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Faunal Lists of the Tertiary Vertebrata of Nebraska and Adjacent Areas


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NEBRASKA GEOLOGICAL SURVEY

Paper Number 5

FAUNAL LISTS OF THE
TERTIARY VERTEBRATA
OF NEBRASKA AND
ADJACENT AREAS

By
HAROLD J. COOK
and
MARGARET C. COOK



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The Papers of the Nebraska Geological Survey are reports on special research projects. They are more restricted in content than the Bulletins of the Survey.

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PREFACE

BY G. E. CONDRA

Tertiary formations of continental origin occur generally in central and western Nebraska. They have a maximum thickness of more than one thousand feet in the western counties and thin out eastward. The oldest sediments of this system were spread upon an eroded marine floor during early Oligocene time. Then followed: 1. an interval of erosion; 2. the deposition of sediments until the end of the Miocene; 3. a short period of erosion; 4. deposition during early Pliocene. Next in sequence was a period of erosion during which the major topographic features of the Tertiary area were outlined. This peneplanation was then interrupted by glaciation in the eastern part of the state, which caused the deposition of thick beds of sediments upon and along the east border of the eroded Tertiary, filling the major valleys with Pleistocene deposits for a considerable distance westward. Much of the Pleistocene sand and gravel of the area came from the Tertiary formations and is, therefore, reworked Tertiary, deposited during the Pleistocene.

Although the Eocene Tertiary seems to be absent in Nebraska, the Oligocene, Miocene and Pliocene formations are well developed with abundant fossils, notably of the vertebrates. These vertebrate fossils have drawn many collectors to the state and have been the objects of study by the paleontologists of museums and educational institutions generally.

Early in the history of western Nebraska, Captain James Cook observed the fossil remains along the Niobrara and at other points. He made these finds known and extended to scientists the privilege of collecting on his ranch at Agate, Sioux County. He has ever been the host of notable guests interested in the evolution of vertebrate life. Harold J. Cook, the son of Captain Cook, has been afforded unusual opportunity to become acquainted with vertebrate fossils. His field experience, his association with paleontologists, his connection with some of the leading museums and his publications

constitute the background for the preparation of this report. Mrs. Margaret C. Cook, too, is deeply interested in the fossil life of the Tertiary and is naturally, by association and work, the second author of the bulletin.

The object of this bulletin is to list by horizons the vertebrate Tertiary fauna of Nebraska and adjacent areas. However, it should be recognized that the Tertiary has not been studied closely and zoned in detail in all parts of its occurrence in Nebraska. This investigation and studies of the faunal and invertebrate remains of the System are under way.

I do not agree with the authors in regard to the age of the Gering formation (see columnar section). In my opinion, it should be correlated as Miocene rather than Oligocene. Fossils thought to be of Miocene age have been collected from the Gering in the vicinity of Redington Pass, Scotts Bluff County, by C. Bertrand Schultz of the University Museum. My opinion has no special bearing, however, because the authors do not list species from the Gering, and because my interpretation may prove to be in error. Also, I would class the Ogallala as Pliocene in age.

The Survey is fortunate in receiving the manuscript for this bulletin which should be helpful to workers in vertebrate paleontology. The content and method of treatment followed in the bulletin have been left to the authors.

Faunal Lists of the Tertiary Vertebrata of Nebraska and Adjacent Areas

BY HAROLD J. COOK AND MARGARET C. COOK¹

INTRODUCTION

With the increase of knowledge through collecting in Nebraska and contiguous territory by representatives of many institutions, it has become increasingly apparent that some of the results of this work should be recorded for the convenience of those desiring this information. While all possible care has been used not to omit described forms, still, owing to the endless sources of publication, and the slow and none too satisfactory centralization of information from such reports, it is almost inevitable that some will have been overlooked.

Our compilation is incomplete due to the fact that the new races found by collectors are undescribed and cannot ethically be included in our lists. It is our purpose, however, to make the present list the most complete report of its scope published to date.

The faunal lists have been kept in the most simplified practical form, listing Order, Family, Genus and Species. In some cases this will not give a complete picture of true relationships; but any more elaborate classification becomes extremely difficult for others than a few specialists in the subject, and would narrow the usefulness of the report. In a report of this kind it is not practical to discuss the bases of classification of faunas, but in certain cases where the senior writer has felt some explanation necessary for the names used, brief footnotes have been added.

No bibliography is possible in a bulletin of this extent; but the name of the person describing the type is in all cases given after its species name, which will enable students wish-

¹ Correlations of geological horizons and their faunas, and review of genera and species listed herein by Harold J. Cook. Compilation and assembling of literature for the report by Margaret C. Cook.

ing to locate descriptions of a species and its occurrence, to find them readily in a bibliography of any adequate library.

To make this list of more general use and more complete, genera and species are included, the types of which were found outside the borders of Nebraska in formations which extend across our state. There is no reasonable doubt that these forms lived within the borders of what is now Nebraska.

It is impossible to acknowledge herein all those whose publications have been consulted in compiling this report. However, gracious acknowledgment is extended by the senior author for the valuable assistance received from the publications of his good friends, now deceased, Doctors W. D. Matthew and O. P. Hay; and for the excellent summaries of his former teacher, Professor Henry Fairfield Osborn, particularly his monumental work on the Titanotheres and his Monograph on the Equidae.

A new formation with the oldest Tertiary faunal horizon yet known for Nebraska is noted in this report, but no definite data concerning it are given. Also an undescribed faunal horizon, giving an important link in the sequence of geologic levels and faunistic connections, is known to the senior author, but this, too, cannot be listed in this paper.

Much painstaking field work needs to be done to interpret fully the stratigraphic relationships of some of the later Tertiary beds in Nebraska. It is also evident that stratigraphic revision is badly needed in places in order to afford an exact basis for the occurrence of many late Miocene and Pliocene fossil types.

Among the problems of Tertiary geology not yet satisfactorily solved in Nebraska are the exact relations between the Lower Rosebud-Monroe Creek series of the Pine Ridge area in northwest Nebraska and southwestern South Dakota and the Gering beds of the Wildcat Ridge area south of the North Platte River. We know that these formations are closely related and roughly of the same age: either the top of the Oligocene, or basal Miocene, according to the view-point.

On the basis of correlations with the John Day beds of Oregon, generally accepted to be Upper Oligocene in age, and on the basis of correlations with European equivalents, it appears to the senior author more logical and consistent to assign the Monroe Creek and Lower Rosebud beds to the Upper Oligocene, than to the bottom of the Miocene, as we have been considering them, and to draw the dividing line at the bottom of the Lower Harrison beds, between Oligocene and Miocene deposits. The fauna of the typical Gering beds is as yet meagerly known, and we are not listing it separately in these correlation sheets.

The Lower Harrison beds are intermediate in age between the Lower Rosebud and Upper Rosebud beds, correspondingly, lying stratigraphically and faunistically between the Monroe Creek and Upper Harrison beds, from which they are readily distinguished both lithologically and faunally. It is entirely probable that this intermediate stage is actually represented in the middle section of the typical Rosebud beds, but, as it is not clearly defined by distinct sediments, and as it is farther west where the Lower Harrison beds occur, it has not been recognized and differentiated in the Rosebud.

The classification in general use among geologists, dividing the Nebraska Tertiary above the White River Formation into Gering, Arikaree, Loup Fork and Ogallala, while useful in a general way, does not fit the faunistic evidence of the formations involved and is too inexact to be of much use in accurate, comprehensive correlations. We are indicating, however, their general relationships to the more accurate geologic divisions given in these lists.

Finally, we wish to emphasize the need of revision in some groups of the Tertiary vertebrates, particularly those of the later Miocene and Pliocene. However, we do not feel justified in attempting this in our lists without citing evidence which is prohibitive at this time. Therefore, in some cases specific and generic references are listed as published by others in which determination we do not necessarily concur. We consider this list in the light of a work sheet to bring together and correlate evidence but subject to further revision and additions as the evidence is worked out.

(UPPER ? EOCENE) or BASAL OLIGOCENE ²

1. Eastern Wyoming and adjoining area in Western Nebraska.

CARNIVORA	
CREDONTIA	
	1
<i>Creodont</i> , gen. et sp. indet. (large).....	x
" gen. et sp. indet. (small).....	x
PERISSODACTYLA	
HYRACODONTIDAE	
<i>Hyracodon</i> , sp. indet.	x
RHINOCEROTIDAE	
? <i>Trigonias</i> sp.	x
BRONTOTHERIDAE Marsh (=TITANOTHERIIDAE)	
<i>Titanothera</i> , gen. et sp. indet.	x
" gen. et sp. indet.	x
EQUIDAE	
<i>Equid.</i> , gen. et sp. indet.	x
TESTUDINATA	
<i>Turtles</i> , at least two genera.	x

LOWER OLIGOCENE

Chadron (White River Group)

TITANOTHERIUM ZONE

1. Chadron, South Dakota, and adjoining parts of Nebraska and Wyoming.
2. Horsetail Creek, northeastern Colorado.

CARNIVORA (CREDONTIA)	
HYAENODONTIDAE	
	1
<i>Hyaenodon</i> near <i>cruentus</i> Leidy.....	x
" " <i>crucians</i> Leidy.....	x
" sp.	x
CARNIVORA (FISSIPEDIA)	
CANIDAE	
<i>Daphoenus dodgei</i> Scott.....	x
" sp.	x
<i>Pseudocynodictis</i> sp.	x
? <i>Cynodon</i> sp.	x

² A report on this new formation, which has been found and studied by Mr. Erich Schlaikjer of Harvard University, and the senior author, the past three years, is in manuscript and will appear shortly, naming the formation and describing its known fauna. Its occurrence is merely noted here for the convenience of students in this matter.

	1	2
FELIDAE		
<i>Dinictis fortis</i> Adams.....		X
” sp.....		X
<i>Hoplophoneus mentalis</i> Sinclair.....		X
” <i>charrai</i> Jepson.....		X
RODENTIA		
ISCHYROMYIDAE		
<i>Titanotheriomys veterior</i> Matthew		X
? ” sp.		X
<i>Cylindrodon fontis</i> Douglas.....		X
LAGOMORPHA		
LEPORIDAE		
<i>Protolagus affinus</i> Walker.....		X
<i>Paleolagus</i> sp.		X
<i>Megalagus turgidus</i> Cope.....		X
<i>Archaeolagus</i> sp.		X
PERISSODACTYLA		
HYRACODONTIDAE		
<i>Hyracodon petersoni</i> Wood.....		X
” sp.		X
AMYNODONTIDAE		
<i>Metamynodon</i> sp.....		X
RHINOCEROTIDAE		
<i>Trigonias osborni osborni</i> Lucas.....		X
” <i>gregoryi</i> Wood.....		X
” <i>paucidens</i> Wood.....		X
” <i>wellsi</i> Wood		X
” sp. indet.....		X
” sp.		X
” <i>osborni precopei</i> Gregory and Cook.....		X
” <i>hypostylus</i> Gregory and Cook.....		X
” <i>preoccidentalis</i> Gregory and Cook		X
” <i>taylori</i> , Gregory and Cook.....		X
” <i>osborni secundus</i> Gregory and Cook		X
” <i>cooki</i> Wood.....		X
” <i>gidleyi</i> Wood.....	Horizon not given	
<i>Leptaceratherium trigonodum</i> Osborn and Wortman.....		X
<i>Subhyracodon</i> , sp. div.....		X X
<i>Caenopus</i> cf. <i>platycephalus</i> Osborn and Wortman.....		X
” <i>mitis</i> Cope.....		X X
? ” <i>premitis</i> Gregory and Cook		X
LOPHIODONTIDAE		
<i>Colodon</i> (= <i>Mesotapirus</i>) <i>occidentalis</i> Leidy		X

		1	2
EQUIDAE			
	<i>Meshippus</i>	<i>proteulopus</i> Osborn.....	X
	"	<i>hypostylus</i> Osborn.....	X
	"	<i>celer</i> Marsh	X
BRONTOTHERIDAE Marsh (=TITANOTHERIIDAE)			
	<i>Menodus</i> (=Titanotherium)	<i>prouti</i> Leidy	X
	"	" <i>giganteus</i> Pomel.....	X
?	"	" " ".....	X
	"	" <i>montanus</i> Marsh	X
	"	" <i>helocerus</i> Cope.....	X X
	"	" <i>trigonoceras</i> Cope	X X
	"	" <i>torvus</i> Cope.....	X
	"	" <i>varians</i> Marsh.....	
Location and horizon uncertain			
	<i>Megacerops</i>	<i>copei</i> Osborn.....	X X
	"	<i>riggsi</i> Osborn.....	X
	"	<i>coloradensis</i> Leidy.....	X
	"	<i>acer</i> Cope	X
	"	<i>bucco</i> Cope	X
	"	sp.....	X
	<i>Diploclonus</i>	<i>tyleri</i> Lull	X
	"	<i>bicornutus</i> Osborn.....	X
	"	<i>amplus</i> Marsh.....	X
	<i>Brontops</i>	<i>dispar</i> Marsh	X
	"	? " "	X
	"	<i>robustus</i> Marsh	X
	"	<i>brachycephalus</i> Osborn.....	X
	<i>Allops</i>	? <i>marshi</i> Osborn	X
	"	<i>serotinus</i> Marsh	X
	"	<i>crassicornis</i> Marsh.....	X
	"	<i>walcotti</i> Osborn.....	X
	"	<i>marshi</i> Osborn.....	X X
	<i>Brontotherium</i>	<i>hatcheri</i> Osborn.....	X
?	"	" " ".....	X
	"	<i>ramosum</i> Osborn	X
	"	<i>medium</i> Marsh.....	X
	"	? " "	X
	"	<i>dolichoceras</i> Scott and Osborn.....	X
	"	<i>platyceras</i> Scott and Osborn.....	X
	"	<i>tichoceras</i> Scott and Osborn.....	X
	"	? " " " "	X
	"	<i>leidyi</i> Osborn	X
	"	? <i>hypoceras</i> Cope.....	X
	"	<i>curtum</i> Marsh	X X
?	"	<i>orphryas</i> Cope	X

"	<i>hypoceras</i> Cope.....	1	2
"	<i>gigas</i> Marsh	X	X
	<i>Telodus avus</i> Marsh	X	X
	ARTIODACTYLA		
	ENTELODONTIDAE		
	<i>Archaeotherium crassum</i> Marsh.....	X	
"	cf. <i>mortoni</i> Leidy.....	X	
"	<i>clavum clavum</i> Marsh.....	X	
"	<i>scotti</i> Sinclair.....	X	
"	<i>marshi</i> Troxell	?	
"	? <i>ingens</i> Marsh.....	X	
	TAGASSUIDAE (=DICOTYLIDAE)		
	<i>Perchoerus minor</i> Cook	X	
"	sp.	X	
	LEPTOCHOERIDAE		
	<i>Stibarus</i> cf. <i>montanus</i> Matthew.....	X	
	ANTHRACOTHERIDAE		
	<i>Aepinacodon americanus</i> Leidy.....	X	
"	<i>deflectus</i> Marsh.....	X	
?	<i>Anthracotherium</i> sp.	X	
	MERYCOIDODONTIDAE		
	<i>Merycoidodon (Oreodon) hybridus</i> Leidy.....	X	
"	" <i>affinis</i> Leidy	X	
	<i>Eporeodon bullatus</i> Leidy	X	
	<i>Agriochoerus</i> sp.....	X	
	HYPERTRAGULIDAE		
	<i>Leptomeryx</i> sp. div.	X	
	<i>Heteromeryx dispar</i> Matthew.....	X	
?	<i>Trigenicus</i> sp.....	X	
	<i>Hypertragulus</i> sp. indesc.....	X	
	<i>Hypisodus</i> sp. indesc.	X	
	PROTOCEROTIDAE		
	<i>Protocerine</i> , gen. et sp. indesc.....	X	
	CAMELIDAE		
	<i>Eotylopus reedi</i> Matthew.....	?	
"	? <i>primaevus</i> Matthew.....	X	
	TESTUDINATA		
	DERMATEMYDIDAE		
	<i>Xenochelys formosa</i> Hay.....	X	
	EMYDIDAE		
	<i>Graptemys ? inornata</i> Loomis.....	X	
	TESTUDINIDAE		
	<i>Testudo cultrata</i> Cope.....	X	
"	<i>amphithorax</i> Cope	X	

	1	2
" <i>brontops</i> Marsh	X	
" <i>laticunea</i> Cope	X	
" <i>ligonia</i> Cope	X	
" <i>praeextans</i> Lambe	X	
" <i>quadrata</i> Cope	X	
" <i>thomsoni</i> Hay.....	X	
" <i>Stylemys nebrascensis</i> Leidy"	X	
TRIONYCHIDAE		
<i>Platypeltis leucopotamica</i> Cope.....	X	
AVES		
CARINATAE		
CATHARTIDAE (=VULTURIDAE)		
<i>Phasmagyps patritus</i> Wetmore.....	X	
? " sp. "	X	
<i>Palaeogyps prodromus</i> Wetmore.....	X	
RALLIDAE		
<i>Palaeocrex fax</i> Wetmore	X	
FAMILY INDET.		
<i>Bathornis veredus</i> Wetmore	X	

MIDDLE OLIGOCENE

BRULE (Lower Part) (WHITE RIVER GROUP)

OREODON ZONE

1. Lower Brule, South Dakota and adjoining parts of Nebraska and Wyoming.
2. Cedar Creek, northeastern Colorado.
3. Near Torrington, Wyoming.

MARSUPIALIA

	1	2	3
DIDELPHYIDAE			
<i>Peratherium fugax</i> Cope	?	X	
" <i>tricuspes</i> Cope		X	
" <i>huntii</i> Cope		X	
" <i>scalare</i> Cope		X	
" <i>marginale</i> Cope.....		X	
" <i>alternans</i> Cope		X	
" <i>pygmaeum</i> Scott.....		X	

CARNIVORA (CREODONTA)

HYAENODONTIDAE			
<i>Neohyaenodon horridus</i> (Leidy)	X	X	
<i>Hyaenodon cruentus</i> Leidy.....	X	X	
" <i>crucians</i> Leidy	X	X	
" <i>paucidens</i> Osborn and Wortman	X		
" <i>leptocephalus</i> Scott and Osborn.....	X		
" <i>mustelinus</i> Scott.....	X		

	1	2	3
CARNIVORA (FISSIPEDIA)			
CANIDAE			
<i>Daphoenus vetus</i> Leidy.....	X	X	
" <i>hartshornianus</i> Cope.....	X	X	
" <i>felinus</i> Scott.....	X		
" <i>nebrascensis</i> Hatcher	X		
" <i>inflatus</i> Hatcher	X		
<i>Pseudocynodictis gregarius</i> Cope	X	X	
" <i>lippincottianus</i> Cope	X	X	
" ? <i>paterculus</i> Matthew	X		
" <i>temnodon</i> Wortman and Osborn	X	X	
<i>Brachicyon intermedius</i> Loomis	X		
MUSTELIDAE			
<i>Bunaelurus lagophagus</i> Cope.....	X		
? <i>Oligobunis</i> sp.....	X		
FELIDAE			
<i>Dinictis felina</i> Leidy.....	X		
" <i>squalidens</i> Cope	X	X	
" <i>paucidens</i> Riggs	X		
<i>Hoplophoneus primaevus</i> Leidy.....	X		
" <i>robustus</i> Adams	X		
" <i>occidentalis</i> Leidy.....	X		
" <i>insolens</i> Adams.....	X		
" <i>oreodontis</i> Cope	X	X	
" <i>latidens</i> Thorpe.....	X		X
" <i>marshi</i> Thorpe	X		
" <i>molossus</i> Thorpe.....	X		
" sp. (approaching <i>Eusmilus</i>).....	X		
<i>Pogonodon cismontanus</i> Thorpe	X		
INSECTIVORA			
ERINACEIDAE			
<i>Proterix loomisi</i> Matthew	X		
SOLENDONTIDAE			
<i>Apternodus gregoryi</i> Schlaikjer			X
LEPTICTIDAE			
<i>Leptictis haydeni</i> Leidy	X		
<i>Ictops dakotensis</i> Leidy	X		
" <i>bullatus</i> Matthew	X		
" <i>porcinus</i> Leidy.....	X		
<i>Mesodectes caniculus</i> Cope.....	X		X
SORICIDAE			
<i>Protosorex crassus</i> Scott	X		

	1	2	3
TALPIDAE			
<i>Domnina gradata</i> Cope.....		X	
" <i>crassigenis</i> Cope.....		X	
? <i>Geolabis rhynchaeus</i> Cope.....		X	
RODENTIA			
SCIURIDAE			
<i>Prosciurus relictus</i> Cope			X
<i>Diplolophus insolens</i> Troxell.....		X	
CASTORIDAE			
<i>Eutypomys thomsoni</i> Matthew		X	
ISCHYROMYDAE			
<i>Ischyromys typus</i> Leidy.....		X	
" <i>typus nanus</i> Troxell.....		X	
" <i>typus lloydi</i> Troxell		X	
" <i>cristatus</i> Cope.....			X
" <i>pliacus</i> Troxell			X
<i>Adjidaumo</i> (= <i>Gymnoptychus</i>) <i>minutus</i> Cope		X	
" " <i>trilophus</i> Cope.....			X
MURIDAE			
<i>Eumys elegans</i> Leidy		X	X
HETEROMYIDAE			
<i>Mookomys parvus</i> Wood.....	Location and level uncertain		
LAGOMORPHA			
LEPORIDAE			
<i>Palaeolagus haydeni</i> Leidy.....		X	X
" <i>turgidus</i> Cope		X	X
" <i>leporinus</i> Cope.....			?
" <i>triplex</i> Cope (= <i>P. turgidus</i> ?).....			?
<i>Archaeolagus ennisianus</i> Cope		X	
PERISSODACTYLA			
HYRACODONTIDAE			
<i>Hyracodon nebrascensis</i> Leidy		X	
" <i>arcidens</i> Cope		X	X
" <i>major</i> Scott and Osborn.....		X	
" <i>apertus</i> Sinclair.....		X	
" <i>leidyanus</i> Troxell.....		X	
AMYNODONTIDAE			
<i>Metamynodon planifrons</i> Scott and Osborn		X	
" <i>rex</i> Troxell		X	
RHINOCEROTIDAE			
<i>Subhyracodon occidentalis</i> Leidy		X	
" <i>metalophus</i> Troxell		X	
" <i>copei</i> Osborn.....		X	
<i>Caenopus</i> (= <i>Subhyracodon</i>) <i>simplicidens</i> Cope.....		X	

	1	2	3
" <i>Caenopus</i> " sp.			X
<i>Leptaceratherium trigonodum</i> Osborn and Wortman...	X		
" " <i>allum</i> Troxell	X		
" <i>Hyracodon</i> " <i>planiceps</i> Scott and Osborn.....	X		
<i>Anchisodon quadriplicatus</i> Cope.....		X	
LOPHIODONTIDAE			
<i>Colodon procuspidatus</i> Osborn and Wortman.....	X		
" <i>luxatus</i> Marsh.....	X		
" <i>dakotensis</i> Osborn and Wortman.....	X		
" <i>longipes</i> Osborn and Wortman.....	X		
" <i>occidentalis</i> Leidy.....	X		
" <i>copei</i> Osborn and Wortman	X		
TAPIRIDAE			
<i>Protapirus simplex</i> Wortman and Earle.....	X		
EQUIDAE			
<i>Mesohippus bairdii</i> Leidy.....	X	?	
" <i>obliquidens</i> Osborn	X		
" <i>eulophus</i> Osborn		X	
" <i>exoletus</i> Cope		?	
" <i>cuneatus</i> Cope		?	
" <i>trigonostylus</i> Osborn.....	X	?	
" <i>barbouri</i> Schlaikjer.....	X		X
" sp. indet.	X		
ARTIODACTYLA			
ENTELODONTIDAE			
<i>Archaeotherium mortoni</i> Leidy.....	X	X	
" <i>clavum darbyi</i> Troxell.....	X		
" <i>ingens</i> Leidy.....	X		
" <i>crassum</i> Marsh.....	?	?	
" <i>wanlessi</i> Sinclair	X		
" sp.....	X		X
<i>Pelonax ramosus</i> Cope ³	X	X	
" <i>potens</i> Marsh		X	
TAGASSUIDAE			
<i>Perchoerus probus</i> Leidy	X		
" <i>nanus</i> Marsh	X		
ANTHRACOTHERIIDAE			
<i>Aepinacodon rostratus</i> Scott.....	X		
LEPTOCHOERIDAE (cf. DICHOBUNIDAE)			
<i>Leptochoerus spectabilis</i> Leidy	X		
" <i>lemurinus</i> Cope.....		X	
" <i>robustus</i> Marsh.....		X	

³ ? Upper Oligocene.

	1	2	3
" <i>gracilis</i> Marsh.....	x		
<i>Stibarus obtusilobus</i> Cope	x		
" <i>quadricuspis</i> Hatcher.....	x		
MERYCOIDODONTIDAE			
<i>Agriochoerus antiquus</i> Leidy.....	x		
" <i>latifrons</i> Leidy.....	x		
<i>Merycoidodon gracilis</i> Leidy	x	x	
" <i>platycephalus</i> Thorpe	x		
" <i>coloradensis</i> Cope.....			x
" <i>periculorum</i> Cope.....			x
" <i>hybridus</i> Leidy.....			x
" <i>culbertsoni</i> Leidy.....			x
<i>Eporeodon</i> cf. <i>bullatus</i> Leidy.....			x
<i>Leptauchenia</i> sp.			x
<i>Merycoidodon culbertsoni culbertsoni</i> Leidy.....			x
" " <i>periculorum</i> Cope.....			x
HYPERTRAGULIDAE			
<i>Hypertrangulus calcaratus</i> Cope.....	x	x	
" sp. div.....			x
<i>Leptomeryx evansi</i> Leidy.....	x	x	
" sp. div.			x
" sp. indet.....			x
<i>Hypisodus minimus</i> Cope.....	x	x	
" <i>alacer</i> Troxell.....			x
CAMELIDAE			
<i>Poebrotherium wilsoni</i> Leidy	x	x	
" <i>andersoni</i> Troxell.....			x
" <i>labiatum</i> Cope.....			x
" <i>eximium</i> Hay			x
" sp. indet.			x
<i>Paratylopus primaevus</i> Matthew			x
TESTUDINATA ⁴			
AVES			
FAMILY INDET			
<i>Bathornis</i> sp.			x
<i>Bird</i> gen. et sp. indet.....			x
<i>Eggs</i> gen. et sp. indet.....			x
CARINATAE			
PHALACROCORACIDAE			
<i>Phalacrocorax mediterraneus</i> Shufeldt.....			x

⁴ Strange as it may seem, in spite of the fact that the Middle Oligocene abounds with turtles, no one appears to have identified and recorded the races that occur here; undoubtedly a considerable array. Some one specializing in turtles should do this.

	1	2	3
CROCODYLOMORPHI			
CROCODYLIDAE			
<i>Caimanoidea prenasalis</i> Loomis	x		
" <i>visheri</i> Mehl.....	x		
SAURIA			
IGUANIDAE			
<i>Aciprion formosum</i> Cope.....		x	
" <i>majus</i> Gilmore.....		x	
<i>Exostinus serratus</i> Cope		x	
LEPOSTERNIDAE			
<i>Rhineura coloradoensis</i> Cope.....		x	
" <i>hatcherii</i> Baur		x	
<i>Hyporhina antiqua</i> Baur		x	
HELODERMIDAE			
<i>Heloderma matthewi</i> Gilmore.....			x
ANGUIDAE			
<i>Glyptosaurus giganteus</i> Gilmore.....		x	
<i>Peltosaurus abbotti</i> Gilmore		x	
" <i>granulosus</i> Cope.....		x	x
<i>Xestops ? pawneensis</i> Gilmore			x
FAMILY UNDETERMINED			
<i>Crematosaurus carinicollis</i> Cope.....		x	
" <i>rhambastes</i> Cope		x	
" <i>unipedalis</i> Cope		x	
<i>Diacium quinquepedale</i> Cope.....			x
SERPENTES			
BOIDAE			
<i>Aphelophis talpivorus</i> Cope.....		x	
<i>Calamagras murivorus</i> Cope		x	
<i>Ogmophis angulatus</i> Cope		x	
CROTALIDAE			
<i>Neuradromicus dorsalis</i> Cope			x
PISCES			
<i>Sardinius ? blackburnii</i> Cope....	Locality and horizon uncertain		
<i>Proballostomus longulus</i> Cope..	Locality and horizon uncertain		
<i>Gephyrura concentrica</i> Cope....	Locality and horizon uncertain		
<i>Plioplarchus sexspinosus</i> Cope..	Locality and horizon uncertain		
" <i>whitei</i> Cope.....	Locality and horizon uncertain		
<i>Eoperca multidentatus</i> Cope....	Locality and horizon uncertain		
<i>Oligoplarchus squamipinnis</i> Cope.....	Locality and horizon uncertain		

FELIDAE			
		1	2
<i>Diniectis bombifrons</i> Adams.....		x	
<i>Hoplophoncus insolens</i> Adams.....		x	
<i>Eusmilus dakotensis</i> Hatcher		x	
<i>Nimravus major</i> Lucas.....		x	
INSECTIVORA			
TALPIDAE			
<i>Proscalops miocaenus</i> Matthew.....		x	
RODENTIA			
CASTORIDAE			
<i>Paleocastor nebrascensis</i> Leidy.....		x	
INSECTIVORA			
TALPIDAE			
<i>Proscalops secundus</i> Matthew.....			x
RODENTIA			
CASTORIDAE			
<i>Paleocastor simplicidens</i> Matthew			x
" <i>sciuroides</i> Matthew			x
" <i>brachyceps</i> Matthew			x
" ? <i>pansus</i> Matthew and Gidley.....			x
<i>Euhapsis platyceps</i> Peterson.....			x
" <i>gaulodon</i> Matthew ⁷			x
ISCHYROMYIDAE			
<i>Ischromys chrysodon</i> Cope.....			
White River, horizon uncertain			
GEOMYIDAE			
<i>Entoptychus formosus</i> Matthew.....			x
" <i>curtus</i> Matthew			x
HETEROMYIDAE			
<i>Heliscomys parvus</i> Troxell.....			
Horizon uncertain			
" <i>vetus</i> Cope			x

⁷ *Euhapsis gaulodon*, *Stenofiber sciuroides*, and *S. brachyceps*, are all synonyms of *Paleocastor simplicidens*, which, in turn, is probably synonymous with *P. nebrascensis*. *Stenofiber* ? *pansus* Matthew and Gidley is possibly referable to the same species. Auct. R. A. Stirton.

	1	2
EQUIDAE		
<i>Miohippus intermedius</i> O. and W.....	x	x
" <i>meteuilophus</i> Osborn.....	x	x
" <i>brachystylus</i> Osborn.....	x	x
" <i>validus</i> Osborn.....	x	x
" <i>gidleyi</i> Osborn.....	x	x
" <i>crassicuspis</i> Osborn.....	x	x
<i>Mesochippus grallipes</i> Sinclair.....	x	x
ARTIODACTYLA		
ENTELODONTIDAE		
<i>Archaeotherium</i> cf. <i>ingens</i> Leidy.....	x	x
" ? <i>crassum</i> Marsh.....	x	x
" sp.....	x	x
<i>Pelonax bothrodon</i> Marsh.....	x	x
" sp.....	x	x
<i>Scaptohyus altidens</i> Sinclair.....	x	x
<i>Megachoerus zygomatiscus</i> Troxell.....	x	x
" <i>latidens</i> Troxell.....	x	x
TAGASSUIDAE		
<i>Perchoerus robustus</i> Marsh.....	x	x
" <i>lentus</i> Marsh.....	?	?
? SUIDAE		
<i>Hyotherium platyops</i> Cope.....	x	x
" <i>americanum</i> S. and O. ⁹	x	x
LEPTOCHOERIDAE		
<i>Leptochoerus</i> sp.....	x	x
EQUIDAE		
<i>Miohippus gemmarosae</i> Osborn.....	x	x
" <i>equinanus</i> Osborn.....	x	x
<i>Parahippus pristinus</i> Osborn.....	x	x
" sp.....	x	x
" sp.....	x	x
" sp.....	x	x
<i>Anchitherium</i> sp.....	x	x
ARTIODACTYLA		
ENTELODONTIDAE		
? <i>Entelodon</i> sp.....	x	x

⁹ Probably not this genus.

	1	2
ANTHRACOTHERIDAE		
<i>Anthracoherium karensense</i> O. and W.	x	
<i>Ancodon brachyrhynchus</i> O. and W.	x	
<i>Elomeryx mitis</i> Marsh	x	
" <i>armatus</i> Marsh	x	
" " <i>angustus</i> Troxell	x	
<i>Heptacodon curtus</i> Marsh	x	
<i>Octacodon gibbiceps</i> Marsh	x	
" " <i>valens</i> Marsh	x	
MERYCOIDODONTIDAE		
<i>Agriocoherus major</i> Leidy	x	
" " <i>auritus</i> Leidy	x	
" " <i>gaudryi</i> O. and W.	x	
" " <i>migrans</i> Marsh	x	
<i>Eporeodon</i> (= <i>Eucrotaphus</i> ?) <i>major</i> Leidy	x	
" " (= <i>Eucrotaphus</i> ?) <i>cedrensis</i> Mathew		x
<i>Eucrotaphus jacksoni</i> Leidy	x	
<i>Leptauchenia</i> sp.	?	
MERYCOIDODONTIDAE		
<i>Eporeodon relictus</i> Loomis		x
" " sp. div.		x
<i>Leptauchenia major</i> Leidy		x
" " <i>decora</i> Leidy		x
" " <i>nitida</i> Leidy		x
" " <i>densa</i> Loomis		x
<i>Leptauchenia</i> sp.		x
<i>Merychynus curtus</i> Loomis		x
" " <i>delicatulus</i> Loomis		x
" " <i>stouacensis</i> Loomis		x
<i>Mesoreodon megalodon</i> Peterson		x
<i>Promerycochoerus thomsoni</i> Loomis		x
" " <i>carrikeri</i> Peterson		x
<i>Hypselochoerus gregoryi</i> Loomis		x
" " <i>pygmaeus</i> Loomis		x
" " sp. div.		x

CORRELATION OF THE MONROE CREEK, ROSEBUD, HARRISON SERIES OF FORMATIONS

The Monroe Creek and Lower Rosebud beds appear to be locality phases of one series of depositions, and, insofar as the accidents of discovery have disclosed their faunas to date, indicate a closely related and nearly identical stage in those races where direct comparison is possible. Local environmental factors at the time of deposition probably account for some of the differences noted in the races present from each formation and locality. Their faunae compare closely with that of the John Day formation, environmental factors considered.

The Lower Harrison is superimposed on the Monroe Creek in the type localities; consequently has a more advanced fauna, but still showing distinct relations to that of the John Day. So far as known to the writers not a single Monroe Creek species has been definitely found in the Lower Harrison, though *Promerycochoerus* and other genera are common to both. Similarly, not a single species common to both the Lower Harrison and Upper Harrison, has been reported definitely, the latter having a distinctly more advanced mammalian fauna, as well as lithological differences, and it directly overlies the Lower Harrison in the type locality. It must be held a distinct formation. As pointed out in a previous paper,⁶ stratigraphic breaks, due to local deformation of the beds, exist in places between both the Monroe Creek and Lower Harrison, and at the Lower Harrison-Upper Harrison contacts, which strengthens the evidence both as to geologic and faunistic distinctness of these members.

No comparable breaks have been reported from the Rosebud, but on the basis of evidence now available, there is no reported stage of these beds quite comparable to the Lower Harrison, though such a section should exist there.

The known faunae of the Harrison beds, Upper and Lower, while closely comparable to the Upper Rosebud in a broad way, do not, in either case, coincide with it. It presents in-

¹⁰ Cook, H. J. "Notes On The Geology of Sioux County, Nebraska, and Vicinity," Nebraska Geological Survey, Vol. IV.

teresting problems in each formation, certain groups appearing to be more advanced than others.

In the dogs of the Lower Harrison, *Temnocyon*, a John Day genus, appears to represent species clearly advanced over those of the Upper Oligocene John Day beds, but is not reported from the Rosebud or Upper Harrison. *Daphaenodon* is an advancement over the Brule *Daphaenus*, but is not reported from other beds. *Nothocyon* is closely comparable to John Day species, and is advanced over the Brule *Cynodictis*. While advanced species of *Nothocyon*, as yet undescribed, occur in the Upper Harrison, the more advanced genus, *Cynodesmus* occurs here, in at least one form, closely comparable to an Upper Rosebud species (*C. thomsoni*), and in the latter beds *Cynodesmus* appears to be the most abundant canid, though not present in the Lower Rosebud. (In this connection, the proper generic references in certain species of the *Cynodictis-Nothocyon-Cynodesmus* line of descent are questionable.) *Mesocyon*, also a John Day genus, known in Nebraska only from the Lower Rosebud and Monrøe Creek, agrees fairly well with the Upper Oligocene John Day fauna. *Borocyon* and *Cynarctus* of the Upper Harrison are more specialized than any canids from the Upper Rosebud. Therefore, on this evidence of the canids, the Upper Rosebud appears a bit older than the Upper Harrison, and more recent than the Lower Harrison.

The Mustelidae, as far as known, indicate about the same thing.

Among the rodents, in a recent conversation with Dr. R. A. Stirton, who is specializing in the Castoridae, the writer was informed that the Upper Rosebud beavers, in the opinion of Dr. Stirton, showed little, if any, advancement over those of the Lower Rosebud, when the material was restudied. Rodents of the Upper Harrison are almost unknown, but an undescribed species of *Mylogaulus* appears here and is the earliest known appearance of the group in the region, again suggesting that the Upper Harrison is a later phase than the Upper Rosebud.

While the Rhinocerotidae are abundant in the Lower Harrison, they are little known from the Rosebud or Upper Harri-

son, save for the type of *Epiaphelops*, which, while primitive in some respects, in others is distinctly more advanced than any now described from the other beds.

The horses are best known from the Upper Harrison and here, in most cases, appear clearly advanced over those now known from both the Upper Rosebud and Lower Harrison.

In the Artiodactyla, the Entelodonts are too little known to offer comparison with the Rosebud, but the last known evidence of the phylum, culminating in the gigantic ? *Dinohyus conodon* of the lower part of the Upper Harrison beds, may represent the time of extinction of that race, which was so abundant in the Oligocene.

In the oreodonts, the evidence reported connects the Lower Harrison more closely with the Lower Rosebud, and indicates a habitat more favorable for them in the Upper Harrison, than in the region where the Upper Rosebud was deposited, and with more advanced species, again, in the Upper Harrison. *Promerycochoerus* is characteristic of the Lower Rosebud and Monroe Creek, and persists in *P. vantasselensis* up into the Lower Harrison. This genus is entirely replaced by the more advanced *Merycochoerus* in the Upper Harrison. *Promerycochoerus* is unknown in the Upper Rosebud and *Merycochoerus* is present, but in undetermined species. Again the evidence points to the Upper Rosebud as more recent than the Lower Harrison, but when one examines the meagre evidence of the other Upper Rosebud oreodonts as compared with those of the Upper Harrison, the latter appear distinctly more advanced.

The same is true in a more marked degree with the camels of these beds. There is a good deal of undescribed camel material known, with some interesting precocious forms appearing in the Upper Harrison. These are more advanced than those of the Rosebud or other beds considered here, and plainly lead up toward the more specialized camels of the later Miocene and Pliocene.

The earliest known occurrence of *Merycodus* is in the Upper Harrison, forecasting the more abundant and specialized species of this group to follow. In the *Blastomeryx* group

certain species more advanced than those of the Upper Rosebud are known.

With the faunal evidence in mind, the writer is placing the Upper Rosebud, at this time, as a stage between the Lower and Upper Harrison. It represents rather distinct faunal facies, due in part, undoubtedly, to differences of physical conditions and habitat when these beds were deposited.

The greatest gap in the faunal record of Nebraska, from the early Oligocene to the end of the Tertiary, occurs between the Lower Miocene-Upper Harrison beds and the Middle Miocene-Lower Sheep Creek beds. This gap will undoubtedly be filled in as later discoveries are accurately recognized and reported. The writer has examined one recently discovered horizon, and some of its fauna, which appears partially to fill in this gap. It occurs in the region where for years we have predicted that such a stage should be found.

LOWER MIOCENE
ARIKAREE FORMATION (in part)
Merycochoerus Zone

- | | |
|--|---|
| <p>First Phase</p> <p>1. Lower Harrison, Nebraska, and adjoining parts of Wyoming.</p> | <p>Second Phase</p> <p>1. Southeastern Wyoming.
2. Upper Harrison, Nebraska.
3. Upper Rosebud, South Dakota and Nebraska.
4. Uppermost Martin Canyon, Colorado.</p> |
|--|---|

CARNIVORA				
CANIDAE		1	1 2 3 4	
<i>Nothocyon arnectens</i> Peterson	.....	x	x	
"	sp.	x	x	
<i>Daphoenodon periculosus</i> Cook	.....	x	x	x
"	<i>superbus</i> Peterson	x	x	x
"	<i>venator</i> Cook	x	x	
"	<i>percussor</i> Cook	x	x	
<i>Aletocyon multicuspis</i> Roamer and Sutton	.....	x	x	x
CANIDAE				
<i>Cynodesmus brachypus</i> Cope	.....		x	
"	<i>thomsoni</i> Matthew		x	x
"	<i>minor</i> Matthew		x	x
"	sp.		x	
<i>Nothocyon</i> sp.	.....		x	
<i>Borocyon robustus</i> Peterson	.....		x	
<i>Cynaretus acridens</i> Barbour and Cook	.....		x	x
? <i>Pachycyonodon harlowi</i> Loomis	.....		x	x
PROCYONIDAE				
<i>Phlaocyon leucosteus</i> Matthew	.....		x	
? <i>Probassariscus</i> sp. indesc.	.....		x	
MUSTELIDAE				
<i>Paroligobunis simplicidens</i> Peterson	.....	x	x	
<i>Oligobunis</i> cf. <i>lepidus</i> Matthew	.....	x	x	x
"	<i>vantasselensis</i> Loomis	x	x	x
<i>Aelurocyon brevifacies</i> Peterson	.....		x	

	1	2	3	4
PERISSODACTYLA				
RHINOCEROTIDAE				
<i>Miocerac</i> <i>cooki</i> Peterson	x			x
<i>Diceratherium niobrarense</i> Peterson	x			x
" <i>petersoni</i> Loomis	x			
" <i>schiffi</i> Loomis	x			
" <i>Metacaenopus egregius</i> Cook	x			
" <i>stageri</i> Loomis	x			
CHALICOTHERIDAE				
<i>Moropus cooki</i> Barbour ¹¹	x			x
" <i>petersoni</i> Holland	x			x
" <i>parvus</i> Barbour (= <i>M. petersoni</i> Holland)	x			
" <i>maximus</i> Holland and Peterson	x			
EQUIDAE				
<i>Parahippus</i> aff. <i>crenoidens</i> Scott	x			x
" sp.	x			x
" sp.	x			x
<i>Kalobatippus agatensis</i> Osborn	x			x
<i>Miohippus</i> sp. <i>indesc.</i>	x			
" Osborn				x
" sp.				x
" sp.	?			x
" sp.				x
EQUIDAE				
<i>Parahippus nebrascensis</i> Peterson	x			x
" <i>tyleri</i> Loomis	x			x
" <i>nebrascensis primus</i> Osborn	x			x
" <i>pawneeensis atavus</i> Osborn	x			x
" <i>coloradensis praecurrens</i> Osborn				x
" sp.				x
" sp.				x
" sp.				x

¹¹ The writer found an old bone pocket near the old Black Hills Stage Crossing, on the Niobrara River, where Hank Clifford collected the type of *Moropus elatus* Marsh; materials from which in color, composition and form appear to be identical with Marsh's types now in Yale University. This quarry is a channel bed of Upper Harrison age and is situated some eighteen miles east of the Agate Springs Fossil Quarries (Lower Harrison beds) from which *M. cooki* Barbour, was collected. H. J. C.

	1	2	3	4
ARTIODACTYLA				
ENTELODONTIDAE				
<i>Dinohyus hollandi</i> Peterson.....	x			x
<i>Archaeotherium</i> sp.....	x			x
<i>Entelodont</i> gen. et sp. indesc.....	x			
TAGASSUIDAE				
<i>Desmathyus siouxensis</i> Peterson	x			x
<i>Desmathyus pinensis</i> Matthew				x
<i>Desmathyus cf. subaequans</i> Cope				x
" sp.....				x
<i>Pedichyus ferus</i> Loomis.....				x
MERYCOIDODONTIDAE				
<i>Promerycochoerus vantasselensis</i> Peterson....	x			x
? <i>Merychyus elegans</i> Leidy	x			?
" <i>harrisomensis</i> Peterson.....	x			?
" sp.....	x			x
? <i>Mesoreodon</i> sp.....	x			x
MERYCOIDODONTIDAE				
<i>Merychyus arenarum</i> Cope.....				x
" <i>leptorhynchus</i> Cope.....				x
" <i>minimus</i> Peterson				x
" sp.....				x
<i>Ticholeptus petersoni</i> Loomis.....				x

¹² Described originally as a proboscidian from fragmentary teeth by the writer; years later Mr. Albert Thomson, of the American Museum of Natural History, found more of the same individual at the same station, and these parts assembled clearly indicate that this type belongs to an *Entelodont* larger, more progressive and probably distinct from *Dinohyus*. H. J. C.

¹³ "Headwaters of Niobrara River, near Fort Laramie."

¹⁴ Sweetwater River, Wyoming.

	1	2	3	4
CAMELIDAE				
<i>Stenomylus gracilis</i> Peterson	x			x
" <i>hitchcocki</i> Loomis	x			x
" <i>crassipes</i> Loomis	x			x
<i>Oxydactylus campestris</i> Cook	x			x
" sp. indesc.	x			x
" sp.	x			x
CAMELIDAE				
<i>Protomeryx halli</i> Leidy				x
" <i>cedrensis</i> Matthew				x
" cf. <i>cedrensis</i> Matthew				x
" <i>leonardi</i> Loomis				x
" sp. div.				x
<i>Stenomylus</i> sp.				x
" sp.				x
<i>Oxydactylus longipes</i> Peterson				x
" <i>brachyodontis</i> Peterson				x
" <i>longirostris</i> Peterson				x
" <i>lulli</i> , Loomis				x
" <i>gibbi</i> Loomis				x
" sp. indesc.				x
HYPERTRAGULIDAE				
<i>Syndyoceras cooki</i> Barbour	x			
<i>Leptomeryx</i> sp. indesc.	x			
<i>Nanotragulus</i> near <i>ordinatus</i> Matthew	x			
" <i>loomasi</i> Lull	x			
" sp.	x			
CERVIDAE				
<i>Machaeromeryx tragulus</i> Matthew				x
<i>Blastomeryx advena</i> Matthew				x
" <i>olecotti</i> Matthew				x
" <i>primus</i> Matthew				x
" sp.				x

1		1	2	3	4
	TESTUDINATA				
	TESTUDINIDAE				
	<i>Testudo arenivaga</i> Hay	x			
	" <i>brevisterna</i> Loomis	x			
	" <i>undabuna</i> Loomis	x			
	CARINATAE				
	BUTEONIDAE				
	<i>Proctinia effera</i> Wetmore	x			
	<i>Geranoaetus ales</i> Wetmore	x			
	" sp.	x			
	CRACIDAE				
	<i>Ortalis tantala</i> Wetmore	x			
	TESTUDINATA				
	TESTUDINIDAE				
	<i>Testudo hollandi</i> Hay		x		
	" "			x	
	" <i>edae</i> Hay				x
	AVES				
	ANTILOCAPRIDAE ("MERYCODONTIDAE")				
	<i>Merycodus</i> sp. indesc.				x

MIDDLE MIOCENE

ARIKAREE FORMATION (in part)

1. Lower Sheep Creek.
2. Pawnee Creek, northeastern Colorado.

	1	2
CARNIVORA		
CANIDAE		
<i>Cynarctus saxatilis</i> Matthew.....		X
<i>Amphicyon reinheimeri</i> Cook		X
" <i>freundens</i> Matthew	X	
" <i>sinapius</i> Matthew.....		X
" <i>idoneus</i> Matthew	X	
" sp.....		X
" <i>Canis</i> " sp.....		X
<i>Nothocyon vulpinus coloradoensis</i> Thorpe.....		X
<i>Tomarctus cf. temerarius</i> Leidy		X
" <i>brevirostris</i> Cope.....		X
" <i>optatus</i> Matthew	X	
? <i>Cyon cf. Icticyon</i> sp.		X
<i>Cynodesmus</i> sp. indesc.....		X
<i>Euoplocyon</i> sp. indet.....		X
? <i>Ursavus pawniensis</i> Frick		X
MUSTELIDAE		
<i>Plionictis parviloba</i> Cope.....		X
" <i>ogygia</i> Matthew.....		X
<i>Mionictis</i> sp. indesc.		X
<i>Brachypsalis matutinus</i> Matthew.....		X
<i>Sthenictis cf. lycopotamicum</i> Cope.....		X
FELIDAE		
<i>Metailurus</i> ¹⁵ <i>intrepidus</i> Leidy.....		X
" sp.....		X
RODENTIA		
MYLAGAULIDAE		
<i>Mylagaulus laevis</i> Matthew.....		X
" <i>paniensis</i> Matthew.....		X
" <i>novellus</i> Matthew.....		X
" <i>vetus</i> Matthew		X
<i>Ceratogaulus rhinocerus</i> Matthew		X
PROBOSCIDEA		
MASTODONTIDAE		
? <i>Miomastodon proavus</i> Cope		X
<i>Rhynchotherium rectidens</i> Osborn.....		X
<i>Trilophodon simplicidens</i> Osborn.....		X

¹⁵ Probably *Pseudaelurus*. Auct. R. A. Stirton.

1 2

PERISSODACTYLA

CHALICOTHERIDAE

<i>Chalicotherid</i> gen. indesc.	X
<i>Moropus</i> sp.	X

RHINOCEROTIDAE

? <i>Caenopus persistens</i> Osborn.....	X
<i>Aphelops megalodus</i> Cope	X X
" <i>profectus</i> Matthew.....	X
" <i>planiceps</i> Osborn	X
<i>Mesoceras medicornutus</i> Osborn.....	X
? <i>Teleoceras</i> sp.	X

TAPIRIDAE

<i>Tapiravus</i> sp. indet.	X
----------------------------------	---

EQUIDAE

<i>Merychippus proparvulus</i> Osborn.....	X
" <i>sejunctus</i> Cope.....	X
" <i>eohipparion</i> Osborn	X
" <i>labrosus</i> Cope	X
" <i>paniensis</i> Cope.....	X
" <i>sphenodus</i> Cope.....	X
" <i>campestris</i> Gidley.....	X
" <i>isonesus secundus</i> Osborn.....	X
" " <i>tertius</i> Osborn.....	X
" " <i>quartus</i> Osborn.....	X
" " <i>quintus</i> Osborn.....	X
" <i>insignis primus</i> Osborn	X
" <i>eoplacidus</i> Osborn.....	X
<i>Hypohippus osborni</i> Gidley	X
" cf. <i>equinus</i> Scott	X
" sp.	X
<i>Parahippus pawniensis</i> Gidley	X
" <i>coloradensis</i> Gidley	X
" near <i>crenoidens</i> Scott	X
<i>Archaeohippus penultimus</i> Matthew	X

ARTIODACTYLA

MERYCOIDODONTIDAE

<i>Merycochoerus</i> cf. <i>proprius</i> Leidy	X
" cf. <i>rusticus</i> Leidy.....	X
<i>Pronomotherium</i> cf. <i>siouense</i> Sinclair.....	X
<i>Merychys</i> sp. div.	X

CAMELIDAE

<i>Protolabis longiceps</i> Matthew.....	X
" <i>heterodontus</i> Cope.....	X
" <i>angustidens</i> Cope.....	X X
" <i>saxeus</i> Matthew.....	X

"	<i>pussilus</i> Matthew.....	1	2
"	<i>fissidens</i> Cope.....	X	
?	" <i>fissidens</i> Cope.....	X	X
?	<i>Procamelus</i> cf. <i>gracilis</i> Leidy.....	X	
	<i>Alticamelus altus</i> Marsh.....		X
"	<i>leptocolon</i> Matthew.....	X	X
"	<i>priscus</i> Matthew.....	X	
"	sp.....	X	
	<i>Myolabis tenuis</i> Matthew.....	X	
CERVIDAE			
?	<i>Palaeomeryx</i> sp.....		X
	<i>Dyseomeryx riparius</i> Matthew.....	X	
	<i>Blastomeryx gemmifer</i> Cope.....	?	X
"	<i>medius</i> Matthew.....	X	
ANTILOCAPRIDAE (MERYCODONTIDAE)			
	<i>Merycodus osborni</i> Matthew.....		X
"	cf. <i>necatus</i> Leidy.....	X	
AVES			
CARINATAE			
ARAMIDAE			
	<i>Aramornis longurio</i> Wetmore.....	X	
BUTEONIDAE			
	<i>Urubitinga enecta</i> Wetmore.....	X	
PSITTACIDAE			
	<i>Conuropsis fraturcuta</i> Wetmore.....	X	
CROCOMORPHI			
CROCODYLIDAE			
	<i>Alligator thomsoni</i> Mook.....	X	
TESTUDINATA			
TESTUDINIDAE			
	<i>Testudo</i> near <i>orthopygia</i> Cope.....	X	
"	<i>orthopygia angusticeps</i> Matthew.....	X	
"	<i>osborniana</i> Hay.....		X
"	<i>pansa</i> Hay.....		X
PISCES			
	<i>Silurid</i> indet.....	X	
	<i>Pisces</i> div. indet.....	X	
"	" " ".....	X	
"	" " ".....	X	
?	<i>Ameiurus</i> sp. indet.....	X	

NOTES ON THE CORRELATION OF THE LATE
MIOCENE-PLIOCENE FAUNAS

From the foregoing faunal sheet, it is obvious that the Lower Sheep Creek and the Pawnee Creek beds are not stratigraphic equivalents, though closely related. Also that the Lower Sheep Creek represents an earlier stage, and that the latter beds are intermediate between the former and the Lower Snake Creek, and more nearly equivalent to the Upper Sheep Creek. This latter member will have to be more clearly differentiated from the Lower Snake Creek, although these faunal elements are being listed together in this paper, due to confusion in early collecting methods.

Owing to the fact that only hazy data are available concerning the locality and level of occurrence of many important early types, and that subsequent collecting in many instances has not served to clarify many problems, it must soon become obvious to any close student of Paleontology that much of the present information regarding these formations and their faunae is sadly in need of revision, partly due to lack of publication of important information already determined; partly due, in some instances, to inaccurate determinations and references. In some instances, confusion may be traced to a possible mixture of faunae, from closely associated beds, where local reworking and redeposition has occurred, but most of these problems can readily be solved and straightened out when enough accurate collecting and assembling of data in the field has been done, and the information been made available to permit exact stratigraphic correlations. For the present, this section of these faunal lists, while reasonably accurate as to the levels of occurrence in the Sheep Creek and Snake Creek beds, is less exact in many instances, in other localities cited. This is particularly true of the fossils reported as coming from the locality of "Ft. Niobrara" and the "Nebraska Formation". The "Republican River" beds will likewise probably prove to have various more or less recent phases as does the Ogalalla.

For reasons stated previously in this paper as to the complexity of bedding and deposition of the various phases of the

Upper Sheep Creek and Snake Creek beds, and the undoubted mixture of faunal elements in collecting from this zone (which condition is particularly true of the Upper Miocene-Lower Pliocene stages here), these horizons and faunal elements are herein grouped together, in most instances, under the "Lower Snake Creek". As a matter of fact, there is little question that part of this fauna is Upper Miocene and part Lower Pliocene, the Upper Sheep Creek being an Upper Miocene stage closely related to the Pawnee Creek beds of Colorado. The typical Lower Snake Creek beds will probably be demonstrated to be early Pliocene.

We note many marked faunal changes nearly coincident with the beginning of Pliocene time, in which increased gradients across western Nebraska and increased stream flow brought down the first "sharp" granitic and quartzitic sands and gravels from the mountains to the westward. It is notable that among horses, the genus *Merychippus*, dominant in Middle and Upper Miocene times, gives way to *Hipparion* and *Pliohippus*, both of which genera are descendants of different branches of the Miocene *Merychippus* group. While species of *Merychippus* are found in the earliest beds containing *Hipparion* and *Pliohippus*, these will undoubtedly be proven to be either persistent primitive members descended from Miocene times, with little change in tooth structure, or their apparent association due to a mixture of faunas.

From all angles, it appears desirable to the writer that we should take the time of the first definite appearance of *Hipparion* as the beginning of Pliocene time. This coincides with the evidence from several directions, and the horses were so abundant and widespread in distribution that this makes a very useful criterion as well. If we do this, as Stirton and others are advocating, then division between the Miocene and Pliocene occurs in what we are listing as the undifferentiated "Lower Snake Creek" in these beds, as well as in the Valentine beds further eastward, in both of which more exact field records are necessary, as previously stated. This is also necessary in other comparable localities, particularly in the western half of Nebraska.

No satisfactory means of settling many points necessary in these problems is available at this time, though work now in progress will undoubtedly clear up many vexed points in the next few years. Evidence available indicates that the Snake Creek beds will probably show at least three determinable Pliocene phases.

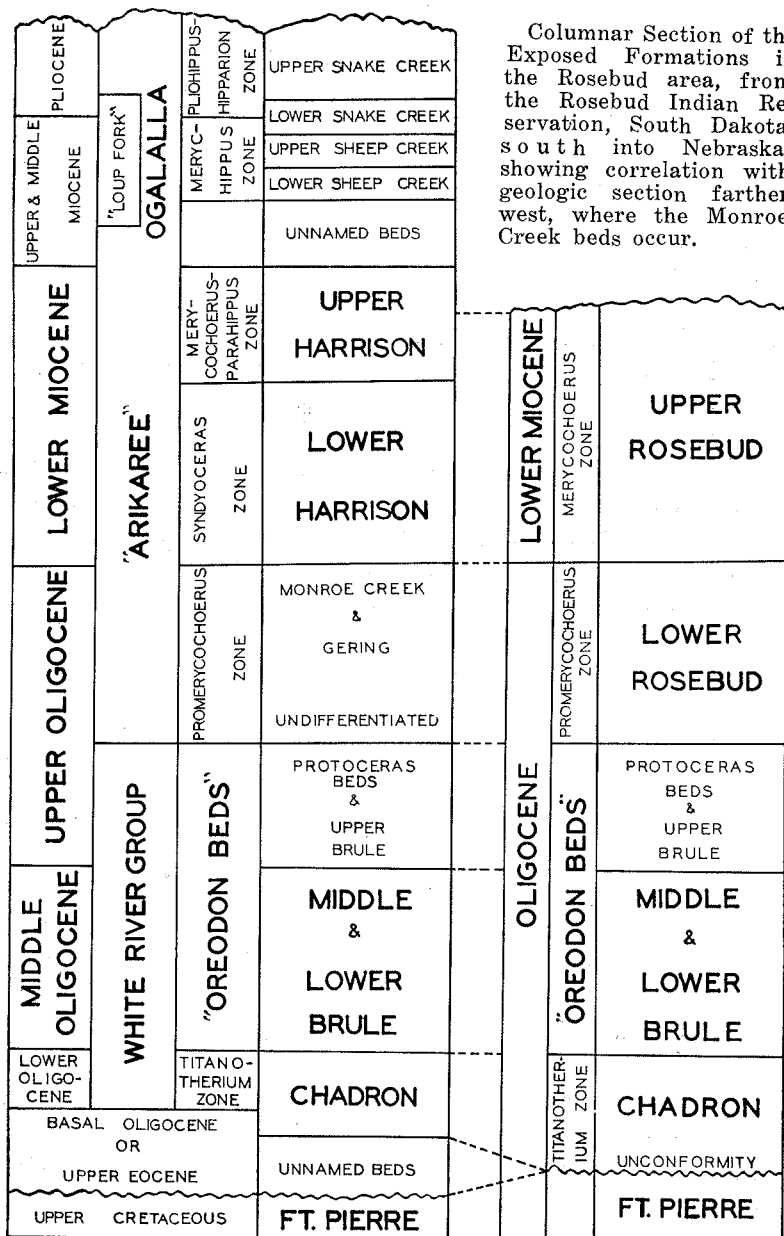
Since these Faunal Lists were compiled, and this report written, the results obtained by careful systematic collecting in the region about Valentine, Nebraska, by R. A. Stirton, Paul O. McGrew and others associated in this work, indicate that at least three faunal phases are present in that region, to only one of which (the upper member) the term "Valentine" can be properly applied. The lower member of this section agrees closely with the typical "Ft. Niobrara"; and there is at least one distinct stage yet to be differentiated. Studies are now in progress by the above men on these beds and their faunae, which when published, will make possible the proper correlations here, and straighten out evidence, and faunal mixtures, now confused. It will undoubtedly be shown that certain beds in the Valentine region agree closely with the phase of the Snake Creek Beds, in which the type of *Hesperopithecus* was found (on Olcott Hill); hence Primates reported from these two phases, are undoubtedly nearly contemporaneous.

Of course these correlations, based on this new evidence, will involve other comparable shifts in the record of the stratigraphic occurrence of many other types listed from this region and series of late Miocene-Pliocene beds, as the true levels of their occurrence can be determined, clarifying the older, less precise records. A comparable condition applies to the "Ainsworth" and "Republican River" sections.

These accurate determinations will, of course, affect the record of the reported vertical range of occurrence of many genera and species, listed from this series of beds.*

H. J. C.

* The base of the Ogallala in our columnar section, Page 44 should not extend below the middle of the Upper Sheep Creek.



Columnar Section of the Exposed Formations in the Rosebud area, from the Rosebud Indian Reservation, South Dakota, south into Nebraska, showing correlation with geologic section farther west, where the Monroe Creek beds occur.

Columnar Section of Nebraska Tertiary Formations; North Platte Valley to Hat Creek Basin, near the Wyoming state line. Vertical scale approximately one hundred feet to 2 inches.

UPPER MIOCENE AND LOWER PLOCIENE

First Phase	Second Phase
ARIKAREE FORMATION (in part)	OGALALLA FORMATION (in part)
MERYCHIPPUS ZONE	HIPPARION ZONE
1. "Fort Niobrara", Nebraska formation.*	1. Republican River, Kansas and Nebraska.
2. Upper Sheep Creek.	2. Ainsworth, Nebraska.
3. Lower Snake Creek.	3. Upper Snake Creek.
4. Little White River, South Dakota.	4. Yuma County, Colorado, and adjoining areas.
5. Valentine, Nebraska.	5. Smoky Hill River, Kansas.
1 2 3 4 5	1 2 3 4 5

PRIMATES

<i>Hesperopithecus haroldcooki</i>	x
Osborn ¹⁶	x

CARNIVORA

CANIDAE	
<i>Aelurodon saevus</i> Leidy.....	x x
" <i>haydeni</i> Leidy.....	x x
CARNIVORA	
CANIDAE	
<i>Aelurodon saevus</i> Leidy.....	x x

* The fauna listed herein by various authors as from this formation is evidently not homogeneous. The writer has not had had time to review these references, personally, that are listed for this "horizon". Both first and second phases undoubtedly are represented.

¹⁶ Owing to the fact that bones of *Pliocene mammals*, found in the same horizon and locality as the type of *Hesperopithecus haroldcooki* Osborn, show evidences of having been cut, bored, and shaped in many ways closely comparable to well-known bone artifacts of primitive peoples; and, while a proportion of these are forms that it is possible may have been shaped by erosion; yet, after eliminating all of such examples, *there still remains a nucleus that are apparently so arbitrarily cut, drilled, or formed, that it seems inconceivable that any known "agent of erosion" could have produced them.* In other words, they appear artificially produced by design, on critical, impartial examination. Inasmuch as the evidence as to the proper family classification of *Hesperopithecus* is highly debatable, at best, the presence of probable artifacts from the same bed adds to the probability of a Primate being responsible for them; *certainly not a peccary.* Therefore, in the absence of definite evidence either way, it appears best to retain the present classification, until more complete evidence is discovered, as surely it will be, sooner or later, to determine the facts definitely.

	1	2	3	4	5		1	2	3	4	5
" <i>compressus</i> Cope.....	x										
" <i>wheelerianus</i> Cope.....		x				"					x
" <i>platyrhinus</i> Barbour and Cook.....			x			"					
" <i>taxoides</i> (? <i>wheelerianus</i>) Hatcher.....				x	x	"					x
" sp.....				x	x	"					x
<i>Osteoborus secundus</i> Matthew and Cook.....				x		"					
<i>Tomarctus marshi</i> Thorpe.....					x	"					
" <i>hippophagus</i> , Matthew and Cook ¹⁷				x	x	"					x
" cf. <i>temerarius</i> Leidy.....			x	x	?	"					x
" <i>confertus</i> Matthew.....			x	x		"					x
" <i>mortifer</i> Cook.....			x	x		"					x
" sp.....					x	"					
<i>Amphicyon americanus</i> Wortman.....						"					
" <i>ingens</i> Matthew.....				x		"					
" <i>sinapius</i> Matthew.....				x	x	"					
? <i>Cynodictis angustidens</i> Marsh.....				x	x	"					
<i>Euoplocyon praedator</i> Matthew.....				x		"					
" <i>magnus</i> Thorpe.....				x		"					x
<i>Cynodesmus cuspidatus</i> Thorpe.....				x	x	"					x
" sp. indet.....					x	"					x

¹⁷ The typical *Tomarctos brevirostris* is from the Pawnee Creek, late Miocene beds and is probably ancestral to the typical *T. hippophagus* of the Lower Snake Creek. This race persists up into the Upper Snake Creek, but little changed; though with a heavier jaw, and more crowded premolars. The evolution of that race at this time was evidently less rapid than in many contemporaries; but it seems desirable to retain both names, at least until more complete materials are known from the different horizons.

	1	2	3	4	5	1	2	3	4	5	
<i>Nothocyon latidens multicuspis</i> Thorpe.....											
<i>Leptocyon vafer</i> Leidy.....	x										x
<i>Pliocyon medius</i> Matthew.....	x										x
<i>Cynarctus crucidens</i> Barbour and Cook.....											x
<i>Ischyrocyon hyaenodus</i> Matthew.....											x
" cf. <i>hyaenoides</i> Cope.....											x
<i>Hyaenarctus</i> sp.....											x
PROCYONIDAE											
<i>Probassariscus antiquus</i> Matthew and Cook.....											x
<i>Leptarctus primus</i> Matthew.....	x										
" <i>wortmani</i> Matthew.....	x										
MUSTELIDAE											
<i>Potamotherium lacota</i> Matthew.....											x
<i>Pliomictis</i> ? <i>parviloba</i> Cope.....											x
" <i>glareae</i> Sinclair.....	x										
" sp. <i>indesc.</i>	x										
<i>Lutra pristina</i> Matthew.....											x
<i>Sthenictis dolichops</i> Matthew.....											x
" <i>robustus</i> Cope.....	x										
" ? <i>lycopotamicum</i> Cope.....	x										
<i>Mionictis elegans</i> Matthew.....	x										
" <i>incertus</i> Matthew.....	x										
<i>Pliocyon meandrinus</i> Hatcher.....											x
" sp.....											x
<i>Ischyrocyon</i> sp. <i>indesc.</i>											x
<i>Osteoborus direptor</i> Matthew ¹⁸											x
" <i>pugnator</i> Cook.....											x
" <i>cyonoides</i> Martin.....											x
PROCYONIDAE											
<i>Leptarctus</i> sp. <i>indesc.</i>											x
MUSTELIDAE											
<i>Sthenictis</i> sp.....											x
<i>Brachyopsalis pachycephalus</i> Cope.....											x
" <i>modicus</i> Matthew.....											x
<i>Plesiogulo marshalli</i> Martin ¹⁹											x

¹⁸ R. A. Stirton, auct.
¹⁹ R. A. Stirton, auct.

	1	2	3	4	5
<i>Cynomys</i> sp.....					x
CASTORIDAE					
<i>Eucastor tortus</i> Leidy.....	x	x	x		x
" <i>curtus</i> Matthew and Cook....	x	x	x		?
? <i>Hystriopsis</i> sp.....	x				
<i>Amblicastor flammivus</i> Matthew.....	x	x			x
<i>Castor californicus</i> Stirton.....					x
MYLAGAULIDAE					
<i>Mylagaulus "monodon"</i> Cope.....	x	x	x	x	?
" <i>laevis</i> Matthew.....	x				x
" <i>paniensis</i> Matthew.....	?				x
<i>Epigaulus hatcheri</i> Gidley.....	x	x			x
" sp.....	x				x
<i>Ceratogaulus rhinocerus</i> Matthew.....	x				x
" sp.....					x
<i>Epigaulus hatcheri</i> Gidley.....					x
" sp.....					x
GEOMYIDAE					
<i>Geomys bisulcatus</i> Marsh.....	?				x
? <i>Thomomys</i> sp.....	x				x
HETEROMYIDAE					
<i>Peridomys rusticus</i> Matthew.....	x				
ISCHYROMYIDAE					
<i>Poemys vivicola</i> Matthew.....	x				
LAGOMORPHA					
LEPORIDAE					
<i>Hypolagus vetus</i> Kellogg.....	x				x

		1	2	3	4	5
PROBOSCIDEA						
MASTODONTIDAE						
	<i>Trilophodon</i> sp.					
	<i>giganteum</i> Osborn		x			
	? <i>Eubelodon</i> cf. <i>phippisi</i> Cook			x		
	<i>Miomastodon matthewi</i> Osborn	x				
	<i>Platybelodon barnumbrowni</i> Barbour					
PROBOSCIDEA						
MASTODONTIDAE ²⁰						
	<i>Stegomastodon nebrascensis</i> Osborn					x
	<i>Trilophodon abeli</i> Barbour					x
	<i>barbouri</i> Osborn					x
	<i>osborni</i> Barbour					x
	<i>euhypodon</i> Cope					x
	<i>ligoniferum</i> Cope					x
	<i>campester</i> Cope					x
	sp.					x
	<i>Amebelodon fricki</i> Barbour					x
	"					?
	<i>paladentatus</i> Cook					x
	"					?
	<i>sinclairi</i> Barbour					x
	"					?
	<i>hicksi</i> Cook					x

²⁰ As the Nebraska Proboscidea listed here are from numerous stations and in some cases from horizons uncertainly determined, only approximate horizon equivalents are given on their occurrence, save where definitely known.

	1	2	3	4	5
? <i>Eubelodon</i> ²¹ <i>morrilli</i> Barbour					x
? " (<i>Megabelodon</i>) <i>bulli</i>					
Barbour.....					x
? " <i>phippesi</i> Cook.....					x
<i>Tetralophodon campester</i> Cope.....					x
" <i>precampestre</i> Osborn .. ?					
? <i>Miomastodon</i> sp. indet.					x
<i>Zygodon</i> sp.....					x

²¹ As Henry Fairfield Osborn is at this time at work on a monumental monograph, revising the Proboscidea, no attempt is made herein to straighten out many problems obviously needing attention among the *Trilophodonts*. However, certain points it may be advisable to discuss at this time. Comparing "*Megabelodon*" *bulli* Barbour, with "*Trilophodon*" *phippesi* Cook, very closely similar conditions are noted, as to size, length and angle of the symphyseal elongation as compared to the line of the alveolar border; size, position, form and relative height of condyle and coronoid process; width of jaws at condyles; and structure of the last molar. As "*T. phippesi*" is a younger individual, the presence in that form and absence in *bulli* of molar 5, may be an age character. As the tip of the lower jaws and its assigned tusks are restored in *M. bulli*, and were not found in the jaws, their actual occurrence is problematical. At best, if present, they are so light that they might be a variable character, though this seems doubtful. However, there was apparently a vast difference in the condition of the anterior part of the lower jaws in these types, "*M. bulli*", having slender, narrower jaws tapering to its tip; *T. phippesi*, a much heavier elongation, expanded toward its tip, with rugose terminations, suggesting its use in a tusk-like digging fashion, in conjunction with the short upper tusks. The position of the tip of these tusks in relation to the tip of the lower jaws make it almost inevitable that if the tusks, (which show evidence of heavy wear to almost chisel-like edges at the tips) were used in digging roots etc., from the muds, the tip of the jaw must have almost equally entered in such contacts. While they are probably distinct species they are at least near relatives. "*T. phippesi*" is surely not so closely related to *Eubelodon morrilli*, Barbour, as Frick suggests. *E. morrilli* has a nearly straight lower jaw, without marked depression of the symphysis, such as is characteristic of "*M. bulli*" and "*T. phippesi*;" and has a remarkably low coronoid process and condyle, scarcely higher than the molar grinding surface, in marked and fundamental contrast to the condition found in the two latter species; and has a much shorter, less developed symphyseal elongation. As the genotype species is based on an old individual, these cannot be age characters. The writer is inclined to the opinion, on present evidence, that these three forms may best be placed in *Eubelodon*, as distinct species. All three are from the same general region and series of beds.

	1	2	3	4	5
<i>Peraceras superciliosus</i> Cope.....					x
?" <i>ponderis</i> Cook.....					x
" <i>troxelli</i> Matthew.....					x
" sp. <i>indesc.</i>					x
<i>Paraphelops rookensis</i> Lane.....					x
" <i>yumensis</i> Cook.....					x
TAPIRIDAE					
<i>Tapiravus rarus</i> Marsh.....	1	2	3	4	5
Recorded by Marsh as "from the Lower Pliocene east of the Rocky Mountains"					
EQUIDAE					
<i>Hypohippus affinis</i> Leidy.....	x	x			x
" <i>perinae</i> Matthew.....		x	x		x
" near <i>affinis</i> Leidy.....		x	x		x
" cf. <i>osborni</i> Gidley.....		x	x		x
" sp.		x	x		x
<i>Parahippus cognatus</i> Leidy.....				x	
" near <i>cognatus</i> Leidy.....				x	
" <i>integer</i> Matthew.....				x	
" sp. <i>indet.</i>				x	
<i>Merychippus insignis</i> Leidy.....	x	x	x	x	x
" <i>severus</i> Cope.....					x
" <i>patricus obliquus</i> Matthew.....					x
" cf. <i>eoplacidus</i> Osborn.....					x
" <i>patricus</i> Osborn.....					x
" <i>paniensis</i> Cope.....					x
" cf. <i>sejunctus</i> Cope.....					x
" <i>proparrulus</i> Osborn.....					x
EQUIDAE					
<i>Hypohippus cf. affinis</i> Leidy.....					x
" <i>matthewi</i> Barbour.....					x
" sp.					x
<i>Parahippus sp. indet.</i>					x
<i>Merychippus cf. insignis</i> Leidy.....					x
" near <i>insignis</i> Leidy.....					x
" <i>republicanus</i> Osborn.....					x
" <i>patricus</i> Osborn.....					x
" cf. <i>calamarius</i> Cope.....					x
<i>Protolophippus cf. perditus</i> Leidy.....					x
" <i>perditus secundus</i> Osborn.....					x
" cf. <i>placidus</i> Leidy.....					?
" <i>propiacidus</i> Osborn.....					x
" <i>retrusus</i> Cope.....					x
" <i>profectus</i> Cope.....					?
" sp. <i>indet.</i>					x
<i>Hipparion occidentale</i> Leidy.....					x
" <i>affine</i> Leidy.....					x

	1	2	3	4	5		1	2	3	4	5
" <i>campestris</i> Gidley.....		x				"					
" cf. <i>eohipparion</i> Osborn ..		x				"			x		
" ? <i>calamarius propinquus</i> Osborn.....			x			"			x	x	x
<i>Protohippus perditus</i> Leidy.....				x	x	<i>Nanippus gratum</i> Leidy.....			x	x	
" <i>placidus</i> Leidy.....				x	x						
" <i>parvulus</i> Marsh ....Horizon uncertain											
" near <i>parvulus</i> Marsh.....					x						
" <i>niobrarensis</i> Gidley.....					x						
" <i>sinus</i> Gidley					x						
" sp. indet.....					x						
<i>Hipparion occidentale</i> Leidy				x	x	<i>Pliohippus leidyanus</i> Osborn.....				x	
" cf. <i>occidentale</i> Leidy.....					x	"					x
" <i>affine</i> Leidy				x	x	"					
" <i>gratum</i> Leidy".....				x	x	"					
" <i>dolichops</i> Gidley					x	"					
" (? <i>Neohipparion</i>) <i>whitneyi</i> Gidley.....						"					
" sp. indet.....					x	"					
<i>Hippodon</i> (? <i>Merychippus</i>) <i>speciosus</i> Leidy.....						"					
<i>Pliohippus robustus</i> Marsh				x		"					
" <i>pernix</i> Marsh.....				x	x	"					
" <i>supremus</i> Leidy.....				x	x	"					
" cf. <i>supremus</i> Leidy.....					x	"					
" <i>mirabilis</i> Leidy					x	"					
" cf. <i>interpolatus</i> Cope.....					x	"					
" <i>ballianus</i> Troxell					x	"					
" sp. indet.....					x	"					
<i>Archaeohippus</i> sp.....					x	"					

	1	2	3	4	5
ARTIODACTYLA					
TAGASSUIDAE					
" <i>Platygonus</i> " <i>striatus</i> Marsh.....	?				x
<i>Prosthenops crassigenis</i> Gidley.....		x			x
" <i>xiphodonticus</i> Barbour	x	x	x	x	x
" sp.....	x	x	x	x	x
<i>Dicotylid</i> gen. indet.....					x
MERYCOIDODONTIDAE					
? <i>Merycochoerus coenopus</i> Scott and Osborn.....	?				x
<i>Merychynus elegans</i> Leidy.....	x				x
? " <i>medius</i> Leidy.....	x				x
" " sp.....	x	x	x		x
<i>Metoreodon relictus</i> Matthew and Cook.....				x	x
" <i>profectus</i> Matthew and Cook.....				x	
" <i>major</i> Leidy	x				
? " sp.....					x
<i>Promotherium siouense</i> Sinclair.....	x	x			
<i>Ticholeptus hypsodus</i> Loomis					?
CAMELIDAE					
<i>Procamelus occidentalis</i> Leidy	x	?	x	x	x
" <i>robustus</i> Leidy.....	x	x	x	x	
" <i>gracilis</i> Leidy	x	x			
" sp.....	x	x	x	x	x
<i>Alticamelus procerus</i> Matthew and Cook.....					x
" sp.....	x	x			x
" <i>Pliauchenia vera</i> Matthew					x
ARTIODACTYLA					
TAGASSUIDAE					
<i>Prosthenops serus</i> Cope					x
" ? <i>serus</i> Cope.....					x
" cf. <i>crassigenis</i> Gidley.....					x
" sp.....					x
<i>Dicotylid</i> gen. indet.....					x
MERYCOIDODONTIDAE					
? <i>Merycochoerus</i> sp.....					x
? <i>Merychynus</i> sp.....					x
<i>Metoreodon profectus</i> Matthew and Cook.....					x
" cf. <i>major</i> Leidy.....					x
CAMELIDAE					
<i>Procamelus</i> cf. <i>gracilis</i> Leidy.....					x
" ? <i>prehensilis</i> Cope.....					x
" ? <i>inaequidens</i> Matthew.....					x
" sp.....					x
<i>Alticamelus</i> sp.....					x
? " sp.....					x
" <i>Pliauchenia vera</i> Matthew					x

	1	2	3	4	5		1	2	3	4	5
BOVIDAE						BOVIDAE					
" <i>Cranioceras unicornis</i> " Matthew ²²	x					<i>Neotragocerus improvisus</i> Matthew					x
<i>Drepanomeryx falciformis</i> Sinclair	x					and Cook.....					
AMPHIBIA						AMPHIBIA					
CRYPTOBRANCHIDAE						AMBYSTOMIDAE					
<i>Picagnathus matthewi</i> Cook.....	x					<i>Plicambystoma kansensis</i> Adams					x
						" " sp. indesc.....					x
						<i>Amphibian</i> gen. et sp. indesc.					x
						SALIENTIA					
						<i>Anurid</i> gen. et sp. indet.					x
						TESTUDINATA					
TESTUDINATA						TESTUDINATA					
TRIONYCHIDAE						TRIONYCHIDAE					
<i>Platypeltis mioaena</i> Matthew.....	x					CHELYDRIDAE					
CHELYDRIDAE						<i>Chelonid</i> gen. et sp. indet.....					x
<i>Chelydrops stricta</i> Matthew.....	x					EMYDIDAE					
						<i>Trachemys hilli</i> Cope					x
						<i>Terrapene longinsulae</i> Hay					x
TESTUDINIDAE						TESTUDINIDAE					
<i>Testudo orthopygia</i> Cope.....	x					<i>Testudo orthopygia</i> Cope					x
						" " cf. <i>orthopygia</i> Cope					x
						" " <i>gilbertii</i> Hay					x
						" " sp.....					x

²² Relationships uncertain. This supposed "horn-core" type is based on what is probably part of an ulna, possibly from a rhinoceros.

	1	2	3	4	5
CROCOTOMORPHI					
CROCODYLIDAE					
<i>Alligator thomsoni</i> Mook	x				
? <i>Crocodylus</i> sp. indesc.	x				
AVES					
ANATIDAE					
<i>Branta</i> sp. indet.					
PHASIANIDAE					
<i>Phasianus miocaenus</i> Shufeldt.					
Location and horizon uncertain					
CRACIDAE					
? <i>Ortalis</i> sp.					
BUTEONIDAE					
<i>Geranoaetus contortus</i> Wetmore.					
<i>Urubitinga enecta</i> Wetmore.					
<i>Aquila</i> sp. indet.					
<i>Buteo typhobius</i> Wetmore					
PISCES					
<i>Silurid</i>					
<i>Centrarchid</i> cf. <i>micropterus</i>					
<i>Ameiurus</i> sp.					
? " sp. indet.					
? <i>Micropterus</i> sp. indet.					
CATOSTOMIDAE					
Gen. et sp. indet.					
Pisces, several indet.					
CROCOTOMORPHI					
CROCODYLIDAE					
<i>Alligator thomsoni</i> Mook					
<i>Reptilia</i> gen. et sp. indet.					
AVES					
FRINGILIDAE					
<i>Paleostruthus hatcheri</i> Gilmore.					
PALUDICOLAE					
<i>Grus mexicana</i> Muller.					
" <i>nannodes</i> Wetmore and Martin.					
CRACIDAE					
<i>Ortalis phengites</i> Wetmore					
BUTEONIDAE					
<i>Geranoaetus conterrimus</i> Wetmore					
" <i>davanus</i> Marsh.					
<i>Proictinia gilmorei</i> Shufeldt					
<i>Aves</i> gen. et sp. indet.					
PISCES					
Pisces, several indet.					