Cretaceous Dakota Group outlier, Sacramento Mountains, Otero County, New Mexico

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CRETACEOUS DAKOTA GROUP OUTLIER, SACRAMENTO MOUNTAINS, OTERO COUNTY, NEW MEXICO

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Abstract—Approximately 44 m of Dakota Group disconformably overlie the Permian San Andres Formation in the Sacramento Mountains, Otero County, New Mexico. The uppermost Dakota Group strata here contain marine invertebrates and foraminifers of late Albian (Early Cretaceous) age.

INTRODUCTION

Pray and Allen (1956) described an outlier of Cretaceous strata in the Sacramento Mountains of southeastern New Mexico that they tentatively assigned to the Dakota Group. Dane and Bachman (1965) followed this assignment, but recently Moore et al. (1988) identified this outlier as Sarten Sandstone. Here, I re-evaluate the stratigraphic assignment of this outlier and determine its age. NMMNH refers to the New Mexico Museum of Natural History, Albuquerque.

STRATIGRAPHY

Pray and Allen (1956) provided a detailed and accurate description of the Cretaceous outlier in the Sacramento Mountains, which is located in parts of T14 and 15S, R13E, Otero County (Fig. 1). I measured a section through the best exposures of the outlier in sec. 9, T15S, R13E (Fig. 1). Here, the outlier is approximately 44 m thick and dominated by bioturbated or laminar quartzarenite. At the base of these strata is an erosional unconformity on Permian (Guadalupian) limestone of the San Andres Formation. The top of these strata is bentonitic shale and nodular, bioclastic limestone that grade upward into soil cover (Fig. 1). I also collected fossils from the uppermost strata of the outlier in the NW1/4 NW1/4 SE1/4 SW1/4 sec. 9, T15S, R13E (NMMNH locality 1488).

My stratigraphic observations are consistent with those of Pray and Allen (1956). However, Moore et al. (1988) mapped the Cretaceous outlier in fault contact with underlying Permian limestone, a conclusion at variance with the field observations of Pray and Allen (1956) and myself.

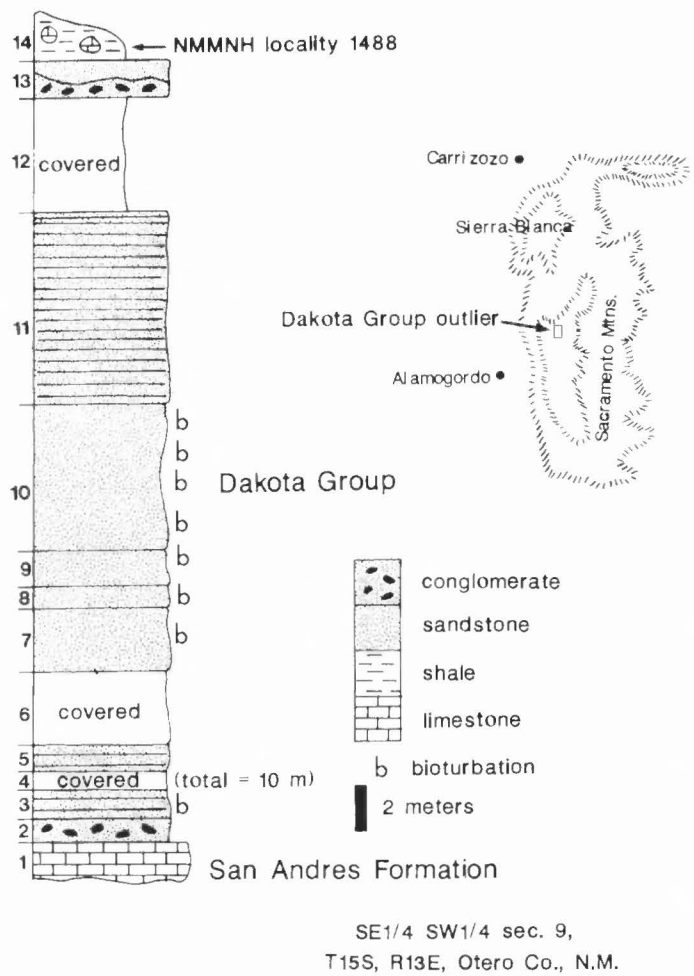

FIGURE 1. Location map and stratigraphic section of Dakota Group outlier (see Appendix for description of numbered lithologic units).

PALEONTOLOGY AND AGE

Most of the fossils from NMMNH locality 1488 are poorly preserved and thus difficult to identify precisely. Fortunately, both the bioclastic limestones and the bentonitic shales at this locality produce numerous specimens of two taxa of large, uniserial, arenaceous foraminifers, *Cribratina texana* (Conrad, 1857) and *Polychasmina pawpawensis* Loeblich and Tappan, 1946 (Figs. 2, 3A).

Both of these taxa have relatively large, free tests that are uniserial and coarsely arenaceous. However, *C. texana* has a circular cross section and straight sutures unlike the compressed, rectangular cross section and arcuate sutures of *P. pawpawensis*. Some nearly complete specimens of *C. texana* from NMMNH locality 1488 have the cribrate, terminal aperture diagnostic of this taxon (cf. Tappan, 1943; Loeblich and Tappan, 1946).

Specimens of *P. pawpawensis* from NMMNH locality 1488 can be

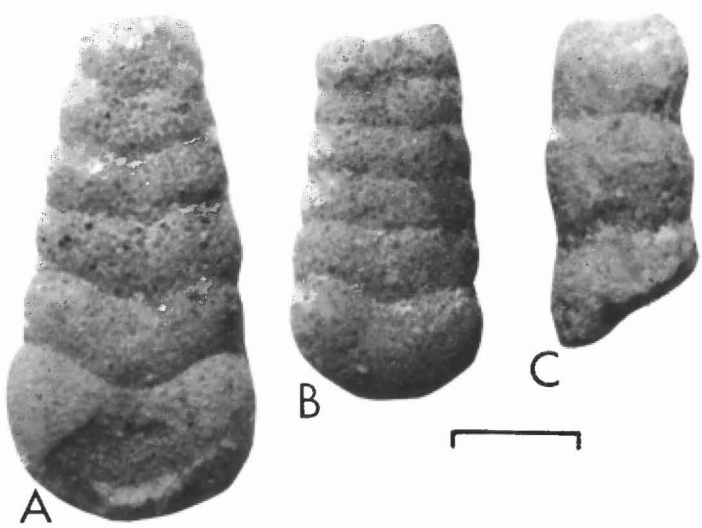

FIGURE 2. Large, arenaceous foraminifers from NMMNH locality 1488. A–B, *Polychasmina pawpawensis*, side views of two tests, NMMNH P-19135. C, *Cribratina texana*, side view of part of test, NMMNH P-19134. Scale = 1 mm.

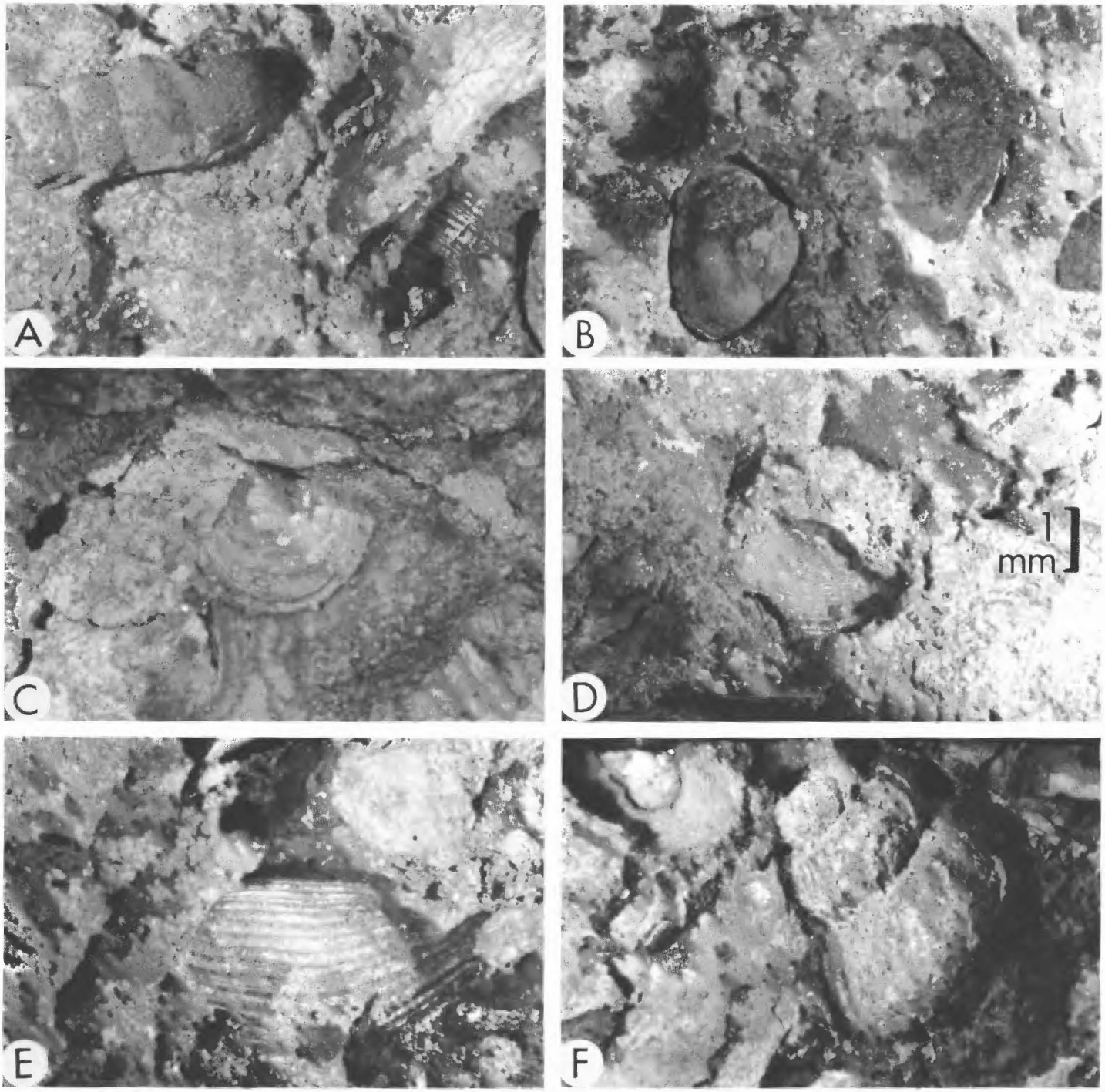

FIGURE 3. Foraminifer, pelecypods and gastropod from bioclastic limestone at NMMNH locality 1488. A, *Cribratina texana,* side view of test, NMMNH P-19138. B, Corbulidae, external view of steinkerns, NMMNH P-19136. C, cf. *Crassinella semicostata,* internal view of mold, NMMNH P-19140. D–E, cf. *Corbula? smolanensis,* molds, external view of NMMNH P-19141 and internal view of P-19140, respectively. F, Gastropod steinkern, NMMNH P-19137. Scale = 1 mm.

distinguished from the late Albian–early Cenomanian foraminifer *Flabellammina*, especially early Cenomanian *F. denisonensis* and *F. brachylocula* (Tappan, 1941, pl. 51, figs. 1–9; Frizzell, 1954, pl. 3, figs. 9, 17–19), which they superficially resemble. Unlike these *Flabellammina* species, the *P. pawpawensis* specimens from Otero County lack a slightly coiled proloculum, show no evidence of central inflation of the later, uniserial chambers, are not parallel sided, have an aperture that is a single row of slits (not a single slit) and are not as coarsely arenaceous.

Cribratina texana is a late Albian index fossil known elsewhere in New Mexico from the Sarten and Mojado Formations of the southwestern portion of the state (Zeller, 1965; Lucas et al., 1988), the interval from the Muleros to basal Anapra Formations at Cerro de Cristo Rey near El Paso (Böse, 1910; Cornell and LeMone, 1987) and the Tucumcari Shale of the east-central portion of the state (Kues et al., 1985). This is the second report of *Polychasmina pawpawensis* from New Mexico. Zeller (1965) reported it from the Mojado Formation in the Big Hatchet Mountains, and it co-occurs with *C. texana* in the upper Albian Paw Paw and Weno Formations of north-central and west Texas (Loeblich and Tappan, 1946).

Most of the fossils from NMMNH locality 1488 are steinkerns or molds of pelecypods (e.g., Fig. 3B). The vast majority of these are of

corbulids (Pray and Allen, 1956). Better preserved specimens appear to represent two of the corbulid taxa recognized by Scott (1970) from the upper Albian Kiowa Formation in Kansas. Those with prominent beaks, trigonal outlines and pronounced, regular concentric ridges on the right valve (e.g., Fig. 3C) are very similar to *Crassinella semicostata* Scott, 1970, to which they are tentatively assigned (cf. Scott, 1970, p. 72, pl. 5, figs. 3–6). However, these specimens also show some similarity to specimens from the lower Cenomanian Woodbine Formation in Texas that Stephenson (1952) termed *Caryocorbula* (cf. Cox et al., 1969, for the updated taxonomy of this corbulid). Those inequivalve/inequilateral corbulids with a posterior extension (rostrum) on the right valve (e.g., Figs. 3D–E) are very similar to *Corbula? smolanensis* (Twenhofel and Tester, 1926) to which they are tentatively assigned (cf. Scott, 1970, p. 76, pl. 5, figs. 7–10). However, these specimens also show strong similarity to Woodbine specimens Stephenson (1952) termed *Parmicorbula*. Other corbulids from NMMNH locality 1488 are too poorly preserved to identify as partial molds of apparent mactrids and pectinids.

Gastropods are represented at NMMNH locality 1488 by steinkerns that appear to pertain to a single taxon. These tiny steinkerns (e.g., Fig. 3F) have strongly convex whorls that increase rapidly in size and are divided by deeply impressed sutures. Apertural areas are missing or obscured by matrix, and transverse ribs are present across the whorls. These transverse ribs exclude identification of the steinkerns as small specimens of a *Tylostoma*-like taxon (cf. Stanton, 1947). These gastropods somewhat resemble the indeterminate apporrhaid from the Kiowa Formation illustrated by Scott (1970, pl. 6, fig. 10) but cannot be identified with certainty.

Pray and Allen (1956, p. 2737) cited the opinion of David Nicol and J. B. Reeside, Jr. (U.S. Geological Survey) that the invertebrate fauna from the Cretaceous outlier in the Sacramento Mountains "is approximately the equivalent of the Texas Woodbine (Cenomanian), although possibly it is uppermost Albian and equivalent to the Washita group of Texas." Indeed, the pelecypods resemble Albian forms from the Kiowa Formation in Kansas and also show some similarity to those of the Woodbine. Based on the pelecypods alone, the precise age of the Cretaceous outlier in the Sacramento Mountains could not be determined with certainty. However, the foraminiferans from NMMNH locality 1488 indicate the Cretaceous outlier is of late Albian age.

DISCUSSION

Assignment of a late Albian age to the uppermost strata of the Cretaceous outlier in the Sacramento Mountains is well supported by the presence of *Cribratina texana* and *Polychasmina pawpawensis*. I assign the outlier to the Dakota Group because of its age and its lithologic similarity and geographic proximity to Dakota Group strata, especially the Mesa Rica Sandstone, in nearby Lincoln County and, to the north, Guadalupe County (Lucas and Kisucky, 1988).

These strata do not represent the Sarten Formation because, as a facies equivalent to part of the Cintura and Mojado Formations of the Bisbee Group, Sarten deposition was limited to that part of the Chihuahua trough located in southwestern New Mexico (Lucas et al., 1988; Lucas, 1989). Dakota Group (sensu Kues and Lucas, 1987) deposition in eastern New Mexico spanned the Albian-Cenomanian boundary, and the Dakota Group outlier in the Sacramento Mountains is the southernmost remnant of this deposition.

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APPENDIX—STRATIGRAPHIC SECTION

unit	lithology	thickness (m)
	Dakota Group (Cretaceous, Albian):	
14	Shale; medium dark gray (N4); bentonitic; not calcareous; mostly covered; contains nodules and lenses of yellowish gray (5 Y 8/1), ferruginous and fossiliferous bioclastic limestone; NMMNH locality 1488.	1.0+
13	Sandstone and conglomerate; sandstone is very pale orange (10 YR 8/2) and grayish orange (10 YR 7/4), weathers medium gray (N5), fine-medium grained, subrounded, moderately sorted, not calcareous, massive quartzarenite; conglomerate (lower part of unit) is composed of gray, white and tan pebbles of quartzite and brown and black pebbles of chert and jasper, as much as 2.5 cm in diameter, in a matrix of very pale orange (10 YR 8/2), very fine to fine-grained, subrounded, moderately sorted, massive quartzarenite that weathers moderate yellowish brown (10 YR 5/4).	1.6

APPENDIX (continued)

unit	lithology	thickness (m)
12	Covered.	5.0
11	Sandstone; same colors and lithology as unit 9 except laminar.	8.5
10	Sandstone; same colors and lithology as unit 8.	6.4
9	Sandstone; grayish orange (10 YR 7/4); weathers dark yellowish orange (10 YR 4/2); very fine-fine grained; subrounded; well sorted; quartzarenite; bioturbated.	1.7
8	Sandstone; mostly grayish orange (10 YR 7/4) but with bands of moderate orange pink (5 YR 8/4) and grayish red purple (5 RP 4/2); very fine-fine grained; subrounded; moderately sorted; quartzarenite; bioturbation: *Ophiomorpha*, *Thalassinoides* and *Planolites*.	1.0
7	Sandstone; same colors and lithology as 5 except bioturbated.	2.8
6	Covered.	3.2
5	Sandstone; grayish orange (10 YR 7/4); weathers dusky yellowish brown (10 YR 2/2); very fine grained; subrounded; well sorted; quartzarenite; laminar; contains ferruginous plant-stem fragments.	1.0
4	Covered.	10.0
3	Sandstone; dark yellowish orange (10 YR 6/6); weathers dusky yellowish brown (10 YR 2/2); very fine grained; subrounded; well sorted; hematitic and not calcareous; quartzarenite; laminar with some bioturbation.	1.0
2	Limestone-pebble conglomerate composed of cobbles of unit 1.	1.2
	unconformity	
	San Andres Formation (Permian, Guadalupian):	
1	Limestone; yellowish gray (5 Y 7/2) and grayish orange (10 YR 7/4); coarsely recrystallized micrite; vuggy.	1.5+