

***Grafordites mcleodi*, a new Pennsylvanian cephalopod from Texas, southern Midcontinent, North America**

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Abstract: A unique specimen of middle Missourian (Late Pennsylvanian; Late Carboniferous) orthoconic cephalopod was collected from the Lake Bridgeport Shale of the Graford Formation in north-central Texas, southern Midcontinent, North America. On the basis of this specimen we describe *Grafordites mcleodi* gen. et sp. nov., whose important diagnostic features are imbricated surface bands, very deep and conical septum, and narrow siphuncle having a supracentral position. The higher taxonomic placement of *Grafordites* is unclear.

Introduction

The Pennsylvanian Graford Formation (Plummer, 1919; Plummer and Moore, 1921) is a shallow marine deposit consisting mainly of shale and limestone with minor amounts of sandstone. It is widely exposed in Palo Pinto, Jack and Wise Counties, north-central Texas, southern Midcontinent, North America. Scott and Armstrong (1932) subdivided the formation into five units on the basis of lithologies; these are the Lake Bridgeport Shale, the Rock Hill Limestone, the Jasper Creek Shale, the Chico Ridge Limestone, and the Devil's Den Limestone. The purpose of this paper is to describe a unique specimen of orthoconic cephalopod from the Lake Bridgeport Shale which represents the lowest unit of the formation and belongs to the *Preshumardites* Ammonoid Zone indicating middle Missourian (early Kasimovian; Late Carboniferous) age (Boardman et al., 1994). The new specimen was obtained from a low-water outcrop of nodular reddish-brown shale exposed along the southwest shore of Lake Bridgeport at Runaway Bay, Wise County (Figure 1). Together with orthoconic nautiloid cephalopods, this locality also yields a molluscan dominated invertebrate fauna including gastropods (*Worthenia*, *Trepostira* and *Glabrocingulum*), coiled nautiloids, and goniatitid ammonoids (McLeod, personal communication). This new cephalopod and the Graford fauna described by previous workers (e.g., Petty, 1975; Hoare et al., 1996; Rigby et al., 2008) represent a biotic community that lived in the neritic zone along the southern margin of Laurentia (Erleben, 1973).

Systematic Paleontology

Class Cephalopoda Agassiz, 1847

Subclass and order uncertain

Family Dentoceratidae Ruzhentsev and Shimansky, 1954?

Genus *Grafordites* gen. nov.

Type species.—*Grafordites mcleodi* sp. nov., by monotypy.

Diagnosis.—Orthoconic longicone having moderate conch expansion, subcircular cross sections and very long body chamber; transverse imbricated bands of surface ornamentation indicate dorsolateral (= ocular) and ventral (= hyponomic) sinuses; septum very deep, conical; siphuncle narrow, supracentral located near midway between center of conch and dorsal margin.

Etymology.—The generic name is derived from the Graford Formation.

Discussion.—The living orientation of the present specimen can be inferred by the sinuses on the exterior surface of the conch. The specimen has subcircular cross sections which bear two kinds of sinuses; one is at the anti-siphuncular side of the conch and the other is on the lateral side of the conch. The counterpart of the lateral sinus is not observable because the bilaterally symmetrical part of shell is embedded in concretionary matrix. We determined that the former is the ventral hyponomic sinus and the latter forms an ocular sinus.

Very deep and conical septum with bluntly pointed apex of *Grafordites* gen. nov. excludes it from almost all known Late Palaeozoic genera of longiconic cephalopods. The only known exception is the Permian genus *Dentoceras* Ruzhentsev and Shimansky, 1954, which has similar septal

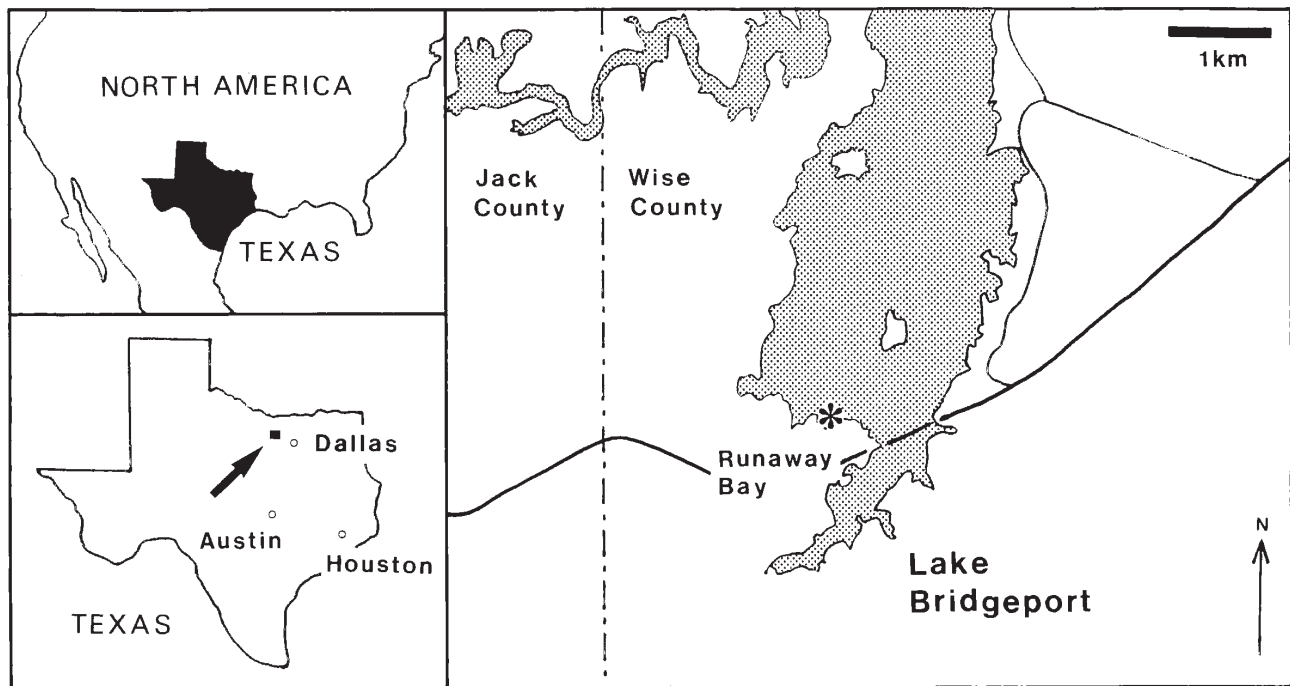


Figure 1. Location map showing fossil locality (asterisk) on the southwest shore of Lake Bridgeport in Wise County, north-central Texas. Inset maps indicate the general position of the area.

character as *Grafordites*. The higher taxonomic placement of *Dentoceras* is currently uncertain. Ruzhentsev and Shimansky (1954) originally assigned the genus to the family Dentoceratidae of the Nautiloidea. Subsequently, Kummel (1964) placed the genus in the Scyphoceratidae, whose family also belongs to the Nautiloidea. On the other hand, Flower (*in* Gordon, 1964) treated it as a genus of the Oncocerida. Although *Dentoceras* is distinguished from *Grafordites* at the generic (and familial?) level by the possession of a gently cyrtoconic conch and a single longitudinal groove on the ventral side of septum, they may belong to an identical group (family?). Therefore, the higher taxonomic placement of *Grafordites* is also unclear and additional and more complete specimens of *Dentoceras* and *Grafordites* are required to solve these questions.

***Grafordites mcleodi* sp. nov.**

Figure 2

Diagnosis.—As for the genus.

Description.—An incomplete longiconic orthocone was available for study; it is 45.5 mm in length, consisting of the last septum and very long body chamber, the latter of which indicates moderate expansion of approximately 5°; cross sections of conch are subcircular and may have faintly angulate ventrolateral and dorsolateral corners;

dorsoventral diameter at the apical end is 7.0 mm; peristome not preserved; ratios of preserved length of body chamber per dorsoventral conch diameter at the adoral end are approximately 5.5. Shell surface ornamented by imbricated and relatively wide bands, 0.6–1.3 mm in width; the bands are roughly transverse and with a very shallow to shallow dorsolateral (= ocular) sinus and a very shallow ventral (= hyponomic) sinus; each band has gentle adapical slope and steep adoral one. Suture is not observable; septum very deep, conical with bluntly pointed apex; ratio of septal depth per maximum septal width is approximately 0.8; weak adapical projection occurs on septum at siphuncular foramen; siphuncle supracentral and located near midway between center of conch and dorsal margin; diameter of siphuncle is narrow, approximately 0.6 mm at foramen; septal neck and connecting ring are not preserved; neither endosiphuncular and cameral deposits are observable. Shell ultrastructure not preserved.

Material examined.—Holotype, AMNH 6015, which is deposited in the American Museum of Natural History in New York.

Etymology.—The specific name honors Mr. John McLeod, who discovered the holotype.

Age.—Middle Missourian (Late Pennsylvanian; Late Carboniferous).

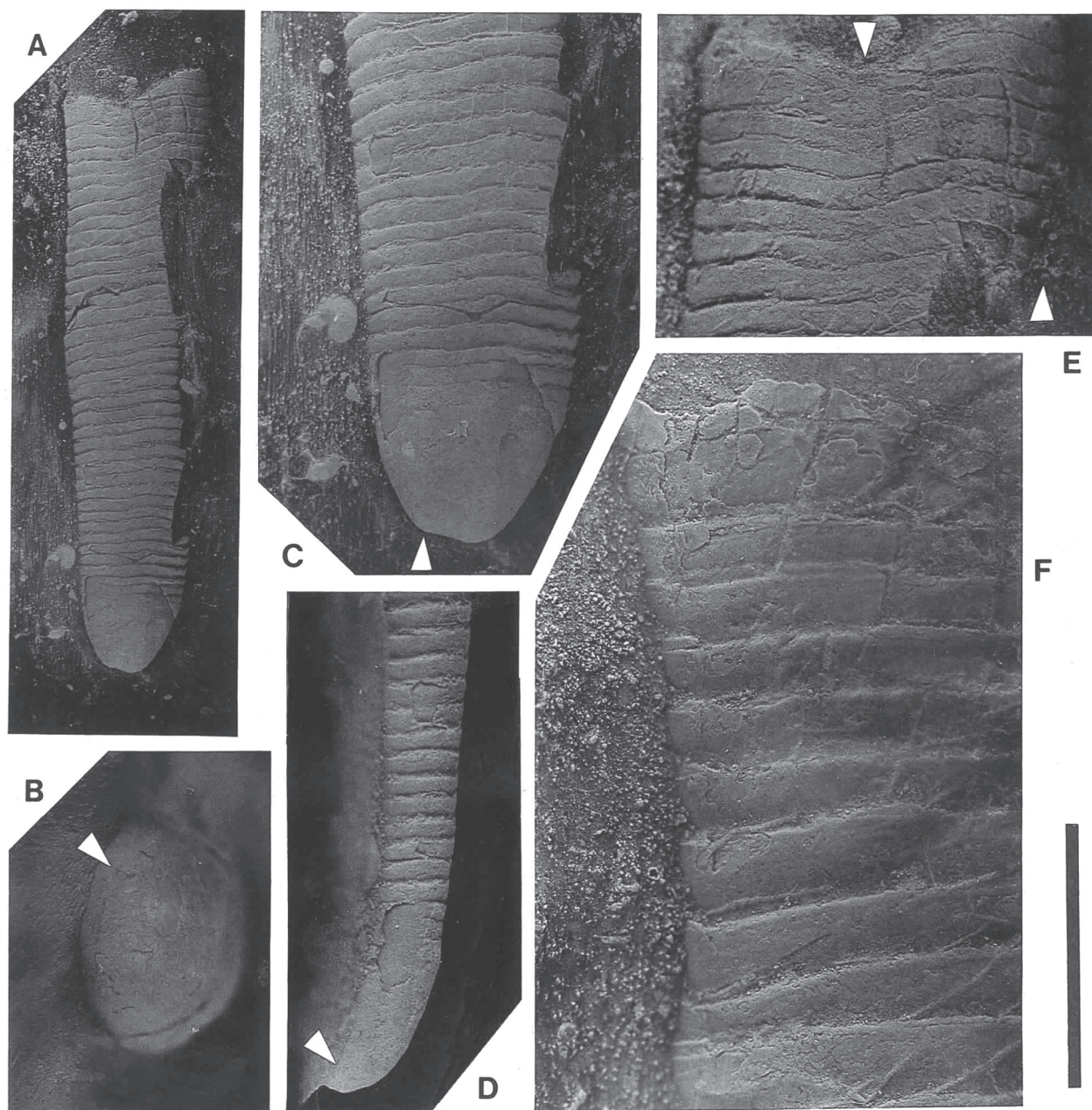


Figure 2. *Grafordites mcleodi* gen. et sp. nov., holotype, AMNH 6015. **A.** Lateral view, venter on right. **B.** Septal view of apical end, venter down, arrow indicates siphuncle. **C.** Details of apical shell, partial enlargement of A, arrow indicates siphuncular position. **D.** Details of apical shell, dorsal view; arrow indicates siphuncle. **E.** Details of adoral shell, partial enlargement of A, arrows indicate respectively ocular (left) and hyponomic (right) sinuses. **F.** Details of adoral shell, partial enlargement of A, note surface ornamentation consisting of imbricated bands. Scale bar is 20 mm in A; 8 mm in B and E; 10 mm in C and D; 4 mm in F.

Acknowledgements

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