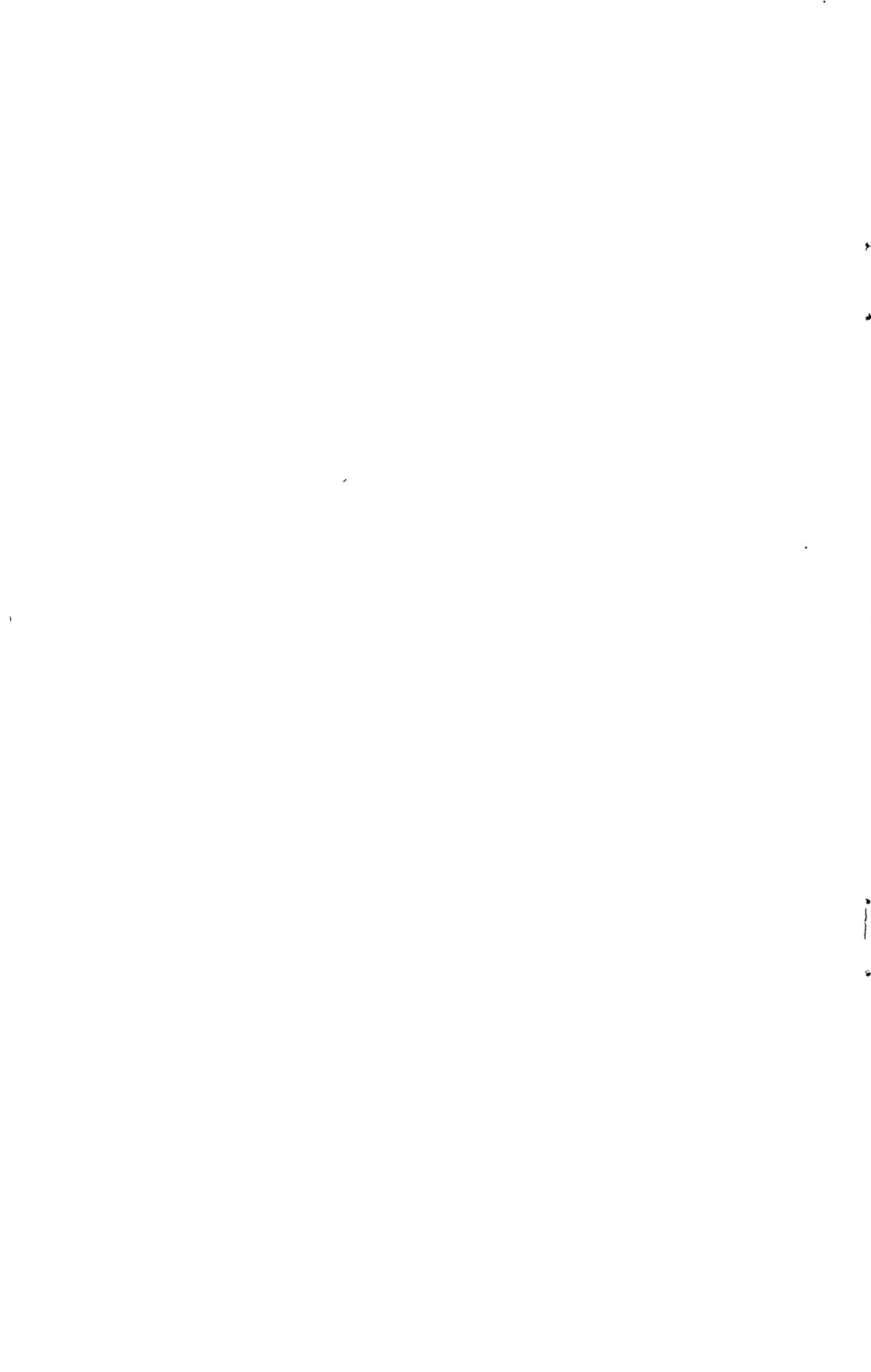


PAPERS OF THE MICHIGAN ACADEMY OF SCIENCE, ARTS, AND LETTERS
VOL. XLIX, 1964 (1963 MEETING)

A CONTRIBUTION TO THE SAW ROCK CANYON
LOCAL FAUNA OF KANSAS

CLAUDE W. HIBBARD
The University of Michigan



A CONTRIBUTION TO THE SAW ROCK CANYON LOCAL FAUNA OF KANSAS

CLAUDE W. HIBBARD

The University of Michigan

INTRODUCTION

THE recovery of the lower dentition of a large marmot and remains of a new *Peromyscus*, in association with the Saw Rock Canyon local fauna, during the summer of 1962, warrants the placing on record these new faunal elements.

Since the discovery of this local fauna in June 1943, by Thad McLaughlin and myself, numerous accounts have been published on various members of the fauna. I described (1944 and 1944a) the first vertebrates from this local fauna. At that time, I assigned the age of the fauna to the Middle Pliocene because of the presence of *Osteoborus* and *Dipoides*. A later study of the area and fauna (Hibbard 1949) showed that the deposits (XI member of the Rexroad Formation) contained a fauna intermediate between the Edson Quarry and Rexroad faunas. Because of the close relationship of the fauna to the overlying Rexroad fauna, I stated that it could be assigned either to the upper part of the Middle Pliocene (Hemphillian) or the lower part of the Upper Pliocene.

The fauna has been assigned various ages during the past ten years. Leonard (1952) and Frye and Leonard (1952) assigned the molluscan faunule from the Saw Rock Canyon local fauna to the Pleistocene (Nebraskan age). I reported (1953) on the fauna as known at that time and stressed the fact that it helped to bridge the gap between the Hemphillian (Middle Pliocene) and the lower Blancan (Upper Pliocene) and placed the fauna in the lower Upper Pliocene. Reed (1962) described a mole, *Hesperoscalops sewardensis*, from the Saw Rock Canyon fauna and assigned a late Pliocene or early Pleistocene age to the specimen. She gives no reason for the possible Pleistocene age assignment.

Unfortunately, no horses are known from the fauna, but from the evidence of the microvertebrates one would expect the horses which lived at the time of the Saw Rock Canyon local fauna to be more like those in the Buis Ranch local fauna of late Hemphillian

age than like the horses in the Rexroad fauna. *Dipoides*, an "index fossil" for the Hemphillian, occurs in the Rexroad fauna, so it is of no great concern whether the fauna is placed in the late Hemphillian or early Blancan, as long as it is understood that early Blancan implies early Upper Pliocene.

THE SAW ROCK CANYON LOCAL FAUNA

Following is a list of the vertebrates, a systematic account of two new members of the fauna with comments on certain groups, and the bibliography on the fauna.

Phylum Mollusca

The mollusks are not listed. They were recently studied by Dwight W. Taylor (1960, p. 23). He reported 2 species of pelecypods and 23 species of gastropods.

Phylum Vertebrata

Class Osteichthyes

Order Cypriniformes

Family Ictaluridae

Ictalurus sawrockensis Smith

Order Cyprinodontiformes

Family Cyprinodontidae

Fundulus sp.¹

Class Amphibia

Order Caudata

Family Ambystomatidae, indet.

Order Salientia

Frog and toad bones

Class Reptilia

Order Chelonia

Geochelone sp.

Terrapene sp.

(Pond and river turtles not studied)

¹ I have been requested by C. L. Smith to correct the following identifications: *Aplodinotus grunnius* C. L. Smith 1954, p. 286; and *Aplodinotus* sp., 1962, pp. 510, 515, 516; and Hibbard and Taylor 1960, p. 57, are species of the genus *Fundulus*. Reidentified by Gerald R. Smith.

Order Squamata

Family Iguanidae

Phrynosoma cf. *P. cornutum* Harlan

Family Scincidae

Eumeces cf. *E. striatulus* Taylor

The snakes are being studied by Bayard H. Brattstrom.

Class Aves

The bird remains are being studied by William A. Lunk.

Class Mammalia

Order Insectivora

Family Talpidae

Hesperoscalops sewardensis Reed

Family Soricidae, indet.

Order Rodentia

Family Sciuridae

Marmota sawrockensis sp. nov.

Citellus sp.

Family Geomyidae

Pliogeomys sp.

Family Heteromyidae

Perognathus mclaughlini Hibbard

Prodipodomys sp.

Family Castoroidae

Dipoides wilsoni Hibbard

Family Cricetidae

Onychomys larrabeei Hibbard

Baiomys sawrockensis Hibbard

Peromyscus sawrockensis sp. nov.

Cimarronomys stirtoni Hibbard

Ogmodontomys sawrockensis Hibbard

Order Carnivora

Family Canidae

Osteoborus progressus Hibbard

Family Mustelidae

Buisnictis cf. *B. schoffi* Hibbard

Order Lagomorpha

Leporid sp.

Order Artiodactyla

Family Camelidae

Gigantocamelus cf. *G. spatulus* Cope

Camel, small sp.

SYSTEMATIC DISCUSSION

CLASS MAMMALIA

ORDER RODENTIA

FAMILY SCIURIDAE

Marmota sawrockensis sp. nov.

(FIG. 1)

Marmota? sp. Hibbard, 1953, p. 392.

Holotype.—No. 45775, University of Michigan, Museum of Paleontology, part of the right incisor and P_4 - M_3 of a young adult. Collected by Claude W. Hibbard and party in the summer of 1962.

Paratypes.—UMMP 29227, a right P^3 and part of the right upper incisor.

Horizon and type locality.—Lower upper Pliocene, XI member of the Rexroad Formation, Saw Rock Canyon, near the center of the west section line of Sec. 36, T. 34S., R. 31W., XIT Ranch (west part of the old XI Ranch), Seward County, Kansas. Taken from stream-laid sandy silts directly across the canyon from the type locality of *Osteoborus progressus* and up the canyon a short distance from the main quarry of the Saw Rock Canyon local fauna.

Diagnosis.—A marmot the size of *Marmota nevadensis* (Kellogg) from the Thousand Creek local fauna of Nevada. It differs from the latter by the absence of an anteroconid (protoconulid of Bryant 1945) on P_4 . A distinct basin occurs on the metalophid of P_4 - M_3 . The basin occurs between the metalophulid I and metalophulid II of Wood and Wilson (1936). *M. sawrockensis* is larger than *M. oregonensis* Shotwell.

Description of holotype.—The P_4 is broken and lacks the hypoconid, but the tooth was not as large as M_1 (Fig. 1). The metaconid of P_4 is low and not recurved as in *Marmota nevadensis* (Kellogg

1910, p. 424) and Recent species of *Marmota*. The metaconid is slightly higher than the protoconid. The talonid floors of P_4 , M_1 , M_2 and M_3 are rugose.

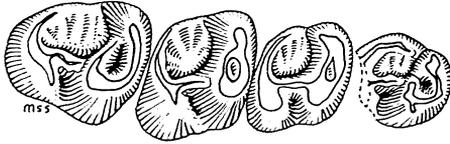


FIG. 1. *Marmota sawrockensis* sp. nov. holotype, UMMP 45775, right P_4 - M_3 . Occlusal view. $\times 2$.

The anteroposterior length of M_1 , M_2 and M_3 is: 6.25 mm; 6.75 mm; and 8.5 mm. The maximum width of M_1 , M_2 and M_3 is: 6.4 mm; 8.0 mm; and 7.7 mm.

The presence of a basin on the metalophid of M_2 and M_3 in the ground squirrels has only been observed in specimens of the genus *Cynomys*. *Marmota sawrockensis* appears to represent a specialized sideline of the Pliocene marmots.

The lower incisor is broken. The enamel surface is smooth. One of the fragments has a depth of 6.0 mm and a width of 4.0 mm.

The paratypes were recovered from the main quarry in the summer of 1951, in association with the holotype of *Cimarronomys stirtoni*. The enamel of the fragment of the right upper incisor is rugose and striated. It has an anteroposterior depth of 6.65 mm and a transverse width of 4.3 mm. The right P^3 has an anteroposterior length of 4.9 mm and a transverse width of 4.0 mm.

Remarks.—In the summer of 1950, the carapace and plastron of *Terrapene* sp., No. 44648, were recovered at the locality where the holotype of *Marmota sawrockensis* was taken. Part of a plastron, UMMP 37186, of another individual of this box turtle was taken at the main quarry where matrix was removed for washing to recover microvertebrates.

FAMILY CRICETIDAE

Peromyscus sawrockensis sp. nov.

(FIG. 2)

Holotype.—UMMP 45779, right lower jaw with incisor, M_1 - M_3 . Taken by Claude W. Hibbard and party in the summer of 1962.

Paratypes.—UMMP 41394, part of right jaw with incisor and M_3 ; No. 46175, part of left jaw with M_2 and M_3 ; and No. 46176, part of left jaw, with incisor and M_1 . All were taken in the summer of 1953. No. 45777, part of a right jaw with M_2 and M_3 , was taken in the summer of 1962.

Horizon and type locality.—Lower upper Pliocene, XI member of the Rexroad Formation, Saw Rock Canyon, near the center of the west section line of Sec. 36, T. 34S., R. 31W., XIT Ranch (west part of the old XI Ranch), Seward County, Kansas, Saw Rock Canyon local fauna.

Diagnosis.—Size smaller than *Peromyscus antiquus* Kellogg, *P. nesodytes* Wilson, and *P. pliocenicus* Wilson. It is larger than *P. kansasensis* Hibbard. It is near the size of *P. dentalis* Hall but is distinguished from the latter by the shorter anteroposterior length of M_2 and the placement of the mental foramen on the dorsal surface of the ramus instead of on the lateral surface as in *P. dentalis*.

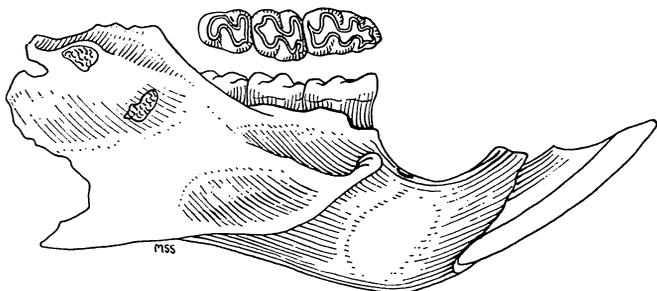


FIG. 2. *Peromyscus sawrockensis* sp. nov. holotype, UMMP 45779, part of right lower jaw, with incisor, M_1 - M_4 . Labial and occlusal views. $\times 5\frac{1}{2}$.

Description of holotype.—The lower jaw lacks the articular condyle (Fig. 2). The jaw is large for the size of the molar teeth. The stage of wear in the molars is that of an adult. The masseteric ridge is well formed and ends opposite the anterior root of M_1 . The mental foramen is located on the dorsal surface of the broad diastema just anterior to the root of M_1 . The molar teeth lack stylids and lophids. The re-entrant valleys also lack the distinct shelf which closes some of the openings of the re-entrant valleys in *Cimarronomys*.

The base of the incisor ends in a well-developed capsular process. The anteroconid of M_1 appears to have been divided by a shallow groove. M_3 is large for the size of M_1 and M_2 when compared with the M_3 of Recent specimens of *Peromyscus leucopus* (Rafinesque) and *P. californicus* (Gambel).

There is no fossa between the M_3 and the base of the coronoid process as occurs in *Peromyscus dentalis* (Hall 1930). A slight depression does occur posterior to M_3 on the posterior edge of the

TABLE I
MEASUREMENTS IN MILLIMETERS OF *Peromyscus sawrockensis* sp. nov.

	UMMP 45779	UMMP 45777	UMMP 46175	UMMP 41394
M_1 - M_3 , alveolar length	4.50	-	-	-
M_1 - M_3 , occlusal length	4.20	-	-	-
M_1 , length	1.70	-	-	-
M_1 , breadth	1.05	-	-	-
M_2 , length	1.20	1.30	1.30	-
M_2 , breadth	1.15	1.15	1.15	-
M_3 , length	1.30	1.30	1.40	1.45
M_3 , breadth	1.05	1.05	1.10	1.10
Depth of ramus below M_1 labial side	4.00	-	-	-
Depth of ramus below M_2 labial side	3.50	-	-	3.50

horizontal ramus. The development of the fossa between M_3 and the coronoid process in *P. dentalis* and the fact that M_2 is nearly as long as M_1 in the species seem to indicate that *P. dentalis* is closely related to the ancestral stock of the subgenus *Megadontomys*.

Peromyscus sawrockensis is distinguished from *P. kansasensis* by the more massive jaw, broader incisor, a dorsally placed mental foramen, and the presence of the capsular process for the base of the incisor.

The dental pattern and the characters of the lower jaws of the paratypes agree with those of the holotype. The dentitions are those of adults or old adults. Paratype No. 45777, a fragment of a jaw with M_2 and M_3 , possesses teeth with the least wear. The M_1 of paratype No. 46176 has an anteroposterior length of 1.7 mm and the greatest width of 1.0 mm. The tooth appears slightly eroded and the width was probably greater (see table of measurements for those of the holotype and other paratypes).

Ogmodontomys sawrockensis Hibbard

(FIG. 3B)

A nearly perfect right lower jaw, UMMP 45754, an adult of the above vole was recovered with the holotype of *Peromyscus sawrockensis*. The mental foramen is located on the labial side anterior to the root of M_1 just anterior to the masseteric crest (Fig. 3B) as in other jaws of this vole previously recovered. This specimen provides the first information concerning the posterior part of the lower jaw. There is only a slight enlargement on the side of the coronoid process where the base of the incisor ends. This is in contrast to the condition observed in *Ogmodontomys poaphagus* from the Rexroad fauna. In *O. poaphagus* the base of the incisor either ends in a pronounced swelling or in a capsular process separated by a shallow sulcus from the coronoid process as shown in specimen UMMP 28212 (Fig. 3A) from the Fox Canyon locality of the Rexroad fauna. The lower jaw, UMMP 28212, is that of a very old adult, which may account for the development of a larger process than noted in some specimens of *O. poaphagus*. The definite increase in size of the area of the jaw where the base of the incisor ends in the specimens from the Rexroad fauna is one of the evolutionary trends observed in the microtines.

There are a number of separate trends in the evolution of the teeth of microtines. One or more of the following trends may be observed in a given group, through time: (1) the increased length of the lower incisor, which results in the development of a swelling to that of a pronounced capsular process for the reception of the base of the incisor on the coronoid process; (2) development of higher crowned teeth; (3) the reduction of root size and the number of roots of some teeth; (4) delayed development of roots on the teeth until individuals have reached adult or old adult age; (5) the loss of roots and the development of ever-growing cheek teeth; (6) the development of cement in the reentrant angles of the teeth of certain late groups; (7) the development of dentine tracts along the sides of the teeth which produce an interrupted enamel pattern in some with rooted teeth and in some ever-growing teeth; and (8) an increase in the number of alternating triangles of M_1 and M^2 .

Much is still to be learned of the early history of these rodents. The known fossil record indicates that *Prosomys mimus* Shotwell

(1956) may be the ancestral stock that gave rise to *Nebraskomys mcgrewi* Hibbard. More complete material is needed of both forms before their true relationship is known.

Ogmodontomys sawrockensis or a closely related species is considered as the ancestral stock of *O. poaphagus*. *O. poaphagus* occurs

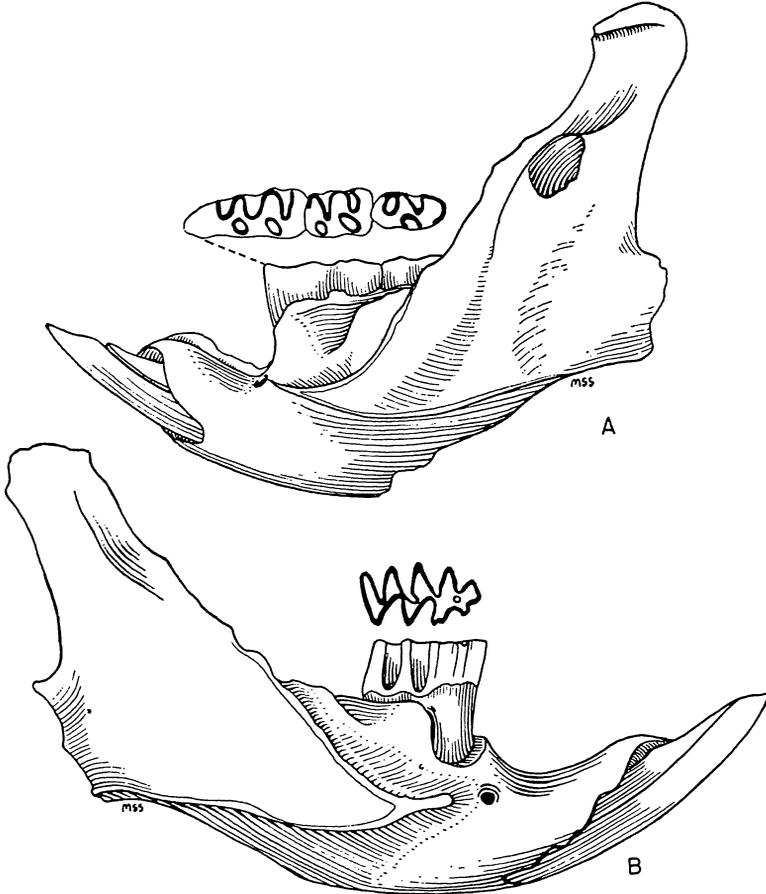


FIG. 3. *Ogmodontomys*. A, *Ogmodontomys poaphagus*, UMMP 28212, left lower jaw, with incisor, M_1 - M_3 . B, *O. sawrockensis*, UMMP 45754, right lower jaw, with incisor and M_1 . Labial and occlusal views. All $\times 5$.

early enough to have given rise to *Cosomys primus* Wilson of the Hagerman fauna. *C. primus* from the Hagerman fauna shows a definite root reduction in M^3 and has a better developed capsular

process for the base of the incisor than occurs in *O. poaphagus*. After a study of specimens of *Mimomys pliocaenicus* Forsyth Major in Europe, I consider *Cosomys* a distinct genus. *M. pliocaenicus* possesses more hypsodont teeth, which develop roots later in the life of the individual than in *Cosomys*. Furthermore, the reentrant angles of the teeth of *M. pliocaenicus* are filled with cement, which is lacking in the genus *Cosomys*.

Ogmodontomys appeared early enough in the Pliocene to have been ancestral to the genus *Mimomys*, though I know of no reason why *Cosomys* could not be the ancestral stock of *M. pliocaenicus*.

Relationship of the Saw Rock Canyon local fauna to the Buis Ranch and Rexroad local faunas.—Unfortunately, most of the vertebrates of the Buis Ranch local fauna (Hazard 1961; Hibbard 1954; and Tihen 1955) are mainly upland forms when compared chiefly to stream, marshland, and lowland valley inhabitants known from the Saw Rock Canyon fauna. The presence of *Buisnictis* cf. *B. schoffi* and *Pliogeomys* cf. *P. buisi* in the Saw Rock Canyon fauna, as well as the presence of *Perognathus* cf. *mclaughlini* in the Buis Ranch local fauna, indicates that these two faunas are nearly the same age. How much time elapsed between the time the Saw Rock Canyon fauna inhabited the region and the time it was inhabited by the later Rexroad fauna is not known, but it was long enough for the gophers to develop ever-growing cheek teeth. There is no evidence of a climatic change between the time the Saw Rock Canyon fauna inhabited the region and the time the Rexroad fauna lived. Both faunas are considered as having occupied the region in a uniform subtropical (frost-free) climate, with more effective moisture than at present (Hibbard 1960).

Many members of the Saw Rock Canyon fauna carried on into the Rexroad fauna unchanged, such as 22 species of mollusks. It was for this reason that Frye and Leonard, 1952, considered the two faunas to be of the same age.

Some of the vertebrates in the Saw Rock Canyon fauna appear to be the ancestral stocks from which members of the Rexroad fauna were derived, such as:

SAW ROCK CANYON LOCAL FAUNA	REXROAD LOCAL FAUNA
<i>Ictalurus sawrockensis</i> Smith	→ <i>I. benderensis</i> Smith
<i>Phrynosoma</i> cf. <i>P. cornutum</i> Harlan	→ <i>P. cornutum</i>

<i>Eumeces</i> cf. <i>E. striatulus</i> Taylor	→ <i>E. striatulus</i>
<i>Hesperoscalops sewardensis</i> Reed	→ <i>H. rexroadi</i> Hibbard
<i>Pliogeomys</i>	→ <i>Geomys</i>
<i>Perognathus mclaughlini</i> Hibbard	→ <i>P. rexroadensis</i> Hibbard
<i>Onychomys larrabeei</i> Hibbard	→ <i>O. gidleyi</i> Hibbard
<i>Ogmodontomys sawrockensis</i> Hibbard	→ <i>O. poaphagus</i> Hibbard
<i>Osteoborus progressus</i> Hibbard	→ <i>Borophagus</i>
<i>Buisnictis</i> cf. <i>B. schoffi</i> Hibbard	→ <i>B. breviramis</i> Hibbard
<i>Gigantocamelus</i> cf. <i>spatulus</i> Cope	→ <i>G. spatulus</i>

More intensive collecting of the Buis Ranch and Saw Rock Canyon faunas should furnish better evidence for some of the ancestral stocks that gave rise to the numerous carnivores and cricetine rodents of the Rexroad fauna.

Acknowledgments.—I am indebted to the following members of the 1962 University of Michigan field party who helped collect the fossils: James B. Stevens and Margaret Skeels Stevens of the University of Michigan; G. Nelson Greene and Jerry G. Smith of Alma College; John R. Bolt, Michigan State University; and Richard Zakrzewski, Wayne State University. We are grateful to David C. Coleman, chief of the Game Division of the Kansas State Forestry, Fish and Game Commission; and Harry Smith, superintendent of Meade County State Park, who gave us permission to live in the park and to wash the fossil-bearing matrix there. I am also indebted to David Adams, XIT Ranch, who allowed collecting and geologic work on the ranch.

This study was aided by permission to examine the specimens under the care of William A. Clemens, Museum of Natural History, University of Kansas.

Financial support to me for the fieldwork in Meade County during the summer of 1962 and for the line drawings by Margaret Skeels Stevens (MSS) was provided by the National Science Foundation (Project G-19458).

LITERATURE CITED

- BRYANT, MONROE D. 1945. Phylogeny of Nearctic Sciuridae. *Am. Midland Nat.* 33 (2) : 257-390, 8 pls., 48 figs.
- * ETHERIDGE, RICHARD. 1960. The Pliocene Lizard Genus *Eumecoides* Taylor. *Bull. So. Calif. Acad. Sci.* 59 (Pt. 2) : 62-69.
- * FRANZEN, DOROTHEA S., AND A. B. LEONARD. 1947. Fossil and Living Pupillidae (Gastropoda = Pulmonata) in Kansas. *Univ. Kans. Sci. Bull.* 31 (Pt. II, No. 15) : 311-411, 6 pls., 15 figs.
- * FRYE, JOHN C., AND A. B. LEONARD. 1952. Pleistocene Geology of Kansas. *Kans. Geol. Surv. Bull.* 99: 1-230, 19 pls., 17 figs.
- HALL, E. R. 1930. Rodents and Lagomorphs from the Later Tertiary of Fish Lake Valley, Nevada. *Univ. Calif. Publ. Bull. Dept. Geol. Sci.* 19 (12) : 295-312, 1 pl., 29 figs.
- HAZARD, EVAN B. 1961. The Subgeneric Status and Distribution in Time of *Citellus rexroadensis*. *Jour. Mammal.* 42 (4) : 477-483, 2 figs.
- * HERRINGTON, H. B., AND D. W. TAYLOR. 1958. Pliocene and Pleistocene Sphaeriidae (Pelecypoda) from the Central United States. *Univ. Mich. Mus. Zool., Occ. Pap.* No. 596: 1-28, 1 pl.
- * HIBBARD, CLAUDE W. 1944. A New Land Tortoise, *Testudo riggsi*, from the Middle Pliocene of Seward County, Kansas. *Univ. Kans. Sci. Bull.* 30 (Pt. 1, No. 7) : 71-76, 2 figs.
- * ——— 1944a. Two New Mammals from the Middle Pliocene of Seward County, Kansas. *Univ. Kans. Sci. Bull.* 30 (Pt. 1, No. 10) : 107-114, 2 pls.
- * ——— 1949. Pliocene Saw Rock Canyon Fauna in Kansas. *Univ. Mich. Mus. Paleon., Contrib.* 7 (5) : 91-105, 2 figs.
- * ——— 1953. The Saw Rock Canyon Fauna and Its Stratigraphic Significance. *Pap. Mich. Acad.* 38 (1952) : 387-411, illus.
- * ——— 1954. A New Pliocene Vertebrate Fauna from Oklahoma. *Ibid.* 39 (1953) : 339-359, 5 figs.
- * ——— 1957. Two New Cenozoic Microtine Rodents. *Jour. Mammal.* 38 (1) : 39-44, 2 figs.
- AND D. W. TAYLOR. 1960. Two Late Pleistocene Faunas from Southwestern Kansas. *Univ. Mich. Mus. Paleon., Contrib.* 16 (1) : 1-223, 16 pls., 18 figs.
- KELLOGG, LOUISE. 1910. Rodent Fauna of the Late Tertiary Beds at Virgin Valley and Thousand Creek, Nevada. *Univ. Calif. Publ. Bull. Geol. Sci.* 5 (29) : 421-437, 20 figs.
- * LEONARD, A. BYRON. 1952. New Gastropods from the Blanco Formation (Nebraskan age) Pleistocene in Kansas. *Nautilus* 66 (2) : 37-45, 1 pl.
- * PACKARD, ROBERT L. 1960. Speciation and Evolution of the Pygmy Mice, Genus *Baiomys*. *Univ. Kans. Publ. Mus. Nat. Hist.* 9 (23) : 579-670, 4 pls., 12 figs.
- * REED, KATHERINE M. 1962. Two New Species of Fossil Talpid Insectivores. *Breviora, Mus. Comp. Zool.* 168: 1-6, 1 pl.
- * SHOTWELL, J. ARNOLD. 1955. Review of the Pliocene Beaver *Dipoides*. *Jour. Paleon.* 29 (1) : 129-144, 6 figs.

- 1956. Hemphillian Mammalian Assemblage from Northeastern Oregon. Bull. Geol. Soc. Am. 67: 717-738, 7 figs.
- SMITH, C. LAVETT. 1954. Pleistocene Fishes of the Berends Fauna of Beaver County, Oklahoma. Copeia 1954, No. 4: 282-289, illus.
- * — 1962. Some Pliocene Fishes from Kansas, Oklahoma, and Nebraska. Copeia 1962, No. 3: 505-520, 9 figs.
- * TAYLOR, DWIGHT W. 1960. Late Cenozoic Molluscan Faunas from the High Plains. U.S. Geol. Surv. Prof. Pap. 337: 1-94, 4 pls., 2 figs.
- * TIHEN, JOE A. 1955. A New Pliocene Species of *Ambystoma*, with Remarks on Other Fossil Ambystomids. Univ. Mich. Mus. Paleon., Contrib. 12 (11): 229-244, 1 pl., 1 fig.
- * TWENTE, JOHN W., JR. 1952. Pliocene Lizards from Kansas. Copeia 1952, No. 2: 70-73, 4 figs.
- WOOD, A. E., AND R. W. WILSON. 1936. A Suggested Nomenclature for the Cusps of the Cheek Teeth of Rodents. Jour. Paleon. 10 (5): 388-391, 1 pl.

* Bibliography on the Saw Rock Canyon local fauna.



