



Ammonite record from the Pierre Shale of northeastern New Mexico

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AMMONITE RECORD FROM THE PIERRE SHALE OF NORTHEASTERN NEW MEXICO

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INTRODUCTION

In northeastern New Mexico, the Upper Cretaceous Pierre Shale is a dark-gray marine unit about 1,600 ft (488 m) thick (Johnson and others, 1966, p. 88). Invertebrate fossils, chiefly mollusks, are locally abundant in gray- to brown-weathering limestone concretions and dusky-red- to rusty-brown-weathering clay ironstone concretions.

The first large collections of invertebrate fossils were made by O. H. St. John (1876, p. 280) near Cimarron (Fig. 1) from several levels of concretions between 90 and 570 ft (27-174 m) below the top of the shale; these fossils were identified by C. A. White who published the list in 1879 (White, 1879b, p. 267, 268). The list included only three species of ammonites, which were identified as *Baculites ovatus* Say, *Scaphites nodosus* Owen?, and *Placenticeras placenta* (DeKay).

W. T. Lee investigated the geology of the Raton basin at various times from 1902 to 1917 and collected from the Pierre Shale at 21 localities in northeastern New Mexico. In a generalized stratigraphic section for the Raton coal field, Lee (1912, p. 611) listed the following ammonites, identified by T. W. Stanton, from the upper part of the Pierre Shale: *Ancyloceras* sp., *Baculites ovatus* Say, *B. cornpressus* Say, *Heteroceras cheyensis* Meek and Hayden, *Heteroceras* sp., *Placenticeras intercalare* Meek and Hayden, *P. whitfieldi* Hyatt?, *P. sp.*, *Ptychoceras* sp., *Scaphites nodosus* Owen, and *S. sp.* Later, in his large summary work, Lee (1917, p. 45-47) gave more specific information regarding localities and stratigraphic positions of these ammonites in the Pierre Shale.

Since the publication of Lee's list of fossils, the only additional ammonites recorded from the Pierre Shale of northeastern New Mexico are *Scaphites hippocrepis* (DeKay), *Baculites rugosus* Cobban, and *B. undatus* Stephenson. *Scaphites hippocrepis* was collected by Lee in 1913 at U.S. Geological Survey Mesozoic locality 8352, 2.5 mi (4 km) southeast of Clifton House (Fig. 1), but the species was not included in the lists of fossils in his summary paper (Lee, 1917). The species was identified as *Scaphites hippocrepis* (DeKay) var. *tenuis* by Reeside (1927, p. 23 and table opposite p. 2), and later it was assigned to *S. hippocrepis* III by Cobban (1969, p. 24). *Baculites rugosus* was recorded near Raton (Cobban, 1962b, p. 134), where the species was collected by J. B. Mertie in 1908 at locality 5566 about 1.5 mi (2.4 km) northeast of Raton. *Baculites undatus* Stephenson was noted at Casa Grande (locality D7484) and 2 mi (3.2 km) west of Cimarron (locality D4826) by Cobban (1973, p. 460).

Several collections made in recent years by G. R. Scott, C. L. Pillmore, the late J. R. Gill, and myself have added much to our knowledge of the faunal content of the Pierre Shale of northeastern New Mexico. The present paper was prepared to update some of the collections of W. T. Lee and to present data concerning the more recently collected ammonites.

AMMONITE SEQUENCE

The sequence of ammonite zones for the Pierre Shale of the western interior region and relevant radiometric dates were presented 10 years ago by Gill and Cobban (1966, p. A28-A37). Twenty-four ammonite zones were recognized. There are indications of 12 of these zones in the Pierre Shale of northeastern New Mexico. The western interior ammonite sequence for the Pierre Shale is shown below, and those zones known from northeastern New Mexico are indicated by asterisks. *Baculites perplexus* is shown as a single zone, although in parts of Colorado and Wyoming it can be subdivided into early and late forms of *B. perplexus* separated by *B. gilberti*.

	<i>Baculites clinolobatus</i>
	<i>B. grandis</i>
	<i>B. baculus</i>
	<i>B. eliasi</i>
	<i>B. jenseni</i>
Maastrichtian	* <i>B. reesidei</i>
Campanian	* <i>B. cuneatus</i>
	* <i>B. compressus</i>
	* <i>Didymoceras cheyennense</i>
	* <i>Exiteloceras jenneyi</i>
	* <i>Didymoceras stvensoni</i>
	* <i>D. nebrascense</i>
	* <i>Baculites scotti</i>
	* <i>B. gregoryensis</i>
	* <i>B. perplexus</i>
	<i>B. sp. (smooth)</i>
	* <i>B. asperiformis</i>
	<i>B. maclearni</i>
	<i>B. obtusus</i>
	<i>B. sp. (weak flank ribs)</i>
	<i>B. sp. (smooth)</i>
	* <i>Scaphites hippocrepis</i>

AMMONITE RECORD

In the following review of ammonite zones represented in northeastern New Mexico, references are given for the best illustrations of the guide fossils. Sketches of most of the baculites are shown on a map by Scott and Cobban (1965) and in a paper by Gill and Cobban (1973, p. 61-11) which also has brief descriptions.

Zone of *Scaphites hippocrepis* (DeKay)

The youngest of three chronologic forms of *S. hippocrepis* (Fig. 2, G) (Cobban, 1969, p. 21, pl. 3, figs. 1-25; pl. 4, figs. 35-49; pl. 5, figs. 36-40; text-figs. 2, 4, 10, 11) is represented in four collections at two localities: U.S.G.S. Mesozoic local-

ities 8352, D4835, and D4836, in the WA sec. 32, T. 30 N., R. 24 E. (unsurveyed), and D3647, in the SEA sec. 13, T. 30 N., R. 24 E. (Fig. 1). The fossils were associated with *Inoceramus balticus* Boehm, *Glyptoxoceras novimexicanum* (Reesi de, 1927, p. 8, pl. 4, figs. 1-6), and *Baculites* sp., in dusky-red-weathering slabby ferruginous concretions and orange-weathering limestone concretions.

Zone of *Baculites asperiformis* Meek

A collection from a slabby ferruginous concretion in the lower part of the Pierre Shale at locality D4838, 2 mi (3.2 km) east of Clifton House, is from the Zone of *Baculites asperiformis* Meek (Fig. 2, B) (Cobban, 1962a, p. 708, pl. 106, figs. 1-16). The baculite is associated with *Inoceramus*, a bit of some heteromorph, and numerous fish scales.

Zone of *Baculites perplexus* Cobban

Baculites perplexus Cobban (Fig. 2, E, F) (1962a, p. 714, pl. 107, figs. 1-16; text figs. 1 a-c) was collected from ironstone concretions in the Pierre Shale south of Raton at locality D3653, at a roadcut about 2.25 mi (3.6 km) south of Hebron siding. Specimens that could be this species were also found at locality D7017 about 14 mi (22.5 km) southwest of Vermejo Park.

Zone of *Baculites gregoryensis* Cobban

Fragments of baculites from gray limestone concretions at locality D6030, near Vermejo River 8.5 mi (13.7 km) northwest of Vermejo Park, may be *Baculites gregoryensis* Cobban (1951, p. 820, pl. 118, figs. 1-5; text figs. 8-13). Associated

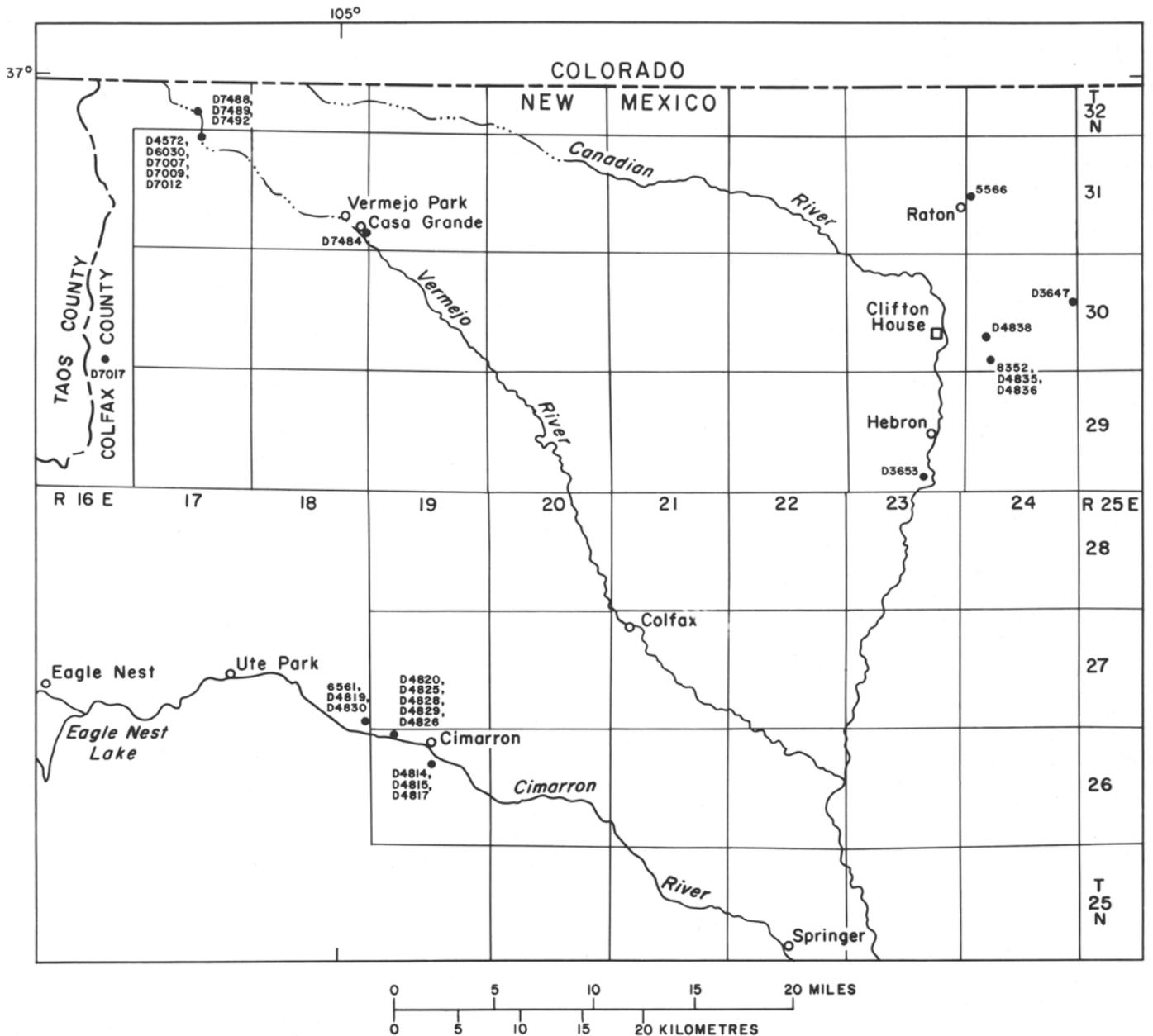


Figure 1. Localities of fossil collections from the Pierre Shale.

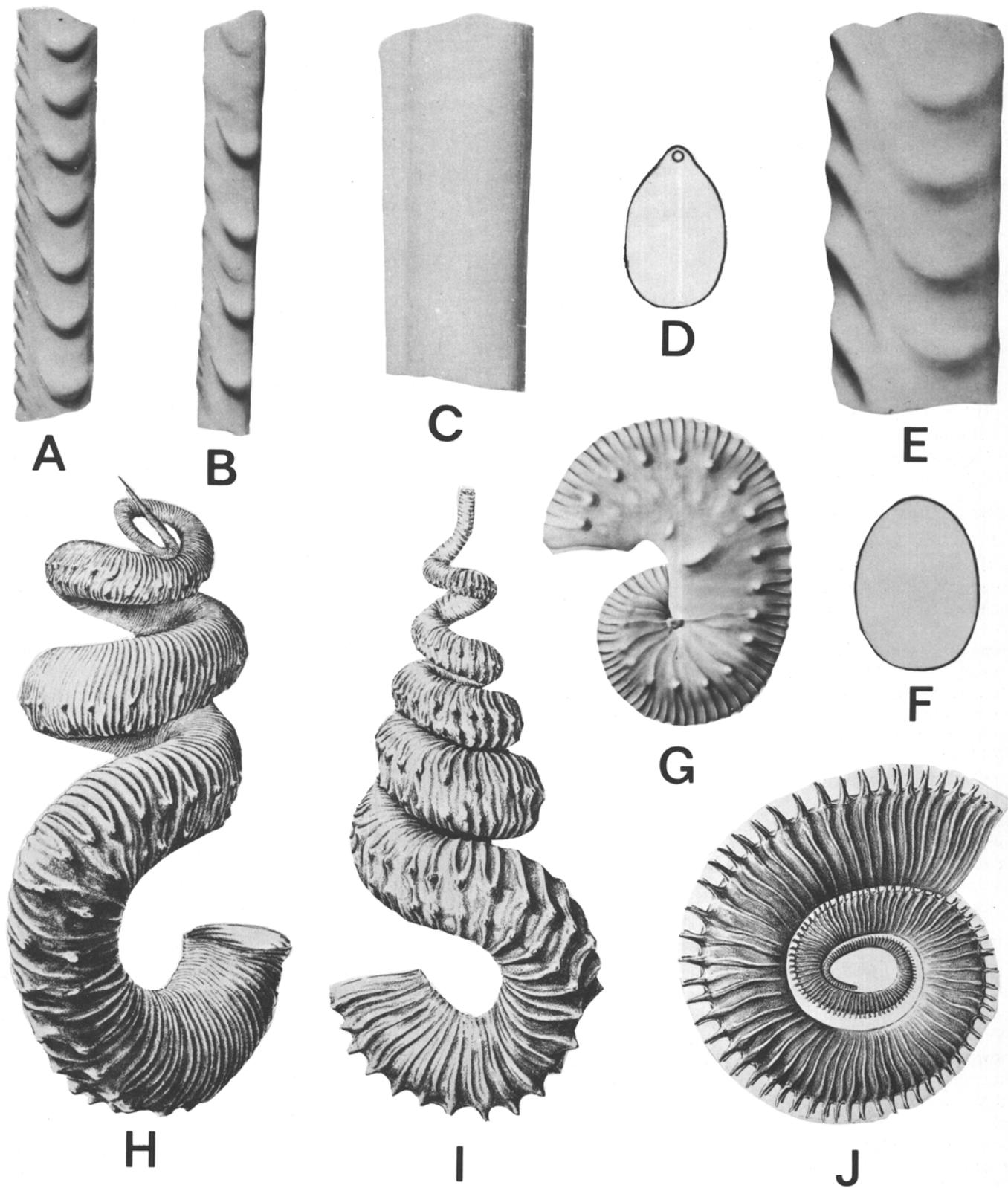


Figure 2. Ammonites found in the Pierre Shale. Figures A-G are natural size; the others are one-half natural size. A, *Baculites obtusus* Meek; B, *B. asperiformis* Meek; C, D, *B. scotti* Cobban; E, F, *B. perplexus* Cobban; G, *Scaphites hippocrepis* (DeKay); H, *Didymoceras nebrascense* (Meek and Hayden); I, *D. stvensoni* (Whitfield); J, *Exiteloceras jenneyi* (Whitfield). From Gill and Cobban, 1973.

fossils consist of *Inoceramus* sp., *Didymoceras?* sp., *Placenticerus* sp., and *Eutrephoceras* sp.

Zone of *Baculites scotti* Cobban

Baculites scotti Cobban (Fig. 2, C, D) (1958, p. 660, pl. 90, figs. 1-9; text figs. 1 a-e, h) is represented by several collections. The species was collected by J. R. Gill 580 ft (177 m) below the top of the Pierre Shale south of Cimarron at locality D4814 in the SW' / SEA sec. 9, T. 26 N., R. 19 E., and at locality D4815 in the SW' NE' / sec. 16 of the same township. The baculite was also found by C. L. Pillmore at localities D7488, D7489, and D7492, near the junction of Ricardo and Little Vermejo Creeks about 9 mi (14.5 km) northwest of Vermejo Park.

Zone of *Didymoceras nebrascense* (Meek and Hayden)

Didymoceras nebrascense (Meek and Hayden) (Fig. 2, H) (Scott and Cobban, 1965) was collected by J. R. Gill from gray-weathering limestone concretions 520 ft (158 m) below the top of the Pierre Shale south of Cimarron at locality D4817 in the SW' / SEA sec. 9, T. 26 N., R. 19 E. The species has also been found at locality D7012, beside Gold Creek 0.5 mi (0.8 km) above its junction with Vermejo River about 8.5 mi (13.7 km) northwest of Vermejo Park.

Zone of *Didymoceras stevensoni* (Whitfield)

J. R. Gill collected *Didymoceras stevensoni* (Whitfield) (Fig. 2, I) (Scott and Cobban, 1965) from gray-weathering limestone concretions 430 ft (131 m) below the top of the Pierre Shale at locality D4819 near the mouth of Turkey Creek Canyon about 4 mi (6.4 km) west of Cimarron. Associated ammonites included *Baculites* cf. *B. rugosus* Cobban, *Solenoceras* n. sp., and *Placenticerus* sp. *Didymoceras stevensoni* has also been found at localities D7007 and D7009 near the junction of Gold Creek and Vermejo River about 8.5 mi (13.7 km) northwest of Vermejo Park. Other ammonites from localities D7007 and D7009 are *Baculites crickmayi* Williams, *Solenoceras?* sp., and *Placenticerus meeki* Boehm.

Locality 6561 of Lee (1917, p. 74), "400 to 500 ft below the top of the Pierre shale" 3 mi west of Cimarron, is probably from the Zone of *D. stevensoni*. In Lee's list of fossils, *Baculites compressus* should probably read *B. crickmayi*, *Placenticerus whitfieldi* should read *P. meeki*, and *Ptychoceras* sp. should read *Solenoceras* sp.

Zone of *Exiteloceras jenneyi* (Whitfield)

An ammonite, now referred to *Exiteloceras jenneyi* (Whitfield) (Fig. 2, J) (Scott and Cobban, 1965), was recorded as *Ancyloceras* sp. by Lee (1917, p. 45, 144) from locality 5731 ("Vermejo Park, N. Mex., near eastern extremity; about 300 ft below top of Pierre shale"). C. L. Pillmore found this aberrant ammonite at locality D4572 near the junction of Gold Creek and Vermejo River about 8 mi (13 km) northwest of Vermejo Park. West of Cimarron, *E. jenneyi* was collected by J. R. Gill from a gray limestone concretion 415 ft (126 m) below the top of the Pierre at locality D4820 in the NW' / NW' / sec. 5, T. 26 N., R. 19 E.

Zone of *Didymoceras cheyennense* (Meek and Hayden)

Lee (1912, p. 611) recorded this helical ammonite as "*Heteroceras cheyensis*." The species is not listed in Lee's summary paper (1917).

Didymoceras cheyennense (Meek and Hayden) (Scott and Cobban, 1965) is not present in the more recent collections from northeastern New Mexico. The presence of the zone, however, is suggested by the occurrence of a late form of *Baculites rugosus* Cobban (1962b, p. 131, pl. 27, figs. 1-9; pl. 28, figs. 1-11; text fig. 1c) collected by J. R. Gill from limestone concretions 290 ft (88.4 m) below the top of the Pierre Shale at locality D4825 west of Cimarron in the NW' / NW' / sec. 5, T. 26 N., R. 19 E. This form of *B. rugosus* is restricted to the Zone of *D. cheyennense* in areas farther north.

Zone of *Baculites compressus* Say

Lee (1917, p. 45) recorded *Baculites compressus* Say (Meek, 1876, p. 400, pl. 20, figs. 3a-c) from 100 to 500 ft (30-152 m) below the top of the Pierre Shale at several localities in northeastern New Mexico. At that time, the name *B. compressus* was applied in a very broad sense, and some of Lee's records may represent other species. Typical specimens of *B. compressus* are not present in the more recent collections from northeastern New Mexico, but the zone is suggested by the occurrence of *B. undatus* Stephenson and *Hoploscaphites* cf. *H. rugosus* (Stephenson) resembling forms associated with *B. compressus* in Colorado (Cobban, 1973, p. 461). The localities of *B. undatus* from northeastern New Mexico are D7484 from 150 to 200 ft (45.7-61 m) below the top of the Pierre Shale at Casa Grande, and D4826, from 260 to 290 ft (79.2-88.4 m) below the top, west of Cimarron, in the NW1/4 NW1/4 sec. 5, T. 26 N., R. 19 E.

Zone of *Baculites cuneatus* Cobban

Although *Baculites cuneatus* Cobban (1962b, p. 127, pl. 25, figs. 1-8; text fig. 1 b) has not been found in northeastern New Mexico, the presence of the zone of this fossil is suggested by the occurrence of an undescribed species of *Placenticerus* collected by J. R. Gill from limestone concretions 100-135 ft (30-41 m) below the top of the Pierre Shale at localities D4828 and D4829 west of Cimarron in the NW' / NWA and NE' / NE' / sec. 5, T. 26 N., R. 19 E. This species of *Placenticerus* occurs with *B. cuneatus* in the Pierre Shale of Middle Park, Colo.

Zone of *Baculites reesidei* Elias

Baculites reesidei Elias (1933, p. 302, pl. 32, figs. 2a-c) has not been found in northeastern New Mexico, but the presence of the zone of this ammonite is suggested by the occurrence of *Inoceramus oblongus* Meek (White, 1879a, p. 285, pl. 2, figs. 1a, b). This inoceramid is common in the Zone of *B. reesidei* in the Pierre Shale of Colorado and Wyoming. In northeastern New Mexico, *I. oblongus* was collected by J. R. Gill from limestone concretions 80-115 ft (24-35 m) below the top of the Pierre Shale at locality D4830 west of Cimarron in the SEA sec. 36, T. 27 N., R. 18 E. (unsurveyed).

MAP POSSIBILITIES

At least 12 ammonite zones are known for the Pierre Shale in northeastern New Mexico. Further collecting will probably reveal additional zones. If collections were made from the many outcrops in the Raton-Cimarron area, a biostratigraphic map could possibly be prepared like those published for two areas in Colorado (Scott and Cobban, 1965, 1975). Such a map would delineate structural features as well as break up the large area of undivided "Pierre Shale and upper part of Nio-

brara Formation" now shown on the geologic map of New Mexico (Dane and Bachman, 1965).

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