

# Invertebrate fossil assemblage from Galisteo Dam and the correlation of the Cretaceous Dakota–Mancos succession in north-central New Mexico

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## Abstract

An invertebrate fossil assemblage from the top of the upper sandstone interval of the Dakota Sandstone at Galisteo Dam, Santa Fe County, New Mexico, consists of the bivalves *Pycnodonte* cf. *P. kellumi* (Jones) and *Inoceramus prefragilis* Stephenson and the ammonites *Eucalycoceras templetonense* Cobban, *Conlinoceras gilberti* Cobban and Scott, and *Turrillites acutus acutus* Passy. This assemblage represents the lower part of the *Acanthoceras amphibolum* zone or the *Conlinoceras tarrantense* zone and confirms correlation of the upper sandstone of the Dakota Sandstone at Galisteo Dam, and around the Sandia uplift, to the Cubero Member.

## Introduction

Strata of the intertongued Dakota and Mancos Formations record the early history of the Late Cretaceous Western Interior seaway in northwestern New Mexico (e.g., Owen, 1966; Landis et al., 1973; Owen and Head, 2001). These rocks are also exposed in north-central New Mexico, just east of the Rio Grande valley (Fig. 1). Until the work of Lucas et al. (1998), little effort had been made to study the intertongued Dakota–Mancos succession in north-central New Mexico and to correlate it to the better studied succession to the west. Here,

I further develop this correlation by describing a biostratigraphically significant invertebrate fossil assemblage from the Cubero Member of the Dakota at Galisteo Dam and by presenting new lithostratigraphic data on the Dakota–Mancos succession around the Sandia uplift.

## Galisteo Dam locality

The fossils described here are from NMMNH (New Mexico Museum of Natural History) locality 3939, which is located immediately south of Galisteo Dam at UTM Zone 13, 390482E, 3923830N, NAD 27 (SW¼ sec. 9 T14N R7E, Santa Fe County; Fig. 1). At locality 3939 the fossils are in calcareous sandstone at the top of the unit Lucas et al. (1998) identified as the Cubero Member of the Dakota Sandstone. Fossils are not abundant at NMMNH locality 3939, and most are sandstone casts.

## Paleontology

Fossils from NMMNH locality 3939 are of bivalves and ammonites (Fig. 2).

### *Pycnodonte* cf. *P. kellumi* (Jones)

The most common fossils at locality 3939 are of the bivalve *Pycnodonte* (Fig. 2A, B).

Left valves are characteristically smooth (due to the very faint growth lines) and have a distinct sulcus and posterior auricle. These specimens closely resemble bivalves Cobban (1977, p. 17, pl. 6, figs. 21–26) identified as *P. cf. P. kellumi* from the Clay Mesa Member of the Mancos Shale in west-central New Mexico.

### *Inoceramus prefragilis* Stephenson

The only inoceramid bivalves from locality 3939 represent a single taxon with a prominent terminal beak that is strongly incurved, a straight anterior margin, narrowly rounded ventral margin, and ornamentation of closely spaced, low, narrow concentric ribs that are most prominent umbonally (Fig. 2D, E). These inoceramids closely resemble specimens of *I. prefragilis* from the Woodbine Formation in Texas described by Stephenson (1952, p. 64, pl. 12, figs. 10–12).

### *Eucalycoceras templetonense* Cobban

The second most common ammonites at locality 3939 (Figs. 2F, H, I) closely resemble specimens of *Eucalycoceras templetonense* described by Cobban (1988, p. 10, pl. 4). These relatively evolute ammonites have flat flanks covered by many closely spaced prorsiradiate, slightly flexuous ribs

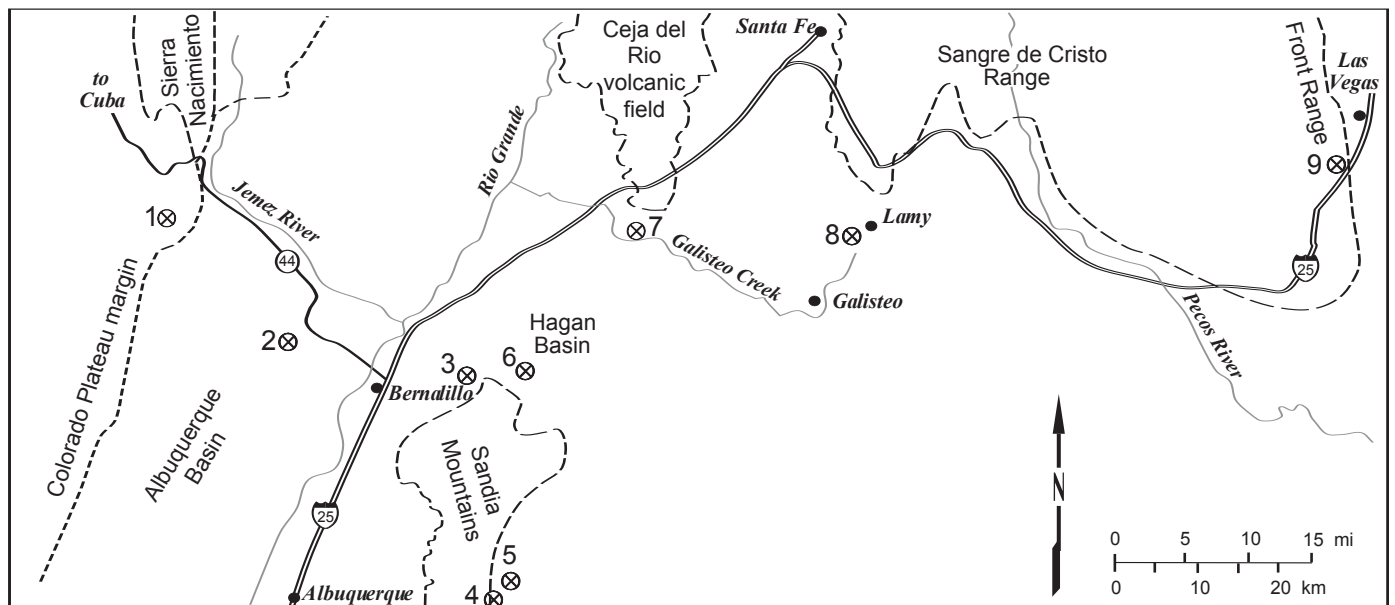


FIGURE 1—Index map of part of north-central New Mexico showing the location of Galisteo Dam fossil locality and sections correlated in Figure 3. Section locations are: 1, San Ysidro; 2, Shell Oil Santa Fe # 1

well; 3, Placitas; 4, Cedar Crest; 5, Sandia Park; 6, Hagan Basin; 7, Galisteo Dam; 8, Lamy; and 9, Romeroville.

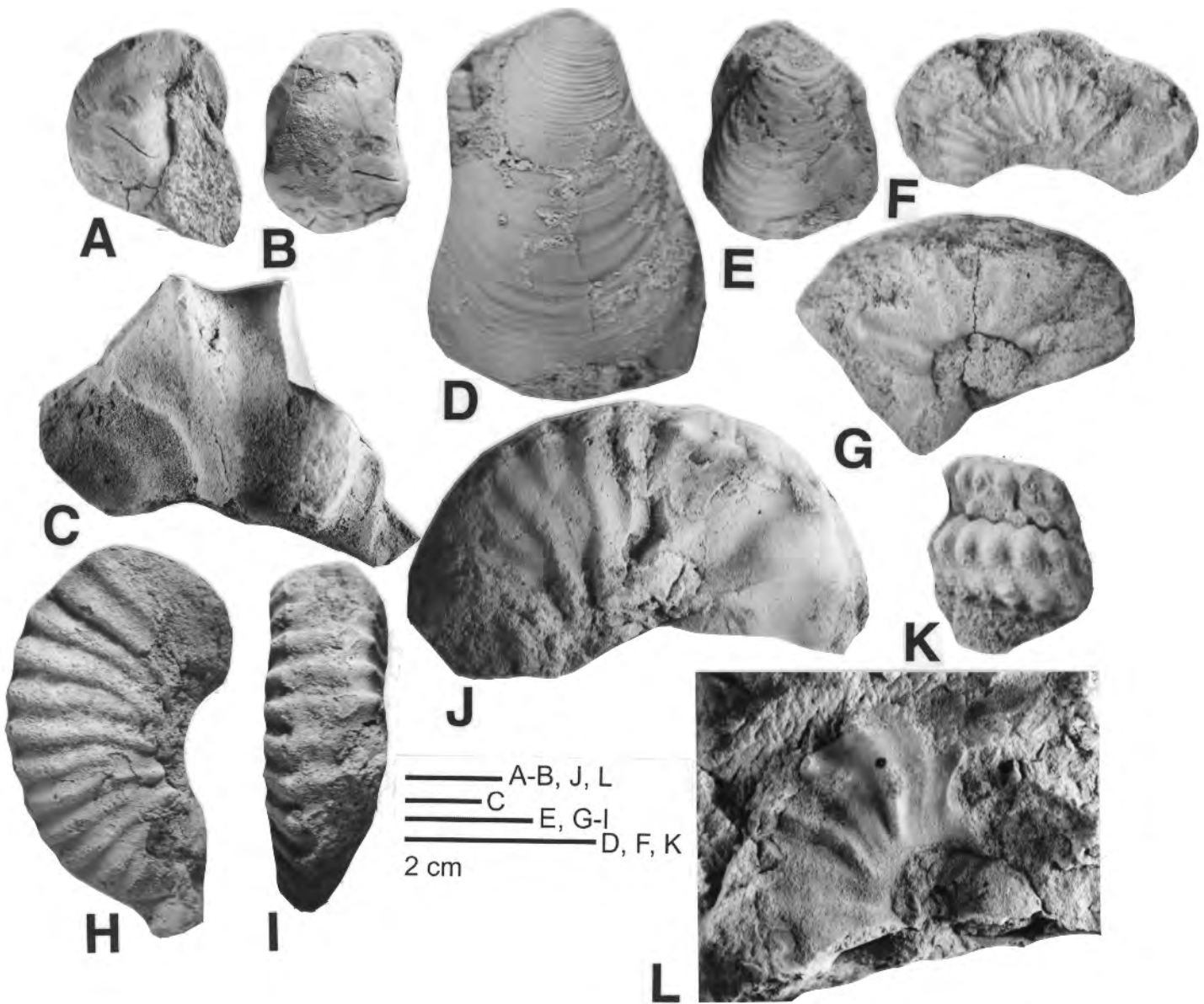


FIGURE 2—Fossils from the Cubero Member of the Dakota Sandstone at NMMNH locality 3939. **A,B**, *Pycnodonte* cf. *P. kellumi* (Jones), two views of left valve, NMMNH P-27584; **C**, *Conlinoceras gilberti* Cobban and Scott, NMMNH P-33016; **D,E**, *Inoceramus prefragilis* Stephenson, NMMNH P-33019 (D) and 33014 (E); **F**, *Eucalycoceras templetonense* Cobban, NMMNH

P-33005; **G**, *Conlinoceras gilberti* Cobban and Scott, NMMNH P-33001; **H,I**, *Eucalycoceras templetonense* Cobban, NMMNH P-33015 (H,I); **J**, *Conlinoceras gilberti* Cobban and Scott, NMMNH P-33018; **K**, *Turrilites acutus acutus* Passy, NMMNH P-33013; **L**, *Conlinoceras gilberti* Cobban and Scott, NMMNH P-33017.

that cross the venter without diminution, and are alternately long and short. Each rib has prominent umbilical, lower ventrolateral and upper ventrolateral tubercles, and all but the outermost whorl ribs also have a siphonal tubercle. The size range of specimens from locality 3939 varies widely and shows a widening of rib spacing and reduction (loss) of tubercles on the outer whorls.

#### *Conlinoceras gilberti* Cobban and Scott

I assign the most common ammonites (Fig. 2C, G, J, L) at locality 3939 to *Conlinoceras gilberti* because they closely resemble specimens of that taxon described by Cobban and Scott (1972, p. 61, pls. 1–3). These ammonites are evolute with widely

spaced, slightly flexuous ribs, slightly convex flanks, flattened venters, and prominent umbilical and ventrolateral tubercles, especially in the early whorls (Fig. 2G). In later whorls, the ribs are very strong and straight (Fig. 2C). As is characteristic of *C. gilberti*, the widely spaced ribs on early whorls are of equal strength at the venter but alternate between ribs that reach the umbilicus and ribs that do not.

#### *Turrilites acutus acutus* Passy

This helical ammonoid (Fig. 2K) displays two rows of essentially equal-sized tubercles on the whorl flanks and thus closely matches specimens of *Turrilites acutus acutus* described by Cobban and Scott (1972, p. 53, pl. 14, fig. 6) and Cobban (1977, p. 22,

pl. 4, figs. 4–5). Significantly, the locality 3939 specimens do not show the smaller tubercles at the whorl base that characterize the subspecies *T. acutus americanus* (Cobban and Scott, 1972), which is characteristic of the Paguate Sandstone in west-central New Mexico (Cobban and Scott, 1972, p. 72, pl. 11, figs. 1–11; Cobban, 1977, p. 22, pl. 10, figs. 3–6, 10–12).

### Biostratigraphy

The invertebrate taxa from NMMNH locality 3939 indicate a middle Cenomanian age but a horizon older than the Paguate Sandstone. Particularly important is the record of *Turrilites acutus acutus*, a taxon restricted to the Oak Canyon–Cubero–Clay Mesa

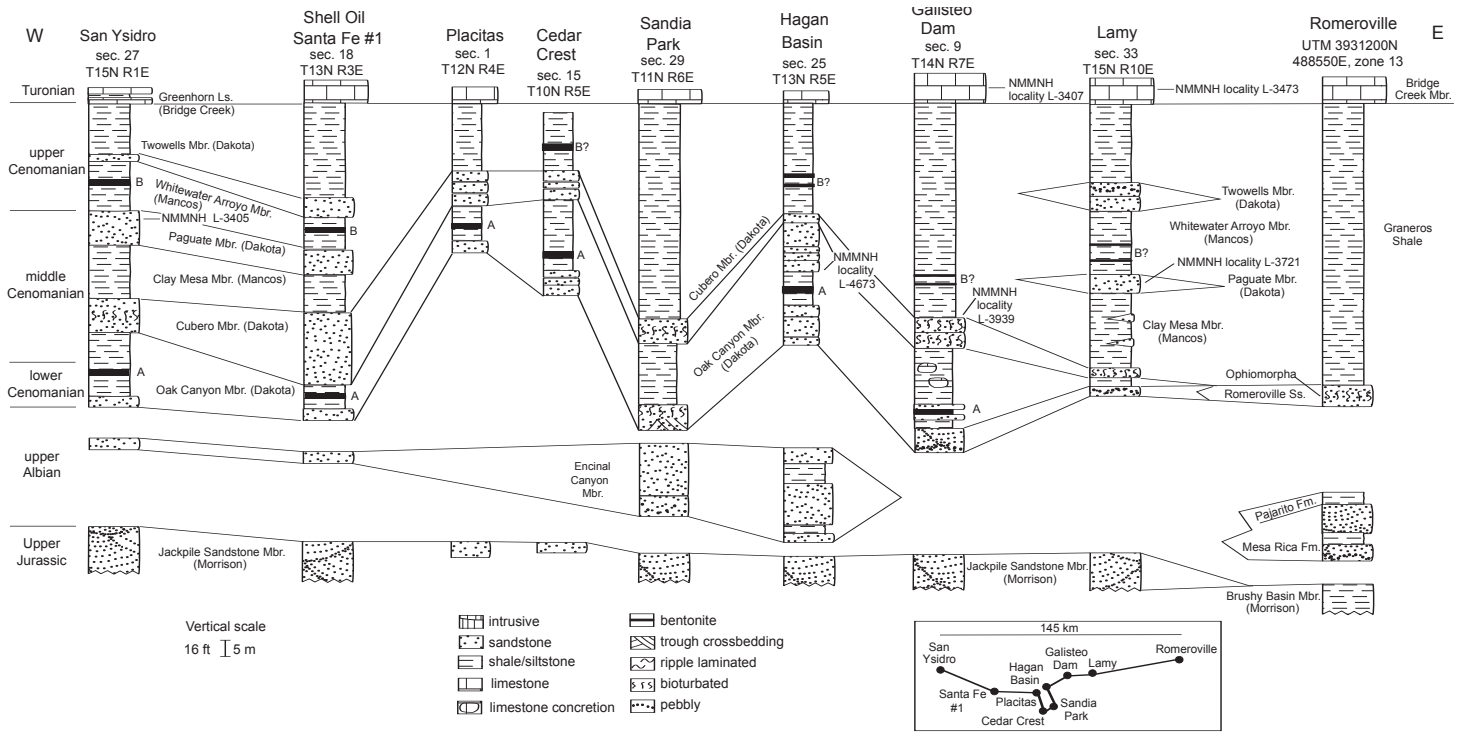


FIGURE 3—West-east correlation of middle Cretaceous rocks from San Ysidro on the Colorado Plateau to Romeroville on the Sangre de Cristo front range. Identification of A and B bentonites is based on Owen and Head (2001).

interval in west-central New Mexico (Cobban, 1977; Cobban and Hook, 1989). *Conlinoceras gilberti* is characteristic of the "Thatcher fauna" in the middle Cenomanian zone of *Conlinoceras tarrantense*, which is the age of the Oak Canyon Member and most or all of the Cubero Member in west-central New Mexico (Cobban and Hook, 1989). *Eucalycoceras templetonense*, however, must have a relatively early record at Galisteo Dam as it has been reported elsewhere in the middle-upper Cenomanian zones of *Plesiacanthoceras wyomingense* and *Dunveganoceras pondi* (Cobban, 1988).

*Pycnodonte* cf. *P. kellumi* has records from the Oak Canyon Member through the Whitewater Arroyo Shale in west-central New Mexico (Cobban, 1977). However, the overlap zone of almost all of the taxa from NMMNH locality 3939 (the exception is *Eucalycoceras templetonense*) is in the Cubero interval. Furthermore, none of the characteristic taxa of the Paguate interval occur at NMMNH locality 3939. Thus, the fossils from locality 3939 indicate either the lower part of the *Acanthoceras amphibolum* zone or the *Conlinoceras tarrantense* zone and confirm correlation of the upper sandstone interval of the Dakota Sandstone at Galisteo Dam to the Cubero Member to the west.

## Correlation

Correlation of the intertongued Dakota-Mancos succession across north-central New Mexico (Fig. 3) is essentially the same

as that advocated by Lucas et al. (1998). New data presented here are:

1. A section in the Hagan Basin in SE $\frac{1}{4}$  sec. 25 (unsurveyed) T13N R5E is complete from the Dakota base through the Bridge Creek Member of the Greenhorn. NMMNH locality 4673 in the Oak Canyon Member in this section yields a poorly preserved bivalve assemblage that includes *Inoceramus arvanus* Stephenson, an inoceramid restricted to the Clay Mesa Shale in west-central New Mexico (Cobban, 1977). In this section, no Dakota sandstone bodies are present between the Cubero and Bridge Creek.
2. A complete section from the Dakota base through the Bridge Creek base has also been identified at Placitas (NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 1 T12N R4E). It, too, lacks any super-Cubero sandstones.
3. Similar sections have been located at Sandia Park (Lucas et al., 1999) and at Cedar Crest (NW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 15 T10N R5E). The latter is very well exposed and shows a two-part Oak Canyon Member seen at some other sections—lower sandy interval with bentonite, overlain by black shale with limestone concretions. Earlier workers (Molenaar, 1983 and Ferguson et al., 1998) suggested that the upper sandstone interval of the Dakota Sandstone in these sections probably correlates to the Twowells Member, but correlation to the Cubero is established here.

The new data presented here support identification of the upper sandstone inter-

val of the Dakota Sandstone at Galisteo Dam and around the Sandia uplift as the Cubero Sandstone. Both the Paguate and Twowells Members are not present here, though they are present in the more offshore section at Lamy, thus underscoring the discontinuous nature of the upper Dakota Sandstone members in north-central New Mexico (Lucas et al., 1998).

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## New Mexico Geological Society 53rd Annual Fall Field Conference

October 2-5, 2002

The 53rd annual field conference of the New Mexico Geological Society will be held on the White Sands Missile Range of south-central New Mexico. The society has never visited this area and will offer access to normally restricted portions of the Oscura and San Andres Mountains and the Tularosa Basin. The conference is hosted by Kate Giles (NMSU), Virgil Lueth (NMBGMR), Spencer Lucas (NMMNHS), Barry Kues (UNM), and Bob Myers (WSMR).

Exposures of rocks ranging in age from Proterozoic to Recent should appeal to all geologic interests. The theme "White Sands" centers on the world famous national monument and attests to the unique nature of the geology of the area. Topics covered during the trip will cover virtually every aspect of the geology. The tentative itinerary is:

Day 1. Geology of the northern portion of the range visiting the Proterozoic/Cambrian contact, Paleozoic stratigraphy, Cenozoic tectonics, ore deposits, and recent volcanism. We will also visit one of the most significant places in human history, the Trinity Site.

Day 2. A daylong trip through the Paleozoic via stops in Rhodes Canyon and a hike down Hembrillo Canyon (vans will be provided for those who cannot walk the entire trip).

Day 3. Geothermal and structural aspects of the Rio Grande rift in addition to metamorphism, structures, and mineral deposits on the margins of a granite intrusive complex.

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