A CONTRIBUTION TO THE SAW ROCK CANYON LOCAL FAUNA OF KANSAS

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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
Claude W. Hibbard

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 grunnieus* 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 Castoridae
      *Dipoides wilsoni* Hibbard
    Family Cricetidae
      *Onychomys larrabean* 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)


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

Paratypes.—UMMP 29227, a right P, 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,. A distinct basin occurs on the metalophid of P,M,. 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, is broken and lacks the hypoconid, but the tooth was not as large as M, (Fig. 1). The metaconid of P, 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.

![Diagram of dental anatomy](image)

**Fig. 1.** *Marmota sawrockensis* sp. nov. holotype, UMMP 45775, right $P_3$-$M_3$. 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 metalophicl 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 M₂; No. 46175, part of left jaw with M₂ and M₃; and No. 46176, part of left jaw, with incisor and M₁. All were taken in the summer of 1953. No. 45777, part of a right jaw with M₂ and M₃, 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. plicenicus 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 M₂ 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, M₁-M₄. Labial and occlusal views. × 5½.

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 M₁. The mental foramen is located on the dorsal surface of the broad diastema just anterior to the root of M₁. 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 M₁ appears to have been divided by a shallow groove. M₃ is large for the size of M₁ and M₂ when compared with the M₃ of Recent specimens of *Peromyscus leucopus* (Rafinesque) and *P. californicus* (Gambel).

There is no fossa between the M₃ and the base of the coronoid process as occurs in *Peromyscus dentalis* (Hall 1930). A slight depression does occur posterior to M₂ on the posterior edge of the horizontal ramus. The development of the fossa between M₃ and the coronoid process in *P. dentalis* and the fact that M₃ is nearly as long as M₁ 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 M₂ and M₃, possesses teeth with the least wear. The M₁ 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).

### TABLE I

**Measurements in Millimeters of *Peromyscus sawrockensis* sp. nov.**

<table>
<thead>
<tr>
<th></th>
<th>UMMP 45779</th>
<th>UMMP 45777</th>
<th>UMMP 46175</th>
<th>UMMP 41394</th>
</tr>
</thead>
<tbody>
<tr>
<td>M₁-M₄, alveolar length</td>
<td>4.50</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>M₁-M₄, occlusal length</td>
<td>4.20</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>M₁, length</td>
<td>1.70</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>M₁, breadth</td>
<td>1.05</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>M₂, length</td>
<td>1.20</td>
<td>1.30</td>
<td>1.50</td>
<td>-</td>
</tr>
<tr>
<td>M₂, breadth</td>
<td>1.15</td>
<td>1.15</td>
<td>1.15</td>
<td>-</td>
</tr>
<tr>
<td>M₃, length</td>
<td>1.30</td>
<td>1.30</td>
<td>1.40</td>
<td>1.45</td>
</tr>
<tr>
<td>M₃, breadth</td>
<td>1.05</td>
<td>1.05</td>
<td>1.10</td>
<td>1.10</td>
</tr>
<tr>
<td>Depth of ramus below M₁ labial side</td>
<td>4.00</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Depth of ramus below M₃ labial side</td>
<td>3.50</td>
<td>-</td>
<td>-</td>
<td>3.50</td>
</tr>
</tbody>
</table>
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 M₁ just anterior to the masseeenteric 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 M₁ and M₂.

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 mcgregori* 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 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 M³ 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:

<table>
<thead>
<tr>
<th>SAW ROCK CANYON LOCAL FAUNA</th>
<th>REXROAD LOCAL FAUNA</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Ictalurus sawrockensis</em> Smith</td>
<td>→ <em>I. benderensis</em> Smith</td>
</tr>
<tr>
<td><em>Phrynosoma cf. P. cornutum</em> Harlan</td>
<td>→ <em>P. cornutum</em></td>
</tr>
</tbody>
</table>
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.

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LITERATURE CITED


* Bibliography on the Saw Rock Canyon local fauna.