# FOSSIL MAMMALS OF THE EARLY WASATCHIAN POWDER RIVER LOCAL FAUNA, EOCENE OF NORTHEAST WYOMING

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## ABSTRACT

THE POWDER RIVER local fauna, collected mainly under the direction of H. E. Wood, II, is of earliest Wasatchian age, correlative with the Four Mile and early Gray Bull assemblages. The enclosing Eocene rocks are probably not referable to the Wasatch Formation. Forty-one species of mammals are represented in the collection; comparative faunal lists of the Powder River and Four Mile local faunas are presented.

A very primitive rodent is present at Powder River, as is a species of true *Leptacodon* and a probably new small pantolestine. Subspecific divisions are abandoned in the genera *Paramys* and *Hyracotherium*, but retained for *Phenacolemur*. The taxa Adapisoricidae, Phenacodontidae, Apheliscinae, *Paeneprolimnocyon*, *Tetonius*, *Haplomylus*, *Hyopsodus miticulus*, and *Esthonyx spatularius* are discussed in some detail.


# INTRODUCTION

IN THE EARLY 1950s, Horace E. Wood, II, and his wife, Florence D. Wood, collected an assemblage of fossil mammals and other vertebrates from Eocene rocks in the Powder River Basin of northeastern Wyoming. Following preliminary investigation during the summers of 1938 and 1941, intensive work was carried out during 1951, 1952, and 1953 in areas around Sussex and Pumpkin buttes, near the center of the Basin (see fig. 1).

At that time, the age of the rocks in the center of the Basin was considered Wasatchian, but of uncertain position within this North American land mammal age (Wegemann, 1917; Wood et al. 1941; Brown, 1948; Love and Weitz, 1951). Fossil mammals had been recovered from the Basin, but interpretations of their affinities varied somewhat (see Jepsen, 1963, p. 676, on the history of this problem). The collection was of further importance as it represented the easternmost extent of Wasatchian age deposits then known. For a number of reasons, however, little work was done on the collection from 1953 until the present study was begun in the late 1960s: minor collections were made in 1958 and 1961 and portions of the assemblage were briefly treated by Kitts (1956) and Radinsky (1963).

In the interim between the original collecting by the Woods and the present study, Hose (1955) published on the geology of the Crazy Woman Creek area, west of the Woods' localities, and Sharp et al. (1964) discussed the region east of the Woods' major collecting areas, but included a few of their field localities. The fossil mammalian remains reported in those papers indicated an age of Gray Bull equivalence for the enclosing sediments. In 1960, McKenna published his analysis of the Four Mile local fauna from Colorado, in which he established a standard of comparison for earliest Eocene mammals. More recently, Guthrie (1967b) reviewed the type Lysite mammals, and Jepsen (1963) reported a collection of early Eocene mammals from the Golden Valley Formation of western North Dakota, thus extending the range of Wasatchian mammals even farther eastward.

Because there has not been any detailed geologic mapping of the area in which the Woods collected, and because almost all the localities are surface or anthill sites, it is difficult to analyze stratigraphy using modern methods. Without further collection and precise correlation of stratigraphic levels, the Woods' collection would either have to be abandoned or treated as if it all came from a single, very broad, faunal "horizon." For these reasons, and on the advice of Malcolm C. McKenna, I spent a week in the Sussex region in an attempt to resolve this dilemma. Details of this work are reported below in the section on Geology. Essentially, the faunal cohesiveness of the collection and its recovery from a relatively narrow span of rocks (and thus time) indicate that the Powder River Basin assemblage is a sample drawn from a community of animals that lived together within a relatively restricted geographical and temporal region, i.e., as a paleontological local fauna. Following Wood et al. 1941, (Chart 1), I will refer to this assemblage as the Powder River local fauna.

## CONVENTIONS AND ABBREVIATIONS

In succeeding sections of the present paper, certain conventions are followed which can best be explained here. All measurements are in millimeters (mm.); in dental measurements, width (W) precedes length (L) in all cases. The widths and lengths are maximal, defined as maximum diameters perpendicular and parallel, respectively, to the major anteroposterior axis of the tooth. In addition, the dental terms "mesial" and "distal" are employed, as they have the advantage of indicating direction toward or away from the interincisive position along the arc of the tooth row. In statistical tables, the symbols N (number of specimens in the sample), OR (observed range), M (mean), SE (standard error of the mean), $\sigma$ (standard deviation), and V (coefficient of variation, V $100\sigma$/M) are used.

Almost 600 specimens have been identified in the Wood collections from the Powder River Basin, but of these only 105 have been assigned American Museum of Natural History catalogue numbers: four by Radinsky (1963, p. 105), and 101 by me. The majority of specimens are isolated teeth, not of great individual importance biologically. After discussion with McKenna, it was decided to assign numbers only to those specimens figured, individually measured, or described in some detail. In order not to lose the collection data, however, each uncatalogued specimen has been stored with a reference to its source locality (see list below).

Abbreviations of institutions:

AC, Amherst College Museum, Amherst
AMNH, the American Museum of Natural History
CM, Carnegie Museum, Pittsburgh
PU, Princeton University Museum
YPM, Yale Peabody Museum, New Haven
UCMP, University of California Museum of Paleontology, Berkeley

## ACKNOWLEDGMENTS

The present paper is the result of a project suggested to me by Dr. Malcolm C. McKenna, Frick Curator of the Department of Vertebrate Paleontology, the American Museum of Natural History. Dr. McKenna has supervised the work since its inception. He has read and commented upon the entire manuscript and has offered aid in the identification of specimens. I have also discussed portions of the work with Drs. Robert M. Hunt, Giles T. MacIntyre, Leslie Marcus, James Mellett, Frederick Szalay, Leigh Van Valen, and Robert M. West, and with Messrs. Edward Atkins, and Thomas Rich. Dr. Robert E. Sloan of the University of Minnesota has identified and will further discuss the allotherians.

I thank Dr. Craig C. Black, section of Vertebrate Fossils, the Carnegie Museum, Pittsburgh, Pennsylvania; Dr. Glenn. L. Jepsen, curator of the Princeton University Museum, Princeton, New Jersey; Dr. Donald E. Savage, director of the University of California Museum of Paleontology, Berkeley, California; Dr. Elwyn L. Simons, associate curator of Vertebrate Paleontology in the Yale Peabody Museum, New Haven, Connecticut; and Drs. McKenna and Bobb Schaeffer of the department of Vertebrate Paleontology, the American Museum of Natural History, for allowing me access to the relevant collections in their care.

During my field work in Wyoming, I was accompanied by my wife, Roberta Marx Delson, who also assisted with curation of the Wood collection. We thank Mrs. Helen Losey of Sussex P. O., Wyoming, for much hospitality and several other local ranchers for permission to work on their property.

The research for the present paper was undertaken while I was a graduate student in the Department of Geology, Columbia University, under the tenure of National Science Foundation predoctoral graduate fellowships and traineeships, supplemented by funds of Columbia University and its Department of Geology.

All photographs were taken by the author. Scales have millimeter divisions; stereo pairs are mounted *ca.* 60 mm. apart. Figure 1 was expertly prepared by Mr. Ray Gooris.

## STRATIGRAPHIC CONSIDERATIONS

In the several years of collection, 122 field localities were examined, and each given a separate reference number. Of these, two were worked in 1938, one in 1941, 59 in 1951, 37 in 1952, and 21 in 1953, all under the supervision of Dr. and Mrs. H. E. Wood, II. In addition, in 1958 one of the areas was re-examined by Dr. Sylvia Graham (then Sylvia R. Fagan), and in 1961 Dr. Leonard B. Radinsky prospected yet another locality in this region. Most of the 122 localities were anthills, flats, or dissected badlands. Material was collected by surface pickup methods, but not all the field localities produced identifiable fossil mammal remains. With the exception of four groups of localities, the Woods' original field numbers are used herein to refer to the source of measured and/or described specimens. These group localities (Reculusa Blowout, Monument Blowout, Dry Well, and Bozeman) yielded material from more or less circumscribed areas of the Powder River "field" from which came more than two-thirds of the identifiable mammal specimens, including representatives of all but five of the known Powder River species. These four named group localities are among the dozen I located and prospected during my 1969 field reconnaissance. Geographic positions of all the Woods' localities, as well as additional information on the faunal composition of the four group localities, are given below. The original locality number cards are preserved with the collection.

As noted above, relative stratigraphic, and in some cases geographic, position of many localities was not clear from Wood's notes. Previous geological investigation of the region between Sussex and Pumpkin buttes (Sharp et al. 1964, pp. 547, 550) indicated that in this part of the Basin the Eocene rocks referred to the Wasatch Formation were essentially flat-lying, with strata dipping between 20 and 100 feet per mile to the northwest. This implies that local topography is the dominant factor controlling stratigraphic position of ground-level localities and collection spots. Most of the collection was mapped on USGS quadrangle maps, so that if localities could be accurately fixed on these maps, their elevation, and thus relative stratigraphic level, could be determined. In this manner, at least a dozen of the Woods' most productive localities were visited and geographically identified. Their elevations were measured and a tentative interpretation of the Eocene stratigraphy was devised.

The 1585 feet of Eocene "Wasatch Formation" reported by Sharp et al. (1964) is considered to have been deposited horizontally throughout the area of interest and to have suffered postdepositional deformation leading to a constant dip of 35 feet per mile due northwest. Thus, the elevation of the "Wasatch"-Fort Union contact at the north end of North Pumpkin Butte may be estimated at approximately 4400 feet (surface elevation 6039 feet, less 1585 feet of Eocene and about 60 feet of White River Oligocene; see discussion below), whereas the contact in section 26, T. 44 N., R. 78 W., at Wood's localities 51–3, 31, 32 and Hough's locality FC 3 (Sharp et al. 1964, pl. 13), lies at roughly 4200 feet (surface elevation slightly over 4500 feet, 330 feet above the contact, Sharp et al. 1964, pl. 13). These two datum points allow the determination of 35 feet per mile as the generalized dip, and in conjunction with the elevations of the named localities permit the following interpretation of their relative stratigraphic position.

Of the four named group localities, Reculusa Blowout, the most productive, is about 400 feet above the "Wasatch"-Fort Union contact. Bozeman locality appears to include rocks from 450 feet to 500 feet above the contact, whereas Dry Well includes rocks between 600 feet and 800 feet above this level. The elevation of Monument Blowout can be only roughly estimated, but it appears to be situated slightly more than 1000 feet above the presumed local contact. Several of the less productive but still important localities occur as low as 300 feet above the contact but none occurs appreciably below this level. Above the 800-foot level (aside from Monument Blowout), the only specimens recovered were some of *Haplomylus* (from localities 51–32 and 51–52), and small adapisoricids (from locality 51–34), all below the 1000-foot level; in addition, there may be some *Coryphodon* from slightly higher in the section (locality 51–50, in the buttes region). As

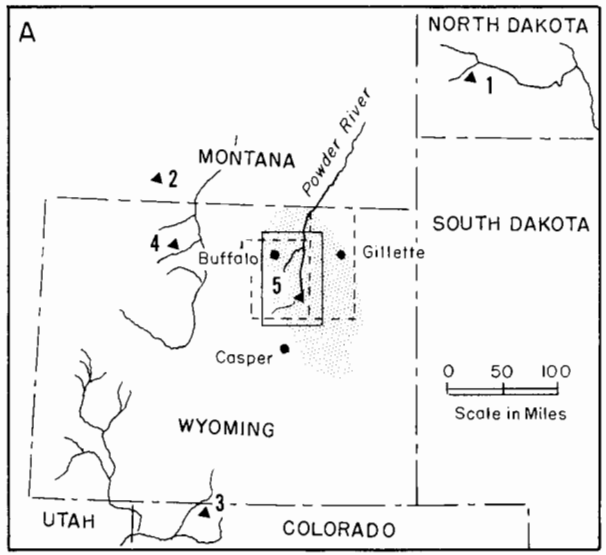
*Haplomylus* is considered an "indicator" for the earlier Gray Bull, it thus appears that there is no appreciable change in age between the "Wasatch"-Fort Union contact and the 1000-foot level above this datum. At least 90 per cent of all fossils recovered have come from rocks between 300 and 800 feet above this horizon, and no difference in faunal elements can be determined in this span.

Before closing the geological section of this paper, it is interesting to note some additional facts about the local geobiology and to make suggestions for future investigation. All the Pumpkin Buttes have a cap-rock 30 to 80 feet thick from which fossils of Oligocene age have been collected by individuals from the U.S. Geological Survey, the U.S. National Museum, the Frick Laboratory of the American Museum of Natural History, and others. Below this cap-rock are several hundred feet of sands which are considered part of the Eocene, although Wood did not find any fossils in them. However, Jean Hough made a collection for the U.S. National Museum at a level about 150 feet below the cap-rock on Dome Butte (near North Pumpkin Butte), which is about 1400 feet above the hypothesized "Wasatch"-Fort Union contact. From these sands have come, in addition to *Phenacodus*, *Coryphodon*, and *Hyracotherium*, a single specimen attributed to *Lambdotherium* sp., an indicator of the Lost Cabin faunal zone (Sharp et al. 1964, pl. 13, FC2; Soister, 1968, p. A42). C. Lewis Gazin wrote that there may be a single specimen referable to *Heptodon* sp. in this collection (personal commun. June 24, 1969).

Information in Sharp et al. (1964; duplicated on larger-scale maps in Sharp and White, 1957) indicated that the upper part of the Eocene may be channel sands, which might respond readily both to surface collecting and, especially, to a washing technique such as that utilized by McKenna (1960). If further work is to be carried out in the Eocene of the Sussex-Pumpkin Buttes region, the controlled study of the rocks below the Buttes cap-rock should be a primary objective. Both blowout localities described should yield much more material to either a washing or quarrying operation: the sediment is not well consolidated, and surface indications are good. Additional controlled prospecting of badland areas, particularly at the Dry Well locality, might also prove productive, especially if quarries could be developed at several different levels.

In a discussion of regional paleogeography, Soister (1968) considered the Powder River Basin Eocene sediments in terms of the Wind River Basin and Wind River Formation. During Gray Bull time, when most of the mammals described herein were living, the Casper arch was high and separated the two basins. Soister (1968, pp. A40–A42) suggested, however, that during Lysite and Lost Cabin time there was a connection between an eastward-flowing river in the Wind River Basin and a north-northwestward-flowing river in the Powder River Basin. This river system may have linked the basins while the upper part of the Eocene rocks now preserved on the Pumpkin Buttes was being deposited.

In this connection, it is to be noted that all previous workers have considered that the Eocene rocks of the Powder River Basin belong to the Wasatch Formation (see Sharp et al. 1964, pp. 546 ff.; Jepsen, 1963). Love and Weitz (1951) named the rocks, in a limited area on the flanks of the Bighorn Mountains to the northwest of the Pumpkin Buttes area, the Moncrief and Kingsbury conglomerate members of the Wasatch Formation. No other names have been proposed in the Powder River Basin. It is most doubtful that these rocks, deposited by a river flowing north from the Hartville uplift (Soister, 1968, p. A42), were derived from the same source as those of the type Wasatch, almost 300 miles to the southwest. Investigation of this problem might also be included in a further study of the region. Having offered these suggestions for future work in the Powder River Basin Eocene, I will add my opinion that it is much more important for vertebrate paleontology and for Wyoming geology in general, that detailed work be carried out first in the Bighorn Basin region, as the fossils are so much more abundant, and the type areas of Gray Bull and Clark Fork faunal concepts are situated there.



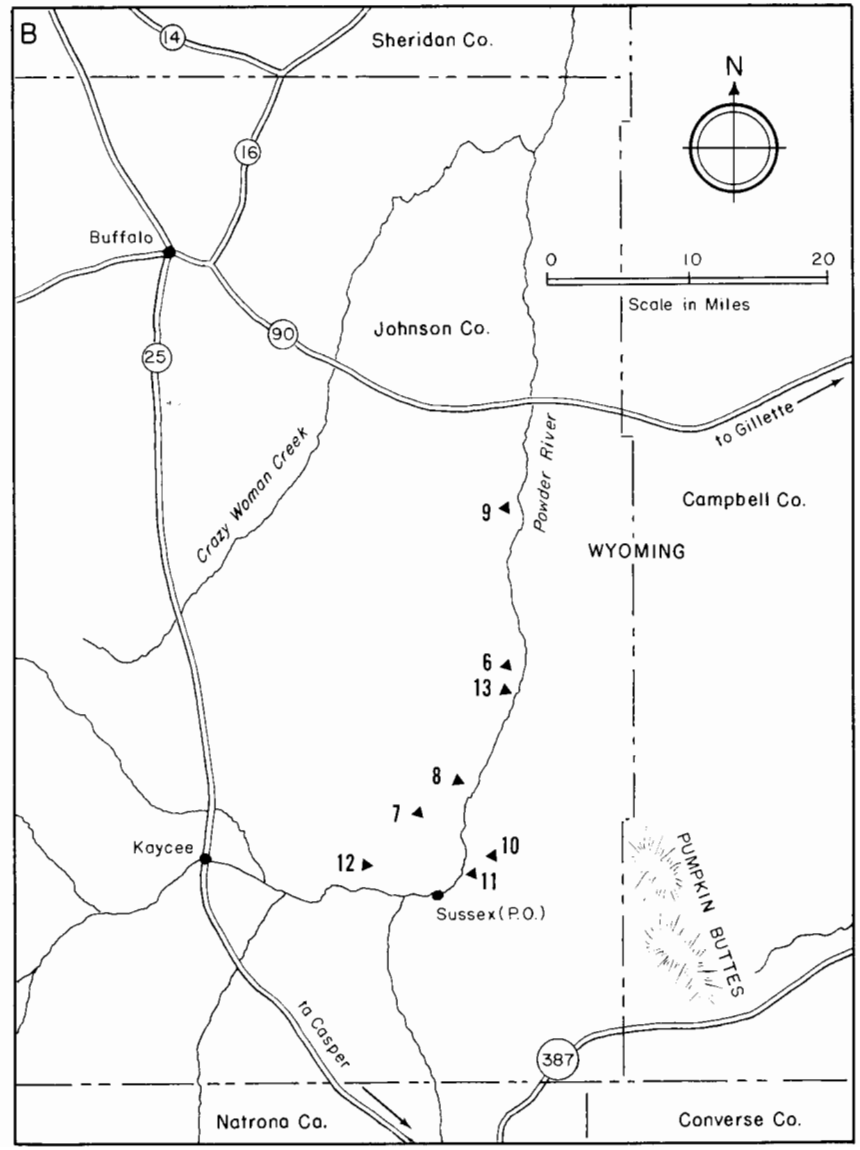




FIG. 1. A. Index map of Wyoming and neighboring states, with locations of major fossil faunas discussed in the text. 1) Golden Valley local fauna. 2) Bear Creek local fauna. 3) Four Mile local fauna. 4) Big Horn Basin local faunas (Gray Bull, Clark Fork, Sand Coulee). 5) Powder River local fauna. Hatched area indicates approximate extent of the Powder River Basin, solid rectangle outlines area enlarged in B, and dotted lines are the borders of Johnson and Campbell counties, Wyoming. B. Major collecting areas in the Powder River Basin. 6) Reculusa Blowout. 7) Dry Well locality (and neighboring localities 51–11, 51–20, 51–62). 8) Bozeman locality. 9) Monument Blowout. 10) Locality 51–3. 11) Locality 51–25. 12) Locality 52–12. 13) Locality 52–36.

## LOCALITY DATA

As noted above, 122 localities in the Powder River Basin were prospected for fossils by the Woods. They gave each locality a field number, assigned sequentially within the year of collection: e.g., 51–3 refers to the third locality collected in 1951. I have sorted these localities geographically, and all those falling inside the same surveyed section (one square mile) are treated together as a group locality. Group localities are referenced by the field number of the earliest collected field locality. Thus, 51–3, 51–31, and 51–32 all were collected in section 26, T. 44 N., R. 78 W.: the group locality is referred to as 51–3 only.

Forty-three such group or single localities have yielded identifiable remains of Eocene fossil mammals. Of these, 25 have produced one or two species; 10, from three to six species; and eight yielded seven or more. Four of these eight localities produced two-thirds of the mammal specimens among them, and I have given names to these four for easy reference (as well as abbreviations for tabular reference). For each of these four, a specimen count has been made by taxon, and an estimate has been made of the minimum number of individuals necessary to produce these specimens. The estimates are based solely on the number of teeth and jaws, taking into consideration size, wear, and tooth homology. These data are presented in table 1.

The specific locality data that follow are presented as an aid to future researchers in relocation of all fossiliferous localities, and in study of the Wood collection. The numbers of sterile field localities are not included, and those of field localities subsumed into named group localities are not listed in the section of "numbered localities." For the 39 unnamed single or group localities, a list of genera (when monotypic in this fauna) or species present is given.

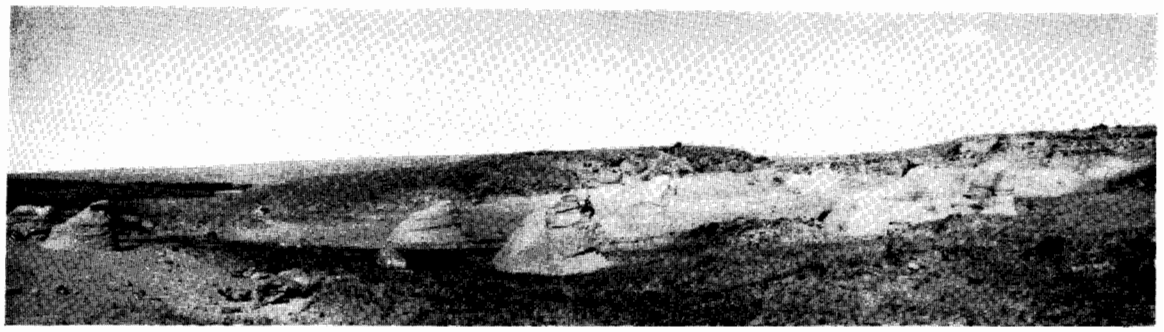
### Named Localities

Reculusa Blowout (Rec.) so named because it is situated on the F. Reculusa ranch, Sussex, Wyoming. Center, NE¼, sect. 2, T. 45 N., R. 78 W., Hoe Ranch quadrangle, Johnson County, Wyoming; surface elevation approximately 4400 feet; map four, Johnson County, general highway map, Wyoming Highway Dept. This sand blowout, about 50 feet in radius, is situated 23.1 miles north of Sussex on Fort Reno road; lying about 0.25 mile east of the road on dirt track beginning about 0.15 mile south of Irigaray Ranch cattle-guard. Other blowouts that might yield fossils may be found nearer the road. This locality was by far the most productive, yielding representatives of almost all taxa. It includes field localities 53–3, 9, 10, 13, 14, 16, 17, 20, and 22. See figure 2A, B.

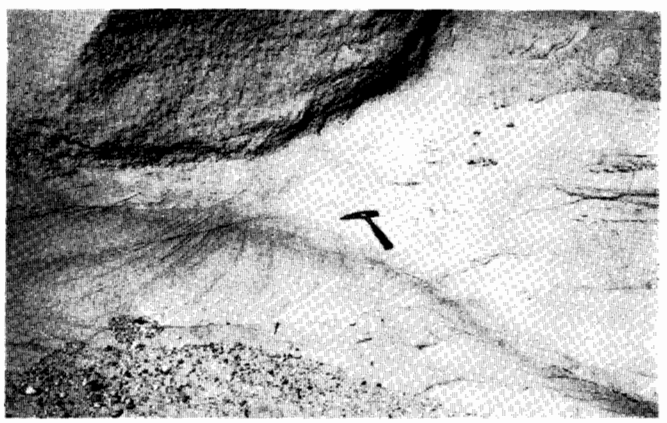
Dry Well locality (Dry), lying 1 mile south of a dry oil well from which it got its name, one of the first drilled in the now-productive Sussex region. Center, sect. 15, T. 44 N., R. 79 W., Soldier Creek quadrangle, Johnson County, Wyoming; elevation 7600 feet to 7800 feet in drainage system northeast of Fourmile Creek/Soldier Creek divide, draining into Soldier; map four, Johnson County, general highway map, Wyoming Highway Dept. Proceeding north on Fort Reno road out of Sussex, turn east 5.75 miles north of road junction with Sussex-Kaycee road (Wyoming 1002), passing Palmer Reservoir; proceed past corner marker (sects. 7, 12, 13, 18), 4.6 miles from Fort Reno road to fence and "T"-shaped road intersection; locality up small hill to north and down canyons beyond. Includes field localities 51–4, 5, 6, 7, 8, 41, 42, 43, 59, 60, 61; 52–25, 26, 27; and 53–2. See figure 3.

Bozeman locality (Boz.) so named because it lies just off old Bozeman Pioneer trail. NE corner, sect. 1, T. 44 N., R. 79 W., Soldier Creek quadrangle, Johnson County, Wyoming; elevation approx. 4500± 50 feet; map four, Johnson County, general highway map, Wyoming Highway Dept. Proceeding 8.7 miles

Fig. 2–5. 2. A. Panoramic view southwest across part of Reculusa Blowout; the mounds of cross-bedded channel sandstone are 3 to 4 feet high. B. Cross-bedded sands *in situ* and lag concentrate at Reculusa Blowout, geology hammer for scale. 3. View northeast of dissected variegated mudstone badland rim of Dry Well locality. 4. The cross-bedded channel sandstone "monuments" and brown concretions of Monument Blowout, geology hammer for scale. 5. View east of Monument Blowout from road.



2A



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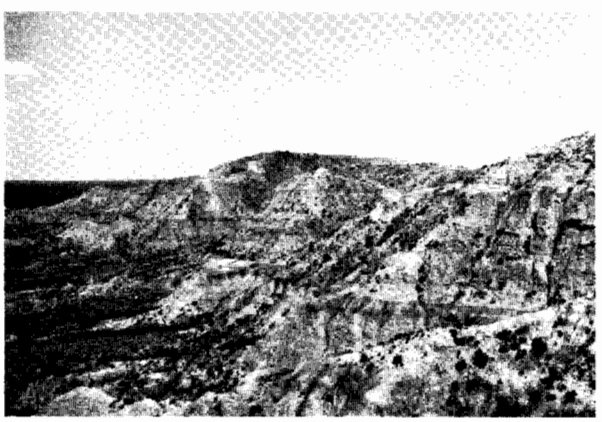

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north of Sussex on Fort Reno road, turn northwest to Bozeman trail; about 1.3 miles beyond are light-colored flats northeast of road, and 0.4 mile beyond that are badlands 25–50 yards southwest of road; both areas were productive for Wood. Includes field localities 51–9, 10, 14, 15, 16, 17, 26, 27; 52–1, 2, 3, 4, 5, 6; and 58–223.

Monument Blowout (Mon.), named by Wood because of high sand columns in center. $NE\frac{1}{4}$ (possibly), $SE\frac{1}{4}$, sect. 14, T. 48 N., R. 78 W., Johnson County, Wyoming; elevation approx. $1050 \pm 50$ feet, no topographic quadrangle map as yet; map one, Johnson County, general highway map, Wyoming Highway Dept. Take Schoonover road turnoff from US 90 between Gillette and Buffalo, Wyoming; 11.1 miles along main artery south, then eastward to series of sand blowouts south and east of road; most distant one is Monument; 5.1 miles beyond is Schoonover bridge across the Powder River. Includes field localities 53–19 and 21. See figures 4 and 5.

NUMBERED LOCALITIES

38–39; sect. 25, T. 44 N., R. 76 W.; *Coryphodon*.

38–41; sect. 28, T. 43 N., R. 78 W.; includes 41–33; "*Chriacus*," *Ectocion*, *Diacodexis*, and *Microsyops*.

41–33; see 38–41.

51–1; sect. 29, T. 43 N., R. 78 W.; includes 51–2; *Coryphodon*.

51–2; see 51–1.

51–3; sect. 26, T. 44 N., R. 78 W.; includes 51–31, 32; and Hough's FC 3 (see pp. 311–312); elevation 4500 feet, about 300+ feet above base of Eocene; rodent incisors, *Arfia*, *Coryphodon*, *Hyracotherium*, and *Pelycodus*.

51–11; sect. 22, T. 44 N., R. 79 W.; includes 51–12, 13; *Diacodexis*, *Arfia*, *Coryphodon*, *Hyracotherium*, *Microsyops*, and *Pelycodus*.

51–12; see 51–11.

51–13; see 51–11.

51–18; sect. 13, T. 44 N., R. 79 W.; includes 51–44, 45; *Didelphodus*, *Microsyops*, *Pelycodus*, rodent incisors, and *Haplomylus*.

51–19; sect. 23, T. 44 N., R. 79 W.; *Arfia* and *Hyopsodus*.

51–20; sect. 10. T. 44 N., R. 79 W., less-developed badland area to north of Dry Well locality, reached by continuing on same road around to northwest; includes 51–21, 22, 23, and 24; *Haplomylus*, *Hyopsodus*, *Apheliscus*, *Esthonyx*, *Ectocion*, *Diacodexis*, cf. "*Leptacodon*" *jepseni*, *Coryphodon*, *Hyracotherium*, and *Microsyops*.

51–21; see 51–20.

51–22; see 51–20.

51–23; see 51–20.

51–24; see 51–20.

51–25; sect. 4, T. 43 N., R. 78 W., continuous to south with sect. 9 and to north with sect. 33, T. 44 N., R. 78 W. (51–30), in central and eastern thirds, and also to east into western third of sect. 3, T. 43 N., R. 79 W. (61–1); House Creek quadrangle, Johnson County, Wyoming; badland rim draining into west side of Powder River; elevation 4400-4600 feet; map four, Johnson County, general highway map, Wyoming Highway Dept. Proceeding east of Sussex toward Linch 4.5 miles, turn north on road along heads of gullies on divide; drop down to west at several points. Area fauna includes: *Haplomylus*, *Hyopsodus*, rodent incisors, *Pelycodus*, *Microsyops*, *Prolimnocyon*, *Didelphodus*, *Palaeictops*, *Palaeoryctes*, and cf. "*Leptacodon*" *jepseni*.

51–30; see 51–25.

51–31; see 51–3.

51–32; see 51–3.

51–33; sect. ?28, T. 44 N., R. 78 W.; *Apheliscus*, rodent incisors, undetermined miacine.

51–34; sect. 20, T. 44 N., R. 78 W.; *Phenacodus primaevus* and *Hyracotherium*.

51–35; sect. 11, T. 44 N., R. 78 W.; *Haplomylus*, *Hyopsodus*, rodent incisors, *Diacodexis*, and *Pelycodus*.

51–37; sect. 15, T. 44 N., R. 77 W.; includes 52–19; *Hyopsodus*.

51–38; sect. 23, T. 44 N., R. 77 W.; *Apheliscus*.

51–44; see 51–18.

51–45; see 51–18.

51–46; sect. 24, T. 44 N., R. 79 W.; *Hyopsodus*.

51–48; sect. 4, T. 43 N., R. 79 W.; *Diacodexis*.

51–49; sect. 11, T. 44 N., R. 76 W.; includes 51–50, 51, and 52; *Coryphodon* and *Haplomylus*.

51–50; see 51–49.

51–51; see 51–49.

51–52; see 51–49.

51–53; sect. 33, T. 44 N., R. 75 W.; *Haplomylus*.

51–58; sect. 24, T. 43 N., R. 79 W.; *Apheliscus*, rodent incisors.

51–62; sect. ?15, T. 44 N., R. 79 W.; listed as sect. 15, but as this is area of Dry Well locality (mistakenly listed by Wood as sect. 14), 51–62 may in fact be in sect. 16 or sect.

10 with 51–25, or continuous with either previously collected locality (see 51–25, Dry Well); *Haplomylus*, *Hyopsodus*, *Apheliscus*, *Paramys* (small), rodent incisors (larger), *Diacodexis*, *Microsyops*, and *Pelycodus*.

52–7; sect. 19, T. 43 N., R. 78 W.; *Diacodexis*.

52–9; sect. 17, T. 43 N., R. 78 W.; rodent incisor.

52–10; sect. 30, T. 45 N., R. 79 W.; *Pelycodus*.

52–11; sect. 19, T. 45 N., R. 79 W.; *Coryphodon*.

52–12; sect. 5, T. 43 N., R. 79 W.; same section as 52–13, 14, and 15; 52–12 reached from Kaycee road, 5.5 miles west of Sussex, turn north opposite gate to Matthews Ranch, drive 0.85 mile on dirt trail to fence; on other side proceed to gully with 100-foot-high north face, elevation about 4600-4700 feet, Sussex quadrangle; 52–13, 14, and 15 can be reached from long, circuitous trail beginning 1.8 miles farther west on Kaycee road, 0.1 mile east of Indart gate, not reached, elevation about 4600-4700 feet, Figure 8 Reservoir quadrangle; both map four, Johnson County, general highway map, Wyoming Highway Dept. Area fauna includes: *Haplomylus*, *Hyopsodus*, "*Chriacus*," *Paramys* (larger), cf. *Diacodon*, *Coryphodon*, and *Hyracotherium*.

52–13; see 52–12.

52–14; see 52–12.

52–15; see 52–12.

52–16; sect. 15, T. 43 N., R. 80 W.; rodent incisor.

52–18; sect. 22, T. 43 N., R. 78 W.; *Coryphodon*.

52–19; see 51–37.

52–20; sect. 34, T. 45 N., R. 77 W.; includes 52–21; *Haplomylus*, *Hyopsodus*, rodent incisors, *Tetonius musculus*, and *Pelycodus*.

52–21; see 52–20.

52–31; sect. 15, T. 45 N., R. 79 W.; *Haplomylus*, *Coryphodon*.

52–32; sect. 30, T. 47 N., R. 78 W. or sect. 25, T. 47 N., R. 79 W., exact location uncertain; includes 52–34; *Haplomylus*, cf. "*Leptacodon*" *jepseni*, and cf. *Leptacodon* sp.

52–34; see 52–32.

52–36; NE$\frac{1}{4}$, NW$\frac{1}{4}$, sect. 14, and SE$\frac{1}{4}$, SW$\frac{1}{4}$, sect. 11, T. 45 N., R. 78 W.; badland rim on north bank of east-west meander of Powder River, reached by Fort Reno road 16 miles north of Sussex (4.5 miles past Fort Reno site, 1.3 past Reculusa ranch road), turn off on dirt track to northeast; at top of rise is Bureau of Reclamation marker "BM 1950 PRU59," elevation 4300 feet; Hoe Ranch quadrangle (and Fort Reno quadrangle); map four, Johnson County, general highway map, Wyoming Highway Dept., *Apatemys*, *Haplomylus*, *Hyopsodus*, rodent incisors, *Diacodexis*, and *Pelycodus*.

52–37; sect. 35, T. 46 N., R. 78 W.; *Haplomylus*, rodent incisors, *Diacodexis*, and *Tetonius musculus*.

52–38; sect. 23, T. 46 N., R. 78 W.; *Hyopsodus*.

53–4; sect. 14, T. 46 N., R. 78 W.; *Hyopsodus*.

53–5; sect. 11, T. 46 N., R. 78 W.; *Diacodexis*.

53–7; sect. 10, T. 45 N., R. 79 W.; *Hyopsodus*.

53–11; sect. 15, T. 46 N., R. 78 W.; rodent incisor.

53–12; sect. 17, T. 46 N., R. 78 W.; *Pelycodus*.

61–1; NW$\frac{1}{4}$, sect. 3, T. 43 N., R. 78 W.; House Creek quadrangle, elevation about 4700 feet; locality found by L. Radinsky, specimens in Yale Peabody Museum collection, only cf. "*Leptacodon*" *jepseni* seen by the author.

## FAUNAL LIST AND CORRELATION OF THE POWDER RIVER LOCAL FAUNA

The presence in the Powder River local fauna of perissodactyls, artiodactyls, and certain primates and deltatheridians (as used here, see pp. 322, 329) indicates a post-Paleocene age for the assemblage. On the other hand, the occurrence of multituberculates and abundant condylarths, and the stage of evolution of some other species, points to Paleocene affinities. Of the several well-described faunal assemblages of late Paleocene through early Eocene age, the Powder River local fauna shows by far the greatest resemblance to that from Four Mile Creek, Colorado (McKenna, 1960), perhaps the earliest Eocene local fauna now known in North America. In order to show close similarity, the faunal list from Powder River will be compared with a revised and updated one from Four Mile (table 1).

Several invertebrates, numerous lower vertebrates, and at least 41 species of mammals are present in the Powder River local fauna, as now known. Only the mammals have been

TABLE 1

COMPARATIVE FAUNAL LISTS FROM THE POWDER RIVER AND FOUR MILE LOCAL FAUNAS WITH RELATIVE SPECIES ABUNDANCES FROM POWDER RIVER

(Fraction numerator is number of specimens; denominator is estimated minimum number of individuals.)

| | Powder River Named Localities | | | | | |
|---|---|---|---|---|---|---|
| | Reculusa | Dry Well | Bozeman | Monument | Powder River Totals | Four Mile Local Fauna |
| Order Multituberculata | | | | | | |
| Family Eucosmodontidae | | | | | | |
| *Neoliotomus ultimus* Granger and Simpson, 1928 | — | — | 1/1 | — | 1/1 | X[a] |
| Family Ptilodontidae | | | | | | |
| *Prochetodon* cf. *cavus* | — | — | — | — | — | X |
| Family Ectypodontidae | | | | | | |
| *Parectypodus* sp. (Sloan) | — | 1/1 | — | — | 1/1 | X |
| *Ectypodus tardus* | — | — | — | — | — | X |
| *Neoplagiaulax* sp. A., cf. *N. hazeni* | — | — | — | — | — | X |
| Order Marsupicarnivora | | | | | | |
| Family Didelphidae | | | | | | |
| *Peratherium comstocki* Cope, 1884 | 1/1 | — | — | — | 1/1 | cf.[b] |
| *Peradectes protinnominatus* | — | — | — | — | — | X |
| New genus and species | — | — | — | — | — | X[c] |
| Order Insectivora | | | | | | |
| Family Palaeoryctidae | | | | | | |
| *Didelphodus absarokae* (Cope, 1881b) | 2/1 | — | — | 1/1 | 6/5 | X |
| *Palaeoryctes* cf. *punctatus* Van Valen, 1965 | — | — | — | — | 1/1 | — |
| Family Leptictidae | | | | | | |
| Cf. *Diacodon* sp. | — | — | — | — | 1/1 | — |
| *Palaeictops tauricinerei* (Jepsen, 1930a) | 1/1 | 3/1 | — | — | 5/3 | cf. |
| Undescribed genus and species cf. *Tupaia* | — | — | — | — | — | X |
| Family Pantolestidae | | | | | | |
| *Palaeosinopa didelphoides* (Cope, 1881a) | 3/1 | 1/1 | — | — | 4/2 | X |
| *Palaeosinopa* cf. *lutreola* Matthew, 1918 | 1/1 | 1/1 | — | — | 2/2 | — |
| Cf. *Palaeosinopa* sp. | 1/1 | — | — | — | 1/1 | — |
| Small pantolestine genus and species | — | — | — | — | — | X |
| Family Apatemyidae | | | | | | |
| *Apatemys* cf. *chardini* (Jepsen, 1930a) | — | — | — | — | 1/1 | — |
| *Apatemys* cf. *kayi* | — | — | — | — | — | X |
| *Apatemys whitakeri* | — | — | — | — | — | X[d] |
| Family Adapisoricidae | | | | | | |
| "*Leptacodon*" *jepseni* McKenna, 1960 | — | — | — | — | 4/4 (cf.) | X |
| Cf. *Leptacodon* sp. | — | — | 2/1 | — | 3/2 | — |
| "Cf. *Metacodon*" | — | — | — | — | — | X |
| *Entomolestes* cf. *nitens* Matthew, 1918 | 1/1 | — | 1/1 | — | 2/2 | X |
| "*Nyctitherium*" sp. | — | — | — | — | — | X |
| Order Deltatheridia | | | | | | |
| Family Hyaenodontidae | | | | | | |
| *Arfia shoshoniensis* (Matthew, 1915a) | 4/4 | 1/1 | — | — | 8/6 | cf.[e] |

Table 1—*Continued*

| | Powder River Named Localities | | | | | |
|---|---|---|---|---|---|---|
| | Reculusa | Dry Well | Bozeman | Monument | Powder River Totals | Four Mile Local Fauna |
| *?Paeneprolimnocyon mordax* (Matthew, 1915a) | — | — | 1/1 | — | 1/1 | — |
| *?Prototomus* sp. | — | — | — | — | — | X |
| *Prolimnocyon atavus* Matthew, 1915a | 1/1 | 1/1 | 1/1 | — | 4/4 | X[f] |
| Family Oxyaenidae | | | | | | |
| *Oxyaena* sp. | — | — | — | — | — | X |
| Order Primates | | | | | | |
| Family Paromomyidae | | | | | | |
| *Phenacolemur praecox* Matthew, 1915c | 5/1 | 2/1 | 4/2 | — | 11/4 | X[g] |
| *Phenacolemur* sp., small | — | — | 1/1 | — | 1/1 | ?[g] |
| Family Anaptomorphidae | | | | | | |
| *Tetonius homunculus* (Cope, 1882a) | 1/1 | — | 1/1 | — | 2/2 | X |
| *Tetonius musculus* Matthew, 1915c | — | — | — | 1/1 | 3/3 | X |
| *Trogolemur* sp. | — | — | — | — | — | X |
| Family Microsyopidae | | | | | | |
| *Microsyops wilsoni* Szalay, 1969a | 5/1 | 10/2 | 3/2 | — | 30/? | X |
| *Microsyops alfi* | — | — | — | — | — | X |
| *Niptomomys doreenae* | — | — | — | — | — | X[h] |
| Family Notharctidae | | | | | | |
| *Pelycodus ralstoni* Matthew, 1915c | 13/2 | 8/3 | 1/1 | — | 43/? | X |
| Order Rodentia | | | | | | |
| Family Ischyromyidae | | | | | | |
| Cf. *Paramys atavus* Jepsen, 1937 | — | — | — | 1/1 | 1/1 | — |
| Small-sized species of *?Paramys* | 2/1 | 2/1 | — | — | 5/3 | — |
| Medium-sized species of *Paramys* | 4/2 | — | 1/1 | — | 6/4 | — |
| *Paramys* sp. A, cf. *P. copei* | — | — | — | — | — | X[i] |
| *Paramys* sp. B, cf. *P. copei* | — | — | — | — | — | X |
| *Paramys*, undescribed species | — | — | — | — | — | X |
| Undescribed genus and species of ?Paramyinae | — | — | — | — | — | X |
| Several additional new forms under study | — | — | — | — | — | X |
| Order Carnivora | | | | | | |
| Family Miacidae | | | | | | |
| Indeterminate genus and species of miacine | — | — | — | — | 1/1 | X[j] |
| *Miacis exiguus* | — | — | — | — | — | X |
| Cf. *Oodectes* sp. | — | — | — | — | — | X[k] |
| *Didymictis protenus* (Cope, 1874) | 1/1 | — | — | — | 3/3 | X |
| *Viverravus acutus* | — | — | — | — | — | X[l] |
| *Uintacyon* sp. | — | — | — | — | — | X[m] |
| Order Condylarthra | | | | | | |
| Family Arctocyonidae | | | | | | |
| "*Chriacus*" *gallinae* Matthew, 1915a | — | — | — | — | 2/2(cf.) | X |
| *Thryptacodon antiquus* | — | — | — | — | — | X |
| Family Phenacodontidae | | | | | | |
| *Phenacodus primaevus* Cope, 1875 | 1/1 | 4/1 | — | — | 7/3 | X[n] |
| *Phenacodus brachypternus* Cope, 1882a | 3/1 | 1/1 | — | — | 5/3 | X |

Table 1—*Continued*

| | Powder River Named Localities | | | | | |
|---|---|---|---|---|---|---|
| | Reculusa | Dry Well | Bozeman | Monument | Powder River Totals | Four Mile Local Fauna |
| *Phenacodus vortmani* (Cope, 1880) | 2/1 | — | 1/1 | — | 3/2 | X[o] |
| *Phenacodus* sp. | — | — | — | — | — | X |
| *Ectocion osbornianus* Cope, 1882a | 4/1 | 1/1 | 6/2 | — | 14/6 | X |
| Family Hyopsodontidae | | | | | | |
| *Haplomylus speirianus* (Cope, 1880b) | 23/8 | 19/5 | 4/3 | 1/1 | 78/? | X |
| *Hyopsodus "miticulus"* (Cope, 1874) | 65/9 | 25/5 | 13/5 | 7/4 | 167/? | X[p] |
| *Apheliscus nitidus* Simpson, 1937 | 2/1 | 1/1 | 1/1 | — | 9/8 | X |
| Family Mesonychidae | | | | | | |
| *Pachyaena ?ossifraga* | — | — | — | — | — | X |
| Family Anchippodontidae | | | | | | |
| *Esthonyx bisulcatus* Cope, 1874 | 1/1 | 1/1 | — | — | 6/3 | X |
| Order Pantodonta | | | | | | |
| Family Coryphodontidae | | | | | | |
| *Coryphodon* sp. | 1/1 | — | 5/1 | — | 19/? | X[j] |
| *Coryphodon ?lobatus* | — | — | — | — | — | X |
| Order Perissodactyla | | | | | | |
| Family Equidae | | | | | | |
| *Hyracotherium angustidens* (Cope, 1875a) | 58/9 | 13/3 | 9/3 | 4/1 | 90/25 | X |
| Family Isectolophidae | | | | | | |
| *Homogalax protapirinus* (Wortman, 1896) | 6/2 | — | — | 6/1 | 12/3 | cf. |
| Order Artiodactyla | | | | | | |
| Family Dichobunidae | | | | | | |
| *Diacodexis metsiacus* (Cope, 1882a) | 12/6 | 7/2 | 4/2 | — | 35/? | X |
| *Wasatchia* sp. | — | — | — | — | — | X |
| Totals | 225/60 | 102/33 | 59/31 | 21/10 | 599 | |

[a] All information on multituberculates interpolated from Van Valen and Sloan, 1966, pp. 269–270, figures 4 and 5.
[b] See Van Valen, 1966, p. 24; was *Didelphodus ventanus*.
[c] Identified in 1960 as a new genus of didelphodontine by McKenna (personal commun.).
[d] See p. 327 below.
[e] Preliminary identification by MacIntyre from the American Museum collections.
[f] See Van Valen, 1966, p. 70.
[g] See pp. 334 ff. below.
[h] See Szalay, 1969b, p. 28; includes *Niptomomys* sp.
[i] It is quite possible that the medium-sized species from Powder River is the same as sp. A from Four Mile; see p. 341 below.
[j] It is doubtful that we are dealing with the same species in both assemblages.
[k] See Van Valen, 1966, p. 24; was *Didelphodus ventanus*.
[l] MacIntyre (personal commun.) recognized this form as a probably new, small species of *Viverravus*; he will describe it as such in due course.
[m] See Van Valen, 1969b, p. 124, no documentation or specimen number mentioned. MacIntyre (personal commun.) will describe this species also; it is possibly related to the undetermined miacine from Four Mile.
[n] Includes *Phenacodus intermedius*; Robert M. West (personal commun.).
[o] Was identified by McKenna as *Phenacodus matthewi*; see p. 345 below.
[p] Includes *Hyopsodus loomisi*; both species are present in both local faunas, if two are recognized; see pp. 350–351 below.

studied in detail. As noted above, numbers of specimens of each species are given for the four named localities and for the total of all productive localities (as fraction numerator shows). In most cases, minimum numbers of individuals are given also (as the fraction denominator shows). All Four Mile species are as listed by McKenna (1960); additions or changes are referenced.

It will be immediately obvious from table 1 that almost all the Powder River species are represented at Four Mile, either precisely or by quite similar forms. Only four Powder River taxa, *Palaeoryctes* cf. *punctatus*, cf. *Diacodon* sp., ?*Paeneprolimnocyon mordax*, and cf. *Paramys atavus*, do not have close relatives in the Colorado faunule. Of these, the first is known otherwise from a single specimen of latest Paleocene or earliest Eocene age from the Bighorn Basin; the leptictid is uncertainly referred to a genus found rarely in Gray Bull beds of the Bighorn Basin and more commonly in the San Jose Formation of New Mexico; *P. mordax* is known only from two other fragmentary specimens of earliest Eocene age from the Bighorn Basin; and *Paramys atavus* is otherwise represented only in the latest Paleocene deposits from Bear Creek, Montana. All the taxa which McKenna (1960, p. 33) noted as significantly absent from Four Mile are absent also from the Powder River assemblage. The only difference of major interest is the extreme scarcity in the Wood collection of carnivorous mammals (Carnivora, mesonychid condylarths, and most large deltatheridians), both in number of taxa present and number of specimens per taxon. This difference, and the general scarcity of larger mammals, is most probably owing to the bias in sampling: ants carry small teeth to build their hills, and sand blowouts normally sort small and medium-sized fragments. Large specimens are more common in quarries, of which none was developed by the Woods.

In addition to Four Mile, two other well-known local faunas are closely similar to Powder River. The faunas of the Willwood Formation of the Bighorn Basin, and the associated faunas of the Clark Fork Basin (both northwestern Wyoming) have been most recently reviewed by McKenna (1960) and R. Wood (1967). The Sand Coulee local fauna of the Bighorn and Clark Fork basins, also termed the early Gray Bull (see Jepsen, 1930b, p. 119; Simpson, 1937, p. 1; van Houten, 1945, p. 426), shares many species with the Four Mile and Powder River local faunas. Both stratigraphically and faunistically the Sand Coulee local fauna is much less well understood, but the large collections offer material for many of the comparisons made in the present paper.

The Bear Creek local fauna of southwestern Montana was first reported by Simpson (1928a) and most recently discussed by Van Valen and Sloan (1966). It now appears to be of quite late Paleocene age. During the course of research for this paper, I examined all specimens from Bear Creek in the Carnegie Museum, Princeton University Museum, and the American Museum of Natural History collections, and some comments on certain of these specimens will be found in the systematic section below.

I conclude that the rocks producing the Powder River local fauna are of earliest Eocene age. They share this age with the faunal assemblages from Four Mile and perhaps Sand Coulee (early Gray Bull).

# SYSTEMATICS

CLASS MAMMALIA

SUBCLASS ALLOTHERIA

ORDER MULTITUBERCULATA

SUPERFAMILY TAENIOLABIDOIDEA GRANGER AND SIMPSON, 1929

FAMILY EUCOSMODONTIDAE JEPSEN, 1940

*NEOLIOTOMUS* GRANGER AND SIMPSON, 1928

*Neoliotomus ultimus* Granger and Simpson, 1928

THE PRESENCE of a eucosmodontid multituberculate is indicated by AMNH 56305, an edentulous mandible fragment from the Bozeman locality. Behind the root of the peglike $P_3$ typical of the genus, are three roots which R. E. Sloan has determined as being anterior and posterior roots of $P_4$, as well as a central accessory root. Thus, total $P_4$ length is about 9 mm. at the alveoli, which could indicate about 11 mm. when complete. The length given for the type of *N. ultimus* is 11.4 mm. As expected, incisor size (depth 5.3 mm., width 2.3 mm.) is slightly smaller than that given for *N. conventus* (6.4×2.5 mm., Jepsen, 1930a). I accept and here register Sloan's identification.

SUPERFAMILY PTILODONTOIDEA GREGORY AND SIMPSON, 1926

FAMILY ECTYPODONTIDAE SLOAN AND VAN VALEN, 1965

*PARECTYPODUS* JEPSEN, 1930a

A single, isolated $P_4$ has been identified by Sloan as belonging to a new species otherwise known from the Four Mile (East Alheit Pocket) and Mutigny local faunas (Russel, Louis, and Savage, 1967). The tooth, AMNH 56306, from Dry Well locality, measures 0.4×3.6 mm. and shows 12 serrations. It is very heavily worn, and Sloan believes it may have belonged to an old individual.

SUBCLASS THERIA

INFRACLASS METATHERIA

ORDER MARSUPICARNIVORA

SUPERFAMILY DIDELPHOIDEA GRAY, 1821

FAMILY DIDELPHIDAE GRAY, 1821

SUBFAMILY DIDELPHINAE GRAY, 1821

*PERATHERIUM* AYMARD, 1850

*Peratherium comstocki* Cope, 1884

Figure 6

The sole marsupial specimen in the Wood collection, AMNH 56307, is one of the few from any early Eocene locality. As McGrew (1959, p. 148) has noted, size is about the only criterion for separating lower dentitions of Eocene didelphids. The morphology of the molars is rather stable, to say the least. The present specimen, an $M_4$, is quite fresh, although the metaconid is broken away, and the few differences it shows from the type of *P. comstocki* ($M_{2-3}$) may be interpreted as those between $M_4$ and more anterior teeth. These differences are basically in the talonid and include reduction of the entoconid, labial shifting of the hypoconulid, and conversion of this cusp into a subconical peak rather than a backward-tilting ridge.

Because the type of *P. comstocki*, AMNH 4252, has never been adequately figured, I compare it with the new specimen here. In addition, AMNH 4253, also apparently from the Gray Bull of the Bighorn Basin (cf. Simpson, 1928b, p. 5; 1968, p.2), was referred to this species by Cope (1884). It is of the size of the type specimen but badly damaged, all of the lingual cusps being shorn off. This specimen may well represent *P. comstocki*, but could almost as easily be a small insectivore.

MEASUREMENTS: AMNH 4252, type: $M_2$, 1.90×3.15 mm.; $M_3$, 1.70×3.25 mm.; AMNH 4253, $M_-$, 1.9×3.1 mm.; AMNH 56307, $M_4$, 1.80×3.25 mm. (Reculusa Blowout).

INFRACLASS EUTHERIA

ORDER INSECTIVORA

SUBORDER PROTEUTHERIA

SUPERFAMILY PALAEORYCTOIDEA WINGE, 1917

Szalay (1968b, p. 2) has argued for the removal of palaeoryctids from Deltatheridia

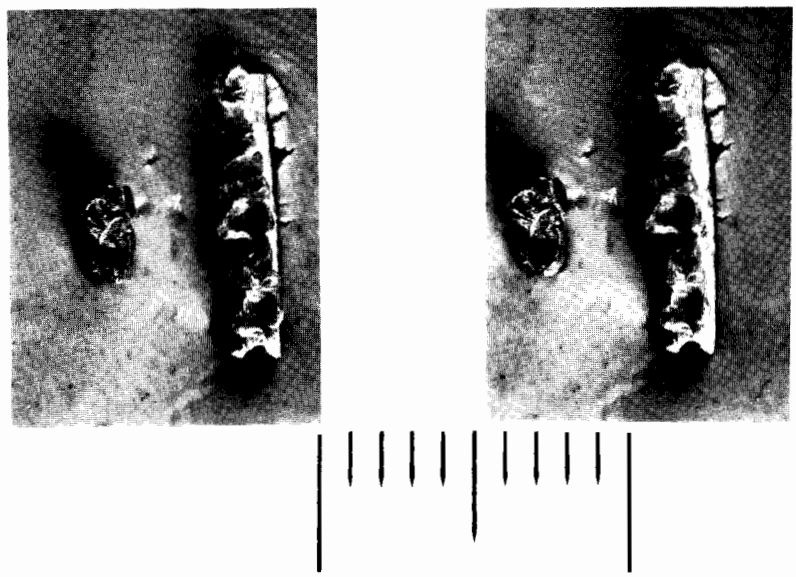

FIG. 6. *Peratherium comstocki*. Left, AMNH 56307, $M_4$ from Reculusa Blowout, Powder River local fauna; right, AMNH 4252, type, $M_{2-3}$, ?Gray Bull of the Bighorn Basin.

to Insectivora on the grounds of their apparent central position in the early evolution of Eutheria. This position is tenable on the basis of recently acquired, but mostly unpublished, knowledge about the radiation of "insectivores" and other Late Cretaceous eutherians. From the standpoint of taxonomic philosophy, it would then be necessary to include within the suborder Proteutheria the "stem placental" and those animals not subordinally distinct therefrom.

FAMILY PALAEORYCTIDAE WINGE, 1917

SUBFAMILY DIDELPHODONTINEA MATTHEW, 1918

*DIDELPHODUS* COPE, 1882b

*Didelphodus absarokae* (Cope, 1881b)

This species has been reviewed by Van Valen (1966, p. 17), who gave extensive metrical data. Measurement of Van Valen's specimens shows that we obtain closely similar results, usually within 0.1 mm. Six isolated teeth from five Powder River Basin localities are identified as from this species. They show some differences in size from Van Valen's specimens, but none is significant enough to indicate a doubtful reference. The measurements are given in table 2 and are those of Van Valen (1966, pp. 18 ff.).

SUBFAMILY PALAEORYCTINAE WINGE, 1917

*PALAEORYCTES* MATTHEW, 1913

*Palaeoryctes* cf. *punctatus* Van Valen, 1966

A single upper molar, AMNH 56308, from locality 51–25, complements our previous knowledge of early Eocene palaeoryctines. The tooth is somewhat damaged labially, but otherwise complete and little worn. The protocone is high and labially convex; the metacone is much smaller than the paracone, and situated on the side of that cusp. There is little or no cingulum development, except on the damaged labial portion. The Powder River tooth, probably an $M^3$, is comparable in size to $M^{1-2}$ of the type of *P. punctatus*. The latter specimen, AMNH 15850, was said by Van Valen to be of Clark Fork age. It is from the head of Big Sand Coulee, type locality of the Sand Coulee (=early Gray Bull) of the Clark Fork Basin. Therefore, both specimens are of closely similar age. As there is little difference in comparable morphology, the Powder River specimen is referred to the already described species.

TABLE 2

MEASUREMENTS (IN MILLIMETERS) OF TEETH OF *Didelphodus absarokae* FROM THE POWDER RIVER LOCAL FAUNA

| | $M_2$ 51–28 AMNH 56167 | $M_-$ 51–18 AMNH 56166 | $M_-$ Rec. AMNH 56165 | $M^2$ Rec. AMNH 56164 | $?M^2$ Mon. AMNH 56163 | $M^3$ Dry AMNH 56162 |
|---|---|---|---|---|---|---|
| Trigonid width | 2.95 | 2.55 | 3.40 | — | — | — |
| Crown length | 3.85 | 4.15 | 4.90 | — | — | — |
| Anterior margin | — | — | — | 5.50 | 4.65 | 3.90 |
| Posterior margin | — | — | — | 4.65 | 4.30 | 3.55 |
| Labial margin | — | — | — | 3.00 | 3.15 | 2.50 |
| Length at paraconule | — | — | — | 2.10 | 2.00 | — |

*Symbols*: 51–28, 51–18, Rec., Mon., and Dry are localities.

MEASUREMENTS: AMNH 56308, maximum width 2.5 mm; width, apexes of paracone and protocone, 1.3 mm.; length at labial border, approximately 1.5 mm. By comparison, AMNH 15850 measures in labial length: $M^1$, 1.95 mm.; $M^2$, 1.70 mm. Van Valen (1966, p. 54) gave for the type of *P. puercensis*, from the Torrejonian of the San Juan Basin, Nacimiento Formation, labial lengths of $M^1$, 1.6 mm.; $M^2$, 1.45 mm.; $M^3$, 1.25 mm. The relative decrease in size from first to third molars indicates that the new specimen could well be a third molar.

SUPERFAMILY TUPAIOIDEA GRAY, 1825

FAMILY LEPTICTIDAE GILL, 1872

SUBFAMILY LEPTICTINAE GILL, 1872

cf. *Diacodon* sp.

A single lower molar, AMNH 56303, from locality 52–14, may represent this genus, but precise determination is extremely difficult. The tooth is wider relative to length than those of the Powder River *Palaeictops tauricinerei* (see below), measuring $1.60 \times 2.40$ mm. *Diacodon alticuspis* Cope, 1875a, is known from this time period, and in one specimen, AMNH 12831, although the jaws are locked, $M_2$ length is 2.5 mm. In addition to a wider (and rather shorter) talonid than in species of *Palaeictops*, the Powder River specimen appears close to *Diacodon* in possessing higher hypoconid relative to entoconid. Besides *Diacodon* or *Palaeictops*, this tooth could possibly belong to a *Leptacodon*-like animal, but its size militates against this referral.

*PALAEICTOPS* MATTHEW, 1899

*Palaeictops tauricinerei* (Jepsen, 1930a)

Five isolated teeth from as many localities are referable to the smallest species of *Palaeictops*. As no measurements of individual teeth were given in the original description, it is not possible to make direct size comparisons, but measurements of Jepsen's figures indicate that the Powder River teeth may be slightly smaller (on the order of 10 to 15 per cent). The two lower and one upper fourth premolars are clearly leptictid, but two fragmentary upper molars show some resemblances to the Bridgerian adapisoricid *Scenopagus* (= *?Talpavus*, see below). None of these teeth adds anything to the knowledge of the morphology of *Palaeictops tauricinerei*, but their measurements are given for reference: $P_4$, $1.5 \times 2.95$ mm. (AMNH 56302, Dry Well); and $1.4 \times 2.8$ mm. (AMNH 56301, 51–28); $P^4$, $2.8 \times 2.4$ mm. (AMNH 56300 Dry Well); M–, $3.2 \times 2.6$ mm., estimated (AMNH 56229, Reculusa Blowout); one upper molar (AMNH 56228, Dry Well) is too badly damaged to measure.

SUPERFAMILY PANTOLESTOIDEA COPE, 1884

FAMILY PANTOLESTIDAE COPE, 1884

*PALAEOSINOPA* MATTHEW, 1901

*Palaeosinopa didelphoides* (Cope, 1881a)

Figure 7

In his discussion of *Pantinomia*, Van Valen