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Charles J. Mankin, *Director*  
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**BRACHIOPODS FROM THE  
TURKEY CREEK LIMESTONE (EARLY DEVONIAN)  
MARSHALL COUNTY, SOUTHERN OKLAHOMA**

THOMAS W. AMSDEN



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## OKLAHOMA GEOLOGICAL SURVEY

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### Title Page Illustration

Pedicle and brachial views of *Havlicekella miticonvexa* Amsden, new genus and new species,  $\times 2$ . Collected from the Turkey Creek limestone at stratigraphic section Ma2, Marshall County, Oklahoma. (See fig. 5.)

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# BRACHIOPODS FROM THE TURKEY CREEK LIMESTONE (EARLY DEVONIAN) MARSHALL COUNTY, SOUTHERN OKLAHOMA

THOMAS W. AMSDEN<sup>1</sup>

**Abstract**—This report describes the articulate-brachiopod fauna from the Turkey Creek limestone, a tiny inlier that crops out in central southern Oklahoma. This fauna is based on a small collection of specimens representing eight species, of which four are new and four are indeterminate, and seven genera, of which two are new (*Havlicekella*, *Plancella*) and two are provisional. Earlier investigations of the conodonts and trilobites indicated a late Early Devonian (Emsian) age for the fauna, which appeared to have Bohemian affinities; subsequent studies, however, suggest a middle Early Devonian (Deerparkian, Pragian) age for the fauna, which exhibits North American affinities. The brachiopod fauna, comprising largely new or indeterminate taxa, provides little solid information bearing on the time-space affinities of the Turkey Creek limestone, but it would seem most reasonably accommodated as a middle Early Devonian assemblage with North American ties.

## INTRODUCTION

The Turkey Creek limestone (fig. 1), an informally named stratigraphic unit, is a small inlier of Lower Devonian limestone that is of special interest because of its reported faunal affinities with European rather than North American taxa. Ormiston (1968, p. 1188) described seven species of trilobites from these strata, of which four were reported to be related to trilobites from the Dalmaniten-Knollenkalk in the Harz Mountains of Germany. This trilobite fauna was assigned an early Emsian age. Klapper and Ziegler (1967, pl. 8) identified the Turkey Creek conodonts as *Icriodus latericrescens huddlei* and correlated this fauna with the *Principes* and *Zorgensis* Limestones of the Harz Mountains and the Schonauer Limestone of the Kellerwald in Germany. The conodonts were assigned an Emsian age and considered to be older than the Sallisaw Formation and younger than the Frisco Limestone (fig. 1).

The Bohemian affinities of the Turkey Creek trilobite fauna were questioned by Campbell (1977, p. 10), who noted that *Reedops amsdeni* Ormiston is more closely related to *R. deckeri* Delo from the Haragan Formation of Oklahoma than it is to any Bohemian species. Furthermore, Campbell pointed out that *Ceratonurus* and *Proetus* were established in the Arbuckle Mountain region by Haragan and Frisco (Helderbergian–Deerparkian) time, and that the Turkey Creek speci-

mens could well have evolved from these stocks. Campbell concludes by stating, "I believe that the evidence favoring the incursion of a Bohemian fauna into Oklahoma in Turkey Creek time is not as strong as it appeared to be when Ormiston reported his conclusions."

The conodont evidence was reviewed by Gilbert Klapper, University of Iowa (letter dated August 29, 1983), who states:

Conodonts were collected by G. Klapper in 1964 from the Turkey Creek limestone unit at Amsden's (1960, p. 259–261) section Ma2, from 0–1.0, 1.0–2.0, and 2.0–3.0 feet above the base. Two specimens were illustrated from the lowest sample by Klapper and Ziegler (1967, pl. 8, figs. 3, 4) and identified as *Icriodus latericrescens huddlei*. The implications for correlation of this subspecies were discussed by Amsden and others (1968, p. 164), who concluded that the Turkey Creek limestone unit was younger than the Frisco and older than the Sallisaw.

*Icriodus huddlei* was taxonomically restricted essentially to the original types by Carls and Gandl (1969), who named two additional subspecies, *curvicauda* and *celtibericus*, on the basis of material from Spain. According to a restudy of Lower Devonian *Icriodus* (Klapper and Johnson, 1980; Johnson and others, 1980, p. 99–100), specimens from Nevada that somewhat resemble *I. curvicauda* and *I. celtibericus* consistently differ from the European species in the significantly greater longitudinal spacing of the lateral row denticles anteriorly. The Nevada material constituted the basis of the new species, *Icriodus claudiae* Klapper (in Johnson and others, 1980).

Recent restudy of the collections from Turkey Creek, especially the lower two samples, suggests that the

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## Introduction

*Icriodus* specimens most closely resemble *Icriodus claudiae*. However, most of the Turkey Creek specimens are fragmentary so that identification is not completely certain. The *Icriodus* specimens are the only Devonian species present, but there is reworked Late Ordovician material presumably from the Sylvan Formation or possibly a somewhat older unit.

*Icriodus claudiae* ranges in Nevada from the *sulcatus* through the *kindlei* Zones (Klapper and Johnson, 1980, fig. 1). *Icriodus latericrescens robustus* first occurs in Oklahoma in the Sallisaw Formation (identifiable specimens have been collected) at 1.0–1.35 feet below the top at locality S14 of Amsden (1961), and the subspecies is not known below the *serotinus* Zone elsewhere. Thus, the Turkey Creek specimens, even though not certainly identifiable as *I. claudiae*, provide some evidence that the parent strata are older than the Sallisaw and at an approximately mid-position within the Lower Devonian.

The Frisco *Icriodus* specimens are highly fragmentary but may also be referable to *I. claudiae*. Therefore, the exact age relationship between the Frisco Formation and the Turkey Creek limestone unit is not demonstrated by the conodonts, despite the earlier conclusions of Klapper (*in* Amsden and others, 1968).

Dr. Vladimír Havlíček, Prague, Czechoslovakia, who has reviewed the present study, states that it is difficult for him to view the Turkey Creek brachiopod fauna as closely related to European lowermost Devonian faunas. He does, however, qualify this statement by noting that he has not studied the meristellid brachiopods and consequently is unable to appraise the degree of relationship between European and American meristellid stocks.

SYSTEM	SERIES OR STAGE		TURKEY CREEK MARSHALL CO.	ARBUCKLE MOUNTAINS	EASTERN OKLAHOMA	
	MISSISSIPPIAN	UPPER		WOODFORD SHALE	WOODFORD SHALE	CHATTANOOGA SHALE
MIDDLE						
DEVONIAN		LOWER	SAWKILLIAN (EMSIAN?)			SALLISAW FORMATION
			DEERPARKIAN (SIEGENIAN?)	?TURKEY CREEK LIMESTONE	FRISCO FORMATION	FRISCO FORMATION
			HELDERBERGIAN (GEDINNIAN?)		HARAGAN-BOIS D'ARC FORMATIONS	
					HENRYHOUSE FORMATION	
SILURIAN		UPPER	PRIDOLIAN— LUDLOVIAN		CLARITA FORMATION	QUARRY MOUNTAIN FORMATION
			WENLOCKIAN			
		LOWER	LLANDOVERIAN		COCHRANE FORMATION	TENKILLER FORMATION BLACKGUM FORMATION
ORDOVICIAN		CINCINNATIAN	GAMACHIAN		KEEL FORMATION	PETTIT FORMATION
	RICHMONDIAN		SYLVAN SHALE	SYLVAN SHALE	SYLVAN SHALE	
	MAYSVILLIAN					
	EDENIAN		VIOLA GROUP	VIOLA GROUP	VIOLA GROUP	

Figure 1. Chart showing stratigraphic position of Turkey Creek limestone at Turkey Creek outcrop in Marshall County, Oklahoma. The Turkey Creek fauna is provisionally assigned to the Deerparkian Stage; however, its precise position within the Lower Devonian Series is uncertain (see discussion in text). Not to scale in terms of stratigraphic thickness or of time.

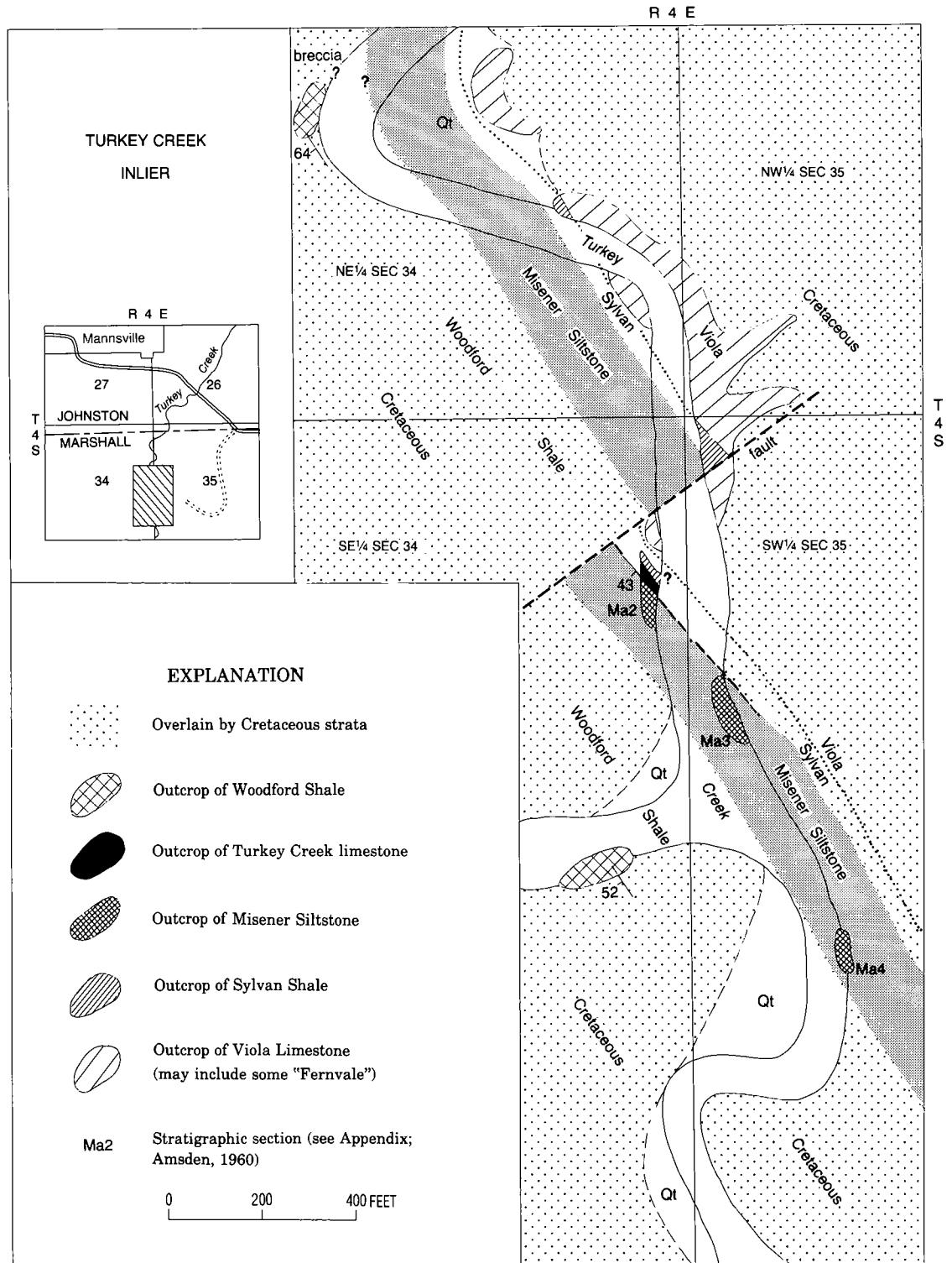


Figure 2. Map showing location of Turkey Creek outcrop in Marshall County, Oklahoma. After Amsden (1960, fig. 47; adapted from Ardmore Geological Society, 1952, pl. 2).

The foregoing comments raise serious questions concerning the trilobite and conodont evidence bearing on the Bohemian affinities of the Turkey Creek fauna, and the fauna would now seem more reasonably interpreted as an Appalachian one modified by incursions from the Great Basin. The conodonts suggest a correlation with middle Early Devonian strata of Nevada and possibly the Frisco Formation of Oklahoma. Ormiston assigned the Turkey Creek trilobites a somewhat younger early Emsian age, but this appears questionable in the light of Campbell's objections to the Bohemian affinities. The small brachiopod fauna described herein contributes little to the solution of this problem, and the precise chronostratigraphic position of the Turkey Creek within the Early Devonian sequence is uncertain.

### Acknowledgments

I express my indebtedness to the following individuals who reviewed this study: Dr. A. J. Boucot, Oregon State University; Dr. Vladimír Havlíček, Ústřední Ústav Geologický, Prague, Czechoslovakia; and Dr. J. G. Johnson, Oregon State University. Dr. A. J. Wright, University of Wollongong, provided information on trilobites and brachiopods from the Jesse Limestone near Bathurst, New South Wales, Australia. I also thank Dr. James Lee Wilson, University of Michigan, for providing specimens collected from the Turkey Creek limestone.

### TURKEY CREEK LIMESTONE

This stratigraphic unit comprises 5 feet of limestone exposed in a small outcrop in the bed of Turkey Creek, NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 34, T. 4S., R. 4 E., northern Marshall County, Oklahoma (fig. 2). It was described by Amsden (1960, p. 259–262) and by Amsden and others (1968, p. 162–164), at which time it was informally designated the Turkey Creek limestone unit.

The Turkey Creek limestone is composed of light-gray skeletal limestone overlain by the dolomitic-siltstone facies of the Upper Devonian Woodford Shale (= Misener Sandstone; Amsden and Klapper, 1972, p. 2332–2333) and underlain by the Upper Ordovician Sylvan Shale (fig. 1). Thin sections show the Turkey Creek to be dominantly a pelmatozoan sparite with a substantial volume of trilobites and ostracodes, the latter being mostly heavy-shelled types whose carapaces exceed 0.1 mm in thickness. Some bryozoans and brachiopods are also present, along with a few tabulate corals and other groups. Preservation of the shelly material is good (see Ormiston, 1968, pls. 157, 158), and most of the brachiopod shells are articulated, pointing to a moderate energy level.

The Turkey Creek is a low-magnesium limestone with relatively little extra-basinal detritus. Chemical analyses of three spot samples show a range of acid insolubles from 5.03 to 10.19 percent, and an MgCO<sub>3</sub> content ranging from 0.38 to 1.44 percent. Some detrital quartz grains are present, ranging up to 1.5 mm in diameter, and glauconite is common, mostly as small light-green, rounded to botryoidal grains. The Turkey Creek sea must have been clear, with little turbidity and a substrate composed largely of clean, washed organic sands not unlike the depositional environment of the Frisco Limestone (Amsden, 1961, p. 24–42; Amsden and Ventress, 1963, p. 16–33). The position of the Turkey Creek sediments with respect to an ancient strandline cannot be determined on the basis of this single, small outcrop.

### TURKEY CREEK BRACHIOPODS

The articulate brachiopods described in this report comprise the following eight species: *Havlicekella miticonvexa* Amsden, new genus and species, *H. wilsoni* Amsden, new species, *Meristella* sp., *Plancellia turkiensis* Amsden, new genus and

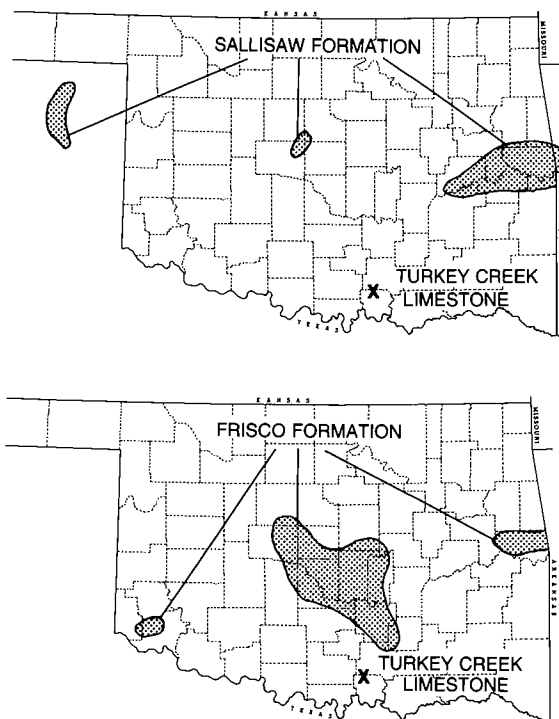


Figure 3. Maps showing distribution of Sallisaw Limestone (Sawkillian, Emsian?) and Frisco Limestone (Deerparkian, Siegenian) in surface and subsurface of Oklahoma. Turkey Creek limestone exposure shown by X.



new species, *Atrypa* sp., *Kozlowskiellina?* sp., *Homoeospirella? subcircularis* Amsden, new species, and "*Septothyris*" sp. Only four of the species in this small fauna can be identified to species, and all of these are new; two are assigned to new genera, and the other two generic assignments are provisional. As thus identified, it is difficult to determine the affinities of this fauna in either time or place. Assuming it to be of Early Devonian age—and determinations derived from the trilobites and conodonts suggest that it falls in the middle part of the Early Devonian Epoch—it has little similarity to other Early Devonian brachiopod faunas in Oklahoma and adjacent areas. The Sawkillian (late Emsian) Sallisaw Formation of eastern Oklahoma includes 11 brachiopod species (Amsden, 1963), representing the strophomenids, chonetids, orthotetacids, atrypids, spiriferids, and terebratulids, of which only *Atrypa* sp. is common

to the two faunas. The Early Devonian (Deerparkian; Siegenian?) Frisco Formation has a brachiopod fauna of 32 species (Amsden and Ventress, 1963), of which only the genus *Meristella* and questionably *Kozlowskiellina* are common to both faunas. The Frisco and Sallisaw brachiopod faunas have distinct affinities with Early Devonian faunas in the Appalachian Basin (Amsden, 1963; Amsden and Ventress, 1963), and both are widely distributed across Oklahoma, including areas in the central part of the State only a few miles north of the Turkey Creek exposures (fig. 3).

Boucot and others (1969, p. 22–23) and Savage and others (1979) note broad differences between Siegenian–Emsian brachiopod faunas from the Appalachian province and the Rhenish–Bohemian subprovince of Europe. Boucot (1975, figs. 2, 38, p. 350) assigned the Turkey Creek fauna to the Rhenish–Bohemian subprovince, which also in-

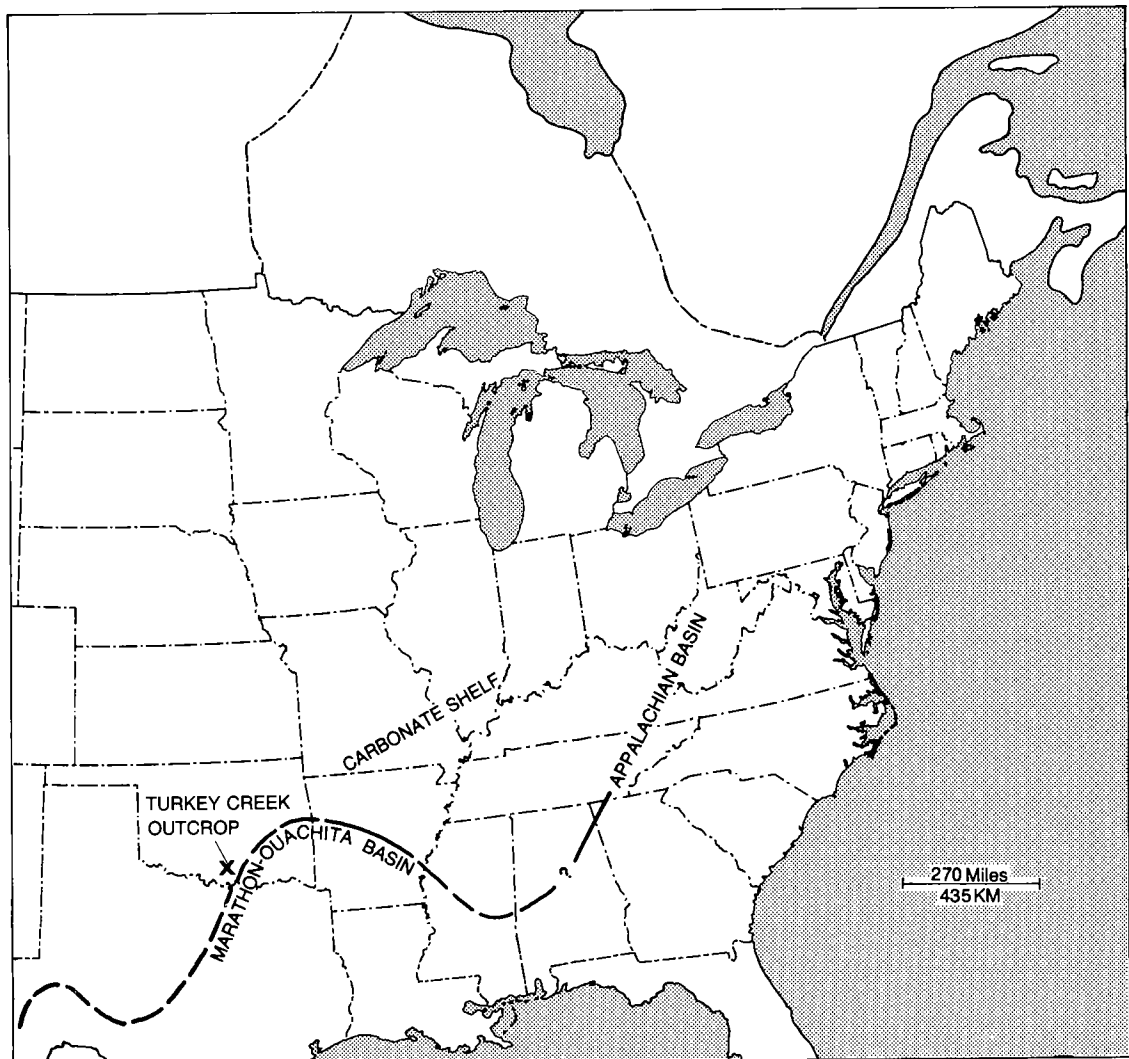


Figure 4. Map showing Ouachita–Marathon Basin and its relation to the Appalachian Basin and to the carbonate shelf.

cludes localities from Early County, Georgia, and near Victoria, Tamaulipas province, Mexico. The Turkey Creek brachiopods have little in common with the brachiopods from the Rhenish-Bohemian subprovince, nor can they be clearly related to any of the other brachiopod provinces cited by these authors.

Johnson (1983, p. 2, fig. 1; letter dated August 22, 1983) suggests that the Turkey Creek was a peripheral biofacies whose source was the proto-Tethys offshore waters, which moved from east to west along the southern shores of Euramerica. In connection with this explanation, I think it important to note that the area south of the early and middle Paleozoic carbonate province is occupied by the Ouachita clastic province, in which middle Paleozoic strata are composed largely of shales, sandstones, and cherts that are almost entirely without shelly benthic faunas (fig. 4). The Ouachita province comprises a sinuous belt of sediments extending from the southern end of the Appalachian Basin to west Texas and Mexico (Flawn and others, 1961, pls. 1, 2; Boucot, 1975, fig. 38, p. 350, and personal communication, 1984, reports the presence of Old-World, Emsian brachiopods near Victoria, Mexico). Silurian and Devonian strata in the Oklahoma-Arkansas portion of this province are referred to the Blaylock Sandstone, the Missouri Mountain Shale, the Pinetop Chert, and the Arkansas Novaculite. Biostratigraphic control for this sequence is meager, but the Blaylock contains Early Silurian graptolites, the Pinetop Chert Helderbergian brachiopods and ostracodes, and the middle and upper members of the Arkansas Novaculite Late Devonian-Mississippian conodonts. This sequence includes no skeletal limestones and only a few carbonate beds interbedded with the Pinetop Chert and Arkansas Novaculite. In fact, with the exception of the Pinetop, which has a small brachiopod-ostracode fauna with distinct Appalachian affinities (Amsden, 1983, p. 1248-1250), no benthic mega-fauna is known from this sequence. Admittedly, a thin sequence of skeletal limestone could have been deposited in the Ouachita province; however, considering the lithofacies-biofacies characteristics of this limestone and its depositional sequence (the Viola Limestone is present beneath the Sylvan Shale), it would seem more reasonable to interpret the Turkey Creek sea as a part of the carbonate platform, with access to the Appalachian Basin and probably also to the Great Basin.

In summary, the Turkey Creek conodonts suggest a middle Early Devonian (Deerparkian-Pragian) age, and the trilobites a Deerparkian-early Emsian age. The brachiopods constitute an indeterminate fauna that provides no substantive evidence bearing on the precise age of this limestone. It should be emphasized that the Turkey Creek brachiopod collection is small in number of

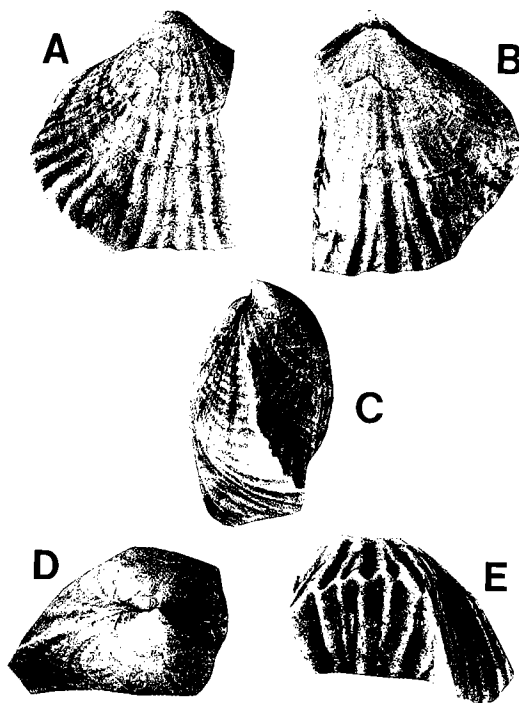


Figure 5. *Havlicekella miticonvexa* Amsden, new genus and new species. Holotype (OU 10282),  $\times 2$ . A-E, pedicle, brachial, lateral, posterior, and anterior views. Turkey Creek limestone, stratigraphic section Ma2, Marshall County, Oklahoma.

specimens and in number of species, and may not be representative of the original brachiopod life assemblage. All of these shells came from one small outcrop and may represent a localized pocket of shells, which for unknown causes were winnowed out of a much more cosmopolitan fauna. This would explain the absence of such common Early Devonian brachiopod groups as the orthids, dalmanellids, strophomenids, and spiriferids, and would help explain the nondescript appearance of the fauna. Weighing all the evidence now available, the Turkey Creek fauna is here provisionally interpreted as a middle Early Devonian fauna of North American affinities.

## BRACHIOPOD TAXONOMY

Superfamily RHYNCHONELLACEA Gray, 1849

?Family UNCINULIDAE Rzhonsnitskaya, 1956

?Subfamily UNCINULINAE Rzhonsnitskaya, 1956

Genus *Havlicekella* Amsden, new genus

*Type species.*—*Havlicekella miticonvexa* Amsden, new species.

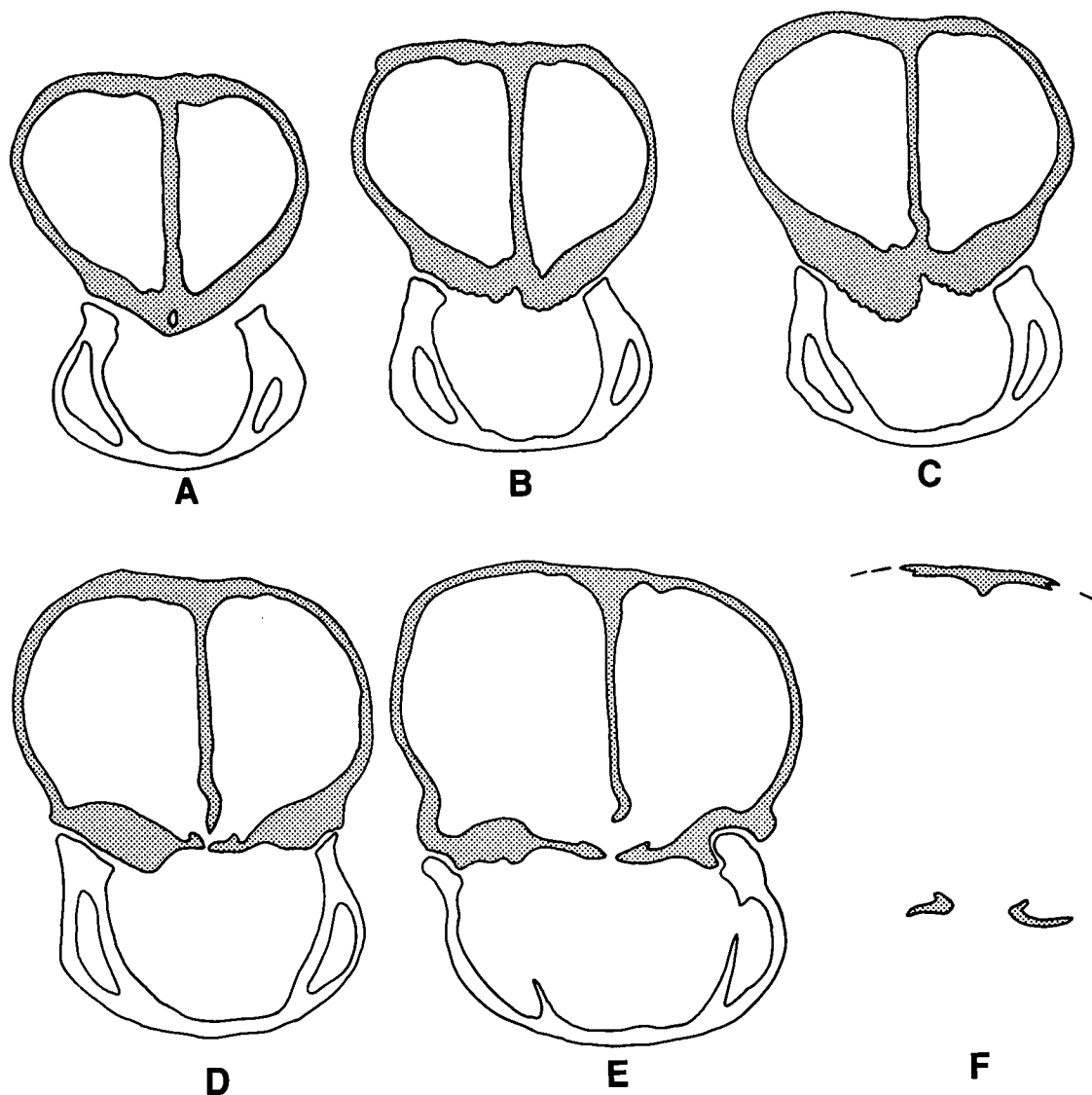


Figure 6. Transverse serial sections of *Havlicekella miticonvexa* Amsden, new genus and new species ( $\times 15$ ). Brachial valve stippled. Distance from posterior tip of pedicle beak (mm): A, 1.2; B, 1.3; C, 1.4; D, 1.5; E, 1.8; F, 2.2 (portion of brachial valve and crura only). Peels prepared from holotype, fig. 5 (OU 10282).

*Description*.—Elongate, moderately and subequally biconvex, non-cuboidal, costate shells; pedicle tongue long, not sharply flexed. Pedicle valve with well-formed dental plates, and brachial valve with hinge plates and crural bases much thickened and with upper, digitate surface developed to produce a broad cardinal process; septal plates flat, extending forward some distance (figs. 5–8). Costae split toward front margin.

*Discussion*.—The taxonomic position of this genus is uncertain. The internal structure of *H.*

*miticonvexa* is typical of the Uncinulinae, but it does not have the cuboidal to subcuboidal shape that characterizes most representatives of this subfamily. In this respect it is like the questionable *Fitzroyella* Veevers; however, the type species, *F. primula*, has a small, coarsely costate shell with a very weakly developed pedicle tongue. In its general external shape, *H. miticonvexa* is similar to that of the Eatonidae, but most representatives of that family have the flanks of the pedicle valve more sharply deflected toward the brachial.

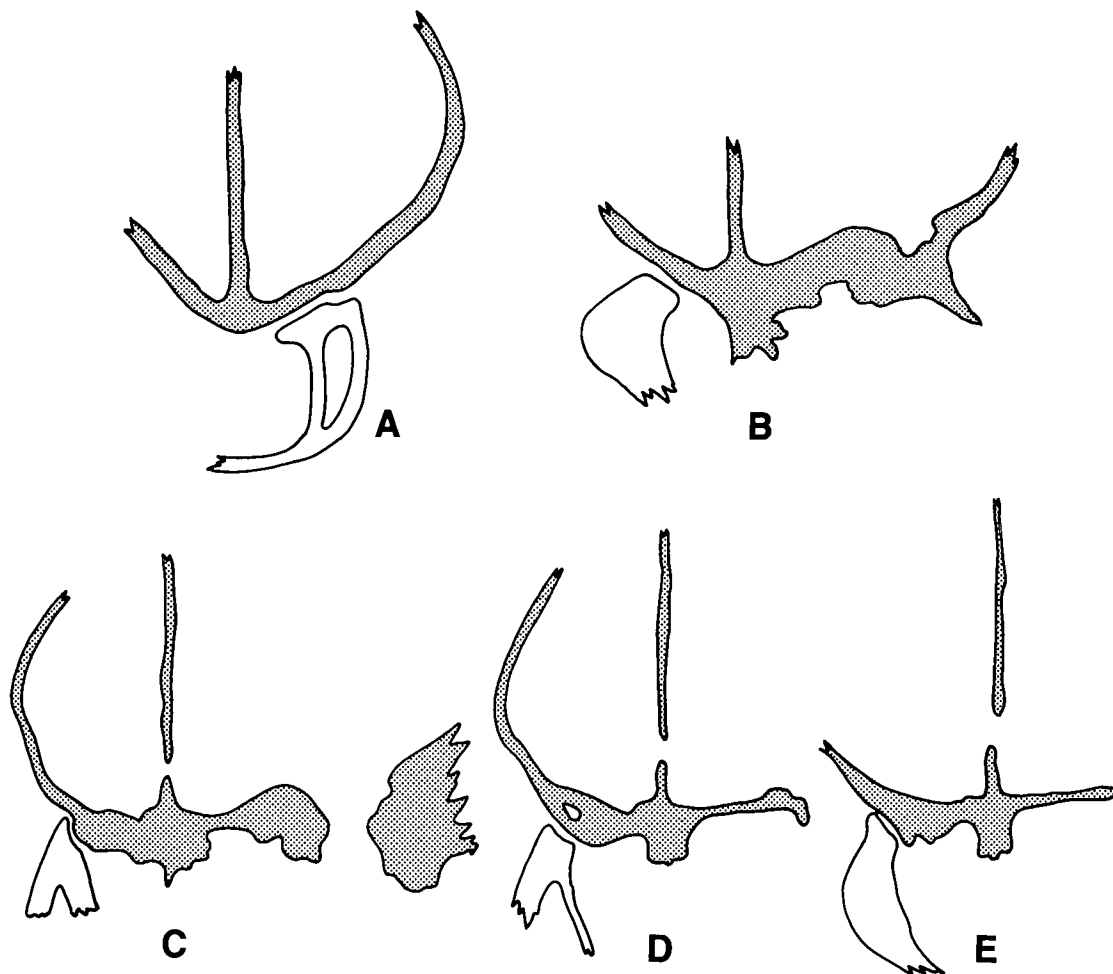


Figure 7. Transverse serial sections of *Havlicekella miticonvexa* Amsden, new genus and new species ( $\times 12$ ). Brachial valve stippled. Pedicle beak broken, and spacing not determined. Peels (OU 10283).

Also, the Turkey Creek shells have well-developed dental lamellae, whereas the eatonids generally have poorly developed dental plates.

This genus is named for Dr. Vladimír Havlíček, Ústřední Ústav Geologický, Prague, Czechoslovakia.

***Havlicekella miticonvexa* Amsden, new species**

Figs. 5-7

*Holotype*.—OU 10282, Turkey Creek limestone, Turkey Creek, south of Mannsville, Marshall County, Oklahoma (stratigraphic section Ma2-A, B, C, Amsden, 1960, p. 260-261).

*Description*.—Subequally biconvex shells with an erect pedicle beak. The pedicle valve has a

well-developed tongue, but this is not abruptly deflected toward the brachial valve, and the posterior end is not boxlike. The costae are weak near the anterior end, becoming strong and subangular toward the front margin, where some of those along the middle part of the valves split. The pedicle valve has strongly developed dental plates, and the brachial valve has a thick hinge plate and solid septalium with a digitate upper surface. The peels in figure 6 show that the entire brachial-hinge structure is constructed of continuously layered shell material with clear, unlayered shell structure, such as is present in secondarily developed shell features.

*Discussion*.—In his review of this paper, Dr. Havlíček notes the external similarity between *H. miticonvexa* and *Astutorhyncha astuta* (Barrande;

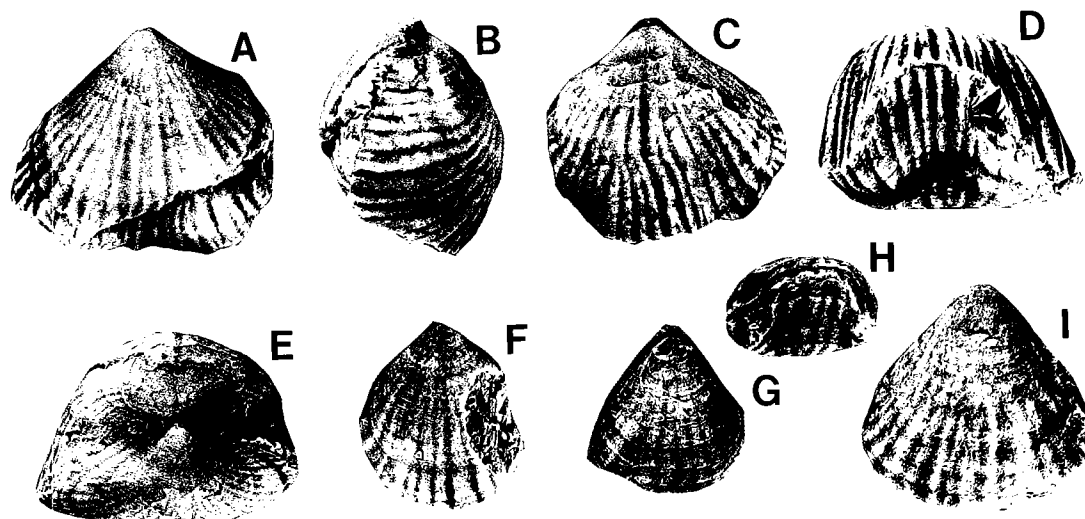


Figure 8. *Havlicekella wilsoni* Amsden, new genus and new species. A–E, pedicle, lateral, brachial, anterior, and posterior views of holotype,  $\times 2$  (OU 10273). F, brachial view,  $\times 2$  (OU 10272). G, H, brachial and anterior views of a small shell,  $\times 2$  (OU 10271). I, pedicle view,  $\times 3$  (OU 10270). Turkey Creek limestone, stratigraphic section Ma2, Marshall County, Oklahoma.

Havlíček, 1961, p. 106–107, pl. 11, figs. 4–7) from the Lochkovian strata of Bohemia, a similarity which is enhanced by his observation that one of the shells in his collection (not illustrated) has split ribs. He agrees that the internal differences justify their generic separation, although he questions the assignment of this genus to the uncinulidids because of the absence of marginal spines and of medianly grooved, rounded costellae on the geniculated anterior and lateral walls. Dr. Havlíček concludes that *H. miticonvexa* and *H. wilsoni* are related to the earlier lower Lochkovian *A. astuta* stock of non-cuboidal rhyntonellids.

*Distribution*.—Four specimens from the Turkey Creek limestone.

***Havlicekella wilsoni* Amsden, new species**

Figs. 8, 9

*Holotype*.—OU 10273.

*Description*.—Subequally biconvex shells, with the brachial valve deeper than the pedicle valve; ventral break small, erect. Anterior commissure strongly uniplicate, but pedicle tongue is not sharply enough deflected to produce the boxlike anterior end that characterizes most of the Uncinulinae. Surface with subrounded costae, becoming obsolete on posterior part of valves; costae somewhat irregular and splitting toward front margin of larger shells (fig. 8C). The largest complete shell measures 16.1 mm long, 17.8 mm wide, and 12.4 mm thick.

*Discussion*.—This species differs from *H. miticonvexa* in having a more deeply biconvex shell and a more subdued fold and sulcus with gently rounded lateral margins. The pedicle and brachial interiors are essentially the same as in *H. miticonvexa*.

This species is named for Dr. James Lee Wilson, University of Michigan, Ann Arbor, Michigan.

*Distribution*.—About 30 specimens, many incomplete, from the Turkey Creek limestone.

Superfamily ATHYRIDACEA M'Coy, 1844

Family MERISTELLIDAE Waagen, 1883

Genus *Meristella* Hall, 1859

***Meristella* sp.**

Figs. 10, 11

*Description*.—Relatively large, subequally biconvex shells with well-developed pedicle fold and brachial sulcus near front end. Pedicle beak of large shell illustrated in figure 10 is hooked over, and in contact with, brachial umbo. Shell is essentially smooth, with only faint traces of plications or costa. It has a subcircular outline, the only complete specimen in the collections, measuring 26.7 mm long, 31.1 mm wide, and 15.9 mm thick.

Pedicle valve has extremely short dental plates and a thick shell wall with impressed muscle scars. Dorsal cardinal plate imperforate, depressed to form a septalium supported on a stout,

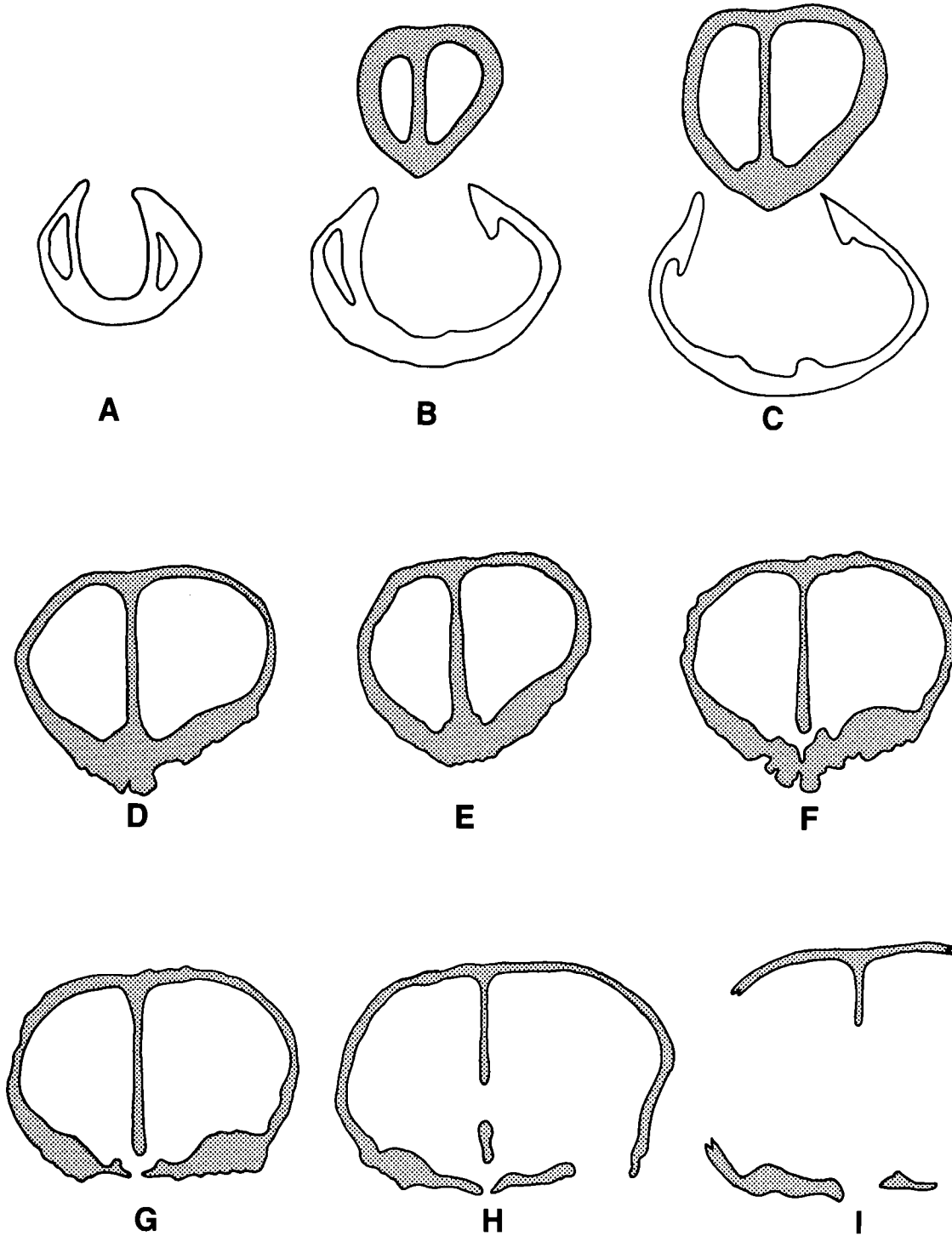


Figure 9. Transverse serial sections ( $\times 15$ ) of *Havicekella wilsoni* Amsden, new genus and new species. Brachial valve stippled. Distance from posterior tip of pedicle beak (mm): A, 0.8; B, 1.4; C, 1.8; D, 2.0; E, 1.9; F, 2.1; G, 2.2; H, 2.5; I, 3.0. Holotype, figure 8. Peels prepared from holotype, OU 10273.

long median septum (fig. 11). Spiranium and jugum unknown.

Only six incomplete specimens in the collections under study.

*Discussion.*—Insofar as can be determined from the few available specimens, this is a typical representative of the genus *Meristella*. The collection is inadequate for any meaningful species comparison.

*Distribution.*—Eight shells and fragments of shells from the Turkey Creek limestone.

Superfamily ATHYRIDACEA McCoy, 1844

?Family MERISTELLIDAE Waagen, 1883

Genus *Plancella* Amsden, new genus

*Type species.*—*Plancella turkiensis*, Amsden, new species. Turkey Creek limestone, Turkey Creek, south of Mannsville, Marshall County, Oklahoma (stratigraphic section Ma2-A, B, C, Amsden, 1960, p. 260–261).

*Diagnosis.*—Subequally biconvex, weakly uniplicate, smooth shells lacking lamellar expansions at growth lines. Pedicle interior has short dental plates and a thin shell wall with weakly impressed, obscure muscle impressions. Brachial interior has a nearly flat septal plate, imperforate at apical end and supported throughout its length by a median septum. Spiranium and jugum unknown.

*Discussion.*—The taxonomic position of this genus is uncertain. In its imperforate septal plate it resembles the Meristellinae (Boucot and others, 1965, p. H654) but differs in that the septal plate is not medially depressed into a septalium and the pedicle musculature is only weakly impressed into the thin shell wall. The character of the musculature is similar to the faint scars developed in the Subfamily Hindellinae; however, in this subfamily the septal plate is generally cleft, at least toward the front. It should be noted that there is a taxonomic problem with the Hindellinae as presently defined by Boucot and others (1965, p. H658). The structure of the pedicle interior given by these authors appears to have been taken from Hall and Clarke (1894, p. 64, text-figs. 48–51), who illustrated transverse sections of *Hindella umbonata* (Billings) showing well-developed dental plates and a thin shell wall with no appreciable muscle scars. Recently I serially sectioned three specimens of *H. umbonata* from Anticosti Island, Quebec, one from the Ellis Bay Formation, Member 1, at Junction Cliff (apparently the type locality) and the other two from this formation at the Salmon River section. All show effectively no dental plates and a thick shell wall with deeply impressed scars (fig. 12). The pedicle and brachial structure of these shells, exclusive of the jugum and spiranium, which are unknown, is similar to that of the Meristellinae but unlike that of *Whit-*

*fieldella* and other genera presently assigned to the Hindellinae (Boucot and others, 1965, fig. 535). Twenhofel (1928, p. 220–221) does not comment on the internal structure of *H. umbonata*, but in his discussion of *H. prinstana* (Billings) he does note that “a single ventral interior shows that the dental plates continue forward and slightly converge to enclose an elongate, muscular cavity and then diverge to disappear on the shell surface.” Thus it seems probable that within the *H. umbonata*–*H. prinstana* group are two externally similar species with distinctly different interiors.

*Plancella turkiensis* Amsden, new species

Figs. 13, 14

*Holotype.*—OU 10276. Turkey Creek limestone, Turkey Creek, south of Mannsville, Marshall County, Oklahoma (stratigraphic section Ma2-A, B, C, Amsden, 1960, p. 260–261).

*Description.*—Smooth, subequally biconvex shells with pedicle beak hooked over, but not tightly appressed against, dorsal umbo. Outline subtriangular and slightly longer than wide. A nearly complete shell measures 7.5 mm long, 6.7 mm wide, and 3.5 mm thick. A faint pedicle sulcus and brachial fold are developed near front end of mature shells (fig. 13H).

The internal characters are described in the generic diagnosis.

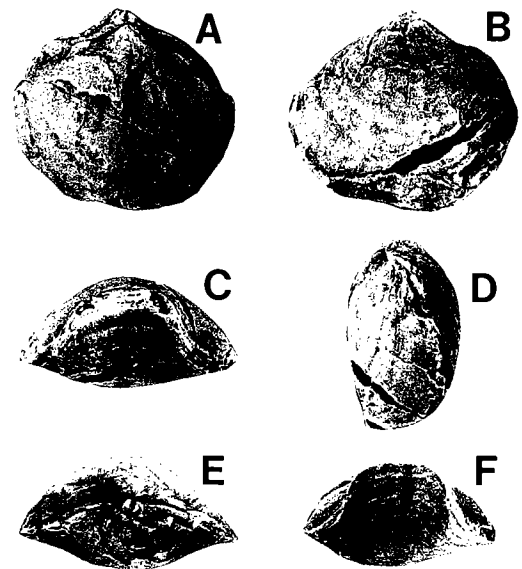


Figure 10. *Meristella* sp. A–E, brachial, pedicle, anterior, lateral, and posterior views of a large shell,  $\times 1$  (OU 10264). F, anterior view,  $\times 1$  (OU 10265). Turkey Creek limestone, stratigraphic section Ma2, Marshall County, Oklahoma.

*Distribution.*—Fifteen shells and fragments of shells from the Turkey Creek limestone.

Superfamily ATRYPACEA Gill, 1871

Family ATRYPIDAE Gill, 1871

Subfamily ATRYPINAE Gill, 1871

Genus *Atrypa* Dalman, 1828

*Atrypa* sp.

*Discussion.*—The collections under study include a single specimen of a reasonably well-preserved specimen.

Superfamily SPIRIFERACEA King, 1846

Family DELTHYRIDIDAE Waagen, 1883

Subfamily KOZLOWSKIELLININAE Boucot, 1957

Genus *Kozlowskiellina* Boucot, 1957

*Kozlowskiellina?* sp.

Fig. 15

*Discussion.*—The Turkey Creek collections include four fragments provisionally referred to this genus. These have a plicate shell with strong growth lamellae and the external form of this genus. No information is available on the internal structure.

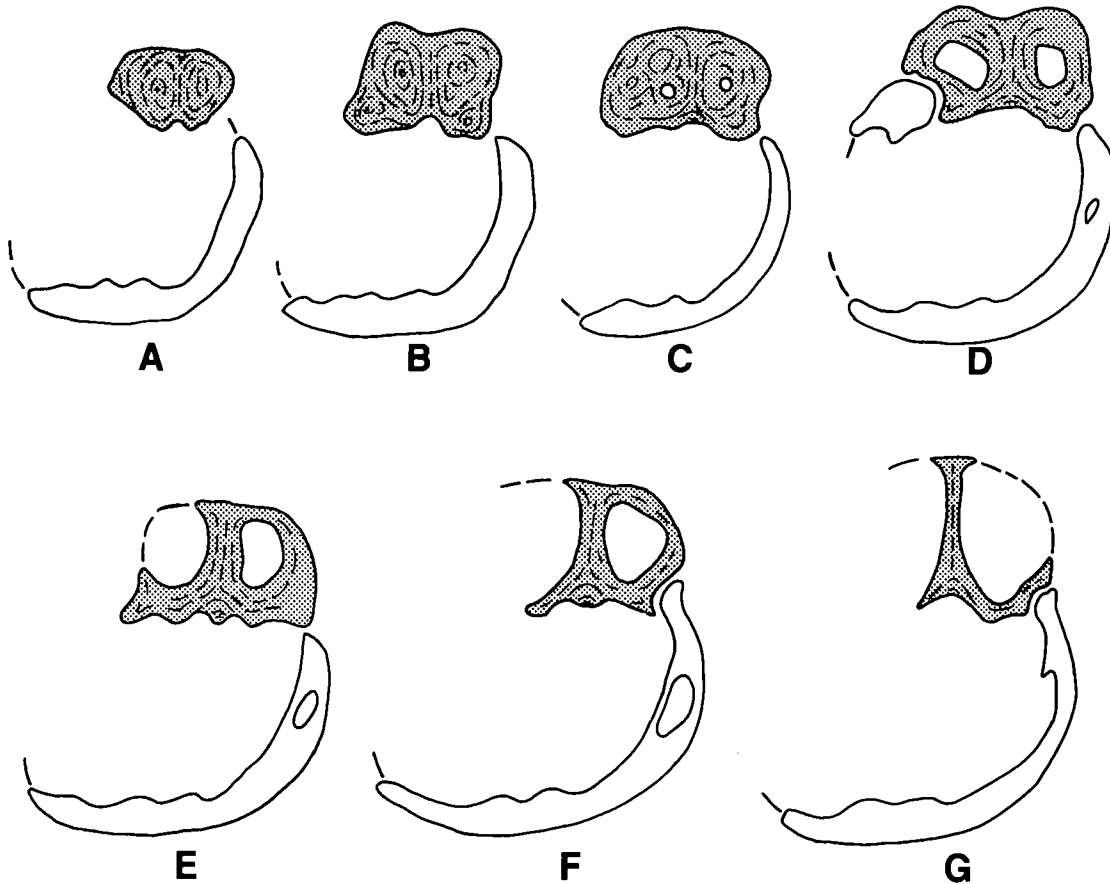


Figure 11. Transverse serial sections of *Meristella* sp. ( $\times 5$ ). Brachial valve stippled. Pedicle beak broken; distance from posterior end of this valve is unknown. Turkey Creek limestone, stratigraphic section Ma2, Marshall County, Oklahoma. Peels, OU 10266.



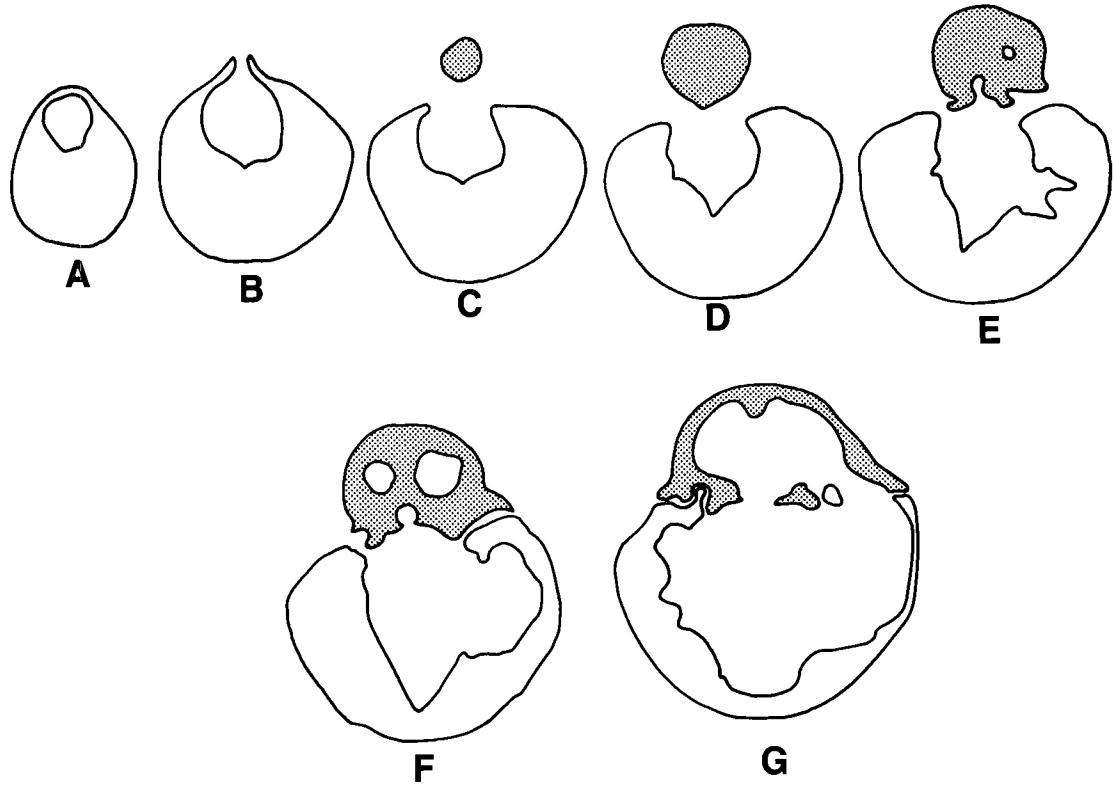


Figure 12. Serial sections ( $\times 7$ ) of *Hindella umbonata* (Billings). Brachial valve stippled. Distance from posterior tip of pedicle beak (mm): A, 0.5; B, 1.0; C, 1.2; D, 1.4; E, 1.5; F, 1.7; G, 2.5. Ellis Bay Formation, Salmon River section, Anticosti Island, Quebec. Peels, OU 10267.

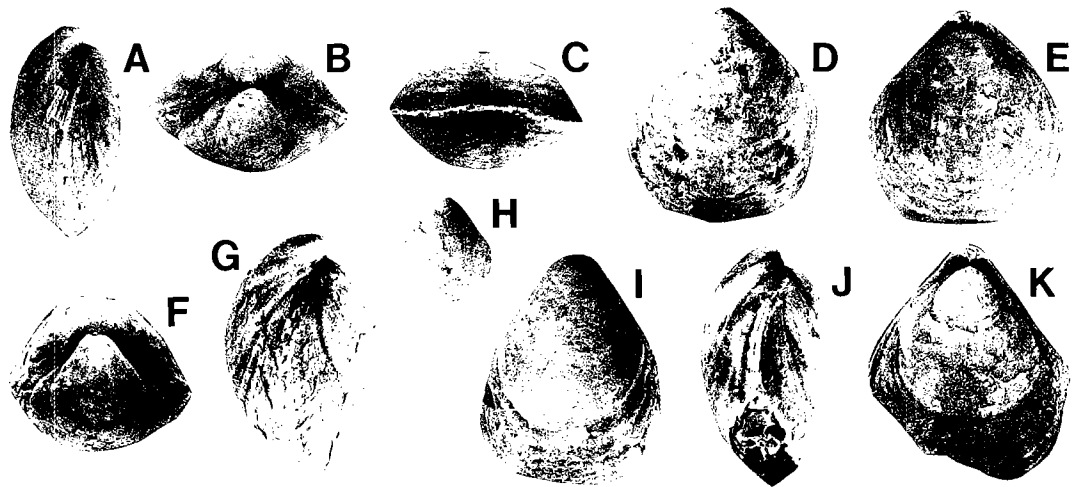


Figure 13. *Plancella turkiensis* Amsden, new genus and new species. A–E, lateral, posterior, anterior, pedicle, and brachial views of holotype,  $\times 2$  (OU 10276). F, G, I, posterior, lateral, and pedicle views,  $\times 2$  (OU 10278). H, pedicle view of small shell,  $\times 3$  (OU 10279). J, K, lateral and brachial views,  $\times 2$  (OU 10277). Turkey Creek limestone, stratigraphic section Ma2, Marshall County, Oklahoma.

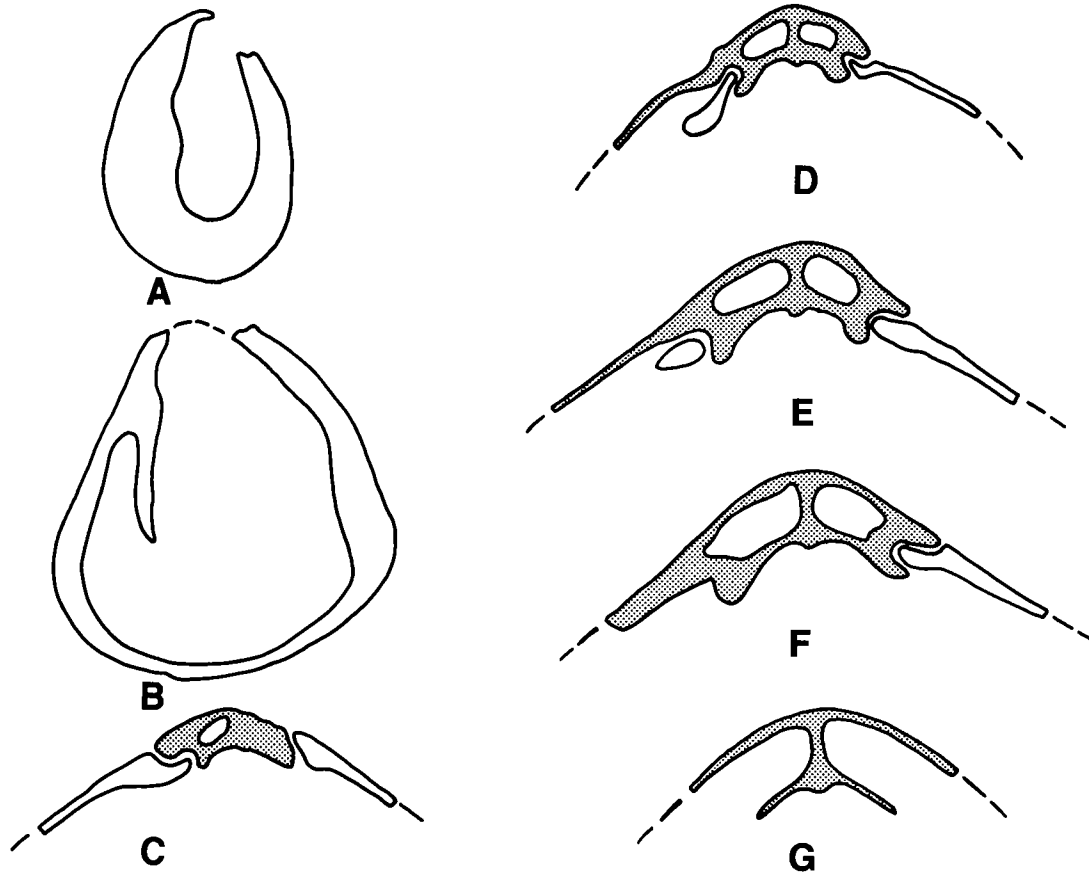


Figure 14. Serial sections of *Plancella turkiensis* Amsden, new genus and new species,  $\times 8$ . Brachial valve stippled. Distance from posterior tip of pedicle beak (mm): A, 0.7; B, 1.3; C, 3.2; D, 3.8; E, 4.2; F, 5.8. Peels, OU 10280.

Superfamily RETZIACEA Waagen, 1883

Family RHYNCHOSPIRINIDAE Schuchert and LeVene,  
1929 (1894)

Genus *Homoeospirella* Amsden, 1968

*Homoeospirella? subcircularis* Amsden, new  
species

Figs. 16, 17

*Holotype*.—OU 10274, Turkey Creek limestone, Turkey Creek, south of Mannsville, Marshall County, Oklahoma (stratigraphic section Ma2-A, B, C, Amsden, 1960, p. 260–261).

*Description*.—Subequally biconvex shells with a subcircular outline. Pedicle beak small, erect. Brachial valve with a sulcus beginning near umbo, continuing to front of valve as a narrow but well-defined trough. Pedicle valve with a shallow sulcus beginning in front of beak and continuing

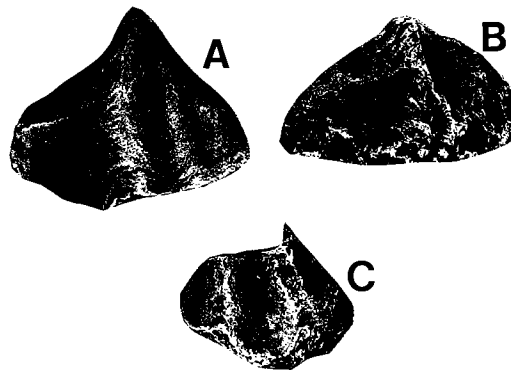


Figure 15. *Kozlowskiellina?* sp. A, fragment of pedicle valve,  $\times 3$  (OU 10268). B, C, palintrope and pedicle exterior of an incomplete valve,  $\times 3$  (OU 10269). Turkey Creek limestone, stratigraphic section Ma2, Marshall County, Oklahoma.

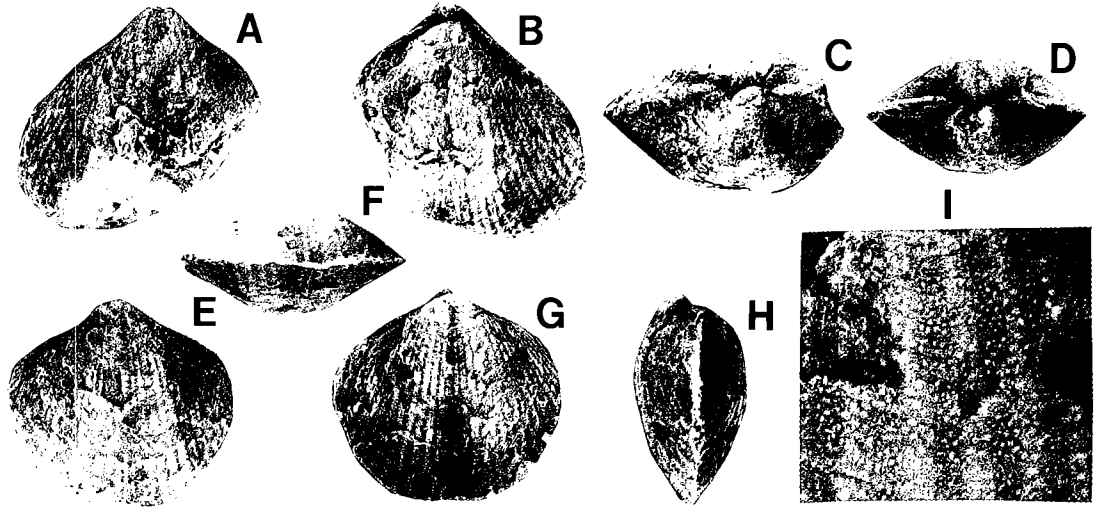


Figure 16. *Homoeospirella? subcircularis* Amsden, new species. A–C, pedicle, brachial, and posterior views of an incomplete specimen,  $\times 2$ ; this specimen subsequently serially sectioned (fig. 17); OU 10275. D–I, posterior, pedicle, anterior, brachial, lateral ( $\times 2$ ), and enlarged surface view ( $\times 2$ ) of holotype (OU 10274). Turkey Creek limestone, stratigraphic section Ma2, Marshall County, Oklahoma.

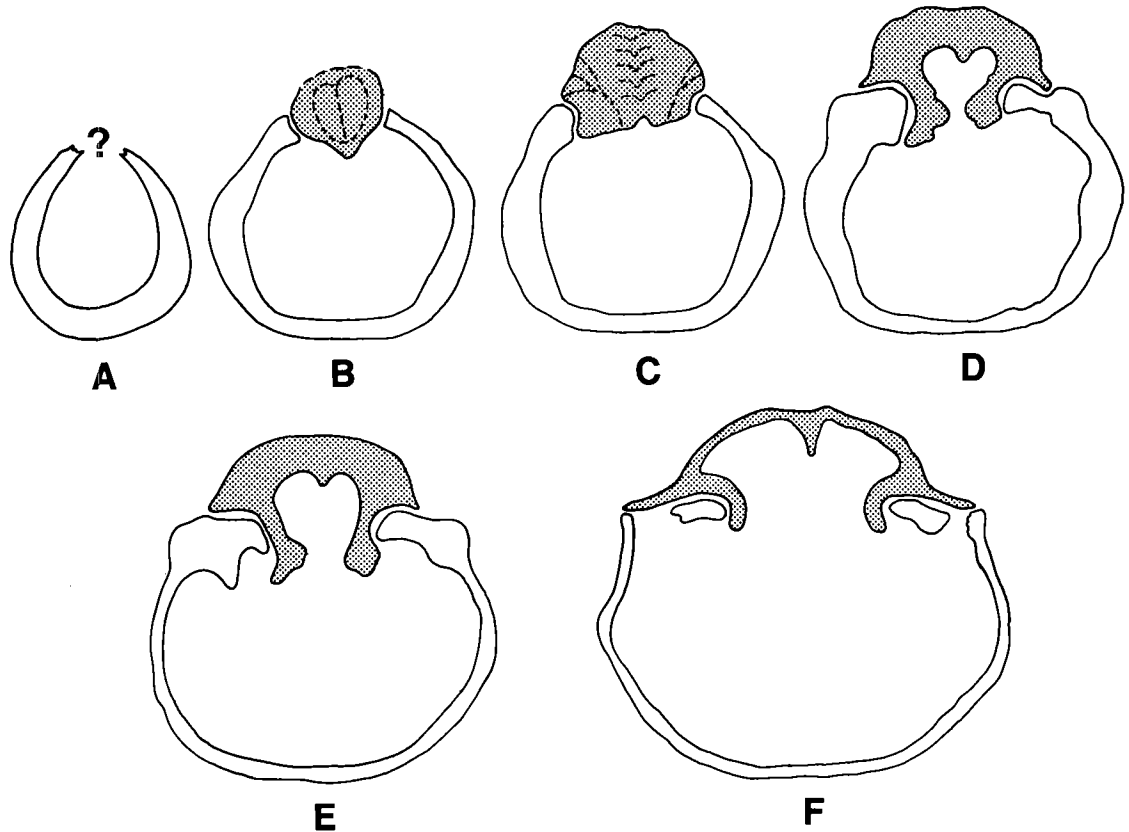


Figure 17. Transverse serial sections ( $\times 10$ ) of *Homoeospirella? subcircularis* Amsden, new species. Brachial valve stippled. Distance from posterior tip of pedicle beak (mm): A, 0.4; B, 0.7; C, 0.8; D, 1.0; E, 1.4; F, 1.6. Peels, OU 10275. Specimen illustrated, figure 16, A–C.

to anterior edge of valve as a shallow, poorly defined structure. Surface covered with low, rounded costellae separated by narrow, shallow interspaces; near front margin of shell illustrated in figure 16, four costellae occupy a space of 2 mm. Surface covered with low pustules, possibly representing bases of delicate spines (fig. 16). Shell substance presumed to be punctate, although punctae are not preserved on the two shells representing this species.

Pedicle valve wall relatively thin; muscle scars are not deeply impressed, and dental plates are lacking (fig. 17). Cardinal plate in brachial valve braced by a median septum, although this is low and extends forward only a short distance. Cardinal plate has no flanges extending ventrally or dorsally (fig. 17).

*Discussion.*—In its bisulcate shell with subdued costellation, and simple cardinal plate with weak septum, this species resembles the species *Homoeospirella costatula costatula* Amsden and *H. costatula arkansana* Amsden (1968, p. 90–95, pl. 19, figs. 3a–3j, pl. 7, figs. 7a–7h) from the Silurian St. Clair–Clarita Formations (Wenlockian). *Homoeospira*, which is widely distributed in Upper Silurian (Wenlockian, Ludlovian, Pridolian) strata in many parts of the world, exhibits much stronger costellation and more elaborate cardinal plates buttressed by a stronger median septum. The only Devonian representatives of the Rhynchospirinae known to me are assigned to *Rhynchospirina*, a genus characterized by stout costellae and a strongly reflexed cardinal plate supported by a high, long septum (Amsden, 1968, pl. 7). The considerable phylogenetic hiatus between the Wenlockian representatives of *Homoeospirella* and the late Early Devonian Turkey Creek specimens raises a question concerning this generic assignment. As noted, *H.? subcircularis* is known only from one complete shell and a fragment of another. Nevertheless, the internal and external features of this species would seem to be best accommodated in the rhynchospirinaid genus *Homoeospirella*.

*Distribution.* One complete shell and the posterior portion of another from the Turkey Creek limestone.

Superfamily STRINGOCEPHALACEA King, 1850

Family RHIPIDOTHYRIDIDAE Cloud, 1942

Subfamily RHIPIDOTHYRIDINAE Cloud, 1942

Genus *Septothyris* Cooper and Williams, 1935

"*Septothyris*" sp.

Figs. 18, 19

*Description.*—The Turkey Creek collections include a single incomplete shell referred to the ter-

ebatulids. This specimen has a smooth exterior with a fairly sharply defined pedicle sulcus and a weak brachial fold (fig. 18). Serial sections prepared from this shell show the septal plate supported on a stout median septum (fig. 19). The loop is incomplete, and based on this single preparation it is difficult to understand fully the rather complicated posterior septal structures. Punctuation is not preserved on this specimen.

*Discussion.*—It is not possible to make a viable generic identification based on this single specimen. It resembles *Septothyris septata* Cooper and Williams (1935, p. 849) in its smooth shell and in having the septal plate supported on a median septum. However, the Turkey Creek shell differs in its well-developed pedicle sulcus and in having what would appear to be a much more complicated brachial apparatus (cf. fig. 19 to Cooper and Williams, 1935, fig. 7).

*Distribution.*—A single specimen from the Turkey Creek limestone.

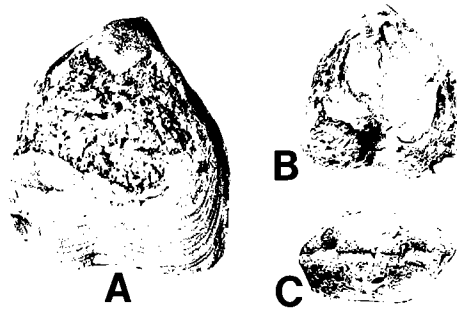


Figure 18. "*Septothyris*" sp. A–C, brachial ( $\times 3$ ), pedicle ( $\times 2$ ), and lateral ( $\times 2$ ) views (OU 10281). Turkey Creek limestone, stratigraphic section Ma2, Marshall County, Oklahoma.

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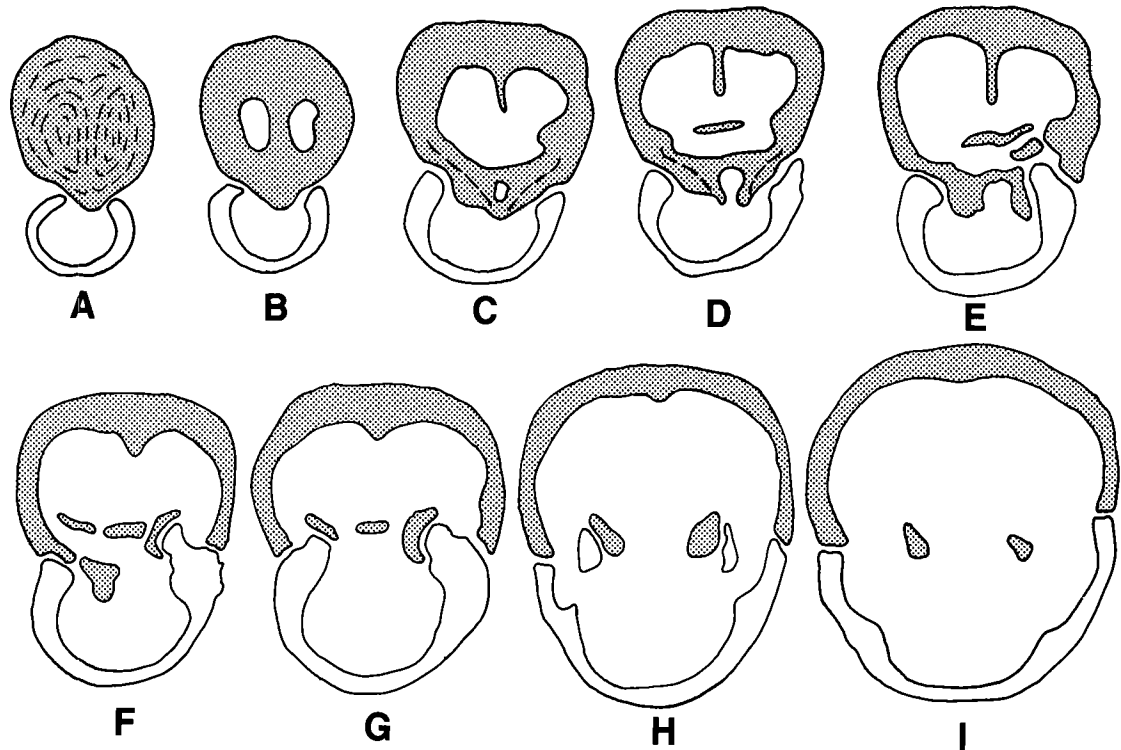


Figure 19. Serial sections of "*Septothyris*" sp. ( $\times 10$ ). Brachial valve stippled. Distance from posterior tip of pedicle valve (mm): A, 0.2; B, 0.4; C, 0.6; D, 0.7; E, 0.8; F, 0.9; G, 1.0; H, 1.3; I, 1.5. Peels, OU 10281. Specimen illustrated, figure 17.

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