HA	WA	H	PD
SUI11205	0.50	4.50	3.70	8.80	8.50	6.20
SUI11205	—	2.40	1.50	4.50	4.20	3.10
SUI11205	0.50	4.00	—	—	8.80	7.00
SUI11205	0.15	3.30	2.40	6.80	6.60	6.20
SUI11205	0.70	5.20	—	10.20	10.00	8.30
SUI11205	—	4.50	4.00	9.00	9.70	7.40
SUI11205	0.35	4.40	3.40	7.90	8.80	7.00
SUI11205	—	3.00	2.50	7.20	6.80	5.30
SUI11205	0.40	4.20	—	—	8.50	6.30
AMNH 29333	—	5.00	3.90	10.00	9.00	6.80
AMNH 29334	0.70	6.00	5.00	11.80	11.60	8.80
SUI11205	0.50	4.50	3.60	8.80	9.50	7.20
SUI11205	0.40	4.10	3.60	7.80	8.30	6.50
SUI11205	—	3.10	2.80	6.80	7.10	5.10
SUI11205	—	3.00	2.00	5.60	6.00	4.80
SUI11205	—	3.30	2.90	7.00	6.30	4.40
SUI11205	0.20	1.70	1.25	3.40	4.00	3.30

monly expressed Upper Paleozoic retispirid morphology of reticulate ornament, minute umbilici, and flat to raised selenizone with spiral threads or lirae. This group of retispirids presents a perplexing taxonomic problem because of the great likelihood of homeomorphy through a long span of geologic time. It may prove possible, after detailed study, to morphologically subdivide *R. tenuilineata* into two meaningful categories—one based on a raised selenizone, the other with a flat selenizone.

For the present, however, I am following the more conservative course set by Weller (1929) and Sturgeon (1964) and retaining a wide morphological and stratigraphical conception of *R. tenuilineata*. This morphological latitude is such as to engulf not only several North American Upper Paleozoic forms but, possibly, also several species from the European and Asian Carboniferous [e.g., *R. decussatus* (Fleming), as figured by Weir, 1931, pl. 8, figs. 12-16 and *R. lineatocarinatus* (Romanovsky) as figured by Licharew and Netschajew, 1956, pl. 9, figs. 4-12]. *Retispira ornatus* (S. Weller) 1920, as figured by Thein and Nitecki (1974) from the Chester of Illinois, is possibly conspecific with *Retispira tenuilineata*.

The Wassonville specimens of *R. tenuilineata?* superficially resemble *R. perelegans* (White and

Whitfield) from the Mississippian of midcontinental United States. The latter species, however, seems more meaningfully compared with another common retispirid morphological plan, primarily of the Devonian and Mississippian, which is typified by the widespread Meramecian *Retispira cancellata* (Hall) (= *R. textilis*) and the middle Devonian *R. leda* (Hall). I have examined the types of *R. perelegans* and that species can be distinguished from *R. tenuilineata?* by its more open umbilici and wider, flatter dorsal whorl profile.

*Retispira exilis* (deKoninck)

Figure 4A-C

*Bucania exilis* deKoninck, 1883, p. 151, pl. 43, figs. 35-38.

*Bucania reticulata* M'Coy: deKoninck, 1883, p. 152, pl. 41, figs. 9-12.

*Bucanopsis exilis* (deKoninck): Weir, 1931, p. 818, pl. 8, figs. 1-7, 11, 23.

*Knightites (Retispira) exilis* (deKoninck): Batten, 1966, pp. 10-11, pl. 1, figs. 10-12, text fig. 1a.

*Description.* Medium-sized, globose bellerophonaceans with wide-open umbilici; whorl profile broadly rounded dorsally, sharply reflexed laterally near umbilici; aperture noninflated, but gently flaring laterally; thick anterior

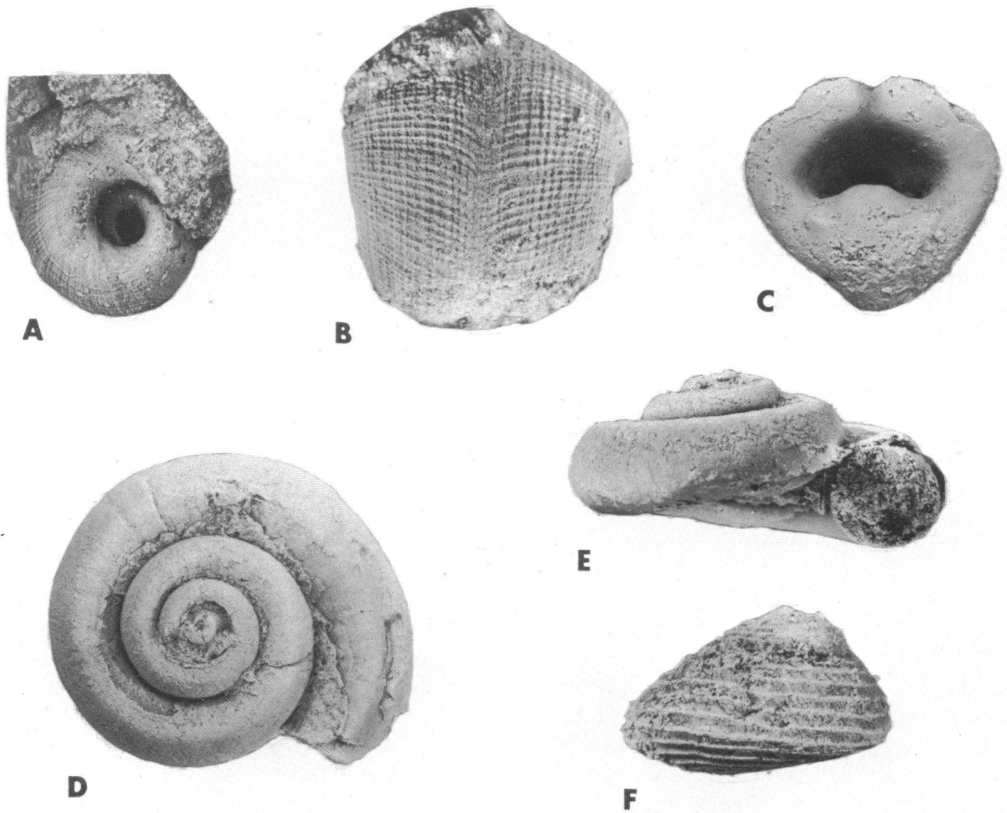


FIG. 4. A-C. *Retispira exilis* (deKoninck). A. Umbilical view, AMNH 29336  $\times 3.0$ . B. Dorsal view, AMNH 29335.  $\times 4.0$ . C. Apertural view, AMNH 29337.  $\times 2.0$ . D, E. *Straparollus* (*Euomphalus*) *obtusus* (Hall). D. Oblique top view of AMNH 29337, showing angulated upper whorl surface.  $\times 3.0$ . E. Apertural view AMNH 29338 showing flattened spire.  $\times 3.0$ . F. *Rhineoderma dinglensis* (Girty), side view, AMNH 29339.  $\times 5.0$ .

lip gently convex forward on either side of moderately wide shallow slit; parietal inductura thick laterally and thin over small dorsal portion of previous whorl; moderately wide, strongly lunulate selenizone, flat to slightly depressed and ornamented by variable number of obscure spiral threads; numerous spiral lirae, often flat-topped; collabral ornament closely spaced growth lines.

*Distribution.* Common in zones no. 2 and no. 3 of the Wassonville Limestone.

*Figured Specimens.* AMNH 29335, AMNH 29336, and AMNH 29337.

*Discussion.* *Retispira exilis* (deKoninck) is readily distinguished from *R. tenuilineata*? (Gurley) on the basis of its open umbilici and more globose whorl profile. Batten (1966, p. 11) mentioned the wide morphologic plasticity of *R. exilis*. In fact, the tendency toward flat-topped spiral elements seems to be one of the few characteristic features of this species, and even this shows great individual variability.

TABLE 8  
Measurements (in Millimeters) of *Retispira exilis* (deKoninck)

	SW	MBW	HA	WA	H	PD
SUI11206	0.60	4.90	—	—	—	—
SUI11206	1.10	5.30	—	—	—	—
SUI11206	0.80	6.10	6.30	17.00	—	—
SUI11206	0.60	5.80	4.60	12.50	13.00	10.00
SUI11206	0.60	6.70	—	—	—	—
SUI11206	—	5.50	4.00	10.50	11.60	9.40
SUI11206	0.50	5.90	4.50	14.10	12.20	9.10
SUI11206	—	4.80	3.00	10.10	—	8.80
SUI11206	—	—	—	—	11.40	8.30
SUI11206	—	4.00	3.50	9.90	—	—
SUI11206	—	4.80	4.50	11.00	—	—

## SUBORDER MACLURITINA

## SUPERFAMILY EUOMPHALACEA

## FAMILY EUOMPHALIDAE DEKONINCK, 1881

*STRAPAROLLUS* (*EUOMPHALUS*) J. SOWERBY, 1814

*Type Species. Euomphalus pentangulatus*, 1814.

*Straparollus* (*Euomphalus*) *obtusus* (Hall)  
Figure 4D, E

*Euomphalus obtusus* Hall, 1858b, p. 523.

*Straparollus obtusus* (Hall): Keyes, 1889, p. 296; 1890c, p. 197, pl., figs. 2a-c; 1894b, p. 157, pl. 51, fig. 5. Weller, 1901, p. 191, pl. 17, figs. 6-8. Thomas, 1925, pl. 3, fig. 25. Branson, 1938, p. 106, pl. 14, figs. 10-12 (pt. 1); p. 44, pl. 24, figs. 4, 5 (pt. 2).

*Straparollus angularis* Weller, 1900, p. 110, pl. 6, figs. 13, 14.

*Description.* Moderately large, low-spined euomphalid with blunt angulation near middle of upper whorl surface; umbilical whorl profile rounded; neanic whorls discoidal and rounded; slightly uncoiled after about two volutions, causing body whorl to embrace penultimate whorl at periphery; sutures impressed only in juvenile stage; flattened upper whorl surface of mature whorls either horizontal or slightly inclined downward; whorl periphery usually occurring near mid-whorl, but somewhat lower in latest

growth stages; umbilicus wide and umbilical sutures pronounced; ornament only growth lines, nearly orthocline on upper whorl surface, gently prosocline from angulation to whorl periphery and into umbilicus.

*Distribution.* Moderately common in zones no. 1 and no. 2 of the Wassonville Limestone. Present in zone no. 3.

*Figured Specimens.* AMNH 29338 and AMNH 29337.

*Discussion.* Extremely large euomphalids from the Lower Mississippian of Burlington, Iowa, were identified by Keyes (1889, p. 296) as *S.*

TABLE 9  
Measurements (in Millimeters) of *Straparollus*  
(*Euomphalus*) *obtusus* (Hall)

	H	W	HA	WA
SUI11207	11.50	27.60	—	—
SUI11207	8.70	22.80	8.30	8.40
SUI11207	7.30	14.60	5.60	5.50
SUI11207	8.00	15.60	7.00	5.50
SUI11207	—	19.50	5.30	5.00
SUI11207	8.00	16.50	—	—
SUI11207	9.00	16.50	6.60	5.20
AMNH 29338	7.70	15.30	5.30	5.70
SUI11207	5.30	10.30	—	—
SUI11207	5.80	11.00	—	—
AMNH 29337	5.40	11.40	4.90	4.60
SUI11207	4.50	9.60	3.80	4.00
SUI11207	7.00	13.90	5.10	5.50
SUI11207	6.40	12.50	4.50	5.00

(*Euomphalus*) *obtusus*. Hall's original description of the species (Hall, 1858b, pt. 2, p. 523) stated an average size of less than 1½ inches. Intensive study of the large Burlington forms may reveal that they are not *S. (Euomphalus) obtusus*.

In all observed characteristics, the Wassonville specimens of *S. (E.) obtusus* seem to compare favorably with Hall's original description. Branson (1938, p. 106, pl. 14, figs. 10-12; pl. 24, figs. 4, 5, 15) described and figured specimens of *S. (E.) obtusus* from the Lower Mississippian of Missouri that appear to agree with the Wassonville specimens in every detail. At the same time, Branson considered *S. (E.) missouriensis* conspecific *S. (E.) obtusus*. The description and illustrations of *S. (E.) missouriensis* (Miller and Gurley, 1896, p. 20, pl. 2, figs. 35, 36) do not indicate, however, an angular upper whorl surface.

Weller (1900, p. 110, pl. 6, figs. 13, 14) described and figured a new species, *Straparollus angularis* from the Lower Mississippian at Burlington, Iowa. His species was established on the basis of one specimen that had previously been identified as *S. (E.) obtusus*. Although *S. angularis* has a rather pronounced angulation on the upper whorl surface, it probably falls within the range of variation of *S. (E.) obtusus*.

As noted by Yochelson (1969b, p. 446) euomphalaceans are often dominant elements of Mississippian gastropod faunas. It seems likely that a systematic study of Mississippian euomphalaceans would reveal the desirability of synonymizing many existing specific names. Taxonomic problems have arisen from the interesting phylogenetic pattern of this group, which displays much morphologic conservatism in the Lower Carboniferous but apparent rapid evolution in the Pennsylvanian and Permian. It is very difficult, if not impossible, to distinguish Lower Carboniferous *S. (Straparollus)* from *S. (Euomphalus)* (Batten, 1966, p. 12).

I suspect that several species described from the western United States are conspecific with *S. (E.) obtusus*. I cannot find any real basis, other than geographic separation, for recognition of *S. (E.) subplanus* (Hall), *S. (E.) brooksensis* Yochelson and Dutro, and *S. (E.) obtusus* as distinctive taxa. If future study demonstrates that these are conspecific taxa, *S. (E.) subplanus* (Hall) will have nomenclatorial priority.

SUBORDER PLEUROTOMARIINA  
SUPERFAMILY PLEUROTOMARIACEA  
FAMILY SINUOPEIDAE WENZ, 1938  
SUBFAMILY TURBONELLININAE KNIGHT, 1956  
*RHINEODERMA* DEKONINCK, 1883

*Type Species. Pleurotomaria radula* de-Koninck, 1843.

*Rhineoderma dinglensis* (Girty), 1927  
Figure 4F

*Pleurotomaria dinglensis* Girty, 1927, p. 428, pl. 25, figs. 21-24.

*Rhineoderma dinglensis* (Girty): Yochelson, 1962, pp. 77-78, pl. 17, figs. 1-3; 1969b, pl. 60, figs. 3-5.

*Description.* Low-spined, as is characteristic of the genus; mature whorl with bluntly triangular profile; upper whorl surface gently convex and quite steeply inclined; narrow shelf immediately below suture; lower whorl surface very slightly convex, turning sharply inward to the flattened base; narrow, slightly concave selenizone situated on upper whorl surface, and bordered by sharp lirae; lower selenizone margin positioned on the whorl periphery; sutures shallow; spiral ornament dominant, consisting of five strong, subequally spaced lirae above selenizone; collabral ornament growth lines only; base flattened, narrowly phaneromphalous, and ornamented with numerous strong spiral lirae.

*Distribution.* Very rare in zone no. 3 of the Wassonville Limestone.

*Figured Specimen.* AMNH 29339.

*Discussion.* The two *Rhineoderma* specimens collected from the Wassonville chert are apparently conspecific with *R. dinglensis*, but appear to show more affinity to *R. dinglensis* from the Redwall Limestone, than to the type material from the Brazer Limestone. However, Yochelson

TABLE 10  
Measurements (in Millimeters) of  
*Rhineoderma dinglensis* (Girty)

	PA	H	W	SW	SS	CAS
AMNH 29339	87.5°	5.10	5.60	0.40	2.10	5



has stated (Yochelson, 1962, p. 78) that Girty's figured holotype is clearly an immature specimen. Neither of the Wassonville specimens displays interference nodes on the upper whorl surface, a feature quite common in *R. dinglensis*.

*Rhineoderma dinglensis* can be distinguished from *R. pealeana* (Girty), of the Brazer Limestone, by its lack of pronounced interference nodes arising from the intersection of spiral and collabral ornament and by having fewer, but sharper, spiral lirae.

*Rhineoderma dinglensis* differs from *R. wortheni* (Hall) and *R. piasense* (Hall) of the Salem Limestone by having a less-rounded whorl profile than the former and a less angular profile than the latter.

*Pleurotomaria subcarbonaria* Keyes (1894b, p. 135, pl. 49, fig. 2), from the Kinderhook of Iowa, appears to be a *Rhineoderma* species. However, the description and illustration is so inadequate that even a superficial comparison with *R. dinglensis* is impossible.

SUBFAMILY PLATYSCHISMATINAE KNIGHT,  
1956

PLATYSCHISMA M'COY, 1844

*Type Species. Ampullaria helicoides* Sowerby, 1826.

*Platyschisma laudoni*, new species

Figure 5A-C

*Diagnosis.* This species can be distinguished

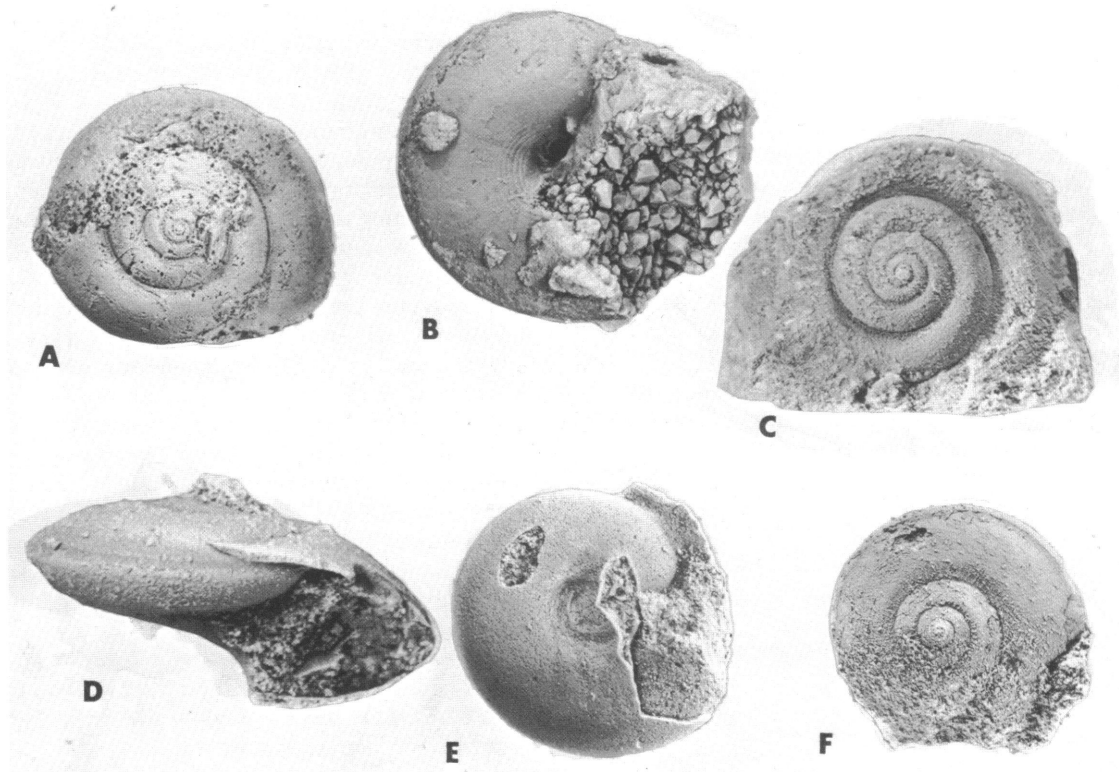


FIG. 5. A-C *Platyschisma laudoni*, new species. A. Oblique top view of holotype, AMNH 29340.  $\times 3.0$ . B. Basal view of paratype, AMNH 29341, showing spiral umbilical ornament.  $\times 3.0$ . C. Top view of paratype, AMNH 29342, a low-spined specimen.  $\times 3.0$ . D-F. *Trepospira (Angyomphalus) penelenticulata*, new species. D. Apertural view of paratype, AMNH 29345, showing lenticular shape.  $\times 8.0$ . E. Basal view of paratype, AMNH 29344, showing shallow umbilical furrow.  $\times 5.0$ . F. Top view of holotype, AMNH 29343.  $\times 3.0$ .

from other species of *Platyschisma* on the basis of its subsutural shelf in combination with an ornamented umbilicus.

**Description.** Medium-sized, naticiform, and very narrowly phaneromphalous; whorls usually six in number, smoothly rounded, with narrow sutural shoulders; sutures moderately impressed; aperture subround, with a rather wide, deep sinus, generating a very obscure pseudo-selenizone just above middle of outer lip; base rounded to slightly flattened with narrow deep umbilicus; ornament of very faint growth lines and several closely spaced, fine spiral lirae within the umbilicus.

**Distribution.** Three specimens from zones no. 2 and no. 3 of the Wassonville Limestone.

**Figured Specimens.** Holotype, AMNH 29340; paratypes AMNH 29341 and AMNH 29342, from zone no. 2.

**Etymology.** Named for Dr. Lowell Laudon.

**Discussion:** *Platyschisma laudoni* closely resembles *P. helicoides* (Sowerby), the type species, but is much smaller, possesses more strongly developed sutural shoulders and has fainter growth lines. *Platyschisma missouriensis* Weller (1899, pp. 42-43, pl. 5, figs. 1-4), from the Northview sandstone of Missouri, is much larger than *P. laudoni* and apparently lacks spiral lirae within the umbilicus. *Platyschisma depressa* Weller (1900, pp. 111-112, pl. 6, figs. 19-21) from the Burlington Kinderhook, differs from *P. laudoni* by being lower spired and possessing a larger unornamented umbilicus.

FAMILY RAPHIOMATIDAE KOKEN, 1896

SUBFAMILY LIOSPIRINAE KNIGHT, 1956

TREPOSPIRA ULRICH AND SCOFIELD, 1897

**Type Species.** *Pleurotomaria sphaerulata* Conrad, 1842.

TREPOSPIRA (ANGYOMPHALUS) COSSMAN, 1916

**Treospira (Angyomphalus) penelenticulata,**  
new species  
Figure 5D-F

**Diagnosis.** This species can be recognized on the basis of its rare combination of a poorly developed umbilical funicle and narrow obscure selenizone. In this sense it shows morphological

TABLE 11  
Measurements (in Millimeters) of  
*Platyschisma laudoni*, New Species

	H	W	HA	WA
Holotype, AMNH 29340	11.00	14.50	8.00	8.10
Paratype, AMNH 29341	11.50	14.00	—	—
Paratype, AMNH 29342	10.00	15.00	—	—

features intermediate between *T. (Treospira)* and *T. (Angyomphalus)*.

**Description.** Moderately small, lenticular, and very low-spired species; upper whorl surface gently convex; sutures distinct but not incised; juvenile whorls rounder and more loosely coiled than mature whorls; shallow slit generating a narrow obscure selenizone just above the sharply angulated whorl periphery; whorls tightly coiled, moderately embracing and obscuring the selenizone on all but final whorl; base slightly arched, cryptomphalous or, rarely, hemiomphalous with a shallow circumumbilical furrow and very weakly developed funicle; columellar lip slightly thickened and nearly straight; anterior lip thin and sharply angulated at periphery; ornamentation collabral only, consisting of very obscure growth lines and short, faint sutural threads.

**Distribution.** Very common in chert zones no. 2 and no. 3 of the Wassonville Limestone.

**Figured Specimens.** Holotype, AMNH 29343; paratypes AMNH 29344 and AMNH 39345, from zone no. 2.

**Etymology:** The trivial name *penelenticulata* is derived from the Latin *pene*, meaning almost, and *lenticula*, meaning lens.

**Discussion:** *Treospira (Angyomphalus)* is apparently rather common in the Lower Carboniferous of Europe, but has seldom been reported from North America. Almost certainly, such lenticular forms as *Straparollus lens* Hall and perhaps *Straparollus northviewensis* Branson will prove, when carefully studied, to be species of *T. (Angyomphalus)*.

*Treospira (Angyomphalus) penelenticulata* displays features characteristic of both *T. (Treospira)* and *T. (Angyomphalus)*. It lacks the well-developed funicle of *T. (Angyomphalus)* and

TABLE 12  
Measurements (in Millimeters) of *Treospira*  
(*Angyomphalus*) *penelenticulata*, New Species

	H	W	HA	WA
Holotype, AMNH 29343	—	11.90	—	—
Paratype, AMNH 29344	—	8.00	—	—
Paratype, AMNH 29345	3.75	7.00	2.37	3.75
SUI11208	3.70	7.30	2.60	3.20
SUI11208	5.10	10.50	3.70	4.10
SUI11208	5.00	10.15	3.50	4.30
SUI11208	4.40	9.50	3.00	3.60
SUI11208	4.60	9.60	3.60	3.80
SUI11208	3.00	6.60	2.00	2.20
SUI11208	3.50	7.10	2.60	3.10
SUI11208	3.10	6.60	2.45	2.90
SUI11208	3.30	7.60	2.80	3.20
SUI11208	5.00	9.20	3.60	5.00
SUI11208	4.40	7.90	3.30	3.40
SUI11208	2.60	5.40	1.90	2.50
SUI11208	4.40	8.00	2.50	3.40
SUI11208	4.00	7.70	3.00	3.10

is seldom hemiomphalous. On the other hand, the type of ornament and the narrow obscure selenizone indicate *T. (Angyomphalus)*.

The only other recorded occurrences of *T. (Angyomphalus)* from the Lower Carboniferous of North America are a single specimen from Northern Alaska (Yochelson and Dutro, 1960, pp. 135-136, pl. 12, figs. 35, 36), a species from the Upper Mississippian or Lower Pennsylvanian of Montana questionably assigned to *T. (Angyomphalus)* (Easton, 1962, p. 99, pl. 13, fig. 16) and *T. (Angyomphalus) discus* (Girty) (Yochelson, 1969a, p. 28, pl. 5, figs. 24, 31, 33). None of these species is well understood morphologically, and comparison with *T. (A.) penelenticulata* is not possible at this time.

TABLE 13  
Measurements (in Millimeters) of *Baylea trifibra*, New Species

	PA	H	W	SW	SS	CS	CAS	CAS
Holotype, AMNH 29346	50°	14.0	9.60	0.55	1.00	0.50	3	3
Paratype, AMNH 29347	61°	12.80	9.20	0.50	1.00	0.70	3	3
SUI11209	—	—	—	0.35	0.70	0.40	3	3

SUBFAMILY OMOSPIRINAE WENZ, 1938

*BAYLEA* DE KONINCK, 1883

*Type Species. Trochus yvanii* Leveille, 1835.

*Baylea trifibra*, new species  
Figure 6A-C

*Diagnosis.* This species can be distinguished from other species of *Baylea* on the basis of the consistent presence of three spiral lirae on the upper whorl surface in conjunction with a single fine spiral thread on the outer whorl surface between the lower selenizone margin and the first spiral lira.

*Description.* Moderately high-spired species of *Baylea*; mature whorls with sharp lateral angle at mid-whorl, dividing flattened upper whorl surface from nearly vertical outer whorl surface, rather wide, slightly concave selenizone situated on upper whorl surface; selenizone margins sharp lirae, lower forming base of upper whorl surface; sutures shallow; collabral ornament obscure, consisting of only very faint growth lines; spiral ornament numerous sharp lirae, three on upper and three on outer whorl surfaces; fine spiral thread on outer whorl surface midway between lower selenizone margin and first major spiral element.

*Distribution.* Three specimens from Wassonville Limestone (zone no. 2) and single specimen from the Gilmore City Oolite, at Humboldt, Iowa (AMNH 29348).

*Figured Specimens.* Holotype, AMNH 29346; paratype, AMNH 29347; figured specimen AMNH 29348.

*Etymology.* The trivial name *trifibra* is derived from the Latin prefix, *tri-*, thrice, and *fibra*, thread.

*Discussion.* *Baylea trifibra* resembles *B. coheni* Yochelson, from the Redwall Limestone (Yochelson, 1962, p. 78, pl. 17, figs. 6, 7), but can be distinguished on the basis of its spiral orna-

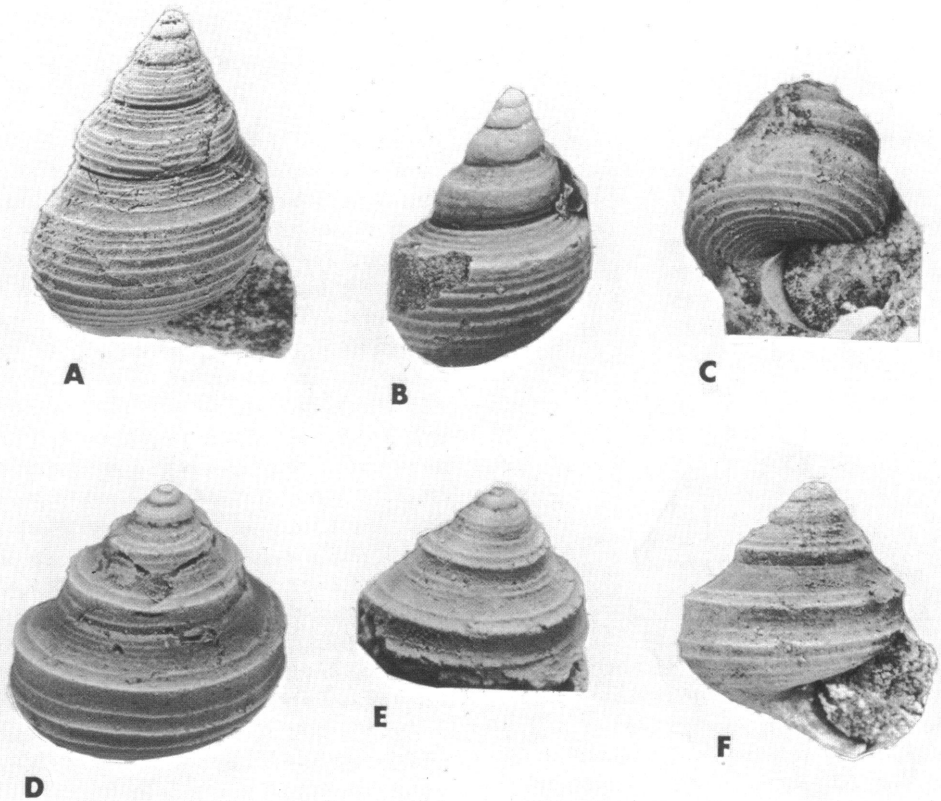


FIG. 6. A-C. *Baylea trifibra*, new species. A. Oblique apertural view of holotype, AMNH 29346.  $\times 4.0$ . B. Oblique side view, AMNH 29348, from Gilmore City Oolite.  $\times 3.0$ . C. Apertural view of paratype, AMNH 29347, showing thickened and reflexed columellar lip.  $\times 4.0$ . D-F. *B. angulosa*, new species. D. Oblique side view of holotype, AMNH 29349.  $\times 8.0$ . E. Oblique side view of paratype, AMNH 29350.  $\times 8.0$ . F. Apertural view of paratype, AMNH 29351.  $\times 6.0$ .

ment. *Baylea trifibra* differs from *B. yvanii* Leveille, the type species, by having fewer and coarser spiral lirae both above and below the selenizone and by its less-turreted shape (see Batten, 1966, p. 25, pl. 3, fig. 4). *Baylea spiroilirata* Batten (1966, p. 24, pl. 3, figs. 2, 3) is morphologically very close to *B. trifibra* and both species consistently possess three lira on the upper whorl surface and are only slightly turreted. *Baylea spiroilirata*, however, has a unique planispiral neanic stage not displayed by *B. trifibra*.

A single specimen of *Baylea* is available from the Gilmore City Oolite and is provisionally assigned to *B. trifibra*, AMNH 29348 (fig. 6B).

Known Mississippian species of *Baylea* from North America appear quite conspicuous in their lack of complex ornament. Contrary to many Pennsylvanian and Permian species of *Baylea*, no described Mississippian forms display nodes arising from the intersection of spiral and collabral ornament. Many post-Mississippian forms, however, also lack conspicuous collabral ornament.

TABLE 14  
Measurements (in Millimeters) of *Baylea angulosa*, New Species

	PA	H	W	SW	SS	CS
Holotype, AMNH 29349	75.5°	5.50	5.60	0.30	0.80	0.60
Paratype, AMNH 29350	74.0°	5.10	5.00	0.30	0.70	1.20
Paratype, AMNH 29351	74.5°	5.20	5.20	0.30	0.70	0.65
SUI11210	68.0°	3.50	3.70	0.20	0.55	0.40
SUI11210	60.0°	—	6.30	0.30	0.90	1.00
SUI11210	—	5.70	5.00	0.25	0.90	0.70
SUI11210	78.0°	6.40	5.70	0.30	0.80	0.80

***Baylea angulosa*, new species**

Figure 6D-F

*Baylea* sp. Yochelson, 1962, p. 78, pl. 17, fig. 8; 1969b, pl. 60, fig. 8.

**Diagnosis.** This *Baylea* species can be recognized by its low, turreted spire caused by a sharply angular whorl profile.

**Description.** Moderately low-spired and slightly turreted; sharp lateral angle at mid-whorl separating slightly concave upper whorl surface from vertical outer whorl surface; somewhat blunter lateral angle separating outer whorl surface from gently convex whorl base; selenizone rather wide, on upper whorl surface and bounded by distinct lirae; lower selenizone margin a pronounced lira forming base of upper whorl surface; sutures moderately impressed; collabral ornament of faint growth lines; spiral ornament of numerous variably developed lirae; upper whorl surface ornamented by sometimes three, but usually four, spiral threads, prominent lira at base of outer whorl surface and variable number of less distinct lirae spaced over remaining outer whorl surface; base anomphalous or minutely phaneromphalous, with numerous subequally spaced lirae; columellar lip slightly reflexed.

**Distribution.** Seven specimens from the Wasoville Limestone (zone no. 2).

**Figured Specimens.** Holotype, AMNH 29349; paratypes, AMNH 29350 and AMNH 29351.

**Etymology.** The trivial name *angulosa* is derived from the Latin *angulosus*, full of corners.

**Discussion.** *Baylea angulosa* resembles *B. supercrenata* (Weller), from the Pennsylvanian of Illinois, but is distinguished from that species by the absence of spiral ornament on the selenizone, the weaker but usually more profuse spiral ornament, and the relatively wider selenizone. An un-

named species of *Baylea* mentioned by Yochelson from the Redwall Limestone in Arizona (Yochelson, 1962, p. 78; 1969b, pl. 60, fig. 8) is considered conspecific with *B. angulosa*. Another unnamed Mississippian *Baylea* species described by Knight from Sonora (Knight, 1958, p. 74, pl. 8, figs. 15, 16) was considered by Yochelson as conspecific with the Redwall form. However, poor preservation of the Sonora material prevents me from assigning that form to *B. angulosa*.

*Baylea angulosa* can be readily distinguished from all other described species of *Baylea* from the Mississippian of North America by its sharply angular whorl profile and low spire.

The relatively simple morphology of the genus *Baylea* permits a high degree of convergence upon similar ornament and whorl profile. Within the genus there are two types of whorl shape dependent upon the presence of either one or two lateral angles. The lack of conspicuous collabral ornament on nearly all species of *Baylea* enhances convergence by decreasing the range of ornament variability.

FAMILY EOTOMARIIDAE WENZ, 1938

SUBFAMILY EOTOMARIINAE WENZ, 1938

TRIBE EOTOMARIIDES WENZ, 1938

*GLABROCINGULUM* THOMAS, 1940

*Type Species. Glabrocingulum beggi* Thomas, 1940.

***Glabrocingulum (Glabrocingulum) minutum*,  
new species  
Figure 7A-D**

**Diagnosis.** *Glabrocingulum (Glabrocingulum) minutum* can be easily distinguished from all

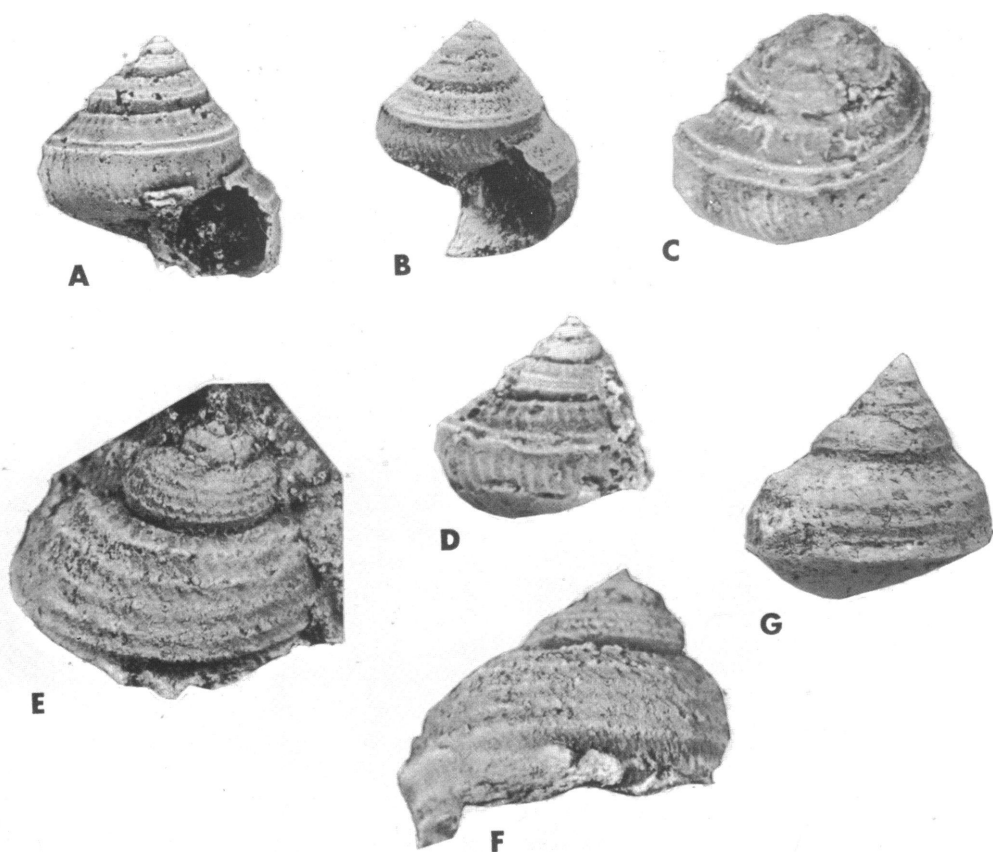


FIG. 7. A-D. *Glabrocingulum (Glabrocingulum) minutum*, new species. A. Apertural view of holotype, AMNH 29352.  $\times 8.0$ . B. Oblique apertural view of paratype, AMNH 29354.  $\times 9.0$ . C. Oblique side view of paratype, AMNH 29353.  $\times 12.0$ . D. Side view of paratype, AMNH 29355.  $\times 12.0$ . E, F. *Portlockiella* sp. E. Oblique side view, AMNH 29362.  $\times 8.0$ . F. Oblique basal view, AMNH 29362, showing selenizone.  $\times 8.0$ . G. *Phymatopleura* sp., side view, AMNH 29361.  $\times 4.0$ .

other described species of *Glabrocingulum* on the basis of its small size and virtual lack of spiral ornament.

*Description.* Tiny species with conical to moderately gradate spire; unornamented, narrow selenizone near mid-whorl on upper whorl surface; selenizone margins sharply raised spiral lirae, the lower of which being coincident with whorl periphery; flattened upper whorl surface meeting nearly vertical outer whorl surface at fairly sharp angle; tendency to uncoil slightly

with growth, causing increasingly gradate profile; sutures shallow; base gently rounded and narrowly phaneromphalous; collabral ornament dominant, consisting of numerous distinct growth lines, thickened into transverse lirae, especially strong on upper whorl surface; other than selenizone margins, spiral ornament restricted to obscure lira on upper whorl surface immediately below suture.

*Distribution.* Rare in chert zone no. 2 of the Wassonville Limestone.

TABLE 15  
Measurements (in Millimeters) of *Glabrocingulum (Glabrocingulum) minutum*, New Species

	PA	H	W	SW	SS
Holotype, AMNH 29352	—	4.20	4.50	0.15	0.60
Paratype, AMNH 29353	79.5°	4.20	4.00	0.20	0.50
Paratype, AMNH 29354	62.0°	3.75	3.70	0.15	0.48
Paratype, AMNH 29355	69.5°	2.33	2.25	0.17	0.41
SUI11211	—	2.30	2.40	0.12	0.50
SUI11211	71.0°	4.00	4.20	0.19	0.65
SUI11211	77.0°	2.80	3.00	0.15	0.42
SUI11211	—	—	3.70	0.15	—

*Figured Specimens.* Holotype, AMNH 29352; paratypes, AMNH 29353, AMNH 29354, and AMNH 29355.

*Etymology.* The trivial name of *G. (Glabrocingulum) minutum* is derived from the Latin *minuta*, small.

*Discussion.* *Glabrocingulum (Glabrocingulum) minutum* belongs to the group of Lower Carboniferous species of *Glabrocingulum* characterized by weakly developed spiral ornament. The group includes such forms as *G. (G.) binodosum* Sadlick and Neilson, 1963, and *G. (G.) stellaeformis* (Hyde), 1953. Batten (1972, p. 17) has recently summarized the nature of morphological variation within the genus.

FAMILY PHYMATOPLEURIDAE BATTEN,  
1956

*GLYPTOTOMARIA* KNIGHT, 1945

*GLYPTOTOMARIA (DICTYOTOMARIA)*  
KNIGHT, 1945

*Type Species.* *Glyptotomaria (Dictyotomaria) scitula* (Meek and Worthen), 1861.

*Glyptotomaria (Dictyotomaria) quasicapillaria*,  
new species  
Figure 8

*Diagnosis.* This species is clearly a phymatopleurid on the basis of selenizone position (slightly below mid-whorl) and the dominance of spiral ornament. *Glyptotomaria (D.) capillaria* (Conrad), from the Middle Devonian of New York, is very similar to this species, and can only be distinguished by its more deeply impressed sutures, more rounded whorl profile and minute

differences in ornament pattern. Other species of *G. (Dictyotomaria)* are not likely to be confused with *G. (D.) quasicapillaria*.

*Description.* Typically turbiniform with slightly gradate spire; protoconch rounded and consisting of 2-3 whorls; upper whorl surface gently convex; outer whorl surface equally convex, grading gently into slightly flattened base; rather wide, concave selenizone situated vertically immediately below whorl periphery; selenizone distinctly lunulate and bounded by sharp spiral cords, upper of which forming whorl periphery; sutures only moderately impressed; ornament both spiral and collabral, creating dictyate pattern; spiral ornament consisting of variable number of cords on upper whorl surface, strongest of which usually slightly above selenizone where often creating slightly angulated whorl profile; fine spiral lira often found between this strong spiral cord and upper selenizone margin; spiral and collabral ornament about equal in development on juvenile whorls but spiral ornament dominant on later whorls; collabral cords best developed on early whorls and on upper whorl surface, becoming weaker and more closely spaced over base of whorl; collabral ornament nearly orthocline on upper whorl face from suture to spiral cord above selenizone, then becoming abruptly prosocline to selenizone; collabral ornament opisthocline immediately below selenizone but resuming prosocline sweep by about second spiral cord below selenizone; base anomphalous to minutely phaneromphalous; columellar lip slightly thickened and straight; aperture subround.

*Distribution.* Numerous specimens were collected from chert zones no. 2 and no. 3 of the

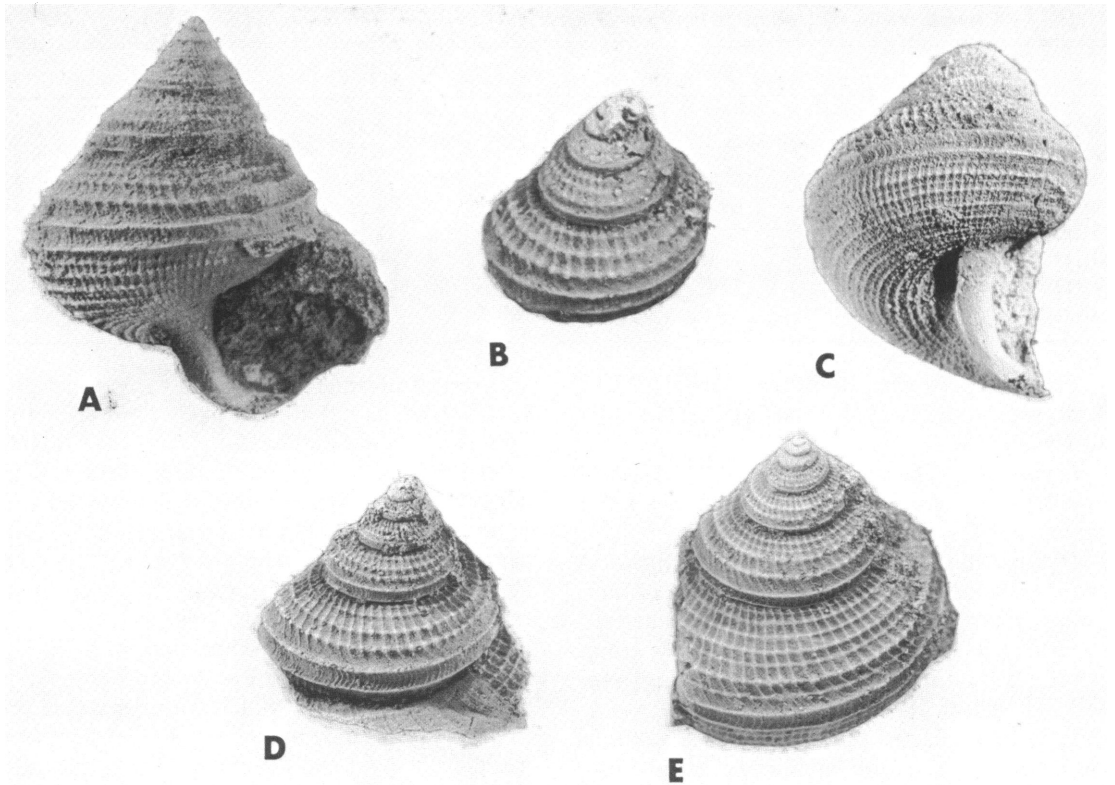


FIG. 8. *Glyptotomaria (Dictyotomaria) quasicapillaria*, new species. A. Apertural view of holotype, AMNH 29356.  $\times 4.0$ . B. Oblique side view of immature paratype, AMNH 29358.  $\times 8.0$ . C. Oblique basal view of paratype, AMNH 29357, showing minute umbilicus.  $\times 2.5$ . D. Oblique side view of paratype, AMNH 29359.  $\times 4.5$ . E. Oblique side view of paratype, AMNH 29360.  $\times 3.5$ .

Wassonville Limestone. *Glyptotomaria (D.) quasicapillaria* is one of the most common pleurotomarians in the Wassonville Limestone.

**Figured Specimens.** Holotype AMNH 29356; paratypes AMNH 29357, AMNH 20358, AMNH 29359, and AMNH 29360, all from zone no. 2, except AMNH 29360 which is from zone no. 3.

**Etymology.** The trivial name *quasicapillaria* refers to the remarkable similarity of this species to the Middle Devonian species *G. (D.) capillaria* (Conrad).

**Discussion.** The aforementioned resemblance of *G. (D.) quasicapillaria* to *G. (D.) capillaria* (Conrad) warrants elaboration. Because *G. (D.) capillaria* has a more rounded upper whorl surface, the spiral cord situated above the selenizone

causes the basal portion of the upper whorl surface to be nearly vertical. Even though the spiral cords are just as strongly developed in *G. (D.) quasicapillaria*, the gently convex upper whorl face prevents a similar profile development in that species. Both species display notable ornamental changes throughout ontogeny. A comparison of young growth stages, however, shows *G. (D.) quasicapillaria* to have less closely spaced collabral and spiral cords (see Rollins, Eldredge, and Spiller, 1971, fig. 10a). It appears likely that *G. (D.) capillaria* was ancestral to *G. (D.) quasicapillaria*.

The Phymatopleuridae are considered closely related to the Eotomariidae. This is perhaps best seen by comparing the basic morphologies of the



TABLE 16  
Measurements (in Millimeters) of *Glyptotomaria (Dictyotomaria) quasicapillaria*, New Species

	PA	H	W	SW	SS	CS	CAS	CBS
Holotype, AMNH 29356	68.5°	12.60	11.90	0.80	2.70	1.00	4	11
Paratype, AMNH 29357	71.0°	14.80	13.50	0.90	3.20	0.60	5	—
Paratype, AMNH 29358	69.5°	3.90	3.90	0.30	1.00	0.30	3	—
Paratype, AMNH 29359	69.0°	11.50	10.30	0.70	2.70	1.00	7	17
SUI11212	80.0°	—	12.70	0.70	2.50	8.80	6	15
SUI11212	—	—	—	0.40	1.20	0.35	4	—
SUI11212	55.5° <sup>a</sup>	14.50	15.50	—	—	—	—	—
SUI11212	61.0°	17.50	16.00	1.20	4.00	—	—	—
SUI11212	59.0°	13.00	—	0.70	3.90	0.80	8	—
SUI11212	65.5°	17.00	16.90	0.90	—	—	—	15
SUI11212	68.5°	13.00	12.40	—	—	—	—	—
SUI11212	68.5°	—	—	0.60	3.00	—	—	17
SUI11212	66.5°	9.80	9.90	0.50	2.50	0.50	5	12
SUI11212	76.5° <sup>a</sup>	11.20	11.60	0.60	3.20	0.70	7	—
SUI11212	75.0°	9.00	9.50	0.50	1.70	0.60	5	—
SUI11212	86.0° <sup>a</sup>	3.00	3.00	0.15	0.60	—	—	—
SUI11212	82.0°	2.65	2.85	0.19	0.40	—	—	—
SUI11212	—	7.00	6.00	0.50	1.10	0.40	—	10
SUI11212	74.0° <sup>a</sup>	5.40	6.00	—	1.60	0.50	—	—
SUI11212	—	—	12.40	0.50	2.50	0.80	5	10

<sup>a</sup>Approximate measurements.

eotomarian *Bembexia* and the phymatopleurid *G. (Dictyotomaria)* (Rollins, Eldredge, and Spiller, 1971, p. 150). The tendency of *G. (D.) quasicapillaria* to develop a nearly carinate upper whorl surface (a typical feature of *Bembexia*) would seem to be yet another clue to the kinship of these two groups.

*Glyptotomaria (D.) quasicapillaria* also bears a superficial resemblance to the eotomarian *Dictyobembix bella* Tyler from the Four Mile Dam Limestone of Michigan (Tyler, 1965, p. 343, pl. 48, figs. 13-16). The latter species, however, has a narrow, supraperipheral selenizone that is weakly lunulate and lacks collabral ornament below the selenizone.

PHYMATOPLEURA GIRTY, 1939

Type Species. *Orestes nodosus* Girty, 1912.

*Phymatopleura* sp.  
Figure 7G

Discussion. A single abraded specimen is assigned to the genus *Phymatopleura*. The concave, lunulate selenizone is situated on the outer whorl

surface slightly above a sharp basal angulation. The selenizone bears a median thread, a feature always found in species of *Phymatopleura*. The whorl surface is nearly vertical near its juncture with the upper selenizone margin, but there is no sharp division of the upper and outer whorl surfaces. The upper whorl surface is ornamented by at least four spiral lirae which form a reticulate pattern upon intersection with numerous collabral threads. The flattened base apparently bears the same reticulate ornament pattern. Sutures are moderately impressed.

The poor preservation of the Wassonville specimen makes comparison with other species of *Phymatopleura* difficult.

Distribution. One specimen from the Wassonville Limestone, chert zone unknown.

Figured Specimen: AMNH 29361.

FAMILY PORTLOCKIELLIDAE BATTEN,  
1956

PORTLOCKIELLA KNIGHT, 1945

Type Species. *Portlockiella kentuckyensis* Knight, 1945.

TABLE 17  
Measurements (in Millimeters) of *Portlockiella* sp.<sup>a</sup>

	PA	H	W	SW	SS	CAS
AMNH 29362	—	—	6.0	0.40	1.70	4

<sup>a</sup>All measurements taken on penultimate whorl.

*Portlockiella* sp.  
Figure 7E, F

*Discussion.* A single specimen assignable to *Portlockiella* was recovered from the Wassonville Limestone. The specimen is, however, incompletely preserved and I am unable to provide specific identification. The Wassonville form resembles *P. kentuckyensis* Knight, the type species, but is slightly lower spired, has more widely

spaced and stronger growth lines, and possesses a more pronounced subsutural shoulder. The selenizone is discernible and is situated at, or slightly below, the whorl periphery.

*Distribution.* One fragmented specimen from chert zone no. 2 of the Wassonville Limestone. *Figured Specimen.* AMNH 29362.

SUBORDER TROCHINA COX AND KNIGHT,  
1960

SUPERFAMILY PLATYCERATAcea HALL,  
1859

FAMILY PLATYCERATIDAE HALL, 1859

*PLATYCERAS* CONRAD, 1840

*Type Species.* *Pileopsis vetusta* J. de C. Sowerby, 1829.

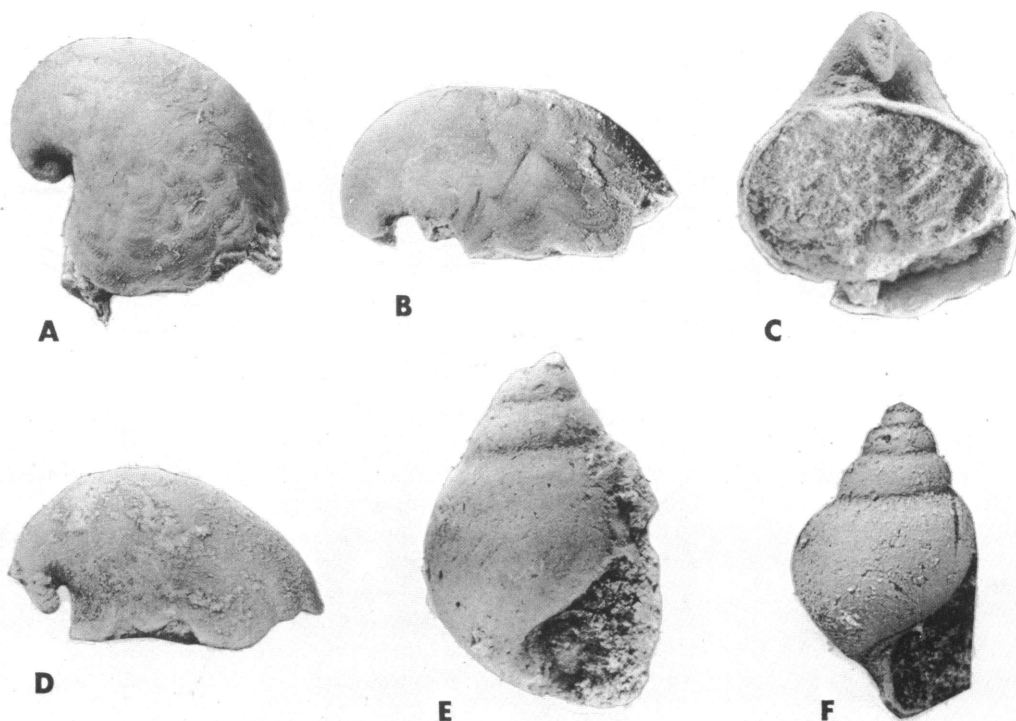


FIG. 9. A, B. *Platyceras (Platyceras) nasutum* (Miller). A. Oblique side view, AMNH 29363.  $\times 3.0$ . B. Oblique side view, AMNH 29364.  $\times 3.0$ . C, D. *P. (P.) latum?* (Keyes). C. Apertural view, AMNH 29365.  $\times 3.0$ . D. Side view, AMNH 29365.  $\times 3.0$ . E, F. *Anematina conica* (Winchell). E. Apertural view, AMNH 29366.  $\times 5.0$ . F. Apertural view, AMNH 29367.  $\times 4.0$ .

*Platyceras (Platyceras) nasutum* (Miller), 1891

Figure 9A, B

*Platyceras paraliium* Keys [non White and Whitfield], 1889, p. 294; Hyde, 1953, p. 333, pl. 47, figs. 28, 29.

*Capulus paralius* (Keyes) [non White and Whitfield], 1890a, p. 9; 1890b, p. 166, pl. 2, figs. 1a-b; 1894b, p. 174, pl. 53, figs. 1a-d.

*Platyceras nasutum* Miller, 1891, p. 82-83, pl. 14, figs. 17, 18; 1892, p. 692, pl. 14, figs. 17, 18; Branson, 1938, p. 109, pl. 14, figs. 15-18.

*Capulus nasutum* (Miller): Weller, 1898, p. 164.

**Description.** Moderately small, laterally compressed species, usually with one rapidly expanding whorl; apex minute and tightly coiled; aperture subovate with slightly sinuate margins; whorl flattened laterally with blunt dorsal angulation bounded on either side by wide shallow depressions; ornament rather distinct undulating growth lines.

**Distribution.** Several specimens available from the C. H. Belanski collection, University of Iowa. The specimens are from the Wassonville chert, but the exact zone is unknown. Probably they were collected from the crinoidal chert band at the top of the Wassonville Limestone.

**Figured Specimens.** AMNH 29363 and AMNH 29364.

**Discussion.** The dorsal angulation and shape of *P. (P.) nasutum* makes that species readily distinguishable from other Mississippian *Platyceras* species.

Before and after Miller described *P. (P.) nasutum*, representatives of that species were considered by Keyes to be conspecific with *P. paraliium* White and Whitfield. The type specimen of *P. paraliium* has a strongly plicated whorl surface, a feature that is apparently never well developed in *P. (P.) nasutum*.

*Platyceras (Platyceras) latum?* Keyes

Figure 9C, D

*Platyceras latum* Keyes, 1888, p. 242, figs. 10, 11; 1889, p. 290. Girty, 1929, p. 95, pl. 12, figs. 25-27.

*Capulus latus* Keyes, 1890a, p. 9; 1890b, p. 168; 1894b, p. 176, pl. 53, figs. 13a-a.

**Discussion.** A single, rather poorly preserved, specimen is questionably identified as an im-

mature representative of *P. (P.) latum* Keyes originally described from the Burlington Kinderhook. This capuliform Wassonville specimen possesses the rapidly expanding whorl and large round aperture characteristic of *P. (P.) latum*, but is much smaller. Coiling is out of contact and the specimen does not accomplish a complete volution. The apex is very slightly inclined from the plane of coiling.

To a lesser degree, the Wassonville form resembles *P. (Orthonychia) sciotoensis* Hyde from the lower Mississippian Logan Formation of Ohio (Hyde, 1953, p. 334, pl. 47, figs. 7-9). The latter has a shorter and less strongly coiled apex.

**Distribution.** A single specimen is available from the Wassonville, chert zone unknown.

**Figured Specimen.** AMNH 29365.

SUPERFAMILY MICRODOMATACEA WENZ,  
1938FAMILY ELASMONEMATIDAE KNIGHT,  
1956

## ANEMATINA KNIGHT, 1933

**Type Species.** *Holopea proutana* Hall, 1858.

*Anematina conica* (Winchell), 1863

Figure 9E, F

*Holopea conica* Winchell, 1863, p. 21. S. Weller, 1901, p. 153, pl. 12, figs. 4-7.

*Holopella mira* Winchell, 1863, p. 22.

*Holopea subconica* Winchell, 1863, p. 21 [non Hall, 1859].

**Description.** Small conical species with moderately elevated spire; minutely phaneromphalous; whorl profile evenly rounded, sutures slightly impressed; aperture small and oval with thin outer lip and thicker, somewhat arcuate, columellar lip which slightly reflexed about minute linear umbilicus; ornament only very faint growth lines.

**Distribution.** Rare in zones no. 1, no. 2, and no. 3 of Wassonville Limestone.

**Figured Specimens.** AMNH 29366 and AMNH 29367.

**Discussion.** Representatives of *A. conica* from the Wassonville compares favorably with Winchell's description of that species in all characteristics but size. The Wassonville individuals are considerably larger.

TABLE 18  
Measurements (in Millimeters) of  
*Anematina conica* (Winchell)

	H	W	PA
AMNH 29366	10.00	6.40	54°
AMNH 29367	11.20	6.00	61°
SUI11213	8.00	7.00	57°

Weller (1901, p. 153), after examining Winchell's type material, concluded that *Holopea conica*, *H. subconica*, and *Holopella mira* constitute different growth stages of a single species. This greatly expanded the previous concept of *Holopea conica* to include both low and rather high spired forms. The Wassonville specimens display only slight ontogenetic change in spire elevation.

SUPERFAMILY ANOMPHALACEA WENZ,  
1938

FAMILY ANOMPHALIDAE WENZ, 1938

*ANOMPHALUS* MEEK AND WORTHEN,  
1867

*Type Species.* *Anomphalus rotulus* Meek and Worthen, 1867.

*Anomphalus* sp.  
Figure 10A, B

*Discussion.* Three poorly preserved specimens, collected from zone no. 2 of the Wassonville Limestone, are placed in the genus *Anomphalus*. As is typical of the genus, they possess rounded whorls, low spire and virtual lack of ornament but do not satisfactorily preserve critical umbilical and columellar characteristics. The base is somewhat flattened and probably cryptomphalous. Specific evaluation must await collection of better preserved material.

TABLE 19  
Measurements (in Millimeters) of *Anomphalus* sp.

	H	W
AMNH 29368	5.00	5.70
AMNH 29369	5.60	5.60

*Distribution.* Very rare in zone no. 2 of the Wassonville Limestone.

*Figured Specimens.* AMNH 29368 and AMNH 29369.

SUBORDER NERITOPSINA COX AND KNIGHT,  
1960

SUPERFAMILY NERITACEA RAFINESQUE, 1815

FAMILY NERITOPSIDAE GRAY, 1847

SUBFAMILY NATICOPSINAE S. A. MILLER, 1889

*NATICOPSIS* M'COY, 1844

*Type Species.* *Naticopsis phillipsii* M'CoY, 1844.

*Naticopsis (Naticopsis) variata* (Phillips),  
1836

Figure 10C, D

*Natica variata* Phillips, 1836, p. 224, pl. 14, figs. 27, 27; [non deKoninck, 1843].

*Naticopsis ovoidea* deKoninck, 1881, p. 14, pl. 1, figs. 15, 16.

*Naticopsis mammillaris* deKoninck, 1881, p. 14, pl. 2, figs. 15-22.

*Naticopsis (Naticopsis) variata* (Phillips): Batten, 1966, p. 64, pl. 7, figs. 9-13.

*Description.* Globular, medium-sized species with relatively low spire; base anomphalous; whorl profile well rounded overall but somewhat flattened at upper whorl surface; ephebic growth stages often with a moderately wide subsutural shelf; sutures shallow, although slightly impressed in later growth stages; large aperture, sub-round to ovate, and only slightly oblique; thick columellar lip distinctly flattened; parietal lip thickened inductural deposit, which is occa-

TABLE 20  
Measurements (in Millimeters) of  
*Naticopsis (Naticopsis) variata* (Phillips)

	H	W	HA	WA
SUI11214	17.00	19.00	13.70	9.70
SUI11214	11.00	12.00	8.50	6.00
SUI11214	11.00	11.50	8.50	6.50
SUI11214	11.00	12.00	9.20	6.10
SUI11214	10.50	10.80	8.80	6.30

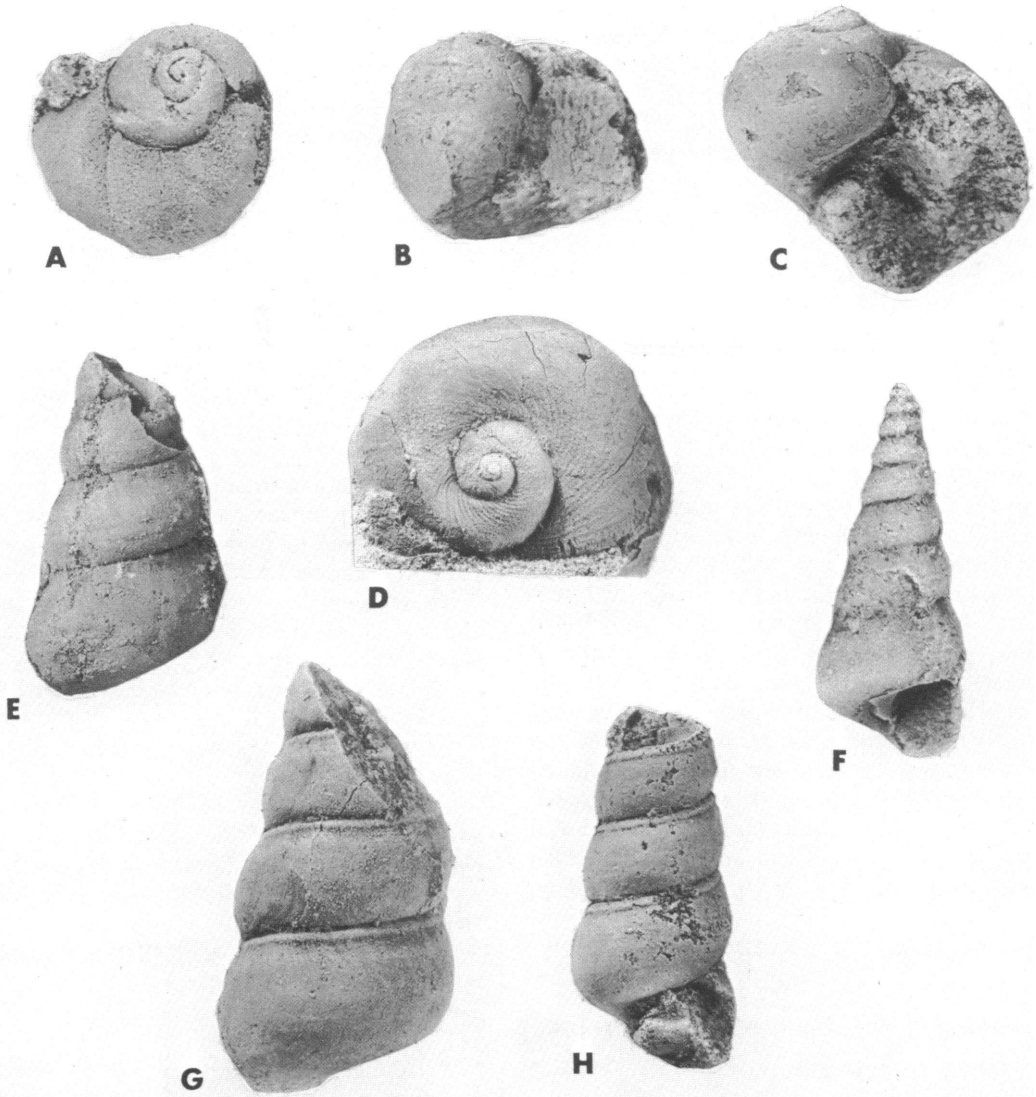


FIG. 10. A, B. *Anomphalus* sp. A. Oblique side view, AMNH 29368.  $\times 6.0$ . B. Apertural view, AMNH 29369.  $\times 6.0$ . C, D. *Naticopsis* (*Naticopsis*) *variata* (Phillips). C. Apertural view, AMNH 29370.  $\times 3.5$ . D. Top view, AMNH 29371, showing ornamented subsutural shelf.  $\times 2.5$ . E, F. *Cerithioides judiae*, new species. E. Side view of holotype, AMNH 29372.  $\times 4.0$ . F. Apertural view of paratype, AMNH 29373.  $\times 4.5$ . G, H. *Cerithioides* sp. G. Side view, AMNH 29375.  $\times 4.0$ . H. Apertural view, AMNH 29374.  $\times 3.0$ .

sionally faintly grooved; ornament collabral only, consisting of growth lines which are more strongly developed near suture; earliest whorls unornamented.

*Distribution.* Moderately rare in zones no. 1, no. 2, and no. 3 of the Wassonville Limestone.

*Figured Specimens.* AMNH 29370 and AMNH 29371.

*Discussion.* That the naticopsids present very perplexing taxonomic problems has been long recognized (Knight, 1933, p. 360; Batten, 1966, p. 61). I agree with Batten (1966) that the group has probably been oversplit with many species recognized merely on the basis of geographic or stratigraphic differences.

Batten utilized four principal characters in studying naticopsids from the Hotwells Limestone. They are, presumably in order of importance: (1) shell shape and whorl profile, (2) degree of uncoiling and spire height, (3) parietal deposits, and (4) ornament.

In all the above characteristics, the Wassonville naticopsids fall within the range of variability of *N. (N.) variata* (Phillips).

*Naticopsis (Naticopsis) depressa* (Winchell) from the Kinderhook of Iowa resembles *N. (N.) variata* but is considerably lower spired. Wassonville representatives of *N. (N.) variata* possess the combination of well-rounded whorls and sub-sutural ornament that Yochelson and Dutro (1960, p. 143, pl. 14, figs. 20-25) considered characteristic of *N. (N.) suturicompta*, from the Lower Mississippian of Northern Alaska. Apparently *N. (N.) suturicompta* has a more oblique aperture, larger size, and less thickened columellar lip than *N. (N.) variata*. However, some specimens of *N. (N.) suturicompta* Yochelson and Dutro, as figured by Thein and Nitecki (1974) may be conspecific with *N. (N.) variata* (Phillips).

SUBORDER MURCHISONIINA  
COX AND KNIGHT, 1960

SUPERFAMILY MURCHISONACEA KOKEN, 1896

FAMILY MURCHISONIIDAE KOKEN, 1896

*CERITHIOIDES* HAUGHTON, 1859

*Type Species.* *Cerithioides telescopium* Haughton, 1859.

*Cerithioides judiae*, new species

Figure 10E, F

*Diagnosis.* *C. judiae* possesses the somewhat pendulant whorl profile and obscure selenizone typical of most species of *Cerithioides* but can be distinguished on the basis of its unornamented base.

*Description.* Medium-sized, moderately high-spired species with gently arched, slightly pendulant whorl profile; whorl periphery rounded and low on whorl; upper whorl surface subjacent to suture slightly concave; sutures shallow; small aperture, subovate with thin straight outer lip and slightly thickened arcuate columellar lip; flat, obscure selenizone situated just below mid-whorl at whorl periphery; selenizone margins indistinct; unornamented base slightly flattened and minutely phaneromphalous; collabral ornament restricted to growth lines, which somewhat stronger on upper whorl surface.

*Distribution.* Rare in chert zones no. 1, no. 2, and no. 3 of the Wassonville Limestone; the types are from zone no. 2.

*Figured Specimens.* Holotype, AMNH 29372; paratype, AMNH 29373.

*Etymology.* This species is named in honor of my wife, Judi.

*Discussion.* Species of *Cerithioides* are few, and this marks only the second occurrence in North America. The only other report involves *C. eversolensis* Stauffer, 1909, from the Middle Devonian of Ohio.

I concur, however, with Batten's suspicion that this genus contains more species than is indicated by the existing literature (Batten, 1966, p. 71).

*Cerithioides judiae* appears to be a rather typical representative of the genus and the only obvious morphologic departure involves the lack of spiral ornament on the whorl base. Otherwise, *C. judiae* is quite similar to *C. telescopium*

TABLE 21  
Measurements (in Millimeters) of *Cerithioides judiae*, New Species

	H	WH	WW	SW	SS
Holotype, AMNH 29372	—	3.00	—	0.20	1.80
SUI11218	17.8	3.50	7.00	—	—
Paratype, AMNH 29373	10.30	2.30	4.20	—	—
Paratype, AMNH 29377	—	3.00	5.50	0.40	1.70

Haughton, the type species. The latter species has, in addition, a peculiar V-shaped selenizone profile.

*Cerithioides judiae* furthermore reaffirms Batten's observation of the conservatism of the selenizone width relative to the width of the exposed whorl below the selenizone, indicating a fixed sutural contact position (Batten, 1966, p. 72).

*?Cerithioides* sp.  
Figure 10G, H

**Description.** Rather large and high-spired species; whorl profile evenly rounded, but slightly bulbous below midwhorl; sutures quite shallow; subround aperture with strongly arcuate, slightly thickened columellar lip; nature of outer lip unknown; growth lines indicating ill-defined selenizone at mid-whorl, possibly bounded by very flat obscure spiral threads; rounded and pronounced spiral carina occurring on upper whorl face immediately subjacent to suture; collabral ornament of weak growth lines, most noticeable near spiral carina; base evenly rounded and apparently anomphalous.

**Distribution.** Rare in chert zones no. 1, no. 2, and no. 3 of Wassonville Limestone.

**Figured Specimens.** AMNH 29374 and AMNH 29375.

**Discussion.** This species is easily recognized by its distinct subsutural carina and is apparently unlike any other described murchisoniid. I have questionably placed this species in the genus *Cerithioides* on the basis of the nature and position of the selenizone. Although I am reasonably confident that this is a new taxon, I am reluctant to erect a species on the basis of three fragmentary specimens.

*STEGOCOELIA* DONALD, 1889

*STEGOCOELIA (HYPERGONIA)* DONALD, 1892

**Type Species.** *Murchisonia quadricarinata* M'Coy, 1844.

*Stegocoelia (Hypergonia)* sp. cf. *S. (H.) percarinata* (Longstaff), 1926  
Figure 11A-C

*Hypergonia?* *percarinata* Longstaff, 1926, p. 548, pl. 36, figs. 10, 11.

TABLE 22  
Measurements (in Millimeters) of *?Cerithioides* sp.

	WH	WW	SW	SS
AMNH 29375	4.50	8.10	—	2.00
AMNH 29374	4.50	8.10	0.50	2.10
SUI11215	2.25	5.00	—	—

*Stegocoelia (Hypergonia) percarinata*: Batten, 1966, p. 80, pl. 8, fig. 20.

**Description.** Medium-sized species with very high spire; subround to bluntly angular whorl profile; sutures moderately impressed; small ovate aperture with straight and slightly thickened columellar lip; outer lip unknown; growth lines suggesting wide obscure selenizone near middle of upper whorl surface; two sharply raised lirae at mid-whorl, upper forming lower selenizone margin; single spiral lira on upper whorl surface, close to suture, forming upper margin of selenizone; single faint spiral lira on outer whorl surface; collabral ornament restricted to weakly developed growth lines; flattened base, unornamented and anomphalous.

**Distribution.** Rare in chert zones no. 1, no. 2, and no. 3 of Wassonville Limestone.

**Figured Specimens.** AMNH 29378, AMNH 29379, and AMNH 29380.

**Discussion.** *Stegocoelia (Hypergonia)* sp. cf. *S. (H.) percarinata* closely resembles *S. (H.) vermicula* (Hall), from the Salem Limestone, but can be distinguished from that species on the basis of its larger size, higher spire, and untapering apex. *Murchisonia proluxa* White and Whitfield, from the Burlington Kinderhook, probably belongs to the subgenus *S. (Hypergonia)* but has

TABLE 23  
Measurements (in Millimeters) of *Stegocoelia (Hypergonia)* sp. cf. *Stegocoelia (Hypergonia) percarinata* (Longstaff)

	WH	WW	SW	SS	PA
SUI11216	1.50	2.70	0.40	0.20	—
AMNH 29378 <sup>a</sup>	0.90	1.70	0.19	0.10	16°
SUI11216 <sup>a</sup>	1.30	—	—	—	—
AMNH 29379	1.50	3.10	0.50	0.20	—

<sup>a</sup>Measurements taken on penultimate whorl.

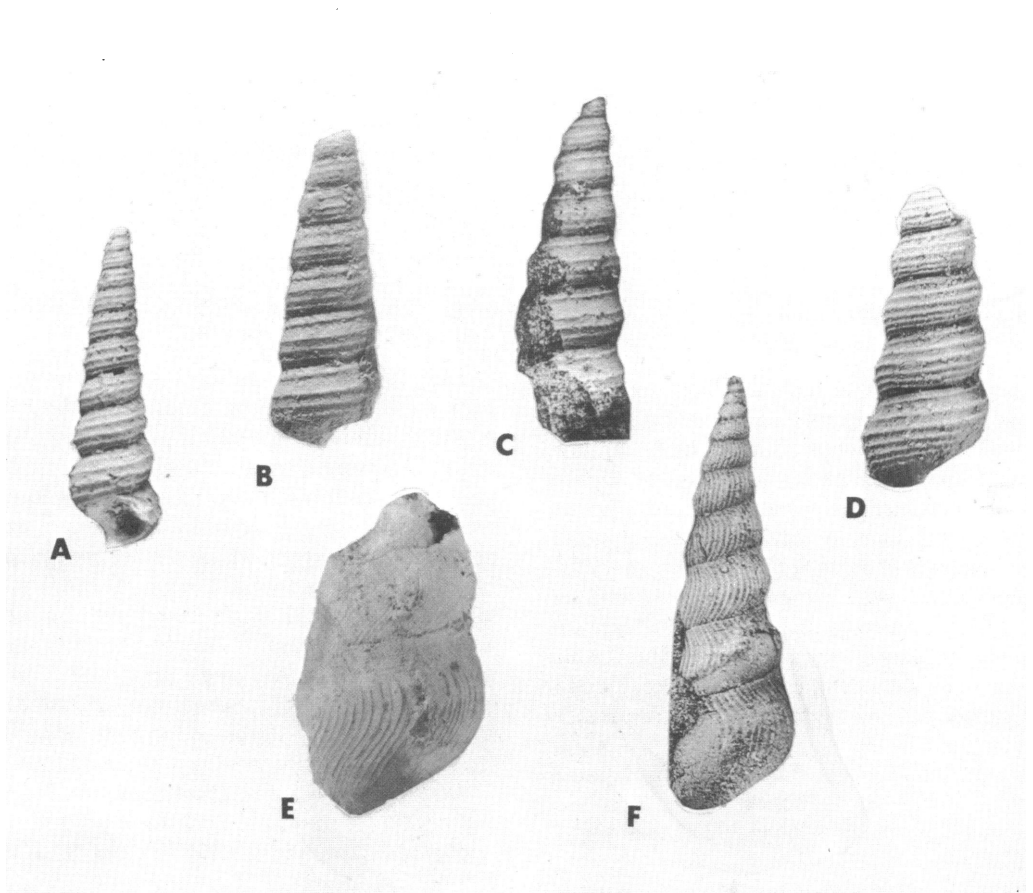


FIG. 11. A-C. *Stegocoelia* (*Hypergonia*) sp. cf. *S. (H.) percarinata* (Longstaff). A. Apertural view, AMNH 29378.  $\times 7.0$ . B. Side view, AMNH 29379.  $\times 5.0$ . C. Side view, AMNH 29380.  $\times 3.0$ . D. *Aclisina* sp., side view, AMNH 29381, showing growth lines.  $\times 5.0$ . E. *Palaeozygopleura difficile* (Sardeson), side view, AMNH 29383.  $\times 2.0$ . F. *Palaeozygopleura* sp., side view, AMNH 29382.  $\times 3.0$ .

a flatter whorl profile than the Wassonville species. *Stegocoelia* (*Hypergonia*) *baldwinensis* Thein and Nitecki (1974), from the Chesterian of Illinois, differs mainly by having a flatter base.

*ACLISINA* DEKONINCK, 1881

*Type Species.* *Muchisonia striatula* de Koninck, 1843.

*Aclisina* sp.  
Figure 11D

*Discussion.* A single specimen from the Was-

sonville Limestone is assigned to the genus *Aclisina* on the basis of a well-developed spiral ornament and the presence of a weakly marginated selenizone bearing a medial spiral lira. The specimen is high spired, but the early whorls are not preserved. The whorl profile is gently rounded. The aperture is small and apparently subround. The outer and columellar lips are not preserved. The lunulate selenizone, however, is situated near the middle of the inclined upper whorl surface. Collabral ornament is restricted to closely spaced growth lines which are sharply prosocline above the selenizone and moderately opisthocline be-



TABLE 24  
Measurements (in Millimeters) of *Actisina* sp.<sup>a</sup>

	WH	WW	SW	SS
AMNH 29381	1.70	3.50	0.35	0.20

<sup>a</sup>All measurements taken on basal whorl.

low the selenizone. The base is somewhat flattened, probably anomphalous, and ornamented by numerous fine spiral threads.

In view of the well-known morphological variation within species of *Actisina*, I am reluctant to attempt specific identification of this specimen.

The Wassonville specimen differs from *A. marvinwelleri* Thein and Nitecki (1974), from the Chesterian of Illinois, by its more numerous spiral lirae. *Actisina golconda* Thein and Nitecki (1974), also from the Illinois Chesterian, may be more similar to the Wassonville species, but is not preserved well enough for meaningful comparison.

*Distribution.* A single fragmentary specimen from the Wassonville Limestone, zone unknown.

*Figured Specimen.* AMNH 29381.

ORDER CAENOGASTROPODA COX, 1959

SUPERFAMILY LOXONEMATACEA KOKEN, 1889

FAMILY PALAEOZYGOPLURIDAE HORNÝ, 1955

*PALAEOZYGOPLURA* HORNÝ, 1955

*Type Species.* *Zygopleura alinae* Perner, 1907.

*Palaeozygopleura* sp.

Figure 11F

*Description.* Rather small but high spired species, possessing at least eleven whorls; bulbous whorl periphery slightly below mid-whorl; upper whorl surface flattened near suture, but gently convex adjacent to periphery; outer whorl surface quite strongly convex; sutures shallow; aperture unknown; collabral threads gently prosocline on upper whorl surface, becoming opisthocline immediately above whorl periphery indicating a wide shallow sinus near mid-whorl; collabral ornament nearly orthocline on juvenile whorls, suggesting accentuation of sinus with growth; nuclear whorls apparently smooth.

TABLE 25  
Measurements (in Millimeters) of *Palaeozygopleura* sp.

	H	WH	WW	SMS <sup>a</sup>
AMNH 29382	23.50	3.80	6.10	1.40

<sup>a</sup>Distance from upper suture to middle of sinus.

*Distribution.* A single specimen from chert zone no. 2 of the Wassonville Limestone.

*Figured Specimen.* AMNH 29382.

*Discussion.* Lower Mississippian *Palaeozygopleura* species have been poorly illustrated and inadequately described. As such, meaningful comparison of this specimen with known species is virtually impossible.

Keyes (1894b, pl. 55, fig. 1) figured an unnamed *Palaeozygopleura* species from the Burlington Limestone that compares favorably with the Wassonville form, especially as regards the whorl profile and the nature of the sinus. Perhaps subsequent study will show these forms to be conspecific.

*Palaeozygopleura missouriensis* Williams (1943, p. 103, pl. 9, fig. 23), from the Louisiana Limestone of Missouri, differs from the Wassonville specimen by possessing a distinct subsutural band on each whorl.

*Palaeozygopleura difficile* (Sardeson), 1902

Figure 11E

*Loxonema difficile* Sardeson, 1902, p. 304, pl. 17, figs. 3, 4.

*Description.* Very large, high spired species with characteristically bulbous whorl profile; whorl periphery below mid-whorl and bluntly rounded; upper whorl surface markedly concave, in sharp contrast to convex outer whorl surface; sutures very shallow; nuclear whorls unknown; aperture distinctly ovate with slightly thickened columellar lip; growth lines gently prosocline on upper whorl surface, nearly orthocline across whorl periphery and sharply opisthocline on outer whorl surface, indicating a wide shallow sinus near mid-whorl; ornament consisting of numerous rather fine collabral threads, nearly obsolete immediately below suture; base gently rounded and anomphalous.

TABLE 26  
Measurements (in Millimeters) of  
*Palaeozygopleura difficile* Sardeson

	H	WH	WW	SMS <sup>a</sup>
AMNH 29383	—	8.00	12.00	3.50
SUI11217	58.00	11.50	16.00	5.50

<sup>a</sup>Distance from upper suture to middle of sinus.

*Distribution.* Rare in zones no. 1, no. 2, and no. 3 of the Wassonville Limestone.

*Figured Specimen.* AMNH 29383.

*Discussion.* *Palaeozygopleura difficile* (Sardeson) can be easily recognized by its large size and distinctive whorl profile, and is not readily comparable with any other described Mississippian forms. The Wassonville specimens agree in every significant detail with the original description of *P. difficile* from the Upper Kinderhook Gilmore City oolite.

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