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## NEW BRACHIOPODS FROM THE GILMORE CITY LIMESTONE (MISSISSIPPIAN) OF NORTH-CENTRAL IOWA

JOHN L. CARTER

Curator, Section of Invertebrate Fossils

### ABSTRACT

Highly fossiliferous coquinoid lenses within the "Cyathophyllum zone" or uppermost Gilmore City Limestone have produced extremely diverse collections of small invertebrates. The brachiopod faunule from these collections consists of at least eighteen species, three of which are new and described herein. Two of the species are the basis for new and unusual genera. *Iowarhynchus mirandum*, new species, is the type species of a new tiny smooth rhynchonellid, and *Gerkispira spinosa*, new species, is the type species of a new impunctate costate spinose spiriferid. *Setigerites facetus*, new species, represents an early occurrence of a typically Visean genus.

### INTRODUCTION

The Gilmore City Limestone of north-central Iowa is a very light to medium gray oolitic limestone with some interbedded hard tough gray to blue dolomitic limestone and minor shale. The dolomitic beds and shales occur only in the lower intervals but comprise much of the exposed portion of the formation found in outcrop near the type section at Gilmore City, Pocahontas County, Iowa.

Most of the major invertebrate groups of the Gilmore City Formation of Iowa have been studied to some extent. The crinoids were first described by Laudon (1933), corals by Carlson (1964), conodonts by Anderson (1969), brachiopods by Carter (1972), and gastropods by Harper (1977).

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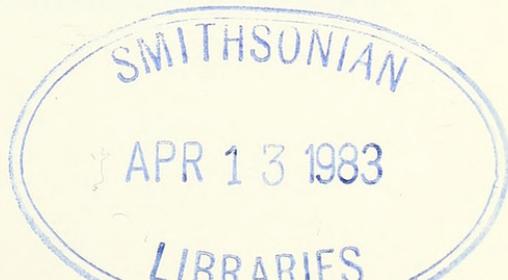


Table 1.—List of brachiopods from the upper beds of the Gilmore City Limestone at Hodge's Quarry, Humboldt County, Iowa.

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<i>Rhipidomella</i> sp. (juveniles?)
<i>Hemiplethorhynchus subovatum</i> Carter (3 mature specimens)
<i>Iowarhynchus mirandum</i> , new genus and new species
<i>Schuchertella</i> sp. (juveniles?)
<i>Rugosochonetes</i> sp. (1 specimen)
<i>Avonia</i> sp. (1 specimen)
<i>Setigerites facetus</i> , new species
<i>Pustula</i> sp. (1 specimen)
? <i>Merista</i> sp. (internal morphology unconfirmed)
<i>Cleiothyridina tenuilineata</i> (Rowley)
<i>Composita</i> cf. <i>C. athabaskensis</i> Warren (4 valves)
<i>Composita</i> sp. (juveniles?)
<i>Prospira</i> sp. (1 specimen)
<i>Gerkispira spinosa</i> , new genus and new species
<i>Syringothyris</i> sp. (2 incomplete specimens)
<i>Punctospriifer</i> sp. (juveniles?)
<i>Cranaena</i> sp. (2 adult specimens)
<i>Girtyella</i> sp. (3 specimens)

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This formation crops out only in north-central Iowa but is reported in subsurface across southwestern Iowa, southern Nebraska, northern and western Kansas. Surface exposures in Iowa are limited to stream banks and limestone quarries, the latter providing the best fossil materials. The quarries in the vicinity of the type section near Gilmore City have produced many of the specimens upon which most of these prior faunal studies were based. My earlier brachiopod paper (1972) was based exclusively on such collections. Almost all of those specimens were recovered from the lower beds of the formation exposed at or near the type section.

The taxa that are the subject of this paper all were collected from the uppermost "zone" or lithologic unit of London (1933), the "*Cyathophyllum* (= *Vesiculophyllum*) zone." This unit is poorly exposed and not fossiliferous in the quarries near Gilmore City, Pocahontas County, but is very well exposed in a relatively new quarry just north of Dakota City, Humboldt County. Originally named Hodge's Quarry, the property is now owned and operated by the P & M Stone Company. This quarry originally consisted of two main pits, east and west. A thin very fossiliferous coquina occurs within the oolitic beds about 35 ft below the top of the formation in the west pit. A very large and diverse collection of invertebrates was assembled from the coquina lenses by A. J. Gerk. Smaller collections made by J. A. Harper of the Pennsylvania Geological Survey and myself, plus the Gerk collections, pro-

vided the brachiopod specimens that form the basis for the present study. The east pit was much less fossiliferous but a fine collection of a new productid species was collected from a horizon 22 ft below a distinctive marker bed of orange-brown shale a few feet below the top of the formation. According to Gerk and Levorson (1982:69), the two pits have become merged into a single large quarry in recent years and virtually all of the highly fossiliferous material has been removed. Brachiopods are very sparsely distributed at Hodge's Quarry except for these coquina lenses. The purpose of this paper is to describe several interesting new brachiopods from Hodge's Quarry, including two unusual new genera.

Most of the brachiopods from the coquina lenses of the west pit are very small specimens. There is a mixture of small adults and juveniles that reflect size sorting, probably from wave and current action in a high energy shallow water environment.

Laudon (1933:29) collected six species of brachiopods from the "*Cyathophyllum* zone" at Humboldt, Humboldt County. None of these species can be identified with certainty in the Hodge's Quarry collections.

#### THE HODGE'S QUARRY FAUNA

At least 18 species of articulate brachiopods occur in the Hodge's Quarry collections. Only two of these occur in the lower horizons or at other localities. *Hemiplethorhynchus subovatum* Carter is common in the lower beds of the formation at Gilmore City and is much less common in Laudon's "*Streptorhynchus* zone." Three specimens were collected at Hodge's quarry by J. A. Harper. *Setigerites facetus*, new species, first occurs in the "*Streptorhynchus* zone" at the quarries near Gilmore City where it is very rare. At Hodge's Quarry it is rare in the lower beds but occurs in large numbers at a single horizon high in the section. Most of the other 16 species (Table 1) are not reported from the lower beds of the formation exposed in Pocahontas County. Many are not identifiable to species level for lack of specimens with adult characters.

#### BIOSTRATIGRAPHIC RELATIONSHIPS

In my earlier Gilmore City Limestone paper (1972), I concluded that the type Gilmore City brachiopod fauna could not be correlated precisely with either Late Kinderhookian or Early Osagian Faunas in the Mississippi Valley region. This conclusion was essentially in agreement with that of Laudon (1933) who instead readily correlated the Gilmore City crinoids with Lodgepole Limestone crinoid faunas of the Cordilleran Region. Laudon arbitrarily assigned the Gilmore City Limestone

to the Late Kinderhookian because it lacked conclusively Osagian crinoid genera. Laudon's crinoids nearly all came from the lower beds of the formation exposed near the type section.

Recently, Harper (1977) also considered the Gilmore City Ls. to be Latest Kinderhookian in its outcrop area. His conclusion was based on his study of the Hodge's Quarry gastropods but he admitted that his judgement was arbitrary and that an Early Osagian correlation was possible. Conodont evidence for precise correlation is scanty (Anderson, 1973). Again, a Late Kinderhookian age is suggested in the absence of Early Osagian taxa. No conodont evidence is available from the "Cyathophyllum zone" of Laudon, the highest beds in the formation.

The brachiopods of the "Cyathophyllum zone" at Hodge's Quarry for the most part provide little new biostratigraphic information. One possible exception is the small athyridid *Cleiothyridina tenuilineata* (Rowley). This distinctive little species was originally described from the lower Burlington Limestone of Pike County, Missouri. The beds from which the type specimens were recovered are of Early but not Earliest Osagian age. However, this species also occurs in the Chappel Limestone of central Texas and the "middle" Banff Formation of Alberta. The Chappel Limestone specimens occur in beds assignable to the *Gnathodus punctatus* zone of Hass (1959), or roughly to the *Siphonodella cooperi hassi*—*Gnathodus punctatus* zone of Thompson and Fellows (1970). The Banff specimens of *C. tenuilineata* all occur in the *Siphonodella cooperi hassi*—*Gnathodus punctatus* zone of Baxter and von Bitter (in press). Wherever recognized, this zone has been considered to be of latest Kinderhookian age. Thus, *C. tenuilineata* occurs only in Late Kinderhookian and Early Osagian strata.

None of the other brachiopod species from Hodge's Quarry offers much assistance in accurately delimiting the age of the "Cyathophyllum zone." The available evidence from all groups, such as it is, still suggests a Late Kinderhookian or Early Osagian age for the Gilmore City Limestone. Definitive data pointing to one series or the other are still lacking.

#### SYSTEMATIC PALEONTOLOGY

Order Strophomenida Öpik  
 Superfamily Productacea Gray  
 Family Tolmatchoffiidae Sarycheva  
 Genus *Setigerites* Girty  
*Setigerites facetus*, new species  
 Plate 1 (figs. 1–20)

1972. *Buxtonia?* sp. B, Carter, p. 480, pl. 1, fig. 19.

*Holotype*.—CMNH 34405.

*Paratypes*.—CMNH 34402–34404, 34406, 34407.

Table 2.—*Measurements of types (in mm) of Setigerites facetus, new species.*

CMNH no.	Length	Width	Height	Surface measure
Pedicle valves				
34402	26.3	29.4	16.3	47.0
34403	28.4	28.3	18.6	49.1
34404	29.3	25.2	19.8	52.6
34405	26.8	25.2	17.1	49.0
Brachial valves (natural molds)				
34406	21.0	26.7	—	—
34407	20.7	24.8	—	—

*Description.*—Average size for genus, outline transversely to longitudinally subovate, lateral profile strongly gibbous; maximum width attained well anterior to hingeline; visceral region subquadrate to convex, brachial valve geniculate, forming moderately thick body cavity; trails moderately produced.

Pedicle valve almost evenly convex in lateral profile, being slightly more convex in region of umbo and visceral disc; venter moderately convex, flattened, or rarely with weak shallow sulcus; flanks dropping steeply to lateral margins; beak small, incurved, slightly overhanging hingeline; anterior margins of largest specimens flaring slightly; radial ornament consisting of elongate spine ridges in umbonal region and irregularly continuous fine costae over remainder of valve that increase by both intercalation and bifurcation, with about 10–13 per cm near anterior margin; concentric ornament consisting of weak irregularly spaced rugae posteriorly, forming weakly reticulate effect on umbo and ears; spine bases irregularly scattered on crests of costae over most of valve; few spines around sides of beak and near hingeline erect and very fine; spine bases on ears and flanks near ears large, not numerous, forming sparse brush in most specimens at cardinal extremities; growth lines very fine, sinuous, irregularly spaced; interior not observed.

Brachial valve with moderately concave visceral disc; trail short, sharply geniculated; ears clearly delineated by convex flexures; dorsum weakly concave, flanks more sharply flexed near margins; pronounced small concave area produced near postero-medial margin by flexures that delimit ears; tiny elongate (protegular?) node externally marking base of cardinal process; radial ornament consisting of elongated dimples on much of visceral disc, forming furrows between fine discontinuous costae anteriorly; dimples round and large on ears; concentric ornament consisting of numerous weak irregularly spaced sinuous rugae and very fine growth lines; spine bases erect, fine, sparsely scattered on visceral disc and trail.

Brachial valve interior with short stout sessile bilobed cardinal process, dorsally inclined from plane of visceral disc; median septum thick at base of cardinal process, tapering anteriorly, extending forward at least to half length of visceral disc; lateral ridges extending along hingeline almost to ears; other internal details not observed.

Measurements are given in Table 2.

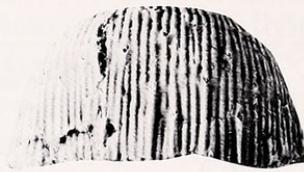
*Distinguishing characters.*—This species is characterized by its lack of, or poorly developed, flared rim or gutter on the pedicle valve trail, a ventral umbo of moderate breadth, about 12 ribs per centimeter on the ventral trail, the conspicuously dimpled dorsal visceral disc, the



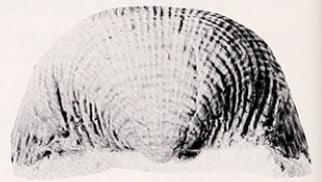
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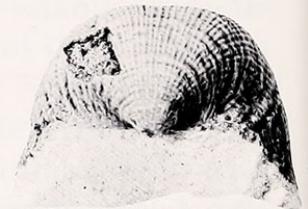
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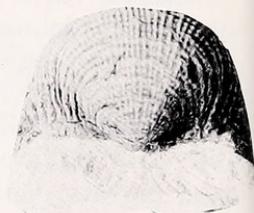
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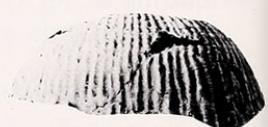
17



18



19



20

sparse brush of relatively coarse spines on the ears of the pedicle valve, and very weakly reticulate visceral disc.

*Comparisons.*—Two species that appear to be similar to this new species are *Dictyoclostus sciotoensis* Hyde, 1953, from the Logan Formation of Ohio, and *Setigerites lichwiniformis* Sarycheva, 1963, from Tournaisian strata of the Kuznets Basin. Both of these species share a similar outline, profile, and ornament with *S. facetus*. *Dictyoclostus sciotoensis* differs in being larger, its ears are more poorly defined, especially on the visceral disc of the brachial valve, and it has slightly finer costae with more numerous bifurcations on the trail of the pedicle valve. *Setigerites lichwiniformis* can be distinguished by its poorly defined ears on the brachial valve, slightly finer more continuous costae with fewer spine ridges on the umbones, and it has a more dense brush of spines at the cardinal extremities.

Smaller specimens of *Productus jasperensis* Warren, 1932, from the Banff Formation of Alberta are similar to *S. facetus*. They can be differentiated by their broader ventral umbo, more strongly reticulate visceral disc, and dense spine brush on the ears. Mature specimens of *P. jasperensis* are much larger and have a flared marginal rim or gutter.

*Setigerites setigerus* (Hall) and *S. altonensis* (Norwood and Pratten) are substantially younger species. Both have more continuous costae on the umbones and both have narrower more elongate ventral umbones that substantially overhang the hingeline. In addition, *S. setigerus* has very dense spine brushes on the ears and *S. altonensis* has much finer costae than does *S. facetus*, new species.

*Comments.*—Assignment of this new species to *Setigerites*, a common Visean genus, is based on general similarity in external form and ornament and close similarity in internal cardinalia. However, there are possibly significant external differences between *S. setigerus* (Hall), the type species, and *S. facetus*, new species. The type species virtually lacks reticulation on the visceral disc in either valve, except near the ears. It possesses a well developed gutter or concave flange around the anterolateral margin, and it has more or less continuous costae that

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← PLATE 1

All figures  $\times 1$

Figs. 1–20.—*Setigerites facetus*, new species, 1–16, ventral, lateral, anterior, and posterior views of four large pedicle valves, CM 34403–34406, including the holotype, figs. 9–12; 17–20, ventral and anterior views of two natural molds of brachial valve exteriors, CM 34406, 34407.

All specimens are from Hodge's Quarry, east pit, 22 ft below a thin marker bed of orange-brown shale near the top of the Gilmore City Limestone.

extend virtually to the hingeline in both valves, lacking the elongate spine ridges seen on the visceral disc of *S. facetus*.

*Setigerites facetus* on the other hand has weak but distinct reticulation on both valves, a gutter has not been observed in any specimen, although the lateral slopes do flare slightly near the margin, and the costae originate from elongate spine bases on the umbo of the pedicle valve and from the complementary ornament of dimples on the brachial valve.

*Dictyoclostus sciotoensis* Hyde and *Productus jasperensis* Warren, discussed above, are species also assignable to *Setigerites* that possess some or all of these different characters with *S. facetus* and it is possible that these three species are closely related, perhaps representing an early adaptive radiation of this genus into distinctly different environments.

*Stratigraphic occurrence.*—This species is very rare in the “*Strepatorhynchus* zone” of Laudon (1933) in the vicinity of the type section, Pocahontas County, Iowa. At Hodge’s Quarry it is rare in the lower beds of both pits, but is common at a single horizon in the east pit about 22 ft below the orange-brown shale marker bed near the top of the formation.

Order Rhynchonellida Kuhn  
Superfamily Rhynchonellacea Gray  
? Family Pontisiidae Cooper & Grant  
*Iowarhynchus*, new genus

*Type species.*—*Iowarhynchus mirandum*, new genus and new species.

*Species assigned.*—Genus monotypic.

*Diagnosis.*—Very small, smooth, elongate rhynchonellaceans with subcardiiform to guttate outline; sulcus variably present in pedicle valve, rarely in brachial valve; fold lacking; short dental plates present; foramen hypothyriddid, slitlike; deltidial plates lacking; dorsal septum lacking; hinge plate often divided but inner hinge plates tending to converge, rarely fused to form undivided hinge plate; crura thin, moderately long, bladefike, falcifer, projecting antero-ventrally.

*Comparisons.*—Tiny entirely smooth rhynchonellaceans are rare in the stratigraphic record. *Dorsisinus* Sanders is such a genus from the Late Famennian Louisiana Limestone of Missouri. Sanders (1958:53) mistakenly diagnosed *Dorsisinus* as possessing a divided hinge plate and septalium by assuming that his silicified Mississippian species from Mexico was conspecific with the type species, *Centronella louisianensis* Weller. However, *Dorsisinus louisianensis* has an undivided hinge plate, lacks a septalium, and has well developed crural plates that buttress the hinge plate. Both *Dorsisinus* and the unnamed Mexican genus lack a ventral sulcus; instead the venter is arched. The Mexican form does

not seem to be related to the Iowa genus of comparable age, but *Dorsisinus* may indeed be a Devonian progenitor of *Iowarhynchus*, new genus.

Other smooth rhynchonellaceans that bear superficial resemblance to *Iowarhynchus* are *Donella* Rotai from the Lower Carboniferous of the Donetz Basin and *Acolosia* Cooper and Grant from the Permian of Texas. *Donella* lacks dental plates, possesses a dorsal septum, and is of enigmatic affinities. Some species of *Acolosia*, especially *A. elliptica* Cooper and Grant, are much more similar both externally and internally to the new Mississippian genus. Externally, *Acolosia elliptica* has a similar outline and profile but differs in having a broader ventral sulcus, a more acute ventral beak, and it never has a dorsal sulcus. Internally, *Acolosia* has fairly wide outer hinge plates and the crura are not as vertically compressed. Interestingly, both *Iowarhynchus* and *Acolosia* lack deltidial plates.

*Discussion.*—The lack of radial ornamentation and dorsal median septum obviate ready assignment of the new genus to an established Carboniferous rhynchonellacean family. The recently erected Permian Family Pontisiidae of Cooper and Grant (1976:2019) includes the genus *Acolosia* Cooper and Grant discussed above. Most external and internal characters of *Iowarhynchus*, new genus, more or less agree with Cooper and Grant's family diagnosis. However, most of the taxa assigned to the family by Cooper and Grant have radial ornament of some sort except for two species of *Acolosia*. There is also one significant internal difference. Virtually all of the Permian species assigned to the Pontisiidae by Cooper and Grant have recognizable outer hinge plates, whereas in *Iowarhynchus* the crural bases arise directly under the socket ridges, the outer hinge plates being completely suppressed. For these reasons and because of the substantial hiatus in stratigraphic occurrences the new Mississippian genus is assigned to the Pontisiidae tentatively.

*Iowarhynchus mirandum*, new genus and new species

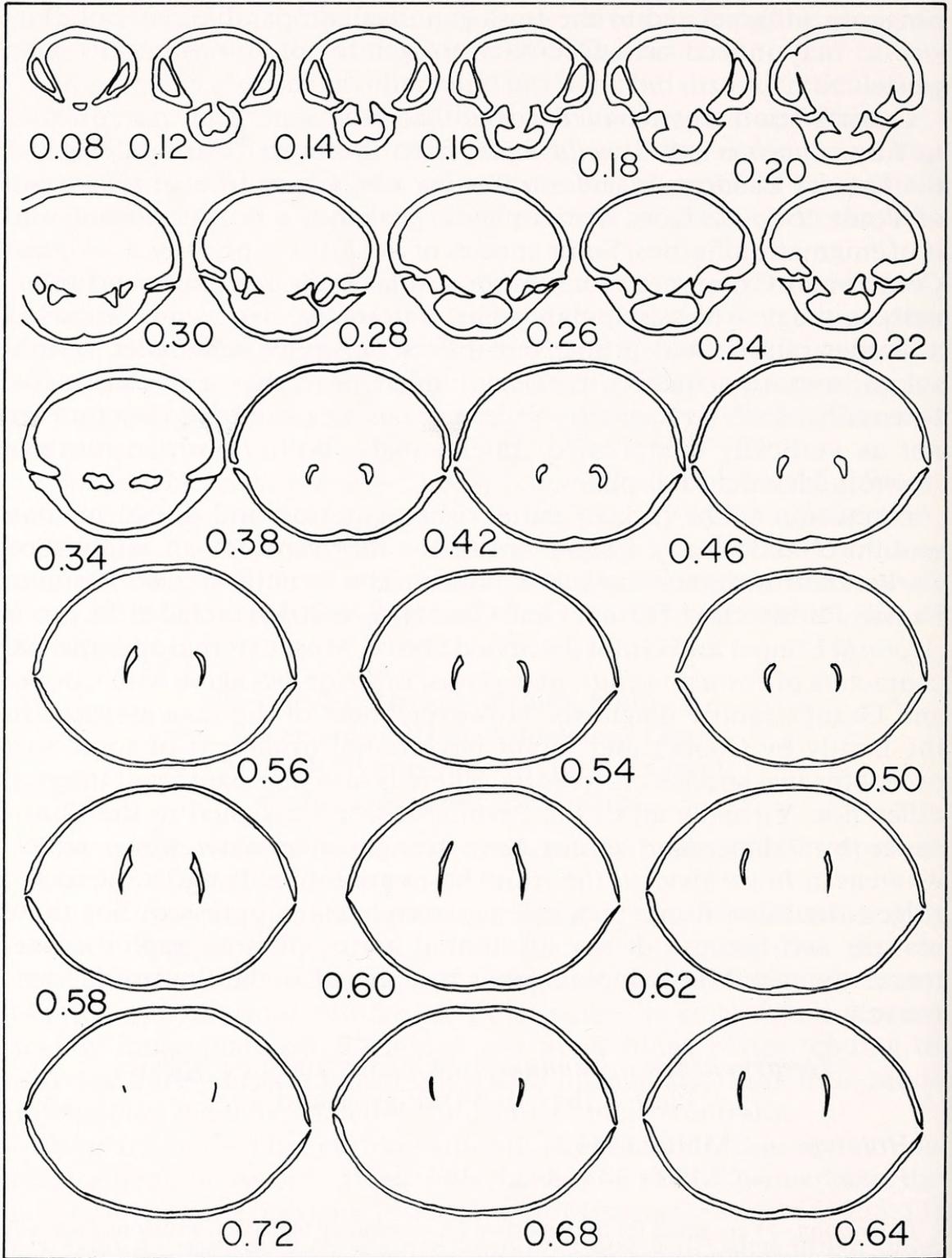
Plate 2 (figs. 1–44); Figs. 1 and 2

*Holotype.*—CMNH 34412.

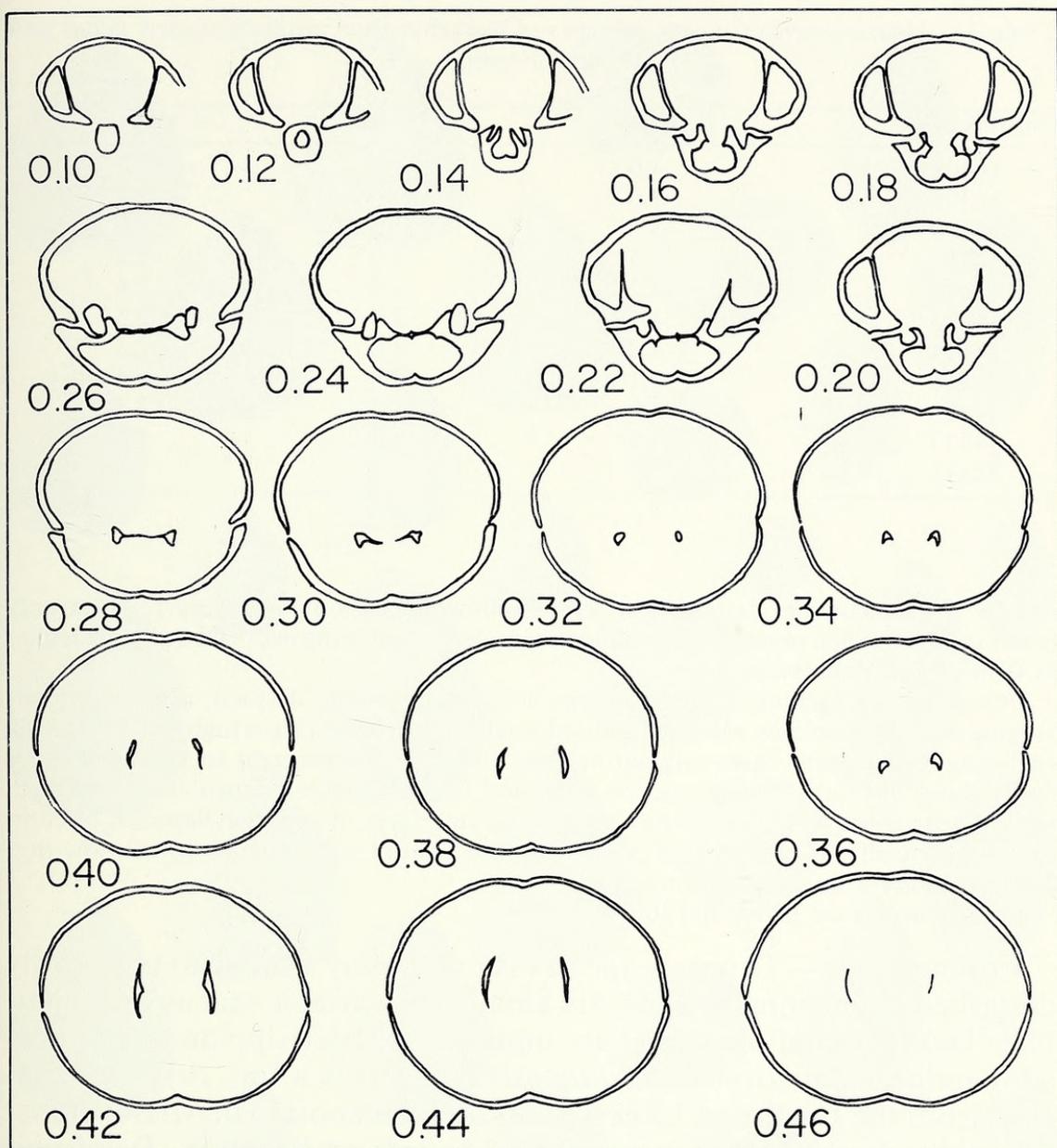
*Paratypes.*—CMNH 34408–11, 34413–20.

*Description.*—Very small for the superfamily, subequally biconvex, with longitudinally subovate, subcardiiform, or guttate outline; maximum width attained anterior to mid-length; lateral profile lenticular to subovate; anterior commissure uniplicate to rectimarginate; fold never developed; sulcus commonly present in pedicle valve, much less commonly in brachial valve; ornament lacking except for irregularly spaced coarse growth varices and very fine faint irregularly spaced growth lines; shell substance impunctate.

Pedicle valve moderately and evenly convex in profile in most specimens; some mature specimens with sharply deflected growth lamellae at margins producing truncated profile; lateral slopes moderately rounded or sometimes slightly flattened; maximum depth usually



Text-Fig. 1.—Transverse serial sections of *Iowarhynchus mirandum* n. gen. n. sp., CM 34419,  $\times 12$ . The numbers refer to distance in mm from the ventral beak. This is a mature specimen with a divided hinge plate, externally similar to the holotype, lacking a dorsal sulcus.



Text-Fig. 2.—Transverse serial sections of *Iowarhynchus mirandum* n. gen. n. sp., CM 34420,  $\times 12$ . The numbers refer to the distance in mm from the ventral beak. This is a mature emarginate specimen with an undivided hinge plate and a sulcus in each valve.

attained near or slightly posterior to mid-length; umbonal region of variable breadth but not inflated in lateral profile; beak small, nearly straight; beak ridges rounded; delthyrium narrow, open, continuous with rounded hypothyriddid foramen; sulcus, if present, originating anterior to umbonal region, shallow, rounded; venter usually flattened or weakly convex in specimens lacking sulcus; dental plates short, thin, diverging slightly.

Brachial valve similar in depth and convexity to pedicle valve but with maximum depth slightly anterior to that of opposite valve; umbonal region variably produced, usually low and broad, never strongly inflated; beak inconspicuous; fold lacking, dorsum

Table 3.—*Measurements (in mm) of types of Iowarhynchus mirandum, new genus and new species.*

CMNH number	Length	Width	Thickness
34408	4.0	3.3	2.3
34409	3.9	3.5	2.5
34410	3.2	2.5	2.0
34411	2.5	2.0	1.5
34412	4.2	3.4	2.6
34413	4.1	3.4	2.5
34414	4.0	3.0	2.3
34415	3.1	2.4	1.6
34416	4.2	3.2	2.5
34417	3.9	3.0	2.0
34418	2.7	2.1	1.4

usually weakly convex, flattened, or with shallow sulcus, but only very rarely evenly convex; sulcus, when present, very shallow, rounded, originating in dorsal umbonal region as faint medial depression.

Dorsal interior lacking median septum; hingeplate usually divided, often with converging inner hinge plates, rarely with fused single plate; socket ridges high, sturdy, stoutly enclosing teeth; crural bases originating near dorso-medial edges of sockets with outer hinge plates not recognizable; sockets deep and rounded; crura triangular or rodlike in section near hinge plate, becoming comma-like anteriorly, then much flattened or compressed vertically, bladelike, and projecting into ventral valve distally; weak low myophragm present in most specimens.

Measurements are given in Table 3.

*Comparisons.*—This new species is not closely similar to previously described rhynchonellaceans. Its small size variable sulcus and complete lack of radial ornament are unusual in Mississippian strata, possibly unique. *Dorsisinus louisianensis* (Weller) is a tiny rhynchonellacean from the Louisiana Limestone (Late Famennian) of Missouri that resembles *I. mirandum*, new species, in size and outline. *Dorsisinus louisianensis* differs externally by invariably lacking a sulcus in the

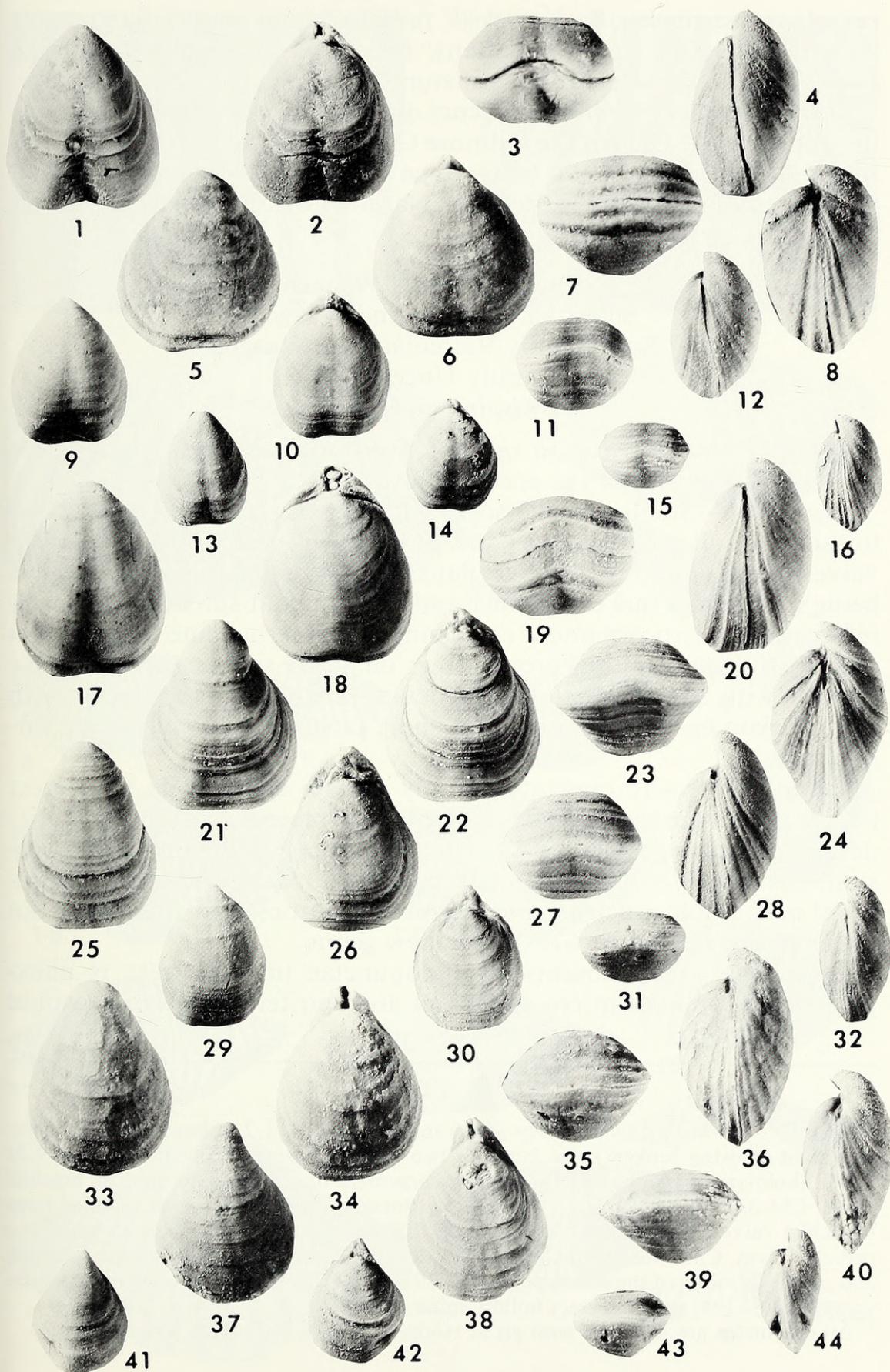
## PLATE 2

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All figures ×6

Figs. 1–44.—*Iowarhynchus mirandum*, new genus and new species, 1–16, ventral, dorsal, anterior, and lateral views of four emarginate specimens with dorsal sulcus, CM 34408–34411; 17–32, ventral, dorsal, anterior, and lateral views of four specimens with ventral sulcus only, CM 34412–34415, including the holotype, figs. 17–20; 33–44, ventral, dorsal, anterior, and lateral views of three rectimarginate specimens lacking a sulcus in either valve, CM 34416–34418.

All specimens are from the thin coquina lenses in the upper 35 ft of the west pit at Hodge's Quarry, Humboldt County, Iowa.



pedicle valve, it usually has weak radial ribbing, and it has narrow deltidial plates in some specimens. Inside the brachial valve of *D. louisianensis* has substantially different cardinalia.

*Stratigraphic occurrence.*—Occurs only in the thin coquina lenses of the upper oolitic beds of the Gilmore City Limestone at Hodge's Quarry, west pit. Many of the better type specimens were collected and donated to the Carnegie Museum of Natural History by Arthur J. Gerk of Mason City, Iowa.

Order Spiriferida Waagen  
Suborder Spiriferidina Waagen  
? Superfamily Reticulariacea Waagen  
Family Uncertain  
***Gerkispira*, new genus**

*Type species.*—*Gerkispira spinosa*, new genus and new species.

*Species assigned.*—Type species only.

*Diagnosis.*—Small transverse spiriferids with rounded lateral extremities in all growth stages and poorly delimited fold-sulcus; both valves with numerous costae on flanks and fold-sulcus, those on flanks being simple with rare exceptions, and those on fold-sulcus occasionally bifurcating; micro-ornament consisting of numerous fine hollow erect spines on costae and fine growth lines on entire surface; pedicle valve interior with slender dental adminicula; brachial valve interior with small striate cardinal process and short tabellae; shell substance impunctate.

*Comparisons.*—Impunctate entirely costate spiriferoids with erect hollow spines are rare in the paleontological record. Martynova (1961) described such a genus, *Spinospirifer*, from the Famennian of Kazakhstan. *Spinospirifer* has a capillate lamellose micro-ornament, an unusual nasute fold-sulcus, acute lateral extremities, and thus, does not appear to be related to *Gerkispira*, new genus.

*Comments.*—The absence of endopunctae in *Gerkispira* is unexpected. The spinose micro-ornament and spiriferoid costation would

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PLATE 3

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Figs. 1–19.—*Gerkispira spinosa*, new genus and new species, 1, 2, enlargements of micro-ornament showing broken spine bases of two typically preserved pedicle valves, CM 34392 (holotype) and CM 34393,  $\times 8$ ; 3, enlargement of an unusually spinose brachial valve, CM 34399,  $\times 5$ ; 4, 5, 15, 16, 18, 19, dorsal, and anterior views of three large brachial valves, CM 34396–34398,  $\times 2$ ; 6, 7, 8, 9, ventral and anterior views of two pedicle valves, CM 34393 and CM 34394,  $\times 2$ ; 10–14, ventral, dorsal, lateral, anterior, and posterior views of the holotype, CM 34392,  $\times 2$ ; 17, enlargement of a small pedicle valve, CM 34395, showing erect hollow spine bases,  $\times 8$ .

All specimens are from the west pit at Hodge's Quarry, Humboldt County, Iowa.



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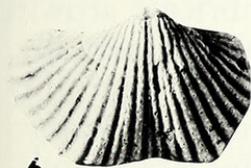
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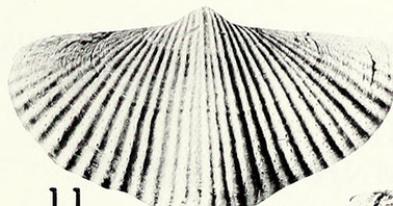
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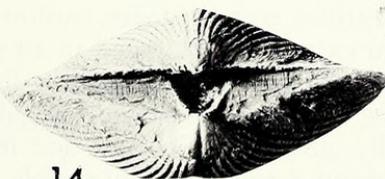
11



12



13



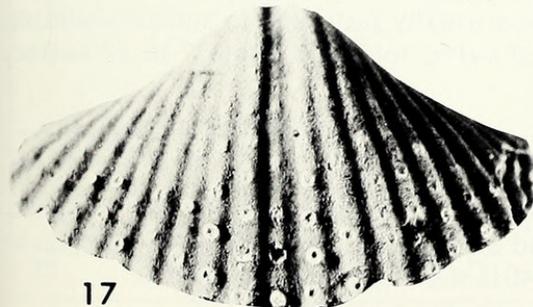
14



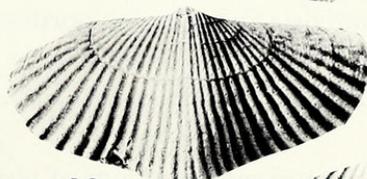
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19

lead one to expect punctate shell structure. However, no punctae were detected after careful examination of every specimen at hand. Furthermore, other punctate taxa from the same collection, such as *Cran-aena* sp., *Punctospirifer* sp., and *Rhipidomella* sp., have well preserved punctae. It seems unlikely that the shell substances of *Gerkispira*, new genus, has been altered.

This new genus is not closely similar to any previously described genus and its familial affinities are uncertain. If one ignores the spinose ornament it would be most similar to members of the Choristitidinae by virtue of its rounded lateral extremities, numerous costae, poorly differentiated fold-sulcus, and short tabellae. On the other hand spinose ornamentation has not, to my knowledge, been reported in impunctate Carboniferous Spiriferacea. The spinose non-capillate micro-ornament, well rounded lateral extremities, poorly delimited fold-sulcus, lack of true spiriferid denticulation (with taleolae in the secondary layer of the interarea), and presence of short tabellae in the brachial valve suggest reticulariacean affinities. However, strongly ribbed reticulariaceans are very rare. Two Triassic genera, *Mentzeliopsis* Trechmann, and *Spiriferinoides* Tokuyama, appear to be reticulariaceans with strongly costate flanks. Both possess hollow spines but they differ from *Gerkispira* n. gen. in having a bald fold-sulcus and imbricate growth lamellae externally, and both have a ventral median septum internally. Although the strongly transverse outline, entirely costate macro-ornament, and erect spines are not reticulariacean characters, *Gerkispira* might be best assigned to the Reticulariaceae for the reasons cited above.

***Gerkispira spinosa*, new genus and new species**

Plate 3 (figs. 1-19); Fig. 3

*Holotype*.—CMNH 34392.

*Paratypes*.—CMNH 39393-39401.

*Description*.—Smaller than average for superfamily, subequally biconvex, transverse, wider than long in all but earliest growth stages; outline spiriferoid; greatest width posterior to mid-length; lateral extremities rounded in all growth stages; fold-sulcus moderately developed, rounded, not well delimited from flanks; anterior commissure uniplicate; ornament consisting of numerous costae, irregularly spaced growth varices, fine rounded spine bases usually on crests of costae, and fine regularly and closely spaced growth lines; flanks with about 9 to 15 mostly simple costae, usually about 11 to 13, sulcus with about 5 to 9 costae, with bifurcation usually restricted to sulcus-bounding costae and median costa in posterior portion of valve; fold with about 7 to 12 costae,

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Text-Fig. 3.—Transverse serial sections of *Gerkispira spinosa* n. gen. n. sp. The numbers refer to the distance in mm from the ventral and dorsal beaks, respectively. A) a pedicle valve, CM 34400. B) a brachial valve, CM 34401, showing the short tabellae.

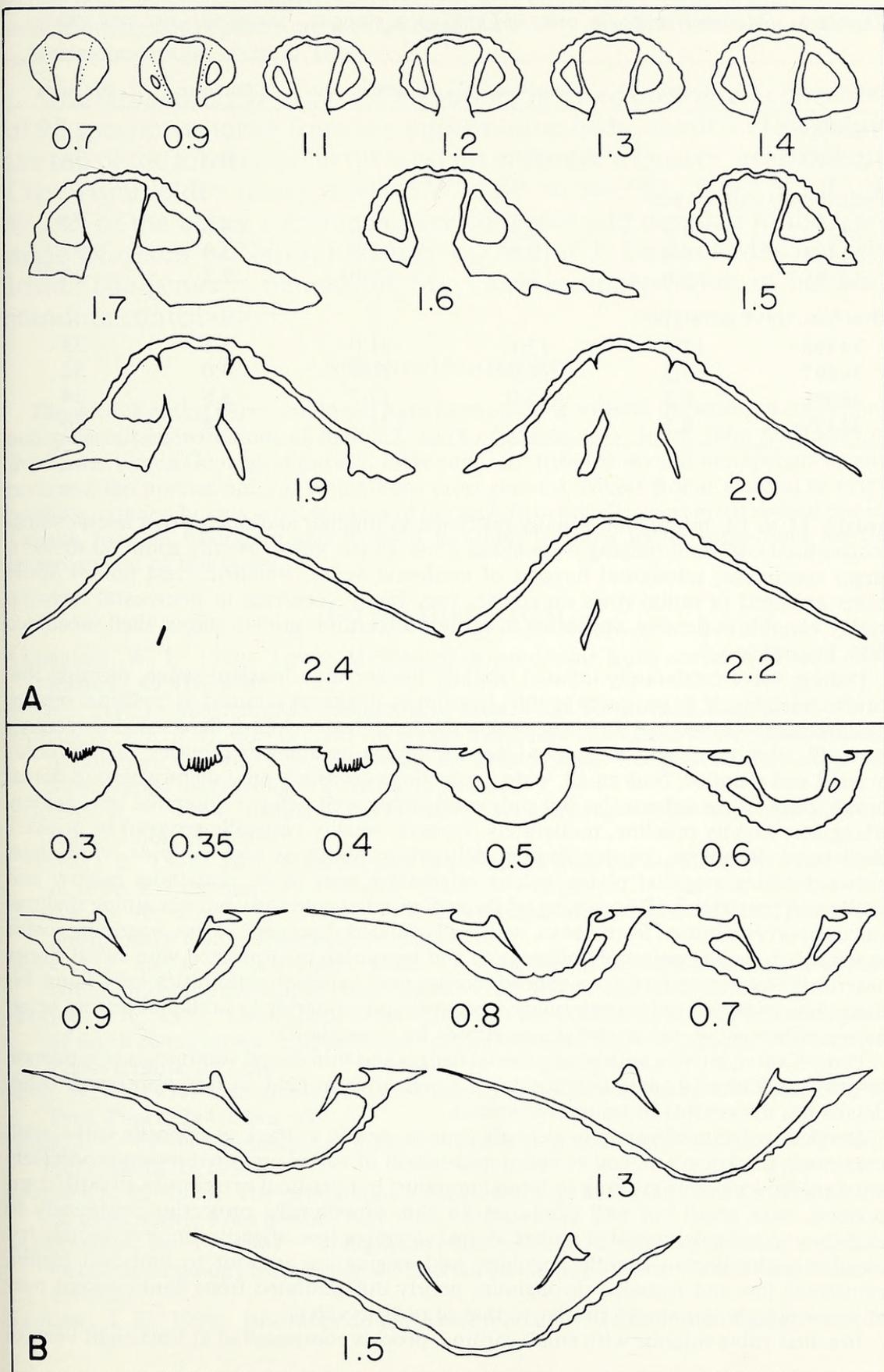


Table 4.—*Measurements (in mm) of Gerkispira spinosa, new genus and new species.*

CMNH no.	Length	Hinge width	Maximum width	Thickness	Rib count
<b>Holotype</b>					
34392	11.1	16.0	19.1	8.6	34
<b>Pedicle valve paratypes</b>					
34393	+8.4	8.5	±14.0	±4.0	28
34394	8.4	10.5	12.8	3.9	±32
34395	+5.0	—	+7.0	2.3	23
<b>Brachial valve paratypes</b>					
34396	11.6	17.1	21.0	5.5	33
34397	9.3	14.0	16.9	4.0	32
34398	8.8	±15.0	17.7	3.8	34
34399	8.5	—	±15.2	3.8	26

usually 11 to 12, bifurcation usually restricted to median and one or two lateral sulcal costae; total rib count ranging from about 27 to 39 per valve, usually about 32 to 34 in larger specimens; intercostal furrows of moderate depth, rounded; erect hollow spine bases arranged in radial rows on costae, very rarely occurring in intercostal furrows, highly variable in density, appearing in earliest discernible growth stages; shell substance thin, impunctate.

Pedicle valve moderately inflated, slightly thicker than brachial valve, forming low equilateral triangle in posterior profile; maximum thickness attained in umbonal region, just anterior to hingeline; umbonal region moderately developed; flanks slightly convex medially, sloping evenly to antero-lateral margins; cardinal extremities slightly compressed and rounded; beak small, wide, projecting posteriorly only slightly beyond dorsal umbo; beak ridges subangular but only moderately well defined; interarea low, acutely triangular, slightly procline, moderately concave, weakly vertically grooved in primary shell layer; hingeline not denticulate; delthyrium about as high as wide, with short outward-flaring stegidial plates; sulcus originating near beak, remaining narrow and shallow in posterior half, becoming wider and rounded anteriorly but remaining shallow; sulcus poorly delimited from flanks, with well rounded shoulders; sulcus-bounding costae in umbonal region commonly bifurcating and becoming incorporated with sulcal slopes anteriorly; moderate tongue produced; costae near cardinal extremities very faint; bifurcations of lateral costae extremely rare, especially anterior to umbonal region; origination of secondary sulcal costae sometimes by intercalation.

Pedicle valve interior with strong dental flanges and thin dental adminicula of moderate length; subdelthyrial plate lacking; teeth small; muscle field weakly impressed; other details not discernible in transverse section.

Brachial valve moderately to strongly convex, nearly as thick as opposite valve, with maximum thickness attained at about mid-length of valve; umbonal region moderately swollen, flanks evenly curving to lateral margins, but cardinal extremities slightly compressed; beak small but well produced for this superfamily, projecting posteriorly to slightly overhang delthyrial chamber; dorsal interarea low, slightly concave, acutely triangular, orthocline to slightly anacline; fold originating anterior to umbonal region, remaining low and rounded throughout, poorly differentiated from flanks except near anterior margin; ornament similar to that of pedicle valve.

Brachial valve interior with small cardinal process composed of at least eight vertical

plates; inner socket ridges fused dorsomedially with crural bases, forming short tabellae; muscle impressions obscure, no median ridge posteriorly; brachial details not observed. Measurements are given in Table 4.

*Stratigraphic occurrence.*—This species is based on a single collection of 93 specimens taken from the upper oolitic beds, about 35 feet below the top of the formation, in the west pit at Hodge's Quarry, near Dakota City, Humboldt County, Iowa, SW $\frac{1}{4}$ , SW $\frac{1}{4}$ , Sec. 32, T. 92 N., R. 28 W. All of the better specimens were collected and donated to the Carnegie Museum of Natural History by Arthur J. Gerk of Mason City, Iowa. The genus is named for Mr. Gerk in appreciation of his outstanding contribution.

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