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A New Limoid Bivalve from the Texas Middle Permian

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ABSTRACT

Fossils described as *Gloverilima pratti* new genus and new species are all from a single locality in West Texas. Equally informative Permian limoids are not known elsewhere in the world. Usually they are represented by poorly preserved small collections, or single specimens in which hinge characters are not observable. Inevitably, they are species in name only.

INTRODUCTION

Paleozoic limoids are rare fossils, usually poorly preserved. Consequently, when I encountered a comparatively abundant sample mostly from a single locality (AMNH 512) among the West Texas silicified faunas I was jubilant. Certainly there are no equally informative Permian examples known elsewhere. Usually they are represented by poorly preserved single specimens in which hinge characters are not observable, and inevitably, they have been recorded as typological species. The collection at hand consists of approximately sixty recognizable fragments of both right and left valves.

Apparently right and left valves are about equally distributed. It is likely that many were destroyed when deposited, or broken in acid preparation. Otherwise, the preservation is good, except that the inner layer with muscle impressions is missing. However, Waller pointed out (personal correspondence) that in modern limids, the inner aragonite layer extends up to the base of the ligament area, meaning that any hinge teeth that were present would also be missing if this layer is absent.

The shells occur as siliceous pseudomorphs in limestone lenses of the Lower-Getaway Member, Cherry Canyon Formation, in an acre or so around the Pine Spring tourist lodge on the old Glover Ranch that is located on the Carlsbad-El Paso highway

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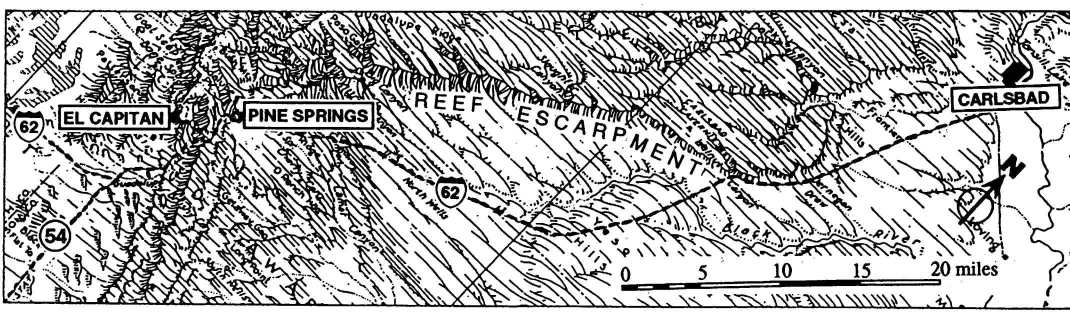

Fig. 1. Permian limoid locality, Pine Springs, Texas.

(fig. 1). The age is Early Guadalupian (Middle Permian), and the associated rich diverse fauna, also silicified and well preserved, includes bivalves, brachiopods, snails, and sponges. Originally it was thought that many of the fossils were in small bioherms, but studies by many investigators strongly indicate that none, if any, of these fossils are in situ. The valves of brachiopods, limoids, and pectinoids invariably are separated and contained in lenses of debris shed from forereef slopes.

Experience with the bivalves (Newell and Boyd, 1995) indicates that both intensity and duration of sampling are important. As with any sampling technique, both quality and quantity are expanded with increase in effort. With fossils, it is particularly difficult to learn the characteristics and boundaries of species.

The Pine Spring locality was a convenient stopping place on a main highway, where blocks of limestone with contained silicified fossils were readily available with minimal expenditure of time and effort. The limoid collection dates from the early 1940s through the late 1980s, and includes the dedicated efforts of a long succession of field teams of one-half dozen or so graduate students from the American Museum of Natural History and Columbia University. They used the Pine Spring motel as a base of operations for a systematic study of the paleoecology of the Guadalupe Mountains (Newell et al., 1953). Probably no other collecting locality in West Texas has received so much attention.

Consequently, I have abandoned here the use of "rare," "common," and "abundant" as meaningless terms for characterizing a fossil assemblage, since there are many variables that determine the result. A single visit to the Pine Spring locality very likely would fail to unearth many of the species that are well represented in collections.

Acknowledgments

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SYSTEMATICS

ORDER LIMOIDA WALLER, 1978

Usually the limoids have been placed in a single family, Limidae Rafinesque, 1815. Stuardo (1968), in a large, but as yet unpublished, anatomical study of the family Limidae found that there are more than 100 published generic and specific names of Recent forms, from which he selected only about 30 as valid. He introduced two additional subfamilies which, of course, are nomina nuda.

Waller (1978) and Gilmour (1990) have shown that the limids possess enough unique anatomical traits (e.g., different placement of muscles, see fig. 2) to logically constitute a

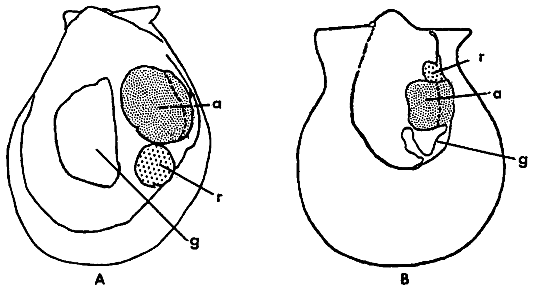

Fig. 2. Contrasting musculature showing reversal of some muscles of a living limid, **A** (Stuardo, 1968), and an aviculopectinacean, **B** (Newell and Boyd, 1995). Both are left valves; **a** = adductor, **r** = pedal retractor, **g** = gill suspensor.

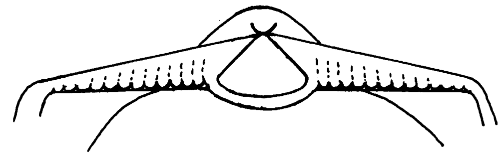

Fig. 3. Hinge of living limoid from Australia, *Gemellima austrina* (Tate), 1887 (p. 73), showing retention of juvenile denticles into adult stage. Original sketch greatly enlarged, from AMNH specimen.

separate order, the Limoida, a taxon used here.

Unlike other bivalves, limoid larvae undergo metamorphosis in which there is a horizontal counterclockwise rotation through 180° of both shell and visceral mass, relative to the foot (fig. 2). This is accompanied by loss of the anterior adductor while bilateral symmetry is retained. However, in life, the valves are vertical instead of horizontal as with the pectens. The limoids also retain this orientation while swimming or climbing with the foot and byssus (Waller, 1976).

Tunnicliff (1987) has introduced *Myodakryotus,* probably a duplivincular cyrtodont from the Middle Ordovician of Wales, as a genus and for a family. It may be a progenitor of both limoids and pectinoids. It belongs to neither, however, because it is dimyarian. Paleontologists have been frustrated by limoid intrapopulation variability, and by the fact that the few taxonomic characters are a mosaic of form and size. Limoids have certain characteristic traits that can be appreciated by an examination of illustrations in the Treatise on Invertebrate Paleontology (Cox and Hertlein, 1969). The ligament invariably is alivincular-amphidetic and the shell is equivalved, slightly higher than long, and projected forward. The hinge is relatively short, the auricles small, and the beaks prominent, enclosing large umbonal cavities. The shells may be either smooth or radially ribbed.

The specimens at hand are very finely costellate and lack plicae. Some retain larval pseudotaxodont denticles well into the adult shell stage (figs. 3, 4), but denticles are completely lacking in others. Since both conditions are seen in associated individuals, I consider all to be members of a single population. Cox (1944) also cited evidence that the retention of prodissoconch denticles in adult limoids is probably not of taxonomic significance.

Branson (1948) listed 16 Permian limoids worldwide, most of which are poorly documented and must await revision based on adequate material. Some were said by the authors to include both coarsely and finely ribbed, or even smooth, shells. In no case, as far as I know, have any been tested by population analysis. Because of the insecure taxonomy of the Paleozoic limoids, it is not practical to use a family rank for the Texas fossils.

Gloverilima Newell, new genus

Type Species: *Gloverilima pratti* Newell, new species.

Diagnosis: Surface usually with very fine costellae; shell somewhat pear shaped, with slender necklike umbones slightly twisted forward bearing sharp beaks; hinge short, about one-half length of shell, with broad, flattened ligament area and elongate median resilifer tilted obliquely forward, its apex lying just below beak.

Distribution: Middle Permian, West Texas.

Etymology: The genus and species names are in recognition of the good will and help of, respectively, the Walter Glover family and Wallace Pratt, a local landowner and eminent geologist.

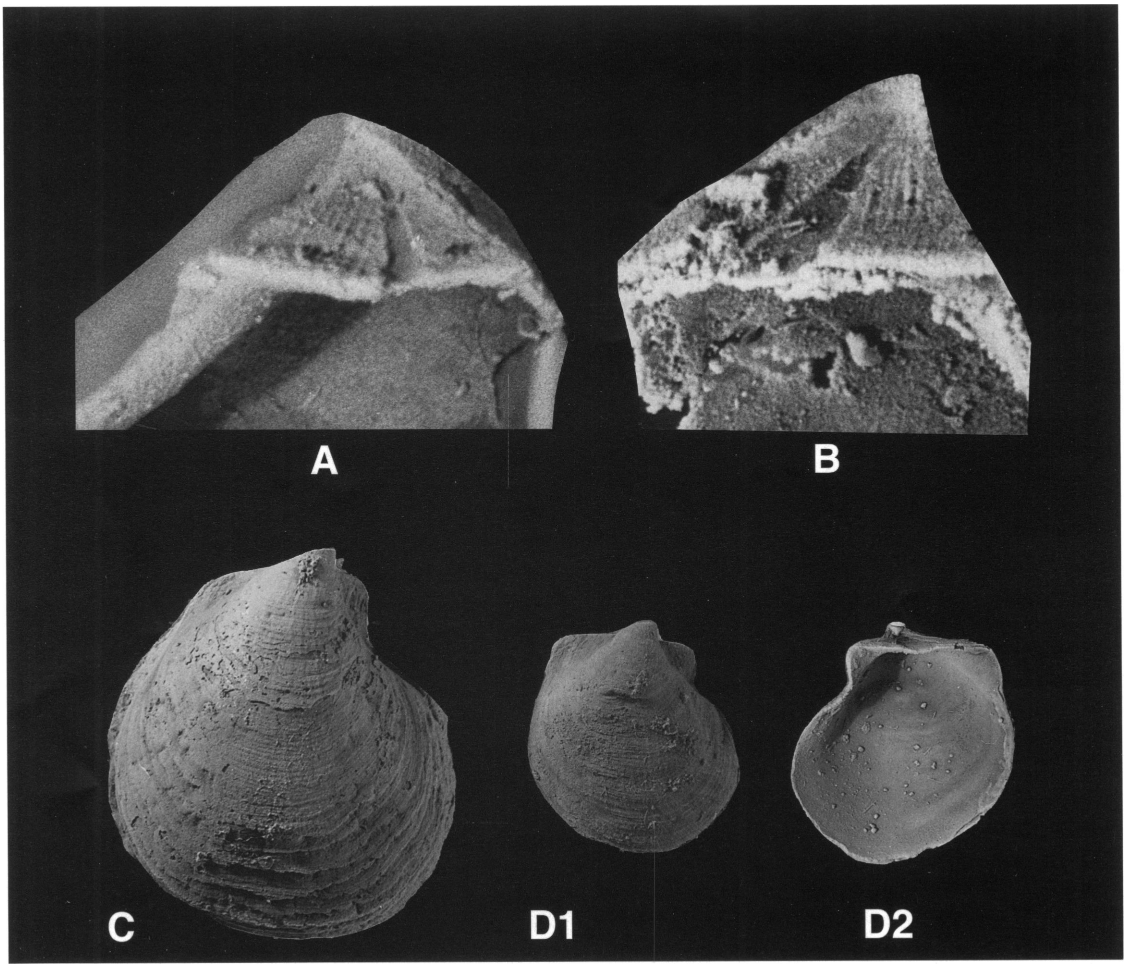

Fig. 4. *Gloverilima pratti* Newell, new species. All from AMNH loc. 512. **A,** right valve, ×10, AMNH 44084, showing flat ligament area with median resilifer and growth traces of juvenile pseudotaxodont dentition in front of resilifer. **B,** left valve, ×10, of another specimen, AMNH 44085. **C,** large right valve (height 27 mm), ×2, AMNH 44086, holotype showing characteristic faint ribs and forward twisted, protuberant umbo. **D1, D2,** right valves ×2, AMNH 44087, illustrating characteristic form and hinge of the species, but lacking the juvenile denticles. Shell height 16 mm.

DISCUSSION: There are three Late Paleozoic genera that should be considered here. I reject both *Gryphellina* Newell, 1940, and *Palaeolima* Hind, 1903, as being unrecognizable.

The type species of *Palaeolima* is *Pecten simplex* Phillips, 1836 (p. 212, and plate VI, fig. 27). The original specimens have long since disappeared and topotypes are not available. Hind himself (1903: 39) stated that he followed M'Coy who described the right valve of *P. simplex* as flat.

The type species of *Gryphellina* Newell, 1940, was designated as *Capulus sellardsi* Beede, 1907, regarded by its author as a gastropod. Knight (1940) confirmed that Beede's *Capulus* was indeed a gastropod. In 1940 I referred to bivalves from the Dozier Dolomite in Texas as *C. sellardsi* (Newell, 1940: 288–290). This was a mistake. They do not resemble Beede's gastropods and add nothing to an understanding of that taxon. I now take the position that the Dozier material was unnamed and conspecific with the new species, *Gloverilima pratti.*

Elimata Dickins, 1963, from the Permian of Australia, is a genus that has turned up in the Guadalupe Mountains and elsewhere. It is similar, but has a smooth shell and lacks the distinctive umbones of *Gloverilima.* Its hinge is unknown.

Gloverilima pratti Newell, new species
Figure 4

DIAGNOSIS: As for the new genus, *Gloverilima.*

DISTRIBUTION: Middle Permian, Guadalupian, West Texas, AMNH loc. 512; and Univ. Kansas locs. 4–9, near Dozier, north West Texas; and Univ. Kansas loc. 1, Whitehorse Springs, Oklahoma.

ETYMOLOGY: See genus.

DISCUSSION: Throughout its range, shells of this species are small and nearly circular below the umbones.

The Getaway specimens have been replaced by very fine-grained quartz, probably as casts in natural molds of limestone (Schmitt and Boyd, 1981). They do not show traces of vestigial primary shell structures, sometimes preserved in Permian bivalves (Boyd and Newell, 1984). Outer surfaces are well preserved in most shells.

In a random sample of eight specimens with complete margins, the ratio of height to length is: 1.11 (largest specimen), 1.20, 1.25, 1.25, 1.10, 1.15, 1.07, and 1.37 (smallest). This indicates great variability in shape; no trend is discernible.

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