PALEOCENE NONMARINE MOLLUSCA FROM THE RATON FORMATION, RATON BASIN, NEW MEXICO

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ABSTRACT—In 1917, W. T. Lee reported on the only fauna of nonmarine Mollusca so far known from the Upper Cretaceous-Paleocene strata of the Raton Formation of the Raton Basin, New Mexico. The specimens collected by Lee are poorly preserved as goethite-stained steinkerns consisting of fine-grained feldspathic sandstone. The taxa recognized include the bivalve Unioniidae, gen. & sp. indet. and the viviparid gastropods Viviparinae sp. indet. and Campeloma sp. indet. These freshwater fossils were found on the top of the west wall of Dillon Canyon, about 1.6 km above the mouth of Coal Canyon, north of Blossburg, Colfax County, New Mexico. The stratigraphic position of the locality is estimated to be about 195 m above the base of the Raton Formation and approximately 165 m above the base of the Paleocene.

INTRODUCTION

In 1917, W. T. Lee reported on the only fauna of nonmarine Mollusca so far known from the Upper Cretaceous-Paleocene strata of the Raton Formation of the Raton Basin, New Mexico. The locality data, stratigraphic context and specimens collected by Lee are reviewed below to summarize this record of bivalves and gastropods and encourage the report of any new or previously unreported fossil occurrences.

LOCALITY DATA

The Raton Formation locality was recorded in the U.S. Geological Survey (USGS) Mesozoic locality catalog as number 5600, with the following data: “Orig. No. 555, Upper Cretaceous(?), west side of Dillon Canyon, one mile [1.6 km] north of mouth of Coal Canyon, 400 ft [121.9 m] above Raton coal ... collected by W. T. Lee, 1908.” In his field book for 13 August, Lee recorded “at top got shells No. 555” (Lee, 1908, p. 16). In the first published reference to this locality, Lee (1917, p. 104) reported the fossil shells in reference to plant localities and the base of the Raton Formation:

Sabal? ungeri (Lesquereux) Knowlton was found (U.S. Geol. Survey fossil locality 5150) half a mile southwest of mouth of Coal Canyon, 300 feet [91.4 m] above base of the Raton formation; about 100 feet [30.5 m] higher (U.S. Geol. Survey fossil locality 5147) Sabalites graysanus (Lesquereux) Lesquereux, Juglans schimperi Lesquereux, and Ficus occidentalis Lesquereux were found. At the letter horizon, about one-half mile farther west (U.S. Geol. Survey fossil locality 5600) were found a few poorly preserved shells of freshwater species, which were identified as Unio sp. (fragmentary casts), Viviparina sp., and Campeloma? sp. (taxa identified by T. W. Stanton of the USGS).

Additional reference to the location of the above sites is given in the sentence that follows (Lee, 1917, p. 104):

In the north wall of the canyon opposite these localities and 150 feet [45.7 m] above the base of the Raton formation (U.S. Geol. Survey fossil locality 5418) Sabal? ungeri (Lesquereux) Knowlton and Palmae- carpus palmarum (Lesquereux) Knowlton were found in place. Le. Lee (1917, pl. 1) marked the locality of USGS locality 5600 in sec. 17, T31N, R23E. A transfer of this location to the Brilliant quadrangle (in Lee, 1922; 1915 map edition, 1:62,500), on which townships are show, clearly appears to indicate a locality position near the top of a northeast-facing ridge on the south side of a tributary to Dutchman Canyon. This location seems to disagree with the more or less straightforward record of the locality as on the top of the ridge forming the west (or south) wall of Dillon Canyon, and may be interpreted as in keeping with Lee’s (1922, p. 8) reference to the locality as “on the ridge south of Dillon Canyon.” The above possibly conflicting information is given to aid in any relocation attempt.

If the locality is on the top (about 7,440 ft; 2,268 m) of the west (or south) wall of Dillon Canyon about one mile upstream from the mouth of Coal Canyon, the following Universal Transverse Mercator (UTM) coordinates represent a reasonable site for exploration: 543,740E, 4,086,700N, zone 13, T1n Pan Canyon quadrangle (1971 edition, 1:24,000; without township base), Colfax County. If the locality occurs on the top (7,440 ft; 2,268 m) of the west wall of a minor tributary of Dutchman Canyon, a site for exploration may reasonably center on the UTM coordinates 543,280E, 4,086,420N. The above locality review reveals information reported by me (Hartman, 1981; locality L4229). In 1981, D. L. Wolfberg, J. D. Archibald, S. G. Lucas and others were unsuccessful in their attempt to relocate the site on the west wall of Dillon Canyon in significantly plant-covered exposures.

STRATIGRAPHIC CONTEXT

The stratigraphic position of the locality was cited in the USGS Mesozoic locality catalog as 400 ft (121.9 m) above the Raton coal bed and later referenced in publication (quoted above) as 400 ft (121.9 m) above the base of the Raton Formation. The Raton coal bed, or possibly more appropriately referred to as the Raton coal zone, occurs in the Vermejo Formation, which is generally erosionally unconformable with the overlying Raton Formation and conformable with the underlying Trinidad Sandstone. The thickness of the Vermejo Formation at the mouth of Dutchman Canyon on Dillon Canyon is 32 ft (9.8 m), where the Raton coal bed is located 17 ft (5.2 m) below the pebbly conglomeratic basal member of the Raton Formation (Lee, 1917, pl. 5, section 61; 1924, pl. 2, section “near 226”). A somewhat greater thickness of 41.4 ft (12.6 m) is reported near Blossburg, about 0.5 km south of Dutchman Canyon (Lee, 1917, pl. 5, section 62; 1924, pl. 2, section 239). The thickest coal in this section is 5.5 ft (1.7 m) and occurs 8 ft (2.4 m) below the base of the Raton Formation. This coal bed would probably be traditionally referred to as the Raton coal (see Lee, 1924, p. 15), although it is probably not directly correlative with coal beds of similar thickness referred to as the Raton near the base of the Vermejo measured in drill-hole sections at locations Q, R and S in Dillon Canyon (see Lee, 1924, pp. 105–107, pls. 1, 12). Assuming, as originally reported by Lee, the stratigraphic position of the fossil shell locality to be 400 ft (121.9 m) above the Raton coal bed, the locality would be about 370 ft (112.8 m) above the base of the Raton Formation. However, on the basis of a difference in elevation, assuming a negligible dip, between the average elevation of the top of the ridge (7,440 ft; 2,268 m) on the west side of Dillon Canyon, and the top of the Raton coal bed in drill-hole section at location R (estimated elevation of 6,772 ft; 2,064 m), the stratigraphic position of the shell locality may be more closely estimated to be 638 ft (± 30 ft; 194.5 m, ± 9.1 m) above the base of the Raton Formation. This difference in stratigraphic position reflects, in part, the less accurate estimation of the elevation of the locality relative to the Raton coal bed at the time the fossils were collected. In his field notes, Lee estimated the difference in elevation between the locality (top of ridge) and valley of Dillon Canyon.
Paleontology

The bivalves and gastropods are preserved primarily as poorly replaced, dark yellowish-orange, goethite-covered steinkerns. External surface features are only vaguely preserved in a few specimens. The steinkerns and associated matrix consist of well-lithified, grayish-olive weathering to olive-gray, immature, poorly-sorted, feldspathic, fine-grained sandstone with oriented, elongate, very fine-to-fine clay pebbles. The matrix grains are composed largely of angular quartz. Interstices are filled by kaolinite and minor amounts of other clay minerals. X-ray diffraction indicates that microcline and albite are the dominant feldspars. Little or no cement is present, and many grains are clay-rimmed. Mafic minerals, such as biotite, are deformed, probably through compaction. The gastropod molds represent specimens of approximately the same size, usually of the last and second to the last whorls, indicating fragmentation and sorting prior to final deposition. All specimens are distorted and compressed in some manner oblique to the axis of coiling. There is no telescoping.

Class Bivalvia
Family Unionidae gen. & sp. indet.
Figs. 1a, b


The *Unio* sp. determination refers to two incomplete specimens. The assignment to *Unio* has little meaning in the classification of fossil freshwater bivalves as it now exists, except as a catch-all for poorly preserved or unornamented unsculptured specimens. Neither specimen preserves the umbonal area, and the shell marginal outline is sufficiently general to prohibit any generic assignment. The most complete specimen consists of portions of a splayed pair of articulated valves. The best preserved valve is elongate in shape, with an overall length somewhat greater than 32 mm and a height of 18 mm. The second specimen is a flattened posterior fragment of an elongate clam. In terms of general simple valve shape, these specimens are similar to *Unio* whitei? Henderson reported from the Nacimiento Formation near Cuba, Sandoval County, New Mexico (Hartman, 1981, pp. 944–945; locality 1,388), but the material is too incomplete for adequate comparison.

Class Gastropoda
Family Viviparidae
*Viviparus* sp. indet.
Figs. 1c, d

1917 *Viviparus* sp.: Stanton in Lee, p. 104.

One specimen in the lot collected by Lee is referable to *Viviparus*. The specimen is distorted and compressed oblique to the axis of coiling viewed from the right lateral-outside aperture margin. The specimen is medium in size, probably about 12 to 16 mm in height. The maximum number of whorls observed was 1.9, representing the last and second to the last whorls. The shell shape is subtrochiform, and probably broadly conic (spire angle between 50°–60°). The shell whorls may be slightly shouldered. The specimen appears to be umbilicate, apparently

FIGURE 1. Paleocene nonmarine Mollusca of the Raton Formation, New Mexico. a, b, Unionidae gen. & sp. indet.; a, left valve, external view; USNM-1416,478; post-umbonal and ventral margin preserved; anterior and umbonal areas are non-cast matrix; ligament area is slightly raised left-to-right ridge; portion of right valve above ridge. b, left valve, external view, posterior fragment; USNM-1416,479. c, d, *Viviparus* sp. indet.; c, apertural-right lateral view, specimen compressed; d, right lateral view. e–h, *Campeloma* sp. indet.; e, apertural view, aperture in plane of paper; USNM-1416,481; f, apertural view, specimen compressed, note umbilicus; USNM-1416,482; g, apertural view, specimen compressed, for general form; USNM-1416,483; h, abapertural view, note shell development; USNM-1416,484. All specimens are in matrix and coated for photography. USNM-1 = U.S. National Museum (of Natural History) – Invertebrate Paleontology Collection.
as a narrow slit. Growth lines, secondary sculpture and the aperture are not preserved. The specimen suggests the form of *Viviparus meeki* Wenz, which has also been reported from the Nacimiento Formation in Torreon Wash, west of Cuba (Hartman, 1981, p. 279; locality L3279). The specimen, however, lacks a sufficient number of characters for adequate assignment.

*Campeloma* sp. indet.

Figs. 1e–h

1917 *Campeloma?* sp.: Stanton in Lee, p. 104

Twenty-one specimens are probably assignable to *Campeloma* sp. indet. All of the specimens have less than two whorls, and, in general, the replaced shell consists of a goethite stain on the steinkern surface. If complete, the shells would be of medium size and subovate in form. The last two whorls of one specimen are about 20 mm in height (Fig. 1g). The suture appears to be moderately impressed, and only one specimen has any evidence of shouldering. In that specimen (Fig. 1h), a strong shelf is developed similar to that described for a species of *Campeloma* from the late Maastrichtian and early Paleocene of the northern Great Plains (species in review: Hartman, 1984, p. 244). A well-preserved aperture in one specimen is ovate in form, with an aperture height and width of 9.1 and 7.2 mm, respectively. The outside apertural margin is nearly vertical and appears sinusoidal as in other species of *Campeloma*. A few specimens indicate that this taxon is umbilicate. As with the specimen of *Viviparus*, there are too few diagnostic characters preserved to warrant a more specific diagnosis.

SUMMARY

Although poorly preserved and low in diversity, this fauna does pose interesting questions and comparisons to the middle Paleocene fauna of the Nacimiento Formation. Additional specimens from the Raton Formation are necessary to permit more definitive taxonomy and biostratigraphy.

ACKNOWLEDGMENTS

At the time I initially reviewed the Paleocene and Eocene nonmarine Mollusca of New Mexico (Hartman, 1981), I had been unable to locate the specimens from the Raton Formation in the USGS collections in the U.S. National Museum of Natural History. Since then, I found the specimens, which have subsequently been transferred to a newly occupied USGS warehouse at the Denver Federal Center. Permission to examine the specimens was given by Bill Cobb of the Paleontology and Stratigraphy Branch. USGS Field Record information was kindly provided by Debbie Rowen. Mineralogic and petrographic information was obtained with the aid of Nels Forsman and Bob Stevenson of the University of North Dakota. This research was supported by the Philip McKenna Foundation and the University of North Dakota.

REFERENCES


Some of the “knights” of the Cretaceous-Tertiary boundary in the Raton Basin. From left to right: Adrian Hunt, Charles Pillmore (kneeling), Michael Payne, the late Donald Wolberg and Jere Knight. Photograph taken in September 1981 at Cretaceous-Tertiary boundary outcrop near Raton, courtesy of C. Orth.