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Cover Picture

Red River Flood Plain

The cover photograph is a vertical view of a portion of the flood plain of the Red River (at bottom of photograph) in southern McCurtain County, in T. 9 S., Rs. 23 and 24 E. The scale of the photograph is approximately 1.6 inches per mile. The section numbers are placed near the centers of the sections. Section 20 is "faked in," as most of the area which would be occupied by section 20 is actually in Texas. The photograph is an uncontrolled mosaic composed of four aerial photographs taken for the U. S. Department of Agriculture, Agricultural Adjustment Administration, on September 23, 1938, by Southwestern Aerial Surveys. The northern border of the area shown is approximately six miles due south of Idabel.

The most striking features of the area are the numerous meander scars, abandoned meanders, and oxbow lakes. Among the oxbow lakes are Bryarly Lake (west side secs. 13 and 24), Charles Lake (sec. 19), and Old River Lake (NE¼ sec. 20). Other named features are Eagle Bend Cut-off (the loop enclosing "section 20") and Jenkins Reilly Slough (the large loop in the northeast corner of the area, passing through secs. 8 and 9).

All these features have resulted from the migration of the Red River back and forth across its flood plain. In some the sequence of events is indicated by their relationships. The meander scars in section 12 were formed by a meander older than the one responsible for the scars in the area to the southeast in sections 13 and 18. Jenkins Reilly Slough represents an old course of the Red River, older than that represented by the loop of the Eagle Bend Cut-off.

In NE¼ section 24 can be seen the trace of an old undercut slope. Charles Lake is in the early stage of filling in; note the encroachment of vegetation at each end of the bow and along its inner margin.

Interestingly, the boundary between Texas and Oklahoma follows the south bank of the Red River only from the west side of the area to a point just east of Charles Lake. From that point the boundary loops southward for about half a mile around the Dick Johnson Cut-off (not shown on photograph), thence immediately back across the Red River and around the Eagle Bend Cut-off, and thence back across the river into the area south of the river. Similarly, the inner part of the Bryarly Cut-off is on the Texas side of the boundary. Apparently Bryarly Lake and the loop around Eagle Bend Cut-off were part of the main channel of the Red River at the time of the establishment of the boundary. A cursory examination of the relationship of the present-day channel of the Red River, compared with the trace of the official Oklahoma-Texas boundary, indicates that the river is tending to develop a straighter course; more cutoffs have been made than new meanders developed.

The area shown on the cover photograph is covered by the Idabel SE and English 7.5-minute topographic quadrangles of the U. S. Geological Survey (edition of 1951, scale 1:24,000).

—A. N.

New Conodonts from Joins (Ordovician) Formation of Oklahoma

R. W. Harris

In describing Simpson Ostracoda in 1957 Harris reviewed the establishment, type section, lithology, thickness, relationship, age, and correlation of the six Simpson formations, including the basal formation, Joins (p. 55-61).

Along U. S. Highway 77, on the southern side of the Arbuckle Mountains, thin-bedded basal Simpson Joins limestones (294 feet) crop out for a distance of 360 feet (dip 55 degrees SW) between underlying Arbuckle West Spring Creek limestones and overlying Simpson Oil Creek basal sandstones (fig. 1). The two- to three-foot "oxidized" Joins basal conglomerate (containing reworked Arbuckle fossils) rests unconformably upon topmost Arbuckle West Spring Creek dense, tan, fossiliferous, argillaceous, thin-bedded limestones that contain the diagnostic Beekmantown ostracode, *Ceratoleperditia arbucklensis* Harris, 1960. Chazyan Joins and superjacent Oil Creek are in disconformable relationship (Harris, 1957, p. 59).

This description of four genera and seven species of conodonts is preliminary to description and zoning of conodonts through the complete Joins sequence (after treatment with 10 percent acetic acid).

Oistodus Pander, 1856

Genotype.—**Oistodus lanceolatus** Pander, 1856

Oistodus Pander, 1856, Monographie der fossilen Fische der silurischen Systems der russisch-baltischen Gouvernements, St. Petersburg: K. Akad. d. Wiss., p. 27 (original description translated by Stauffer (1935a, p. 146) and Lindström (1954, p. 572).

Pander's original generic description embraced "a small subdivision . . .of simple teeth. . .as a rule, translucent, yellow, and horny in appearance. . ." resting upon an elongate, widened, excavated base.

Lindström (1954, p. 572, 573) noted that though Pander's description emphasized the elongate, expanded, hollow base, his original illustrations of *Oistodus* spp. reveal two other characteristics currently considered diagnostic of the genus: (1) carinae on one or both lateral faces and (2) acutely angled posterior junction of tooth and oral edge of posterior bar.

The genus differs essentially from *Drepanodus* Pander, 1856, in that the more symmetrically biconvex tooth of the latter joins oral margin of posterior bar in a curve, not at an acute angle.

Oistodus angulensis, new species

Plate I, figure 1a-c

In *Oistodus angulensis* a fairly thick, noncarinate, prominently keeled blade is strongly reclined to position subparallel with aboral margin of base.

The basal cavity (subquadrate in outline) is deep, expanded posteriorly, and narrowed slightly anteriorly, with sides sloping inward essentially equally; central apex of cavity points anteriorly. Inner margin of aboral cavity is slightly depressed or incised near middle and turned in slightly at rounded corner; outer margin is smoothly rounded.

SILURIAN					
ORDOVICIAN	CINCINNATIAN	RICHMONDIAN	PATTERSON RANCH	Sylvan Shale	300 feet
				Fernvale Limestone	50 feet
	MOHAWKIAN	TRENTONIAN		Viola Limestone	700 feet
			SIMPSON	Corbin Ranch Formation	(missing)
		BLACKRIVERAN		Bromide Formation	427 feet
				Tulip Creek Formation	395 feet
				McLish Formation	490 feet
	CANADIAN	CHAZYAN		Oil Creek Formation	668 feet
				JOINS FORMATION	294 feet
		BEEKMANTOWNIAN	ARBUCKLE	West Spring Creek Limestone	1,550 feet
				Kindblade Formation	1,400 feet
				Cool Creek Formation	1,350 feet
				McKenzie Hill Formation	1,000 feet
CAMBRIAN					

Figure 1. The Ordovician System along U. S. Highway 77, south side of Arbuckle Mountains, Oklahoma.

Oral surface is short, rounded, keeled; oral angle of approximately 45 degrees is filled and spanned by transparent, coalescing keel on blade and oral surface. Anterior and posterior basal angles are approximately 90 degrees.

Fairly thick, smooth, biconvex, slightly inwardly flexed blade is strongly rimmed basally.

Holotype OMC* 101 (pl. I, fig. 1) and paratype OMC 102 are from the Joins horizon 65.5 feet above the base of the formation in the Simpson section, along west side of U. S. Highway 77, south side of Arbuckle Mountains, Oklahoma.

Remarks.—In lateral profile this Joins species resembles *O. parallelus* Pander and *O. contractus* Lindström (Lower Ordovician of Sweden) and *O. gracilis* Branson and Mehl (Jefferson City of Missouri). The Oklahoma form lacks the carinae of *O. parallelus* Pander; its oral surface appears longer, basal cavity deeper, and blade more flexed than in *O. contractus* Lindström; its blade appears straighter and its oral angle more acute and more keeled than in *O. gracilis* Branson and Mehl.

Diagnostic features of the new species are: (1) strong keels on both edges of fairly straight, slightly inwardly flexed blade, (2) keel spanning acute oral angle, and (3) subparallel anterior and posterior margins of base.

Range.—Fairly common in lower and middle Joins.

The trivial name is a combination of the Latin noun angulus, meaning "corner, bend," and ensis, meaning "sword," referring to the sharp keel in acute oral angle.

Oistodus bilongatus, new species
Plate I, figures 8, 9a, b, 10a-c

In lateral view, *Oistodus bilongatus* shows pronounced downward arching, rimmed, barlike basal extensions (especially posterior) and strongly reclined (acutely angled), rimmed, flattened, and inwardly flexed blade above a basal cavity with expanded inner margin.

Rather narrow, elongate basal cavity is subtriangular to subrhomboidal in aboral view, with outer margin but slightly arcuate, and inner margin rather sharply convex (expanded) beneath blade. Long, narrow, downward curving, bluntly pointed, basally expanded, aborally flattened, barlike posterior extension approximately one-half length of entire blade; oral edge of posterior extension with narrow keel throughout its length. The short, laterally compressed, acuminate, downward- and forward-projecting anterior basal extension is simply the forward end of the blade and keel. In immature specimens (pl. I, fig. 8) this nose is extremely thin and sharp. In mature forms (pl. I, fig. 10) this anterior keel becomes basally thickened and barlike; also slightly flattened aborally (resembling posterior basal keel). The base is excavated or concave, with posterior slope longer and flatter than anterior.

The flattened, elongate, inwardly flexed blade, with sharp rim along anterior and posterior edges, is strongly reclined and acutely angled

*Oklahoma Micropaleontological Collection in The University of Oklahoma, Norman.

above basal expansion. Lateral faces are smooth, without carinae; inner face is flatter; adult outer face is axially thickened and lowly convex.

Holotype OMC 103 (pl. I, fig. 10) and paratypes OMC 104 (pl. I, fig. 8) and OMC 105 (pl. I, fig. 9) are from the Joins horizon 187 feet above the base of the formation in the Simpson section, along west side of U. S. Highway 77, south side of Arbuckle Mountains, Oklahoma.

Remarks.—*Oistodus bilongatus* most closely resembles one of the Plattin specimens of Missouri illustrated as *O. breviconus* Branson and Mehl (1933d, pl. 9, fig. 13, not fig. 14). As in the Joins species, this figure-13 specimen displays elongate, downward curving, dorsally keeled anterior and posterior basal extensions, and long, flattened, sharp-edged, inwardly flexed blade, with recurvature angled above basal expansion. It differs in that these extensions are not basally expanded, thickened (barlike), and aborally flattened, as in the Joins species. The new species is not carinate along inner face of blade, as in such Sweden Lower Ordovician forms as *O. linguatus* Lindström, *O. inaequalis* Pander, and *O. lanceolatus* Pander. The straighter blade of the Joins form is not faintly striate, as in the Sweden Lower Ordovician form *O. gracilis* Lindström (not Branson and Mehl). Basal extensions of the new species are longer, and the inner lateral face is not sharply convex, as in *O. abundans* Branson and Mehl, from the Plattin of Missouri.

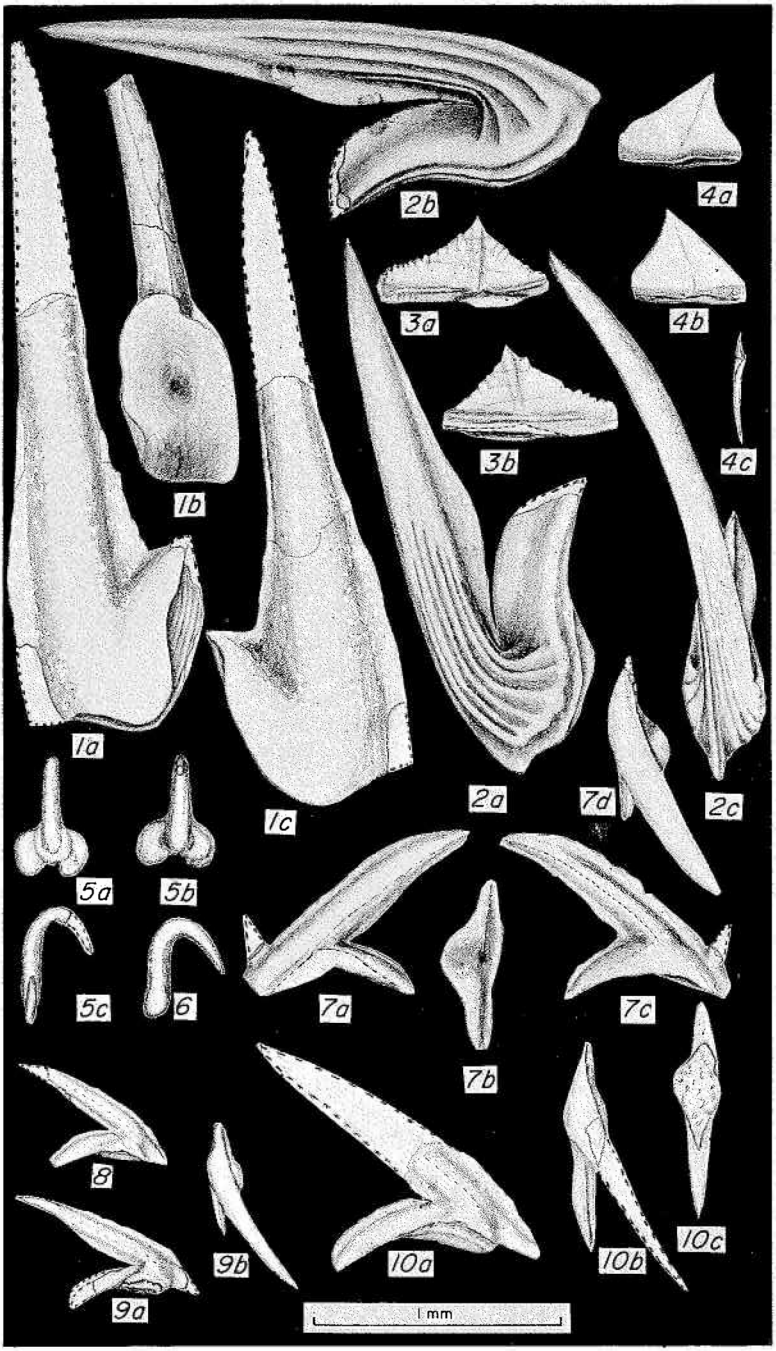
Range.—Several specimens have been observed in upper Joins strata.

The trivial name is a combination of the Latin prefix bi, meaning "two," and the adjective longus, meaning "long," referring to the two prominent basal extensions.

Explanation of Plate I

1. Oistodus angulensis, **n. sp. Holotype OMC 101**
   a. Inner (left) side. b. Basal. c. Outer (right) side.
2. Oistodus multicorrugatus, **n. sp. Holotype OMC 106**
   a. Outer (left) side. b. Inner (right) side. c. Dorsal.
3. Histiodella serrata, **n. sp. Holotype OMC 118**
   a. Inner (left) side. b. Outer (right) side.
4. Histiodella altifrons, **n. sp. Genoholotype OMC 115**
   a. Inner (left) side. b. Outer (right) side. c. Dorsal (apical).
5. Ptiloncodus simplex, **n. sp. Genoholotype OMC 112**
   a. Anterior. b. Posterior. c. Left lateral.
6. Ptiloncodus simplex, **n. sp. Paratype OMC 113**
   Left lateral side of cusp (auriculae displaced)
7. Eofalodus brevis, **n. sp. Genoholotype OMC 109**
   a. Inner (left) side. b. Basal. c. Outer (right) side. d. Dorsal.
8. Oistodus bilongatus, **n. sp. Paratype OMC 104**
   Inner (right) side.
9. Oistodus bilongatus, **n. sp. Paratype OMC 105**
   a. Inner (right) side. b. Dorsal.
10. Oistodus bilongatus, **n. sp. Holotype OMC 103**
    a. Inner (right) side. b. Dorsal. c. Basal.

Plate I


2b
4a
3a
4b
3b
4c
1b
1a
1c
2a
7d
2c
5a
5b
5c
6
7a
7c
7b
8
9b
10a
10b
10c
9a
1 mm

Oistodus multicorrugatus, new species
Plate I, figure 2a-c

Oistodus multicorrugatus has a fairly wide, flattened, elongate, pointed, inwardly flexed, multicorrugated, wide-rimmed blade tightly reclined against a wide and sharply rimmed posterior extension of compressed base with narrow, elongate aboral cavity.

In lateral profile the aboral margin is asymmetrically sigmoidal, the sharply upturned, shorter anterior end terminating beneath incised overhang of anterior rim; the posterior curvature slightly concave and longer. In some specimens a narrow channel borders the aboral margin, extends about anterior nose, and continues within anterior rim of blade. Narrow, elongate, deep aboral cavity (generally filled with "bony" material) has forward-pointing apex located directly below and before tight oral angle; transparency reveals longer, gracefully arching posterior slope and shorter upturned anterior slope of cavity. Posterior extension exceptionally long, high, and carinate orally; in some specimens the posterior extension is so thickened in development that it resembles a secondary, dorsally rimmed tooth.

The elongate, flattened, strongly flexed and rimmed blade bears on its inner surface four or five fairly fine, sharp riblets, and on its outer surface, five or six riblets; the riblets extend from base to approximate midlength of blade, a frontal to near-mid riblet being longest.

Holotype OMC 106 (pl. I, fig. 2) and paratypes OMC 107 and OMC 108 are from the Joins horizon 168 feet above the base of the formation in the Simpson section, along west side of U. S. Highway 77, south side of Arbuckle Mountains, Oklahoma.

Remarks.—The Joins species displays the inwardly flexed blade, sharp oral angle, and long, sinuous aboral base of *Oistodus forceps* Lindström (Lower Ordovician of Sweden), but the Swedish form is not corrugated. Corrugated *Scolopodus rex* Lindström (Lower Ordovician of Sweden) differs generically in its subcylindrical cusp and conical basal cavity. *Distacodus expansus* (Graves and Ellison) (Ordovician of Sweden and Marathon of Texas) displays only one lateral costa and a much more open oral angle.

Range.—Commonly occurring in middle and upper Joins strata.

The trivial name is a combination of the Latin adjective multi, meaning "many," and corrugis, meaning "having folds or wrinkles," referring to the corrugated blade.

Eofalodus, new genus
Genotype.—**Eofalodus brevis**, new species

Eofalodus brevis is an oistodian-falodian form with a single, suberect, secondary denticle developed on produced anterobasal edge of blade (anterior extension of base). The denticle is essentially in plane of blade and axis of basal extension.

Genotype OMC 109 (pl. I, fig. 7) is from the Joins horizon 16 feet above base of the formation in the Simpson section, along west side of U. S. Highway 77, south side of Arbuckle Mountains, Oklahoma.

Remarks.—*Eofalodus*, new genus, is a connecting link between non-

dentate *Oistodus* Pander and multidentate *Falodus* Lindström. It resembles several representatives of the genus *Oistodus* Pander (posterior margin of blade forming sharp angle with oral margin of posterior extension) in which the anterobasal nose of the blade is extended to form an anterobasal bar (see *O. linguatus* Lindström, *O. inaequalis* Pander, and *O. lanceolatus* Pander). The new genus differs from all representatives of the genus *Oistodus* Pander, however, in development of the secondary anterobasal denticle.

The genus *Falodus* Lindström (1954, p. 568) displays more than the single denticle on the produced anterobasal nose of the blade (fig. 2).

The secondary denticle of this genus represents simply an outgrowth through the sharp rim on the produced nose of the blade, i. e., the anterior extension of the base. To accommodate the secondary denticle the underlying basal extension is thickened and barlike (particularly in mature specimens). In this latter respect the anterior bar resembles the thickened anterobasal nose or bar of Joins *Oistodus bilongatus,* new species.

In the genotype the primary blade is subcircular in section (thickened axially) and bears anterior and posterior keels. Possible specific variations in the blade may involve modifications in section (flatter or more angular), absence of rims, or presence of lateral striae or carinae. Likewise, the secondary denticle may vary in section and surface ornamentation.

Range.—Middle Ordovician.

The generic name is derived by combining the Greek word eos, meaning "dawn, early," as prefix to the established generic name *Falodus,* the combination implying falodian ancestry.

Eofalodus brevis, new species
Plate I, figure 7a-d

In lateral view *Eofalodus brevis* shows a downward-arching base, rimmed basal extensions, slightly recurved, axially thickened, rimmed blade, and short, flat, suberect, rimmed secondary anterobasal denticle; elongate basal excavation expanded along inner margin.

Entire aboral surface excavated, narrow, and shallow in basal extensions, deepest in aboral cavity beneath blade. Outer wall of aboral cavity but slightly arcuate and rather abruptly steepened within; inner margin flaring near middle, with anterior curvature or flare shorter and more indented than posterior.

Anterior basal extension is shorter and more compressed than longer, wider, more downward-projecting, barlike posterior extension. Both basal extensions bear dorsal rims.

Dorsal rim of anterior extension bears a short, suberect, sharp-edged denticle that is flattened in plane of blade and axis of aboral cavity.

Elongate, inwardly flexed blade rather strongly reclined posteriorly, its posterior edge straighter than the slightly curving anterior edge. The blade is axially thickened (subcircular in section), with sharply rimmed edges; it becomes flatter apically. Blade may attain a length of one and

one-half that of base; its wider posterior rim is acutely angled with the narrow oral rim of the posterior extension.

Genoholotype OMC 109 (pl. I, fig. 7) and paratypes OMC 110 and OMC 111 are from the Joins horizon 16 feet above base of formation in the Simpson section, along west side of U. S. Highway 77, south side of Arbuckle Mountains, Oklahoma.

Remarks.—*Eofalodus brevis* resembles such ancestral oistodian species with downward-projecting anterior and posterior extensions as *O. linguatus* Lindström and *O. lanceolatus* Pander (Lowermost Ordovician of Sweden), and *O. bilongatus,* new species (Joins). It more closely resembles the Joins species in that both forms display a thick, barlike, rimmed posterior basal extension. *Eofalodus brevis,* new species, displays a more excavated aboral surface, a thicker blade, and the distinctive anterobasal secondary denticle.

This unidenticulate species is ancestral to such multidenticulate forms as *Falodus prodentatus* Lindström (Graves and Ellison, 1941) (Marathon of Texas and Lower Ordovician of Sweden) and *F.* sp. Wolska (1961, p. 350, pl. II, fig. 5) from Ordovician of Poland—both forms displaying at least two secondary denticles.

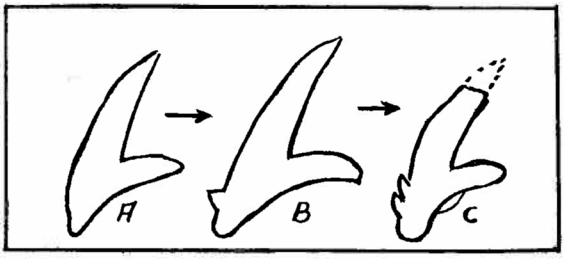


Figure 2. Development of Oistodus **Pander**
A—B O. bilongatus **into** Eofalodus
B—C E. brevis **into** Falodus
C F. prodentatus

Range.—The species has been observed only in lower Joins.

The trivial name is derived from the Latin adjective brevis, meaning "short," referring to the short secondary tooth on the anterior nose or bar.

Ptiloncodus, new genus
Genotype.—**Ptiloncodus simplex,** new species

Ptiloncodus has a simple, subcylindrical, hook-shaped, pointed cusp bearing two subflattened, auricular expansions attached to opposite sides of base at right angles to plane of curvature of "hook" (auricular "wings" are broken off most specimens). There is no basal escutcheon.

Genoholotype OMC 112 (pl. I, fig. 5) is from the Joins horizon 47.5 feet above the base of the formation in the Simpson section, along west side of U. S. Highway 77, south side of Arbuckle Mountains, Oklahoma.

Remarks.—The simple, subcylindrical, hooked, pointed shaft of this genus (with "wings" missing) slightly resembles some recurved representatives of the Lower and Middle Ordovician fibrous genus *Stereoconus* Branson and Mehl (neither genus possesses basal escutch-

eon). The new genus differs in its characteristic hook-shaped cusp and basal "wings."

Some specimens of the subcylindrical shaft, slightly inflated at base, bear placental scars of displaced "wings." The cusp of some specimens is slightly beveled on both lateral sides below the recurved "hook."

The two auricular "wings" were probably never inflated—they do not appear collapsed, though indistinct, partial, subconcentric ridges apear on one or both lobes.

Range.—Middle Ordovician.

The generic name is obtained by combination of the Greek words ptilotus, meaning "winged," onkos, meaning "hook," and odous (odon), meaning "tooth," the combination thus meaning "winged hook tooth."

Ptiloncodus simplex, new species
Plate I, figures 5a-c, 6

In *Ptiloncodus simplex* a minute, subcylindrical, apically pointed, hook-shaped shaft is but slightly inflated basally and but faintly flattened and beveled (though not keeled) along the lateral sides below "hook." Base of shaft is bluntly rounded. Hooked end of shaft beyond bend is fairly straight, not strongly recurved.

Two flattened, subovate, auricular lobes are attached to opposite sides of shaft base at right angles to plane of curvature of hook; attachment areas of lobes are slightly depressed. Indistinct, elongate placental scars occur on base of some shafts, where auricular lobes are missing. A distinct basal gap below the shaft separates the two lobes. Surfaces of lobes are smooth, though marked with one or two indistinct, irregularly broken, subconcentric semiridges.

Genoholotype OMC 112 (pl. I, fig. 5) and paratypes OMC 113 (pl. I, fig. 6) and OMC 114 are from the Joins horizon 47.5 feet above the base of the formation in the Simpson section, along west side of U. S. Highway 77, south side of Arbuckle Mountains, Oklahoma.

Remarks.—This species is smaller, definitely more hook-shaped, and more evenly cylindrical than *Stereoconus maximus* Rhodes (Pen-y-garnedd= Caradocian of North Wales); neither does the latter display the characteristic basal lobes of the Joins species. The Joins form is smaller, more symmetrically cylindrical, and more hooked than are several species of the genus *Stereoconus* Branson and Mehl from the Harding Formation of Colorado (*S. gracilis* Branson and Mehl, *S. robustus* Branson and Mehl, and *S. plenus* Branson and Mehl). No basal lobes characterize the Harding forms.

Range.—Many specimens have been observed in lower and middle Joins strata. Though the lateral "wings" are missing from the majority of Joins specimens, the tiny, cylindrical, hook-shaped shaft is readily recognizable.

The trivial name is derived from the Latin word, simplex, meaning "simplicity," referring to the smooth surface and edges of the shaft.

Histiodella, new genus
Genotype.—**Histiodella altifrons,** new species

Histiodella has an exceedingly flat (scalelike), asymmetrically triangular plate with indistinct, near-median, vertical rib developed into

apical spine, the whole resting upon a low, elongate base with aboral cavity and subapical, flared navel. Dorsal peripheries are sharp to serrate; surface is smooth, papillose, or striate. On some forms a low, longitudinal, lateral ridge marks junction of flat plate and base.

Genoholotype OMC 115 (pl. I, fig. 4) is from the Joins horizon 39 feet above the base of the formation in the Simpson section, along west side of U. S. Highway 77, south side of Arbuckle Mountains, Oklahoma.

Remarks.—This flattened, triangular, saillike genus with shallow, elongate aboral cavity is a primitive conodont, the dorsal edges not having developed distinctly separate teeth. The serrated edges of *Histiodella serrata,* new species, however, suggest the initial step of separate teeth. With increasing size, arching of the base, and development of individual teeth, this genus conceivably would become subtriangular, dentate *Ozarkodina* Branson and Mehl.

Two species of the genus occur in the Joins formation. The smaller holotype *H. altifrons,* new species (pl. I, fig. 5), sharp-edged and nonserate, first occurs 39 feet above base of the formation. The larger serrate species *H. serrata,* new species (pl. I, fig. 4), first occurs 187 feet above base of the formation.

Range.—Middle Ordovician.

The generic name is derived by combination of the Greek noun histion, meaning "sail," with the diminutive form of the Greek word odous (odon), meaning "tooth."

Histiodella altifrons, new species
Plate I, figure 4a-c

In lateral view *Histiodella altifrons* shows an exceedingly flat, asymmetrically triangular, apically pointed, snow-white, porcellaneous, saillike plate above a low, flat, elongate, transparent, slightly twisted base with elongate, narrow, slightly flared aboral excavation.

The smooth, triangular, white plate has sharp (not serrated) dorsal edges. The anterior slope is slightly longer and straighter than the steeper and slightly concave posterior slope. Anterior nose of plate is taller and more bluntly rounded than the more acutely angled posterior nose. A narrow, indistinct, slightly inclined (posteriorly) median rib terminates in the apical spine. In some specimens, a low, indistinct, threadlike, lateral thickening marks the contact of the porcellaneous plate with the underlying transparent base.

Transparent base (continuation of plate) may be slightly thinner and more twisted than the overlying plate. Its anterior end is taller.

Aboral cavity of base is elongate, narrow, and twisted (sigmoidal) along its axis—the twisting is outward anteriorly and inward posteriorly. Slightly flared lips emphasize sigmoidal curvature of the cavity. The subapical pit is shallow.

Genoholotype OMC 115 (pl. I, fig. 4) and paratypes OMC 116 and OMC 117 are from the Joins horizon 39 feet above the base of the formation in Simpson section, along west side of U. S. Highway 77, south side of Arbuckle Mountains, Oklahoma.

Remarks.—This species differs from upper Joins *Histiodella serrata,* new species, in its slightly smaller size, absence of serrated dorsal edges,

and concavity of posterior, rather than anterior, dorsal slope.

Range.—Several specimens have been recovered from lower Joins strata.

The trivial name is derived by combination of the Latin words altus, meaning "high," and frontis, meaning "fore part," referring to the taller anterior end (anterior nose) of the base.

Histiodella serrata, new species
Plate I, figure 3a,b

Histiodella serrata has an extremely flat, asymmetrically subtriangular, peripherally serrated, apically pointed, white, porcellaneous plate with slight posterior inclination of indistinct midrib that terminates in an apical spine, the whole resting upon a low, flattened, elongate, slightly sigmoidal, transparent base with narrow, elongate aboral excavation and apical pit.

Both the longer, slightly concave anterior edge and the shorter, steeper, straighter posterior edge are serrate. Posterior nose of plate is more acute and slightly upturned. Anterior nose of plate is taller because of taller anterior end of underlying base.

A thin lateral keel (or partial keel) marks contact of plate with transparent base (particularly on inner posterior side). Aboral cavity is narrow, elongate, and follows sigmoidal curvature of base (bent outward anteriorly and inward posteriorly). Flaring lip (particularly posteriorly) accentuates the curvature. A shallow, subapical pit marks deepest part of cavity.

Holotype OMC 118 (pl. I, fig. 3) and paratypes OMC 119 and OMC 120 are from the Joins horizon 187 feet above the base of the formation in the Simpson section, along west side of U. S. Highway 77, south side of Arbuckle Mountains, Oklahoma.

Remarks.—The larger size and serrated dorsal edges serve to differentiate this species from *H. altifrons,* new species, in the lower Joins.

Range.—Several specimens have been recovered from middle and upper Joins strata.

The trivial name is derived from the Latin word serratus, meaning "toothed as a saw," referring to the serrated dorsal edges of the species.

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Additional Fossils from the Bois d'Arc Formation in the Southeastern Part of the Arbuckle Mountains Region

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Throughout much of the southeastern part of the Arbuckle Mountains region, in parts of Pontotoc, Coal, Johnston, and Atoka Counties, the Bois d'Arc Formation rests unconformably on the Cochrane Member of the Chimneyhill Formation. This is an unconformity of some magnitude as it brings the Lower Devonian (Helderbergian) strata in contact with the Lower Silurian (Alexandrian) strata. These stratigraphic relationships were first noted by Maxwell (1936, pl. 5) and have been confirmed by all subsequent investigators who have done detailed work in this region (Ham and Oakes, 1944, p. 417, 420, figs. 1, 2; Amsden, 1960, p. 220, panel III). I have already described the lithostratigraphic and biostratigraphic relationships in this area, including stratigraphic sections where Helderbergian fossils can be collected from strata immediately overlying the Cochrane (stratigraphic sections P9, A2; Amsden, 1958b, p. 13-14; Amsden, 1960, p. 181, p. 279-282). In the spring of 1962 I again spent several days examining and collecting from the well-exposed Hunton outcrops located a few miles west of Wapanucka (fig. 1). This is an important area, which includes the type locality of the Cravatt Member of the Bois d'Arc Formation (Maxwell, 1936, p. 84), the manganese deposits described by Ham and Oakes (1944, p. 434), and my described stratigraphic sections j6 and j7 (Amsden, 1960, p. 220). At four different localities I was able to collect a number of well-preserved Helderbergian fossils from the lower part of the Bois d'Arc Formation. Throughout the area this formation is fossiliferous, and any interested person could easily duplicate or even enlarge on the collections cited below with a day or so of collecting.

The Bois d'Arc Formation crops out in both the Arbuckle Mountains region and the Criner Hills of south-central Oklahoma. It is divided into two members or lithofacies: the Cravatt Member, consisting of marlstone with varying amounts of chert, and the Fittstown Member, composed of bioclastic calcarenites, also with variable quantities of chert (Amsden, 1958b, p. 8-15; Amsden, 1960, p. 99-125). The Cravatt generally underlies the Fittstown, although no well-defined boundary separates them, there being a complete gradation between the two rock types. In some areas the Fittstown calcarenites are not well developed and the entire Bois d'Arc is represented by the Cravatt cherty marlstone facies. The Bois d'Arc generally rests upon the Haragan Formation, but these strata are also facies of one another and in some areas the entire Bois d'Arc grades laterally into and completely replaces the Haragan. The Haragan and Bois d'Arc Formations carry similar faunas and are assigned to the Helderbergian stage, the fossils being much like those from the New Scotland Formation of the eastern United States (Amsden, 1958a, p. 18-24; 1958b, p. 22-25). Throughout much of the outcrop area in the Arbuckle Mountains-Criner Hills region the Haragan-Bois d'Arc strata rest on the Henryhouse Formation of late Niagaran (early Ludlovian) age (fig. 2). However, as noted above, there is a fairly large area

in the southeastern part of the Arbuckle Mountains region where the Henryhouse and Clarita are generally absent and the Haragan or Bois d'Arc (commonly the latter) rests upon Early Silurian or older strata (Amsden, 1960, panel III). Throughout the outcrop belts west of Wapanucka (fig. 1) the Bois d'Arc Formation, which here is entirely in the Cravatt facies, rests directly upon the Cochrane Member of the Chimneyhill Formation (fig. 3). The strata are well exposed and the actual Cravatt-Cochrane contact may be observed at several places. Representatives of 19 different Helderbergian species were collected from the lower part of the Cravatt at four different localities, including the type locality (fig. 1).

The type locality of the Cravatt Member is a short distance west of Delaware Creek in the SW¼ sec. 2, T. 2 S., R. 7 E. (fig. 1). The Cravatt consists of about 75 feet of well-bedded marlstones with numerous chert nodules. It is overlain by the Woodford Formation and underlain by the Cochrane Member of the Chimneyhill Formation. The latter is about 15 feet thick and is composed of highly glauconitic and cherty bioclastic calcarenites in irregular beds. The Cravatt-Cochrane contact is not perfectly exposed but can be located within a couple of feet. The Cochrane is underlain by the Keel Oölite, mostly in slump blocks; the Sylvan contact is not exposed. The Cravatt is fossiliferous

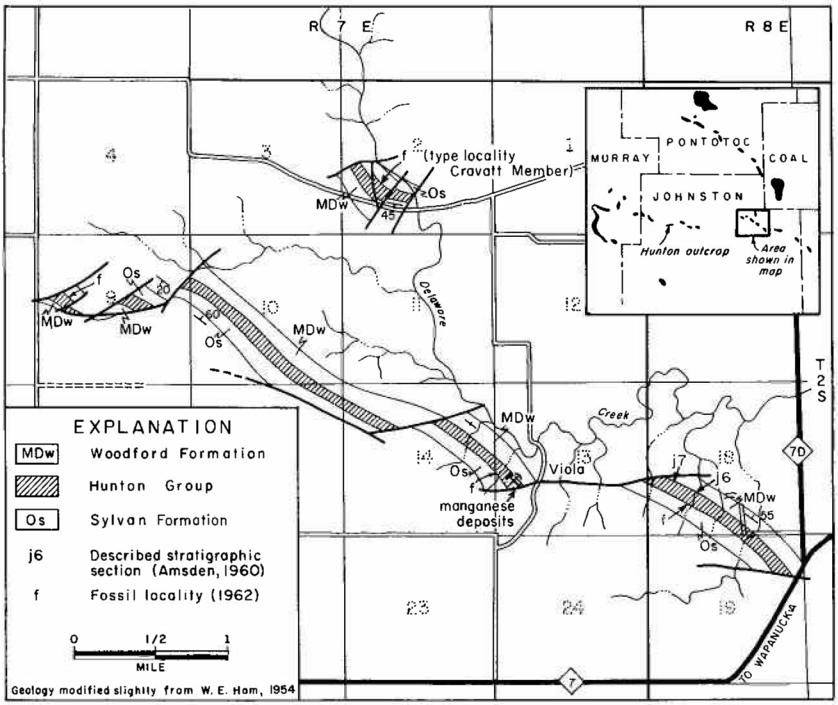

Figure 1. Map showing Hunton outcrops in the area discussed in this report. Outcrop width exaggerated.

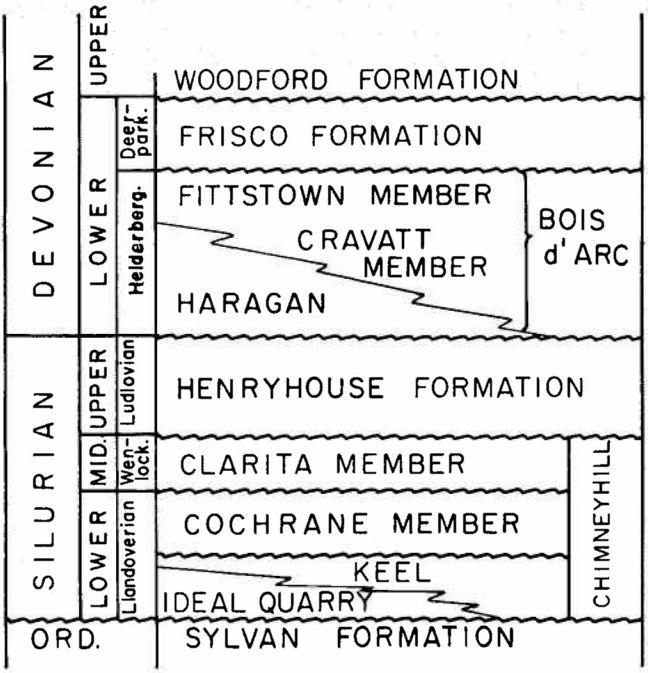

Figure 2. Complete stratigraphic section of the Hunton Group.

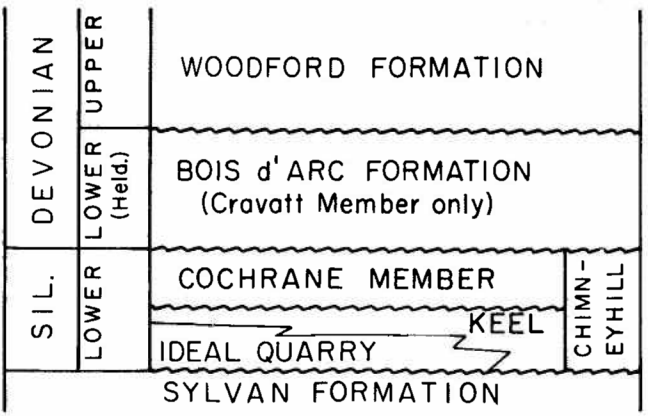

Figure 3. Stratigraphic section of the Hunton Group in the area shown in figure 1.

and specimens can be collected from both the cherts and the marlstones, the latter yielding silicified specimens of *Leptocoelia*. The following fossils were collected from strata 20 to 25 feet above the base of the formation: *Orthostrophia strophomenoides parva, Rhipidomelloides oblatus*?, *Strophonella bransoni, Leptaena acuticuspidata, Sphaerirhynchia lindenensis, Schuchertella* sp., *Leptocoelia* sp. (fig. 4), *Meristella atoka, Howellella cycloptera,* and *Phacops* sp. This is a typical Helderbergian assemblage. In previous publications (Amsden 1958a, 1958b) I have described all of these brachiopods except *Leptocoelia* sp. (fig. 4), which has not heretofore been recorded from the Hunton Group of the Arbuckle region. This genus is unknown in North American strata older than Helderbergian.

A collection was made from the Cravatt in the westernmost exposures shown in figure 1. This is a small outcrop in the SW¼ NW¼ sec. 9, T. 2 S., R. 7 E., Johnston County. The cherty marlstones of the Cravatt rest directly upon the glauconitic and bioclastic limestones of the Cochrane. The Cochrane is about 30 feet thick and is underlain by the Keel Oölite. Both the cherts and the marlstones of the Cravatt are fossiliferous and the following brachiopods were collected from beds 25 to 35 feet above the base: *Leptaenisca concava, Strophodonta gibbera, S. arata, Strophonella* sp., *Sphaerirhynchia lindenensis, Costellirostra singularis, Kozlowskiellina* sp., and *Meristella atoka.* I have described and illustrated these species of this typical Haragan-Bois d'Arc assemblage in previous publications (Amsden 1958a, 1958b).

A few fossils were collected from the Cravatt in the outcrop belt just west of Viola in the NW¼ SW¼ sec. 13, T. 2 S., R. 7 E. (fig. 1). The Chimneyhill in this area carries the manganese deposits described by Ham and Oakes (1944, p. 434, figs. 1, 2). Throughout this belt the cherty marlstones of the Cravatt rest directly upon the Cochrane, and blocks of Keel Oölite are present at the base of the Cochrane. The following fossils were collected from the lower 30 feet of the Cravatt: *Schellwienella* sp., *Costellirostra singularis, Sphaerirhynchia lindenensis, Meristella atoka,* and *Kozlowskiellina (M.) velata.*

A B C

Figure 4. Leptocoelia sp. **Silicified specimens collected from the Cravatt Member about 20 feet above the base; SW¼ sec. 2, T. 2 S., R. 7 E., all x2. Paleontological collections, The University of Oklahoma.**

A. Pedicle view, specimen OU 5054.

B. Pedicle view, specimen OU 5055.

C. Brachial view, specimen OU 5055.

In 1960 the writer (Amsden, 1960, p. 220) described a Hunton section (j6) in the E½ SW¼ sec. 18, T. 2 S., R. 8 E. (fig. 1). At this locality the Cravatt rests directly upon the Cochrane, the contact being completely exposed for some distance. Beneath the Cochrane are excellent exposures of the Keel and Ideal Quarry Members, and erosion from recent rains has now exposed the Sylvan Shale. The Cochrane, Keel, and Ideal Quarry Members have a combined total thickness of only 8 feet so the Cravatt Member of the Bois d'Arc Formation can be *observed* within less than 10 feet of the Ordovician. In April of 1962 I collected the following fossils from a zone 5 to 25 feet above the base of the Cravatt: *Orthostrophia strophomenoides parva*?, *Levenea subcarinata pumilis, Leptaena acuticuspidata, Strophonella bransoni, Costellirostra singularis, Anopliopsis* sp., *Sphaerirhynchia lindenensis, Meristella atoka,* and *Phacops* sp. The only other fossils collected are one small solitary coral and a sponge resembling a *Hindia.*

At all these localities the Henryhouse and Clarita are absent, the Cravatt Member of the Bois d'Arc resting directly upon the Lower Silurian Cochrane Member. The fauna collected is the typical Haragan-Bois d'Arc Helderbergian assemblage like that obtained from these strata at old Hunton townsite, Bois d'Arc Creek, White Mound, and elsewhere. All these collections were made in close stratigraphic proximity to the Ordovician, that from stratigraphic section j6 being within 35 feet of the Sylvan Shale.

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