

Article VIII.—PLEISTOCENE MAMMALIAN FAUNA OF THE SEMINOLE FIELD, PINELLAS COUNTY, FLORIDA

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22 TEXT FIGURES

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INTRODUCTION

Early in 1924, Mr. Walter W. Holmes discovered a scute of *Chlamytherium septentrionale* in Pinellas County, Florida, not far from St. Petersburg. After this specimen had been identified by Dr. W. D. Matthew, Mr. Holmes became so interested that from 1924 through 1927 he carried on intensive search for fossil vertebrates in this region. The resulting unusually large and important collection has been presented to the American Museum of Natural History and includes the mammalian specimens described in this paper. The collection also includes numerous edentate dermal bones, being described elsewhere by Holmes and Simpson, bird bones, being studied by Dr. A. Wetmore, and remains of lower vertebrates, not yet thoroughly studied.

The results obtained in the first year of work were summarized by W. D. Matthew, Walter W. Holmes, and G. R. Megathlin in a paper read before the Paleontological Society of America, Dec. 30, 1925, but published by title only.¹ The locality has been examined by W. D. Matthew, Walter Granger, J. W. Gidley, and C. Wythe Cooke, the latter of whom has published a brief résumé of the geology.² I have had the advantage of suggestions and information from all of these authorities. From January to May, 1925, the work was in charge of G. R. Megathlin. Preliminary identifications of many of the specimens were made by W. D. Matthew and G. R. Megathlin. Although solely responsible for the results in the present paper, I have made full use of their notes and am

¹Bull. Geol. Soc. Am., XXXVII, 244; 1926.

²Amer. Jour. Sci., (5) XII, 441-452; 1926.

much indebted to them. Dr. Gidley kindly permitted comparison with the fauna of similar age from Melbourne, collected by Loomis and Gidley.

Not only is the Seminole Field collection itself due to Mr. Holmes, but also the possibility of publishing and illustrating it at this time. He has constantly assisted and encouraged the extension of our knowledge of the Pleistocene life of Florida.

The figures in the present paper were drawn by Mrs. Louise Nash, with the exception of figure 11, drawn by Miss H. DeBerard for Mr. Childs Frick and used with his permission.

OCCURRENCE

The history of the field is being given elsewhere in more detail, and Dr. Cooke's paper, already cited, sums up the geology and geography. The name Seminole Field has been applied by Mr. Holmes to the region about the unincorporated settlement of Seminole. No fossils were derived from the higher ground on which the settlement itself is situated, but it is the approximate center of five fossil localities. All of the remains identified and described below were derived from a single bone bed, generally one to two feet thick. Many specimens were found in place in this bed; others had been redeposited in the bed of a recent stream (Joes Creek) which cuts through the original deposit; and still others came from the dump along a drainage canal.

The lowest bed exposed is of white sand, with numerous marine shells, correlated by Cooke with the Anastasia formation of the east coast, and hence the equivalent of Stratum No. 1 at Vero and Melbourne. Above this, sometimes with a barren sand layer intervening, is the bone bed, equivalent in age and character with Stratum No. 2. This is generally overlain by a sandy soil derived from it by weathering, but in some places, according to Gidley (oral communication), there are thin superficial lenses of sand and muck strictly equivalent to Stratum No. 3 of the east coast.¹ All of these beds are cut by the valley of Joes Creek, the deposits of which are the youngest natural beds in the area, recent in age but containing derived Pleistocene fossils.

MAMMALIAN FAUNAL LIST

MARSUPIALIA

Didelphis virginiana. Jaws, skeletal parts.

INSECTIVORA

Scalopus sp. Humeri.

¹In contrast with most previous workers, Dr. Gidley thus distinguishes between the largely paludine and eolian Stratum No. 3 and the more recent stream deposit which may cut through it.

RODENTIA

- Sylvilagus floridanus*. Jaws, limb bones.
Sylvilagus palustris. Jaws, limb bones.
Geomys floridanus. Jaws.
Sigmodon hispidus. Jaws.
Oryzomys palustris. Jaws.
Neofiber alleni. Jaws.
†*Synaptomys australis*. Jaws.
Sciurus cf. *carolinensis*. Incisor.
Erethizon cf. *dorsatus*. Incisors.
†*Hydrochaerus* (?*Neochaerus*) cf. *pinckneyi*. Part of molar.

CARNIVORA

- †*Canis* (*Enocyon*) *ayersi*. Isolated teeth, foot bones.
†*Canis* (*Thos*) cf. *riviveronis*. Teeth.
†*Urocyon seminolensis*, new species. Lower jaws, bones.
Mephitis elongata. Skull, jaw.
Spilogale ambarvalis. Jaw.
Mustela peninsulæ. Jaw.
Procyon lotor. Numerous jaws, bones.
†*Procyon nanus*, new species. Upper jaw.
Lutra canadensis. Jaws, limb bones.
†*Arctodus floridanus*. Jaws, teeth, bones.
Lynx rufus. Jaws, teeth, limb bones.
?†*Lynx* sp. Lower jaw.
†*Felis* cf. *veronis*. Isolated teeth, foot bones.
?†*Felis* cf. *inexpectata*. Tooth.
†*Smilodon* cf. *floridanus*. Broken carnassial, bones.

XENARTHRA

- †*Mylodon ?harlani*. Isolated teeth, dermal ossicles, foot bones.
†*Megalonyx* cf. *wheatleyi*. Isolated teeth.
†*Tatu bellus*, new species. Teeth, scutes, foot bones.
†*Chlamytherium septentrionale*. Teeth, scutes, foot bones.
†*Boreostracon floridanus*, new genus and species. Teeth, scutes.

PERISSODACTYLA

- †*Equus* cf. *complicatus*. Teeth, bones.
†*Equus* cf. *leidyi*. Teeth, bones.
†*Tapirus veroensis sellardsi*, new subspecies. Palate, jaw, teeth, bones.
†*Tapirus* sp. Teeth, bones.

ARTIODACTYLA

- †*Platygonus* sp. Isolated teeth.
†*Mylohyus gidleyi*, new species. Jaws, teeth.
†*Mylohyus* cf. *pennsylvanicus*. Teeth.
†*Mylohyus* cf. *lenis*. Teeth.
?†*Tagassu* cf. *tetragonus*. Teeth.
†*Tanupolama mirifica*, new species. Teeth, bones.
†*Tanupolama* cf. *americana*. Teeth.

†Extinct.

††Probably extinct.

- †*Cf. Camelops* sp. Teeth, limb bones.
 †*Bison cf. latifrons*. Jaws, teeth, bones.
Odocoileus osceola. Jaws, teeth, antlers, bones.

PROBOSCIDEA

- †*Mastodon americanus*. Teeth, bones.
 †*Archidiskodon columbi*. Teeth.

SIRENIA

- Trichechus* sp. Tooth, rib fragments.

Forty-nine species are indicated by the material now in hand. Of these it is reasonably certain that fourteen are still living and that twenty-eight are extinct, the others being doubtful. Thus about 66% of the species (and about 27% of the genera) are extinct. For the most part, however, these extinct species and genera have no close relatives in the recent fauna.

RELATIONSHIPS BETWEEN PLEISTOCENE AND RECENT FAUNAS

East coast Stratum No. 2 as a unit, its equivalent in the Seminole Field, and the Saber-tooth Cave of Citrus County contain faunas approximately contemporaneous and sufficiently well-known to give an unusually complete conception of the terrestrial mammalian fauna of a limited part of Pleistocene time in middle and northern peninsular Florida. No genera except *Megatherium* and *Castoroides* have yet been positively identified anywhere in the Florida Pleistocene which do not occur in at least one of these better-known faunas. These genera, omitting a few of the most doubtful identifications, are as follows:

<i>Didelphis</i>	† <i>Arctodus</i>
<i>Scalopus</i>	<i>Euarctos</i> (Vero and Melbourne)
<i>Sylvilagus</i>	<i>Lynx</i>
<i>Geomys</i>	<i>Felis</i>
* <i>Thomomys</i> (Saber-tooth Cave)	† <i>Smilodon</i>
<i>Sigmodon</i>	† <i>Mylodon</i>
<i>Oryzomys</i>	† <i>Megalonyx</i>
<i>Neotoma</i> (Vero and Melbourne)	†(<i>Megatherium</i> —Zolfo and Archer)
<i>Neofiber</i>	* <i>Tatu</i>
* <i>Synaptomys</i>	† <i>Chlamytherium</i>
<i>Sciurus</i>	† <i>Boreostracon</i>
†(<i>Castoroides</i> —Sarasota)	* <i>Equus</i>
* <i>Erethizon</i>	* <i>Tapirus</i>
* <i>Hydrochaerus</i>	† <i>Platygonus</i>
† <i>Canis</i> (<i>Enocyon</i>)	† <i>Mylohyus</i>
* <i>Canis</i> (<i>Thos</i>)	*? <i>Tagassu</i>
* <i>Vulpes</i> (Vero)	*? <i>Pecari</i> (Melbourne)

†Extinct.

*Living, but not in peninsular Florida.

<i>Urocyon</i>	† <i>Tanupolama</i>
<i>Procyon</i>	* <i>Bison</i>
<i>Lutra</i>	<i>Odocoileus</i>
<i>Spilogale</i>	*? <i>Blastocerus</i> (Saber-tooth Cave)
<i>Mephitis</i>	† <i>Mastodon</i>
<i>Mustela</i>	† <i>Archidiskodon</i>

Genera not identified in the Seminole field are followed by another locality in parentheses.

Omitting the marine mammals, insectivores, and bats, which are little known or quite unknown in these deposits, the following are the only recent mammalian genera of peninsular Florida which have not yet been identified in the Pleistocene:

<i>Reithrodontomys</i>	<i>Pitymys</i>
<i>Peromyscus</i>	<i>Glaucomys</i>

The apparent absence of these genera can be imputed to their size and habits, which would make their fossilization under the conditions of the known Florida deposits very rare and their recovery more or less accidental, or possibly also in part to a difference in environment at that time. The same explanations may be given for the fact that *Sciurus* is, so far as I am aware, represented only by a single incisor.

Of those recent genera which occur in the Pleistocene and are represented by any approach to adequate material, the recent species occur in the older fauna, with the following as the only noteworthy exceptions:

<i>Mustela vison</i>	* <i>Canis floridanus</i>
<i>Urocyon cinereoargenteus</i>	<i>Felis coryi</i>

These groups, however, are also rather poorly represented in the known material, and one or all of these species may appear at any time in the constantly growing collections. Some of the *Urocyon* fragments already known probably do belong to the recent species. The common Pleistocene wolf was obviously *Canis* (*Ænocyon*) *ayersi*, and *Canis* (*Canis*) has not yet been identified, but was probably present, as it was elsewhere in the North American Pleistocene. A few fragments indicate that there was a cougar of about the size of *Felis coryi*, and it may prove to be this species.

It appears that, with only a few possible but improbable exceptions, the ancestors of all the terrestrial mammals of peninsular Florida were already living in the same region at the time of Stratum No. 2. The distinctions between this Pleistocene fauna, or assemblage of approxi-

†Extinct.

*Living, but not in peninsular Florida.

mately contemporaneous faunas, and the recent one are (1) that about two thirds of the Pleistocene species and between a fourth and a third of the genera are now extinct, and (2) that the ranges of certain groups which once included Florida have been restricted, in part by extinction of marginal species, so as to exclude that state. There is no good evidence of any marked evolutionary advance or of the introduction of any new species, save through the activity of man. The differences are due to a very radical faunal impoverishment.

Among the living groups which no longer inhabit this region are:

A. Now farther north:

Synaptomys

Erethizon

Vulpes

B. Now farther west or south:

Thomomys

Hydrochaerus

Tatu

Canis (*Thos*)

*Bison*¹

Tapirus

*Tagassuidæ*²

?*Blastocerus*³

C. Not now native in the Western Hemisphere:

Equus

The range of most superspecific taxonomic units was less restricted in the Pleistocene than at the present time, as the above list, and others that might be compiled for almost any part of the continent, clearly show. For the species, and, still more, subspecies, the data are now entirely inadequate, but what is known suggests that the ranges of these smaller units were more comparable in extent with those of the analogous recent groups, although of course not necessarily coinciding with the latter.

Latitudinal or zonal distribution must have fluctuated with the climate as it is known to have done in Europe, although the sequence on this continent is still far from clear. As a "dead end" far from the actual ice sheets, Florida would be less directly affected by these fluctuations than almost any other part of the country. The slow southern surge of mammalian life in the glacial stages would to some extent impound tropical and austral animals in that region, possibly increasing the local competition perceptibly, but Florida was not a corridor—the animal

¹Also in the East, immediately north and northwest of Florida, at the beginning of historic times, but not in that state so far as known.

²It is probable that one or both of the recent genera inhabited Florida in the Pleistocene, but this has not been rigidly proven.

³Affinity with the South American deer probable, but not proven.

population could not escape to the south, and its very presence would to a large degree hamper the entrance of more northern animals. The peninsula was, indeed, so far from the ice-front and so favorably tempered by winds and currents that it is doubtful whether in even the coldest stages of the Pleistocene it was climatically well adapted for the animals of our present transitional and boreal zones. No recent genus or species has yet been identified in any part of the Florida Pleistocene which does not range at least into the upper austral zone at present. The same is true of the extinct forms—all so far known occur in the southern and warm phases. In another area this might mean only that the known faunas are of interglacial stages, but it seems probable that the general composition of the Florida fauna did not change greatly during the glacial stages and that correlation on this basis is not here possible. As a final climatic observation, all of the known Florida Pleistocene mammals could apparently survive or thrive in a still more tropical climate than the present one, but none offers any positive evidence that the climate was, in fact, warmer.

ORIGIN OF THE MAMMALIAN FAUNA

Those mammals may be considered as autochthonous which belong to groups present in North America since the first half of the Tertiary and which are more nearly related to North American later Tertiary mammals than to those of any other landmass. As would be expected, this includes the majority of the Pleistocene and practically all the recent mammals of Florida. Others, however, whatever the ultimate geographic origin of their remote ancestry, are clearly immigrants in the American late Tertiary and Pleistocene, some coming from South America, others from Eurasia. So far as now possible, the grouping of the members of this Pleistocene fauna on this basis is as follows:

A. Autochthonous in North America:

- Didelphids
- Leporids
- Geomyids
- Hesperomyids
- Carnivores
- Equids
- Tapirids
- Tagassuids
- Camelids
- Cervids

B. Immigrants from the neotropical region:

- Xenarthrans

Hydrochærids

Erethizontids

C. Immigrants from the palæarctic region:

Probably the microtines

Bovids

Proboscideans

The resemblance to the South American fauna, often stressed, is due in large part to the xenarthrans, which were of ultimately northern origin but whose immediate ancestors came from South America. This resemblance is in part deceptive and due to the fact that certain northern groups are extinct in most or all of North America, but survive in South America, where they are not autochthonous. This is true of the arctotheres, a branch of which is seen in *Tremarctos*, and of the tapirids, tagasuids, and camelids.

CORRELATION¹

The exact age determination of the Pleistocene deposits of Florida is an exceptionally difficult problem. The most definite opinions as regards the mammalian faunas, notably that of Hay, seem largely to depend on the following assumptions:

1. That each local fauna studied is actually an assemblage of contemporaneous mammals.
2. That the Pleistocene mammalian sequence is certainly known, if only in part, for other regions in North America (especially along the margins of the drift).
3. That the sequence in Florida was essentially the same as in these regions.

If each of these three assumptions were true beyond much doubt, unanimity of opinion as to age would soon be achieved more or less

¹On the correlation of the mammal-bearing Pleistocene of Florida, see especially the following: Sellards, E. H. 1916. Fossil vertebrates from Florida, etc., Fla. State Geol. Surv., 8th Ann. Rept., pp. 79-119. (Bibliography).

Sellards, E. H. 1916. Human remains and associated fossils from the Pleistocene of Florida. Fla. State Geol. Surv., 8th Ann. Rept., pp. 122-160.

Berry, E. W., R. W. Shufeldt, O. P. Hay, and E. H. Sellards. 1917. Additional studies in the Pleistocene at Vero, Florida. Fla. State Geol. Surv., 9th Ann. Rept., pp. 17-82. (Vero bibliography).

Sellards, E. H. 1917. Supplement to studies in the Pleistocene at Vero, Florida. Fla. State Geol. Surv., 9th Ann. Rept., pp. 141-143. (Additions to Vero bibliography).

Hay, O. P. 1923. The Pleistocene of North America . . . from the states east of the Mississippi River, etc. Carnegie Instn., Washington, Pub. No. 322. (Florida, esp. pp. 372-384).

Gidley, J. W., and F. B. Loomis. 1926. Fossil man in Florida. Amer. Journ. Sci., (5) XII, pp. 254-264.

Cooke, C. W. 1926. Fossil man and Pleistocene vertebrates in Florida. Amer. Jour. Sci., (5) XII, pp. 441-452. (Cites other papers on Melbourne deposit).

Hay, O. P. 1927. A review of recent reports on investigations made in Florida on Pleistocene geology and paleontology. Jour. Wash. Acad. Sci., XVII, pp. 277-283.

Hay, O. P. 1927. The Pleistocene of the western region of the United States, etc. Carnegie Instn. Wash. Pub. No. 322B. (Florida, pp. 273-275).

Simpson, G. G. 1928. Pleistocene mammals from a cave in Citrus County, Florida. Amer. Mus. Novitates No. 328.

Cooke, C. W. 1928. The stratigraphy and age of the Pleistocene deposits in Florida from which human bones have been reported. Jour. Wash. Acad. Sci., XVIII, pp. 414-421.

along the lines laid down by Hay. The present wide diversity of views is due to the fact that each of these assumptions is questionable.

The danger of accepting the first without a separate and critical study of each occurrence is at once seen when supposed faunal lists from Florida are examined. Hardly one of the faunas recognized previous to 1915 can be taken at its face value. In some cases a single list has been made to include remains actually derived from several isolated occurrences over a large area without any guarantee of contemporaneity. In other cases the fossils actually were found together or in the same deposit but were derived from beds of different ages. This is strikingly true of the so-called Peace Creek fauna, the elements of which were in large part found in beds of recent age but were derived from both Pleistocene and older deposits. Similar confusion is seen in the Alachua Clays "fauna" which, as usually listed, includes mammals certainly not younger than Middle Pliocene along with others certainly not older than Pleistocene. The majority of occurrences of Pleistocene mammals in Florida are so equivocal that they can be interpreted only in the light of the few less doubtful occurrences. The need is for faunas of considerable size, from a limited area, found under such conditions and collected in such a way as to give reasonable assurance of contemporaneity. Only four such occurrences have yet been made known: (1) the fauna of Stratum No. 2 at Vero, (2) the same at Melbourne, (3) the fauna of Saber-tooth Cave near Lecanto, and (4) the fauna of the Seminole field. Present activity promises early important additions to the list.

The second assumption, that of definite knowledge of the salient features of Pleistocene mammalian history farther north, is partially justified. The work of Cope, Osborn, Hay and many others has resulted in the recognition of a sequence of three general faunal types which seems to hold good over a large area and not to be due in any marked degree to non-temporal differences. In the earlier phases of the Pleistocene, as now generally understood, *Neohipparion* was absent, *Equus* occurred, tapirs and camels were present, and most of the smaller animals and all of the larger ones were of extinct species.¹ The second phase, in evidence before the close of the Pleistocene and possibly in the earliest post-glacial or recent, was apparently marked in the north by the disappearance of horses, tapirs, camels, and some other groups, but with the continued existence of some of the ground sloths, proboscideans, peccaries, etc.

¹It does not follow that extinct species of modern genera occur only in the older Pleistocene. It should further be noted that some statements, as for instance that the presence of extinct species of *Bison* or of *Chlamytherium* indicates early Pleistocene age, are based on no decisive evidence despite the positive way in which they are sometimes made.

The last phase was post-glacial and continued to historic times, and was marked by the absence of the groups just mentioned, among others. Further subdivisions applicable more than locally are surely obtainable, but at present they seem so largely based on negative, inconclusive, or erroneous evidence that they carry no strong conviction.

The correlation of the better-known Florida mammalian Pleistocene faunas thus hinges largely on the third assumption, that the sequence in Florida was much as in the more northern and western areas. If this were granted, then almost the whole of the known Florida Pleistocene (with the possible exception of Stratum No. 3 and its equivalents) would be referred to the earlier phases of that epoch, for it is clear that any Pleistocene locality so far discovered may yield horses, tapirs, camels, or other mammals supposedly characteristic of the earlier Pleistocene. Since the Florida mammals when well-known generally prove to be of different species from those of the north and west, this would be correlation on the basis of essentially simultaneous extinction of related but distinct species rather widely separated geographically. Hay accepts this basis and, indeed, insists upon it. As a logical consequence he considers Stratum No. 3 at Vero as of mid-Pleistocene, possibly Sangamon (3rd interglacial) age, and all the other Florida Pleistocene mammal-bearing deposits, apparently without exception, as either Aftonian or Nebraskan, that is, as belonging to the earliest Pleistocene.

Setting aside for the moment the east coast Stratum No. 3 and those Alachua Clays mammals which all authorities but Dr. Hay consider as pre-Pleistocene, it is noteworthy that the known faunas do not reveal internal evidence of any marked age differences. The percentage of extinct forms varies somewhat, being so dependent on accidents of discovery and on the personal factor in identification, but in the better-known faunas it is about 60–70% for the mammalian species. The species which occur are also much the same at all localities, aside from differences which could well be due to slightly different facies or to chance. Refinements of method and enlarged collections may make possible some distinction, but it seems highly probable that the faunas of Stratum No. 2, of the Seminole Field, of Saber-tooth Cave, and most of the doubtful faunas (in so far as they are true Pleistocene) represent a single phase of geologic time. In spite of a distinct difference in facies and in mode of occurrence, about 85% of the Saber-tooth Cave species also occur in the Seminole Field. Stratum No. 2 of the east coast and the bone bed of the Seminole Field are closely similar in geologic relationships and show a very marked faunal resemblance.

Above Stratum No. 2, especially at Vero and Melbourne, there does occur a more recent fauna. Its exact composition is now doubtful and is not accurately represented by the published lists¹ but its general nature is known. Although still containing some extinct species, and apparently no species that were not already present when Stratum No. 2 was laid down, it is impoverished relative to the latter. When better known, this level may prove to be intermediate in the variety of its fauna between the older level and recent times.

The Seminole fauna furnishes welcome new data for the eventual solution of this involved problem, although it obviously cannot yield an immediate conclusion. Most important is the fact that it, in common with the other faunas of similar age in Florida, contains numerous species quite indistinguishable from those still inhabiting the same region. There is no evidence, in any group, of more than subspecific advance from that time to this, and even the subspecies have not been shown to be different. Reference of these recent forms to the earliest Pleistocene because of their faunal associations would seem to involve exaggerated respect for the hypothesis of simultaneous extinction of genera. It is true that mammalian genera and species are relatively short-lived, and Hay cites this to emphasize his belief that early Pleistocene forms did not survive into the later Pleistocene in Florida.² But for the most part it is clearly genera and not species which were involved in this survival, if it occurred, and since all living genera did actually survive through nearly or quite the entire Pleistocene, why is it not probable that extinct genera also survived from early to late Pleistocene times? And granting that species are much more mutable, how, then, does it occur that these supposedly earliest Pleistocene faunas contain the living species of the same region?

If one is to follow the evidence of this modernized part of the fauna and the (not thoroughly conclusive) geologic facts which also point to a relatively recent age for the deposit, it is necessary to suppose that Florida formed part of an asylum where obsolescent groups survived for some time after they had become extinct over much of North America. There is nothing improbable in this view. Essentially simultaneous extinction of all species of a genus over an area as large as North America, or even the United States, far from being the rule and hence tentatively acceptable until disproven, would be very exceptional. The climate of Florida may not have been quite ideal throughout the Pleistocene, but it

¹Recent and as yet unpublished work by Dr. Gidley and others will probably considerably alter our conception of Stratum No. 3. It may prove that the supposed fauna of this horizon is composite and includes some recent animals, others derived from Stratum No. 2, and finally a distinctive fauna characterizing a transition zone above a post-Stratum 2 erosion plane.

²Jour. Wash. Acad. Sci., XVII, 282; 1927.

must at all times have had the most congenial climate available in this country for just those animals supposed to have survived longest here.

Nor is there good reason to believe that extinction whenever it occurred was more sudden and mysterious here than elsewhere. The difference between the fauna of Stratum No. 2 and the transitional fauna which followed shows that extinction was here progressive, as always. It is no solution of the problem to say that this extinction took place between the early and middle Pleistocene rather than between the late Pleistocene and recent. As to why these animals should eventually have become extinct in this relatively favorable climate, there is no immediate answer, although the case is no more difficult than hundreds of other examples of extinction. It would be possible to advance many hypotheses, the most interesting of which, although the facts are still *sub judice*, might be based on the constantly increasing evidence that the most destructive of all animals, man, entered Florida at about the time of the greatest decimation of its fauna.

To sum up, there are two chief possibilities regarding the age of the widespread Stratum No. 2 fauna and its equivalents: (1) that it is early Pleistocene like those northern faunas most similar to it in general make-up, and (2) that it is of late Pleistocene age and that a number of genera survived longer here than they did near the glaciated areas. Neither view is yet supported by conclusive evidence, but in my personal opinion the latter is more in accordance with what is now known. To assign the fauna to a definite stage of the Pleistocene, even tentatively, would involve an unwarranted assumption of knowledge which no one now possesses. The need for further careful work and correlation of the physiographic and palæontologic evidence is pressing.

DESCRIPTIONS

Canis (*Ænocyon*) *ayersi* Sellards

Both in the Saber-tooth Cave and the Seminole Field there appear to be two forms of large canids, a larger and a smaller, as shown by the following measurements:

Characteristic <i>C. ayersi</i>		Smaller Form	
Amer. Mus. No. 23401, from Cave.		P ⁴ , A. M. No. 23402, from Cave.	
		M ¹ , A. M. No. 23582, Seminole.	
P ⁴	{ Length 29		26.5
	{ Width 15		13
M ¹	{ Length 18.5		17
	{ Width 22.5		21

There are various minor differences in morphology, but the smaller form also appears to be more like *Enocyon* than like typical *Canis*, although not larger than the largest recent wolves. The difference may be sexual or individual, and the smaller animal may be considered a variant of *C. ayersi*, at least until better material is found.

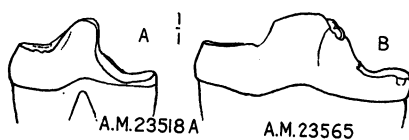


Fig. 1

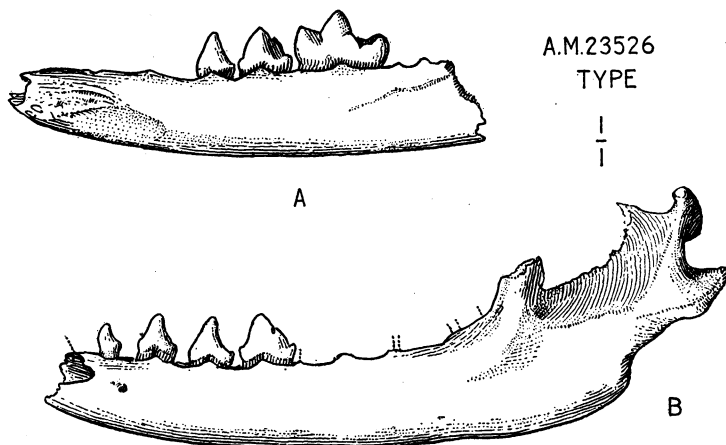


Fig. 2

Fig. 1. Internal views of right lower carnassials of canids. A, *Canis* cf. *riviveronis* Hay. B, *Canis ayersi* Sellards. Both natural size.

Fig. 2. *Urocyon seminolensis*, new species. Type. A, Right lower jaw, internal view. B, Left lower jaw, external view. Natural size.

***Canis* (Thos) cf. *riviveronis* Hay**

A canid apparently of the subgenus *Thos* is represented by a much-worn right lower carnassial and by a fragment of a lower jaw with alveoli for C-P₃, and the crown of P₂. M₁ (Amer. Mus. No. 23581A) is 21.5 mm. long, P₂ (Amer. Mus. No. 23581B) 9.0. *C. riviveronis* Hay was based on an upper sectorial with adjacent alveoli and is not directly comparable, but it was of about the same size as the present animal and apparently belonged to the same group.

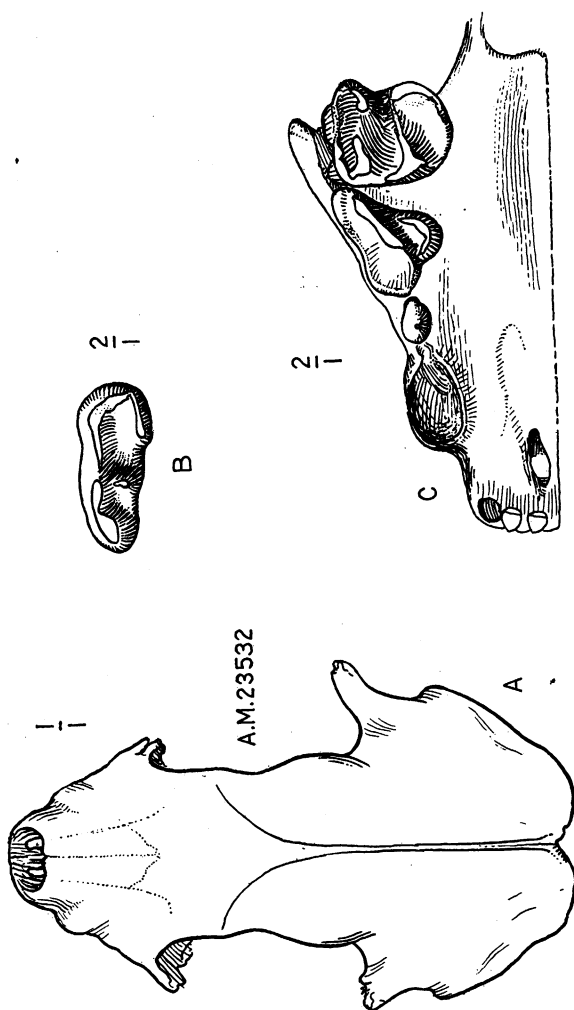


Fig. 3. *Mephitis elongata* (Bangs). A, Skull, dorsal view, natural size. B, Right lower carnassial, crown view, twice natural size. C, Left half of palate, twice natural size. Referred Pleistocene specimen.

***Urocyon seminolensis*, new species**

TYPE.—Amer. Mus. No. 23526. Associated rami of lower jaw, with right P_3 - M_1 and left P_1 -4.

PARATYPE.—Amer. Mus. No. 23527. Fragment of right lower jaw with M_2 .

HORIZON AND LOCALITY.—Pleistocene, Seminole Field, Florida.

DIAGNOSIS.—Jaw elongate, about 54 mm. from posterior end of canine alveolus to posterior end of alveolus for M_3 . M_1 , of same size as in *U. cinereoargenteus* and similar in structure, but metaconid slightly reduced. M_2 relatively larger, with small distinct entoconid, small cusp between this and base of metaconid, ridge running from apex of hypoconid to base of protoconid, and a minute posteromedian cusp. M_3 (alveolus) also relatively large, elongate anteroposteriorly, with two incompletely severed roots.

MEASUREMENTS

Lengths: P_1 —3 mm.

P_1 —5

P_3 —6

P_4 —7.5

M_1 —13

Widths: M_1 —5.5

M_2 —8

M_2 —5.5

Posterior end of C alveolus to post. end M_3 alv. 54

Post. end M_3 alv. to tip of angle. 31

***Mephitis elongata* (Bangs)**

The most complete single specimen in the collection is a nearly perfect skull of a large skunk, Amer. Mus. No. 23532. There is no morphological character of the skull or teeth which does not appear to be within the range of variation of *Mephitis elongata* and the measurements all check very closely with those of adults of this recent species.

Typical Recent Skull

Pleistocene, Amer. Mus. No. 23532

Basilar length. 66.4

66.8

Occipitonasal length. 71

70.0

Mastoid breadth. 40

39.1.

***Procyon nanus*, new species**

TYPE.—Amer. Mus. No. 23529. Left upper jaw with P^4 - M^2 .

HORIZON AND LOCALITY.—Pleistocene, Seminole Field, Florida.

DIAGNOSIS.—Cheek teeth smaller than in *P. lotor*. Postero-external cusp of P^4 vestigial. M^1 longer than broad. M^2 relatively small and narrow.

True *P. lotor* is very abundant in the collection and is highly variable, as is the recent animal, but no other specimen closely approaches this distinctive form.

MEASUREMENTS

P^4 { Length 7 mm.

Width 7

M^1 { Length 8

Width 7.5

M^2 { Length 5

Width 6.5

Length P^4 - M^2 —19

Arctodus floridanus Gidley

A number of ursid teeth and a few bones were found in the Seminole Field, but they all seem to belong to a single species which Dr. Gidley is describing elsewhere (on the basis of specimens from Melbourne) as *Arctodus floridanus*. No remains certainly belonging to *Euarctos americanus* were found. Figures of the more important of the Seminole specimens are here given, but discussion is deferred until the completion of Dr. Gidley's studies.

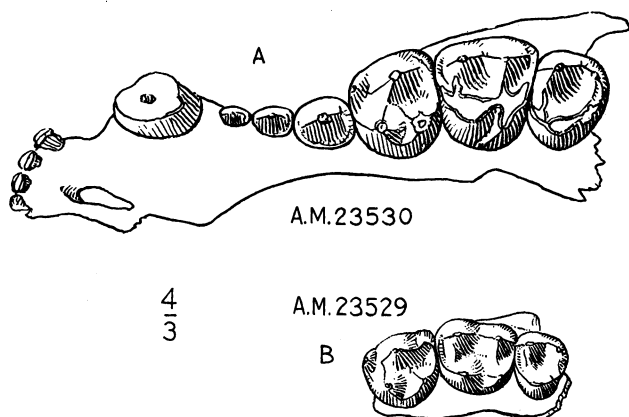


Fig. 4. A, *Procyon lotor*, left upper cheek teeth, referred Pleistocene specimen. B, *Procyon nanus*, new species, left upper cheek teeth, type. Both $\frac{4}{3}$ natural size.

Lynx sp.

Amer. Mus. No. 23533, a right lower jaw with P_4 and M_1 , indicates an unusually small felid probably distinct from *L. rufus*. The lengths of P_4 and M_1 are 7.5 and 9 mm. There are no definite morphological distinctions from *L. rufus* and the preservation is poor. Several specimens may be definitely referred to the recent species, although in the best of them (A. M. No. 23534) the lower carnassial is smaller than is usual in *L. r. floridanus*, measuring 10.2 mm. in length.

Felis cf. **veronis** Hay

The largest true feline in the collection is represented chiefly among dental material by a broken lower carnassial, complete upper and lower milk carnassials, and fragmentary premolars. Ratios between the available dimensions of these specimens show some slight discrepancies, but allowing for variation they may all be referred provisionally to *F. veronis*. The type of this species is an upper carnassial from Vero 33 mm. in length.

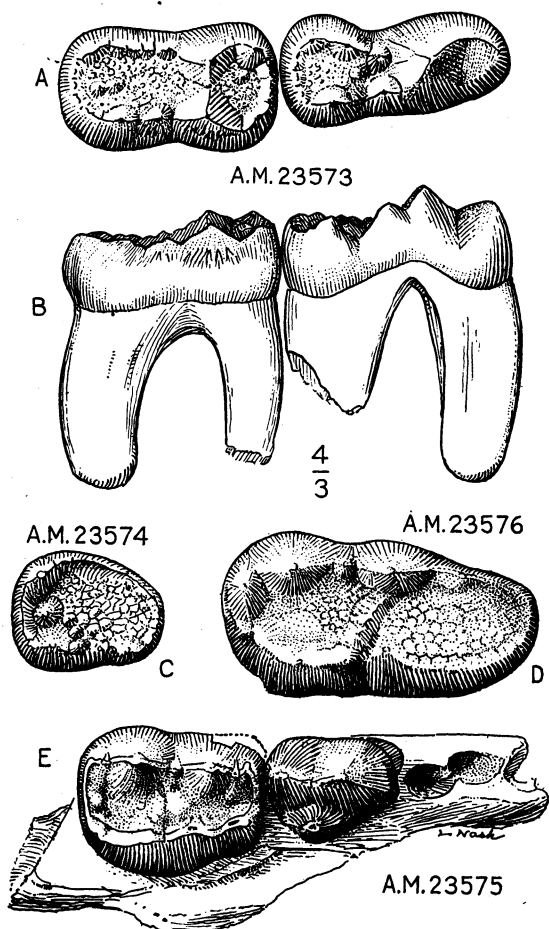


Fig. 5

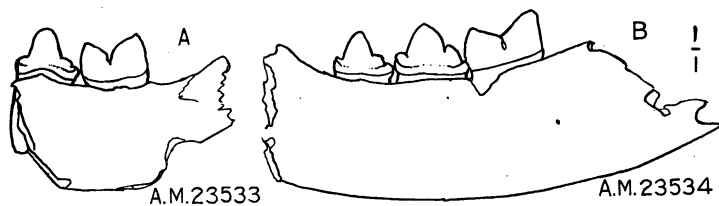


Fig. 6

Fig. 5. *Arctodus floridanus* Gidley. Referred specimens. A, Left M_{1-2} , crown view. B, Same, internal view. C, M_3 , crown view. D, Left M_2^2 , crown view. E, Fragment of right upper jaw with P^4 and M^1 , crown view. All $\frac{4}{3}$ natural size.

Fig. 6. *Lynx* sp. Internal views of right lower jaws. A, An unusually small individual. B, Referred to *Lynx rufus*. Both natural size.

Measurements of some of the Seminole teeth follow:

Amer. Mus. No. 23537, dm³. Length 20 mm.

No. 23536, dm₄. Length 18

No. 23539, P³. Length 19.3

No. 23538, M₁. Width 14

***Felis* cf. *inexpectata* (Cope)**

A cat intermediate in size between *F. veronis* and *Lynx rufus* is represented chiefly by Amer. Mus. No. 23541, a right upper carnassial, 21.5 mm. in length and 11 mm. in width. I have been unable to compare this with *F. coryi*, but the tooth is relatively shorter and wider, the protocone more posterior, than in any recent puma examined. Although slightly smaller, it agrees more closely with "*Uncia*" *inexpectata* Cope than with any other described Pleistocene species.



Fig. 7. Crown view of felid teeth. A, *Felis* cf. *veronis* Hay, upper milk carnassial. B, *Felis* cf. *veronis*, lower milk carnassial. C, *Felis* cf. *inexpectata* (Cope), upper carnassial. All $\frac{2}{3}$ natural size.

***Smilodon* cf. *floridanus* (Leidy)**

Saber-tooth cat remains are very rare in the Seminole Field. A worn and badly broken upper carnassial is unidentifiable, but indicates an animal of about the same size as *Smilodon floridanus*.

***Mylodon* ?*harlani* Owen**

Both megalonychid and mylodont ground sloths occur in the Seminole Field, but the material is too fragmentary for definitive choice among the fifteen or more specific names, most of them badly grounded, which have been proposed for eastern North American gravigrades. About fifteen teeth and fragments, numerous dermal ossicles, and some fragmentary phalanges are indistinguishable from the variable common species *M. harlani*.

***Megalonyx* cf. *wheatleyi* Cope**

Megalonyx is represented by two fragmentary upper anterior teeth, seven characteristic quadrate cheek teeth, and some other fragments. All of these are smaller than the corresponding parts of *M. jeffersonii*. The adult teeth agree approximately in size with those from the Saber-tooth Cave in Citrus County, and like the latter may be compared with *M. wheatleyi* Cope, although the true characters of these small megalonyces are not yet understood. A much larger species seems to have flourished on the east coast, but it has not yet been recognized in the west coast faunas.

Tatu bellus, new species

TYPE.—Amer. Mus. No. 23542. Single scute of movable ring.

PARATYPES.—Amer. Mus. No. 23543, seven scutes of movable rings. A. M. No. 23544, fifteen marginal buckler scutes. A. M. No. 23545, twenty-nine caudal scutes, some associated. A. M. No. 23546, twenty-seven polygonal scutes of bucklers, casque, and legs, some associated.

HORIZON AND LOCALITY.—Pleistocene, Seminole Field, Florida.

DIAGNOSIS.—Size of known scutes and limb bones averaging over twice that of *T. novemcinctus* and nearly equal to *T. sulcatus*. Sculpture similar to that in the latter species, but grooves generally less deep and larger foramina more distinct. Follicles of movable plates well developed.

The dermal plates of this interesting species are being described and figured elsewhere. Through the courtesy of Dr. Gidley I have been able to examine a jaw of this species, collected by C. P. Singleton at Melbourne, and hence to identify other

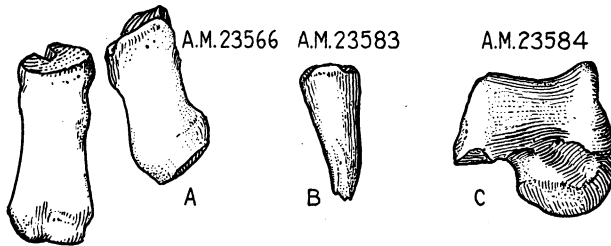


Fig. 8. *Tatu bellus*, new species. Foot bones. A, Third and fourth left metatarsals. B, Terminal phalanx. C, Right astragalus. All $\frac{1}{2}$ natural size.

isolated teeth. The Melbourne specimen includes five teeth and an alveolus for another anterior to these. There was probably one and perhaps several more teeth in the complete jaw. The more anterior teeth are elongate, with flattened sides and rounded ends, wider posteriorly than anteriorly. The more posterior teeth are nearly circular, the largest slightly wider than long. They reach a maximum length of about 5 mm., depth about 13 mm.

This extinct armadillo is apparently closely related to the living *T. novemcinctus*, and perhaps still more closely to a group of extinct South American species, *T. punctatus* (Lund) and *T. sulcatus* (Lund) of Brazil¹ and *T. grandis* (Ameghino) of Argentina.² All these extinct forms are much larger than the recent species and generally have more prominent punctations, but the generic name *Propaomys* proposed for *grandis* by Ameghino seems unjustified. *T. bellus* was common in Florida, but has not yet been reported from outside that state. It occurs at Seminole, Vero, Melbourne, Ocala, Lecanto, and Sarasota. A single scute from Vero was figured as *Dasypus* sp. by Sellards.³ In the Seminole Field the scutes are very abundant, only a few repre-

¹Winge, 1915. E. Museo Lundii, III. 2nd Part, pp. 80-88.

²Lydekker, An. Mus. La Plata, Pal. Arg., III, Pt. 2, 2, p. 66.

³Fla. State Geol. Surv., 8th Ann. Rept., Pl. xxix, Fig. 2.

sentative specimens being selected as paratypes, but they are almost always dissociated.

T. bellus is also a large form, larger than *T. punctatus* on the average, and old robust animals may have reached the size of *T. sulcatus*, but I have seen no specimens comparable to the largest referred to *T. grandis*. The punctation and follicle development are less than in *T. punctatus*, but unlike *T. sulcatus* (*fide* Winge) the posterior follicles of the movable bands are well developed, three or four to each plate.

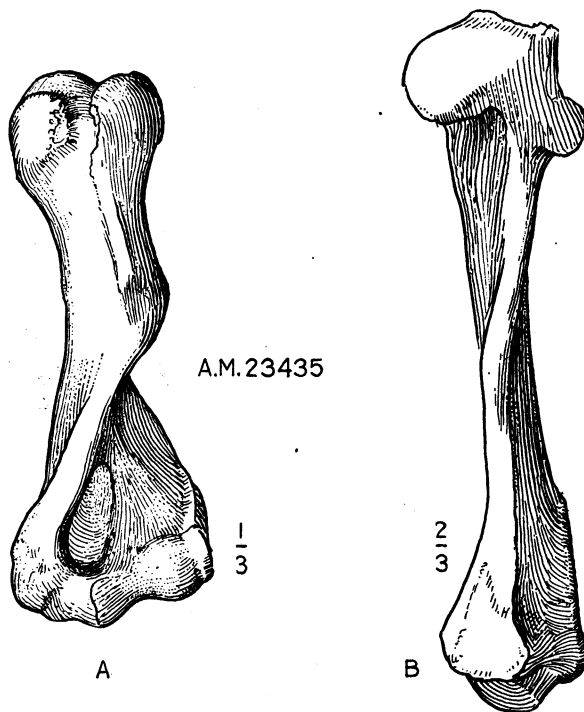


Fig. 9. *Chlamytherium septentrionale* (Leidy). A, Left humerus, anterior view, $\frac{1}{3}$ natural size. B, Left ulna, lacking olecranon, superior view, $\frac{2}{3}$ natural size. Both specimens from Saber-tooth Cave, Citrus County, Fla.

Chlamytherium septentrionale (Leidy)

This species also appears to be restricted to the warmer stages and regions of our Pleistocene. It is found at numerous localities in Florida (Vero, Melbourne, Peace Creek, Withlacoochee River, Lecanto, Venice, Sarasota, Seminole), and at two localities in Texas (Pittbridge¹ and near Sinton²), but the genus is not otherwise recorded outside of South America.

¹Cahn, A. R. 1922. Jour. Mam., III, 22.

²Hay, O. P., 1926. Proc. U. S. Nat. Mus., LXVIII, Art. 24, 2.

As with the other edentates, the scutes are not here described in detail. All the available bones are closely similar to those from Brazil figured by Winge as *Chlamydotherrium majus*.¹

***Boreostracon floridanus*, new genus and species**

TYPE.—Amer. Mus. No. 23547, part of posterior border and adjoining plates of carapace.

PARATYPES.—Amer. Mus. Nos. 23548–23562, topotypical series of carapace and caudal groups and individual scutes.

HORIZON AND LOCALITY.—Pleistocene, Seminole Field, Florida.

GENERIC AND SPECIFIC CHARACTERS.—A relatively small animal of the *Glyptodon* group. Scutes unfused in adult. Central carapace scutes with an approximately circular, punctate central figure, usually slightly depressed in the center, its diameter not less than one third of the maximum diameter of the whole plate and becoming greater toward the edges of the carapace. Marginal portions of the central plates divided by grooves, which are often very obscure, into a single ring of seven to nine



Fig. 10. *Boreostracon floridanus*, new genus and species. Crown views of teeth. A–C, Young, broken teeth. D, adult right lower tooth.

figures with strong but irregular radial sculpturing. Plates of nuchal border without definite bosses; these plates and those of succeeding row without marginal figures. Lateral border plates with bosses of moderate size, not pendant, projecting outward, backward, and downward. Anterolateral portion of carapace composed of small firmly sutured plates. Lateral plates internal to border generally somewhat elongate, hexagonal and pentagonal, small, with relatively narrow margins, and regularly seriate in arrangement. Posterior border plates with small pointed bosses. Tail composed of a number of biseriate rings followed by a probably short tube. Caudal bosses not strong.

Figures and more detailed descriptions of these scutes will also be given by Holmes and Simpson. Although the scutes are very abundant in the Seminole Collection, glyptodont teeth are rare. In the Seminole Field itself only a few broken teeth were found, and these belong to young animals which do not show the definitive characters. Mr. J. E. Moore has, however, lent a good adult tooth, probably of this species, which he found at the mouth of Hog Creek at Sarasota. This is a right lower tooth, probably the fourth or adjacent to it, and is of familiar type but apparently unique in detail. Secondary branching of the central dentinal ridges is slight, and the three primary branches in the anterior lobe part from a single point. The anterior

¹E. Museo Lundii, III, 2nd Half, Pls. XIII–XIV.

lobe is about as long (i.e., anteroposteriorly) as the second; the latter is unusually long in proportion to its width. Second and third lobes are markedly oblique. The maximum diameter of the first lobe, in a plane transverse to the axis of growth, is 10.7 mm., second 12.0, third 11.5. The greater width of the second than of the third lobe is very unusual for a tooth in this position. The posterointernal angle of the tooth is relatively undeveloped. The posterior face is divided into a smaller external portion, convex in horizontal section, and a larger internal portion marked by a very broad and shallow vertical groove. This grooved character is less marked than in *Glyptotherium arizonæ*, but the available specimens suggest that it was more constant than in *Glyptodon* proper, in which it is only abnormally present.

In 1888 Cope based the name *Glyptodon petaliferus* on about half of an isolated plate from Nueces County, Texas¹ (type, Amer. Mus. No. 14158). In the following year Leidy described several scutes from Peace Creek, Florida, which he referred to Cope's species.² Hay has subsequently described important specimens from Texas which include parts of the skull and dentition, some skeletal remains, and carapace fragments.³ The first lot was from near Wolfe City, Hunt County; the second from near Sinton, San Patricio County. This material was also referred to *G. petaliferus*. Far the best-known North American Pleistocene glyptodonts are, however, *Brachyostrea cylindricus* Brown and *B. mexicanus* (Cuatáparo and Ramírez) from Mexico.⁴ Two well-defined and well-known species, probably of distinct genera, are known from the Pliocene of the United States: *Glyptotherium texanum* Osborn⁵ and "*Glyptotherium*" *arizonæ* Gidley.⁶ A fifth species of North American glyptodonts was proposed by Hay in 1923 on the basis of some or all of Leidy's plates from Peace Creek.⁷ Undetermined glyptodont plates are also known from Hawley, Jones Co., Texas,⁸ and from Frederick, Oklahoma.⁹ In Florida, besides the Peace Creek occurrence and the present one, glyptodonts are reported from Melbourne and from Sarasota.

Although relatively few, the correlation of these finds is difficult. For all practical purposes, *Glyptodon petaliferus*, by which name most of the specimens have been called, is a *nomen nudum*. The type is inadequate for either generic or specific determination. Hay's Hunt County specimen, from a locality far removed from Nueces County, is said to include scutes with all the characters of Cope's type, but Hay's figures do not show such a specimen. His San Patricio specimen is not far removed from the type locality geographically, but it is not known to be of the same age and is not a topotype. Hay suggests that his two specimens may not be of the same species, and neither can be surely referred to *G. petaliferus* or considered as fixing the characters of this species. If they do belong here, they prove that the Florida species is quite distinct, as the sculpture of plates known to be from homologous regions is different. The most obvious distinction is that in all of Hay's figures, the marginal areas of the plates are strongly punctate, while in homologous Florida plates (and to a less degree in the type of *G. petaliferus*) these areas are marked by prominent, irregular, radial

¹Amer. Nat., XXII, 345.

²Trans. Wagner Inst. Phila., II, 25-27.

³Proc. U. S. Nat. Mus., LI, 107-116; 1916, *ibid.*, LXVIII, 2-5; 1926.

⁴Bull. Am. Mus. Nat. Hist., XXXI, 167-177; 1912.

⁵Bull. Amer. Mus. Nat. Hist., XIX, 491-494; 1903.

⁶U. S. Geol. Surv., Prof. Paper 140B, 91-94; 1926.

⁷Carnegie Instn. Washington, Pub. No. 322, pp. 39-40.

⁸Hay, 1924, Carn. Instn. Wash., Pub. No. 322A, p. 2.

⁹Through the kindness of C. N. Gould I have been able to examine parts of this important find. The plates do not agree with those of any other North American specimen known to me, and probably represent an undescribed species.

grooves. Cope's specimen is of historical interest as being the earliest indication of a glyptodont north of Mexico, but his name cannot properly now be used for specimens from other localities.

The status of *G. rivipacis* Hay is also dubious. Basing himself on Leidy's figures, the author gave an admittedly inconclusive comparison with the Hunt County, Texas, specimen (which may or may not be of the same species as the type of *G. petaliferus*). He did not distinguish the Florida form from any other, gave no diagnosis or definition, and designated no type, but said that the Florida species "is to be called *Glyptodon rivipacis* Hay." On a later page (381) of the same work, he lists both *G. petaliferus* and *G. rivipacis* as occurring in the Peace Creek fauna. It is not clear just what this latter name is meant to include, it does not appear to be validly established under the accepted codes of nomenclature, and it certainly would be desirable, from a strictly scientific point of view, for a name to be based on better material than an unidentified one or more of Leidy's scutes. I therefore have rather reluctantly taken the step of basing a new name on the incomparably better Seminole materials, and of considering both *G. petaliferus* and *G. rivipacis* as *nomina nuda*.

The generic affinities of the northern glyptodonts also present a difficult problem. On the basis not only of *a priori* probability but also of the positive knowledge so far gained, it seems very unlikely that any of the known remains really belong to *Glyptodon*, unless that genus be improperly used for all later glyptodonts with a rosette-like plate pattern.

From *Brachyostracon* Brown, the only previously established North American Pleistocene glyptodont genus, *Boreostracon*, differs most definitely in the radiating sculpture of the marginal figures of the plates; the small, flat, seriate, closely sutured anterolateral plates; the non-pendant border plates with apices directed more backward—but also in many other details as may readily be seen by comparing Brown's figures with those of Florida specimens being published elsewhere.

Glyptotherium Osborn has many points of similarity in the general form and structure of the carapace, and it may be a closely related, but not ancestral, form. But in this genus the central figure of the lumbar scutes is larger; the sculpture is quite different; the anterolateral plates are differently patterned, more uniformly quadrate, less firmly sutured; the posterior margin is without definite projections; and many minor differences occur. It is, of course, a much earlier genus than *Boreostracon*. "*Glyptotherium*" *arizonæ* Gidley probably represents an unnamed genus, but it is also considerably older than *Boreostracon*¹ and equally distinct from it.

Of the currently recognized Pampean genera, only *Glyptodon* is closely comparable with *Boreostracon*. In *Glyptodon*, however, the marginal figures of the scutes only very exceptionally show any radial sculpturing and never have this as marked as in *Boreostracon*: the anterior margin of the carapace has bosses or spines; the lateral and caudal projections are more conical and project more straightly; the anterolateral area is quite differently constructed. Some individual plates of *Lomaphorus* resemble those of *Boreostracon*, save for their smoother texture and finer sculpture, but the general structure was very different.

¹It is placed by Gidley in the upper Pliocene. Hay considers it as Pleistocene, on evidence not generally accepted by other workers. The associated fauna includes *Stegomastodon*, *Pliauchenia*, *Merycodus*, etc., and must in any event be much older than that of the Seminole Field.

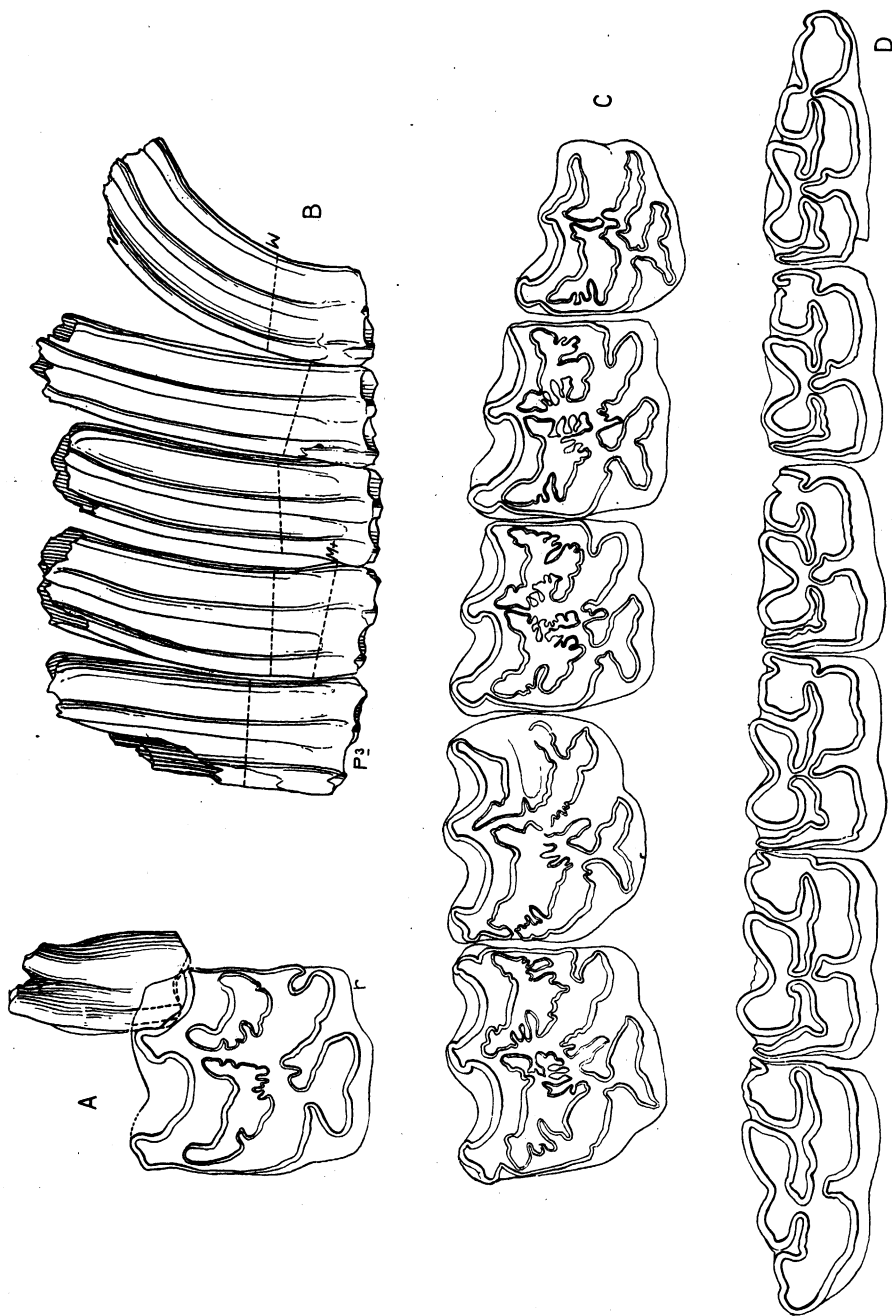


Fig. 11. A, *Equus complicatus*, left upper cheek tooth, crown view, natural size, and external view, $\frac{1}{2}$ natural size. B-D, *Equus leidyi*. B, Left upper P^2-M^3 , external view, $\frac{1}{2}$ natural size. C, Same, crown view, natural size. D, Left lower cheek teeth, crown view, natural size.

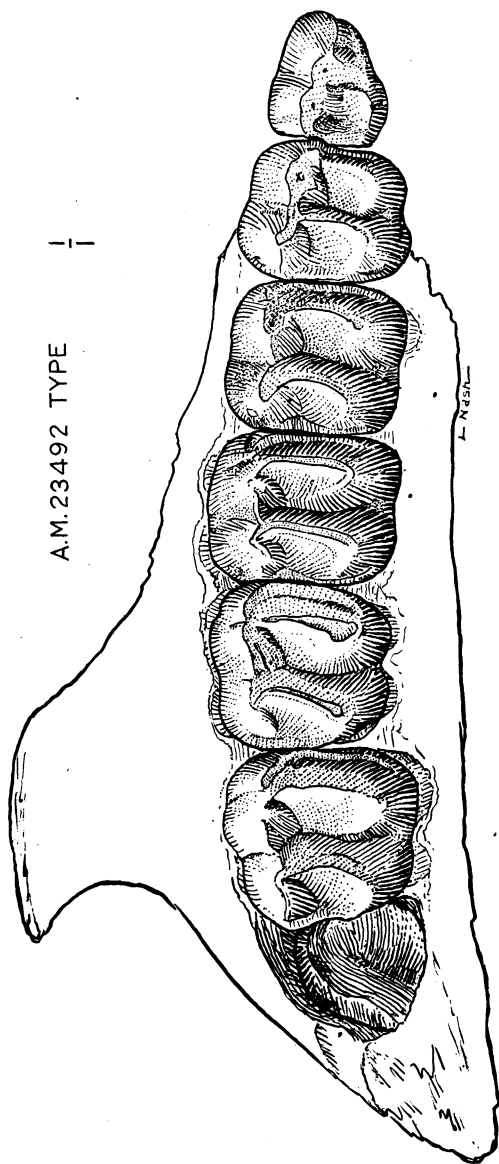


Fig. 12. *Tapirus veroensis sellardsi*, new subspecies. Type. Right upper cheek teeth, crown view, natural size.

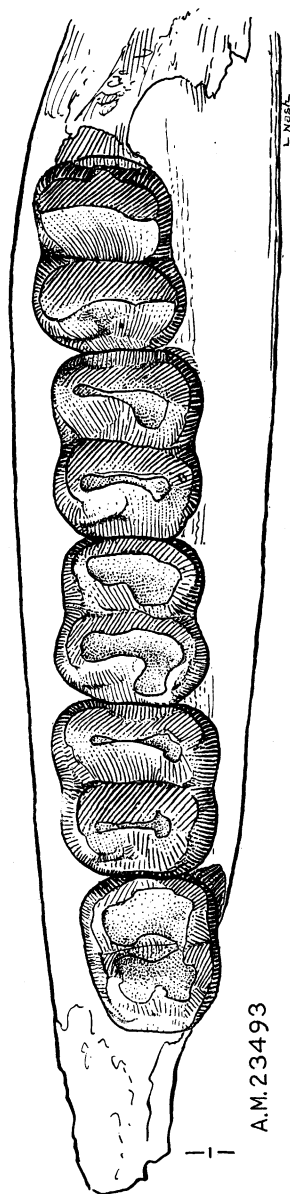


Fig. 13. *Tapirus veroensis sellardsi*. Referred specimen. Part of left lower jaw, crown view, natural size.

EQUIDÆ

Three species of *Equus* are usually recognized in the Florida Pleistocene, distinguished chiefly by size. The characters and nomenclature of these horses are not very satisfactorily established, and it is not proposed to go into the matter here. The Seminole Field specimens, which are numerous, are being studied in connection with the other Pleistocene horses by Mr. Childs Frick, through whose courtesy the accompanying figure is given. It suffices to point out that the common horse at Seminole is that of medium size which Hay calls *E. leidy*, Gidley *E. fraternus*, but that the larger form, *Equus complicatus* (or *E. fraternus*), is also present.

Tapirus veroensis sellardsi, new subspecies

TYPE.—Amer. Mus. No. 23492, palate with all cheek teeth.

HORIZON AND LOCALITY.—Pleistocene, Seminole, Florida.

DIAGNOSIS.—Length of upper cheek tooth series in type, 140 mm. Parastyles large and general tooth structure much as in *T. veroensis*. No external cingulum and no external tubercle between paracone and metacone. Internal tubercle between protocone and hypocone weak and often absent. P^1 relatively wider than in *T. veroensis*, M^3 smaller and relatively narrower anteriorly. In referred lower jaw, cheek teeth shorter and wider than in *veroensis*, and M_1 narrower than P_4 , rather than wider. Small tubercles may appear at either ends of the transverse molars in the lower teeth, but they are usually absent.

Four species of tapirs are currently recognized in the Pleistocene of eastern North America: a form not yet distinguished from *T. terrestris* although probably distinct, the large *T. haysii*, *T. veroensis*, and *T. tennesseæ*. Of these, the present form is clearly closest to *T. veroensis* and provisionally considered as only subspecifically distinct. Sellard's clear description¹ obviates the necessity of close comparison with other species. So far as I am aware, only *T. tennesseæ* Hay² has been described since Sellards' work, a species inadequately known but probably distinct from *T. veroensis* as pointed out by its author. *T. veroensis sellardsi* is apparently the form recorded by Hay as a possible new species on the basis of an isolated M^3 from Dunnellon, Florida.³

In the type palate all the permanent teeth are in use save M^3 which is still in its crypt. A second upper jaw (A. M. No. 23494) of older individual age, with right P^4-M^3 , agrees fairly well and is referred. A number of isolated teeth show variations of not over 2 mm. in any dimension from the type, and a lower jaw with P_3-M_3 (Amer. Mus. No. 23493) is also referred. This is slightly too large for perfect occlusion with the type, but doubtless belongs to the same subspecies.

¹Fla. State Geol. Surv., 10th and 11th Ann. Repts., p. 57; 1918.

²Proc. U. S. Nat. Mus., LVIII, 88; 1920.

³Carnegie Instn. Washington, Pub. No. 322, p. 207; 1923.

MEASUREMENTS OF TEETH

Specimen	P ¹		P ²			P ³			P ⁴			M ¹			M ²			M ³		
	Length	Width	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width
No. 23492	17	15.5	18.5	20.0	21.8	19.3	22.8	23.0	20.0	24.7	24.4	20.0	24.5	22.5	23.5	26.2	23.0	.....	.....	.....
No. 23563 ¹	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	22.5	24.2	22.0
No. 23494 ²	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23.3	20.0	23	22	22.8	25.0	.....	22.0	25.0	20.2

Specimen	P ₃			P ₂			M ₁			M ₂			M ₃		
	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width
No. 23493.....	20.5	16.7	18.5	22.5	20.2	21.7	21.5	18.6	17.6	24.2	19.8	19.8	25.5	19.5	18.5

¹Isolated M³ of about same size as in No. 23492 and more exactly measurable.

²Old individual, teeth somewhat worn and broken.

Description of the dentition beyond that given by Sellards for *T. veroensis* and the distinctive features given in the diagnosis above is unnecessary.

OSTEOLOGY

Most important of a number of skeletal parts of this species is a left fore limb, including proximal and distal ends of the radius; the ulna lack-

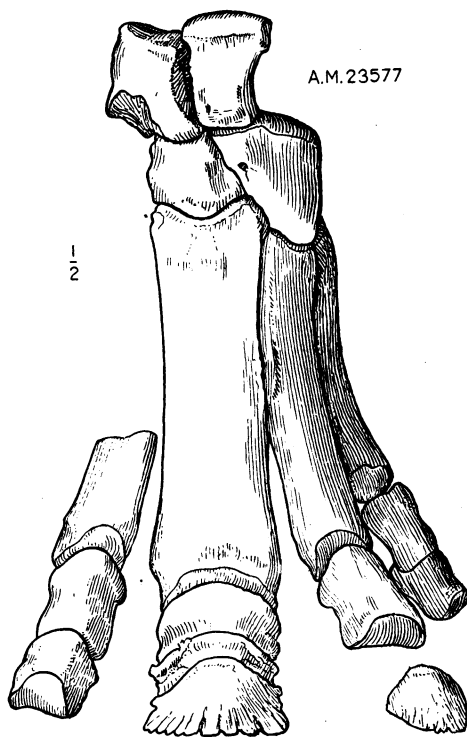


Fig. 14. *Tapirus* sp. Left manus, anterior view. $\frac{1}{2}$ natural size.

ing part of the shaft; the carpus, save for the cuneiform, trapezium, and trapezoid; metacarpals, save the proximal end of the second; and all but three of the phalanges. This manus is robust, but its probable reference to this rather than to the somewhat larger animal described below is indicated by the presence in the collection of another scaphoid which is larger and differs in some morphological details.

The foot in general is heavier than in *T. terrestris*. The longitudinal (or vertical) dimensions of the carpus and foot bones are little larger than in this recent species, but most of the transverse dimensions are markedly greater. In the radius, the proximoexternal process is of about the same size as in *T. terrestris*, while the medial and internal portions of the proximal end are greater in every dimension. The distal articulation in the fossil is more transverse. On the ulna, the proximal part of the trochlear facet is larger, but the distointernal extension of this and the distoexternal facet are weak.

In addition to their relative stoutness, the carpals show various peculiarities in their articular facets, but without a large series of specimens it is difficult to evaluate these. Thus on the scaphoid the anterior lunar facets are small and the posterior facet is high up and separated from the anteroinferior facet by a broad groove. The posterior process of the lunar is more bulky and more expanded transversely than in *T. terrestris*. The posterior scaphoid facet on the lunar faces somewhat upward and is separated some 6 mm. from the magnum facet.

The metacarpals and phalanges differ but little from the recent species save in being somewhat stouter. There is no distinction in the relative development of the digits. The following measurements of the median metacarpal and digit are characteristic:

Metacarpal (III)	{	Length.....	126 mm.
		Trans. diam. of shaft.....	25
Prox. Phal. (III-I)	{	Length.....	36
		Shaft.....	26
Med. Phal. (III-2)	{	Length.....	27.5
		Width.....	32
Dist. Phal. (III-3)	{	Length.....	29
		Width.....	36

***Tapirus* sp.**

There were also found in the Seminole Field a number of isolated teeth which average a little less than 15% larger than in typical *Tapirus veroensis sellardsi*. Morphological differences are slight or absent, and this larger form may represent either the males or a series of large individuals. The size difference between this form and *T. haysii* is less than that between the two groups of Seminole teeth, but the proportions of the individual teeth and, supposing the isolated teeth to give an average conception of the dentition as a whole, those between the various teeth are much closer to *T. v. sellardsi* than to *T. haysii*. This agreement in proportion is more important than slight differences in size alone, and, to

2d	3d			4d			M ¹			M ²			M ³		
	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width	Length	Ant. Width	Post. Width
19.5	22	28	28	22.5	28	27	25	27	25	25	29	27	25	29	25
21	23	26		22.5		26.5							26	29	24.5
													25	28	24

a limited extent, tends to confirm rather than to contradict the distinction between the common Seminole tapirs and *T. haysii*. The following measurements are all from isolated teeth (page 590):

As mentioned above, there is a left scaphoid which probably belongs to this larger form. The groove for the trapezoid is larger, the posterior lunar facet less isolated, the anterior lunar facets are larger, but these characters, so readily modified by varying mechanical stimuli, are of doubtful systematic value.

Platygonus sp.

This genus is relatively rare. An M^3 measures 23 mm. in length by 17 in width, and is thus relatively small but within the designated size range of *P. cumberlandensis* or *P. intermedius*. An M^3 is of about the same length as in the latter two species, but relatively narrower, measuring 25 by 14.5 mm. Such isolated teeth are not specifically identifiable.

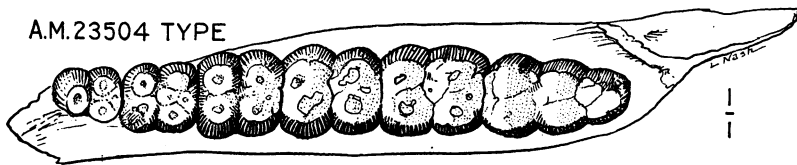


Fig. 15. *Mylohyus gidleyi*, new species. Type. Right lower cheek teeth, crown view. Natural size.

***Mylohyus gidleyi*, new species**

TYPE.—Amer. Mus. No. 23504, parts of right and left lower jaws with all cheek teeth.

HORIZON AND LOCALITY.—Pleistocene, Seminole Field, Florida.

DIAGNOSIS.—A small species of *Mylohyus*. Total length of cheek teeth about 76.5 mm. Maximum breadth (anterior lobe of M_2) about 12.3. P_2 with single anterior cusp followed by a transverse pair with a smaller cuspule wedged between them posteriorly. Heel of M_3 about as long as each of the two anterior lobes, chiefly composed of two obliquely placed large cusps, one anteroexternal and one posterointernal, and a small posteroexternal cuspule. Approximate ratios of lengths to widths of molars in type: M_1 , 1.08; M_2 , 1.08; M_3 , 1.70. Molar cingula slight. Accessory cusps few and simple.

Peccary teeth are fairly common, but except for the present specimens they are so isolated and fragmentary that the only valuable conclusion to be drawn from them is that the group was important in this fauna and included a considerable variety.

Mylohyus exortivus Gidley from Pennsylvania most nearly approaches *M. gidleyi* in size, the lower cheek tooth series being only about 5 mm. (ca. 6%) longer. As figured by Gidley,¹ however, P² has two pairs of main cusps and no posteromedian cusp. There are also differences of proportion throughout; thus P₄ and M₁ are relatively wider and M₃ is proportionately shorter. The heel of M₃ is abbreviated, although less so than in *M. lenis*, and is simpler than in *M. gidleyi*. Gidley's referred specimens of *M. pennsylvanicus* show this to be a larger animal, with more complex M₃, and with M₂ even narrower, relatively, than in *M. gidleyi*. *M. nasutus* is imperfectly known. It is intermediate between *M. exortivus* and *M. pennsylvanicus* in size, and the type is from Gibson County, Indiana.

In *M. browni* the cheek tooth series is 14 mm. (ca. 18%) longer, and the heel of M₃ is shorter and simpler. One of the two types² of "*Tagassu*" (probably *Mylohyus*?) *lenis* is an M₃ in which the heel is much shorter and simpler than in *M. gidleyi* and the accessory cusps still less developed. It is probable that some isolated teeth of *M. gidleyi* have previously been referred to *M. lenis*, but it is clear that the two species are distinct. *M. tetragonus* is very unlike any of the preceding species and, as Hay has suggested, may belong to *Tagassu*. *M. temerarius* and *M. obtusidens* were based on canines.

MEASUREMENTS							
P ₂		P ₃		P ₄		M ₁	
Length	Width	Length	Width	Length	Width	Length	Width
8.0	5.5	10.5	8.8	11.0	11.0	13.0	12.0
M ₂				M ₃			
Length		Width		Length		Width	
14.3		12.3		19.0		11.2	

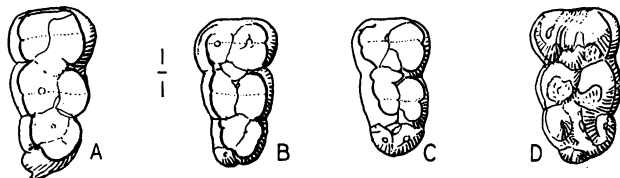


Fig. 16. Crown views of left last lower molars of Pleistocene peccaries from the Seminole Field. A, *Mylohyus* cf. *pennsylvanicus*. B, *Mylohyus gidleyi*. C, *Mylohyus* cf. *lenis*. D, ?*Tagassu* cf. *tetragonus*. All natural size.

Mylohyus cf. *pennsylvanicus* (Leidy)

Some relatively large, rather narrow, isolated teeth compare closely with *M. pennsylvanicus*, although they are, of course, inadequate for specific determination. The heel of M₃ is much as in *M. gidleyi*, but slightly more complex, and this tooth measures in one case 22 by 12.5 mm.

¹Proc. U. S. Nat. Mus., LVII, 651-678; 1920—a valuable résumé of the Tagassuidæ.

²I judge the two "*Dicotyles fossilis*" teeth in Pl. xvii, figs. 13-14, of Holmes' Post-Pliocene Fossils to be the types of this species.

***Mylohyus* cf. *lenis* (Leidy)**

To this species may belong several teeth, especially last molars which agree with Leidy's specimen in having the third lobe much reduced and with only two cusps, one smaller than the other. Accessory cusps are present (as, indeed, they are in Leidy's figure) but are small and simple. The teeth themselves are the smallest of any Pleistocene peccaries known to me, an M_3 measuring only 17 by 10.5 mm. and an M_2 15 by 10,—somewhat narrower than Leidy's specimens.

?*Tagassu* cf. *tetragonus* (Cope)

The last type of peccary teeth in the collection represents an animal very different from any of the above and probably belonging to another genus, possibly to *Tagassu* or to an unnamed group. Although slightly smaller, these teeth most closely resemble Cope's *Mylohyus tetragonus* (referred by Hay to *Tagassu*) among named species. There is a strong tendency to form external and internal basal cingula, and the heel of M_3 is large, with a transverse series of three cusps followed by a postero-median cusp of equal size which may be fused with the one preceding it. A first lower molar, probably of this form, measures 15 mm. in length by 14 in width, and a third lower molar 20 by 12.

***Tanupolama mirifica*, new species**

TYPE—Amer. Mus. No. 23483. Three associated left lower molars

PARATYPES—A. M. No. 33488, part of right lower jaw with P_4 . A. M. No. 23487, isolated P^4 . A. M. No. 23485, isolated M^3 . A. M. No. 23489, associated M^{1-2} .

HORIZON AND LOCALITY.—Pleistocene, Seminole Field, Florida.

DIAGNOSIS.—Cheek teeth somewhat larger than in recent llama. P_3 present in known specimens. P_4 relatively large, broad anteriorly, anterointernal groove complicated by sharp anterior secondary folding. Lower molars similar in size and character to *Tanupolama stевensi*, but no median external style on M_1 . P^4 sharply triangular, external wall strongly oblique and with a single apex, internal angle sharp. Outer walls of M^{1-3} more sharply folded than in *T. stевensi*. Anterior lobes of M^{1-2} markedly wider basally than posterior lobes. Maximum length and breadth of each upper molar nearly equal.

This small camel is clearly allied to "*Lama*" *stевensi* Merriam and Stock from McKittrick, California. The genus clearly is not *Lama*, and in a publication (Carnegie Institution of Washington) which will be in print before the present paper, Dr. Stock is proposing for it the name *Tanupolama*, type *T. stевensi*, which will also embrace "*Camelus*" *americanus* Wortman and the present form. Probably many of the small and doubtful camels which have been found throughout the American Pleistocene will be found to belong to this distinctive and clear-cut

group. I am indebted to Dr. Stock for information regarding his work and for permitting me to examine part of the proof of his forthcoming study.

Remains of camels have hitherto been very rare from eastern localities. In Florida itself the situation is peculiar. Of certainly Pleistocene finds only two have been recorded: Sellards (Fla. Geol. Surv., 8th Ann. Rept., p. 149) reported fragments from Vero, and Loomis and Gidley (see, for example, list by Gidley in Hay, Carn. Inst. Pub. No. 322B, p. 274,

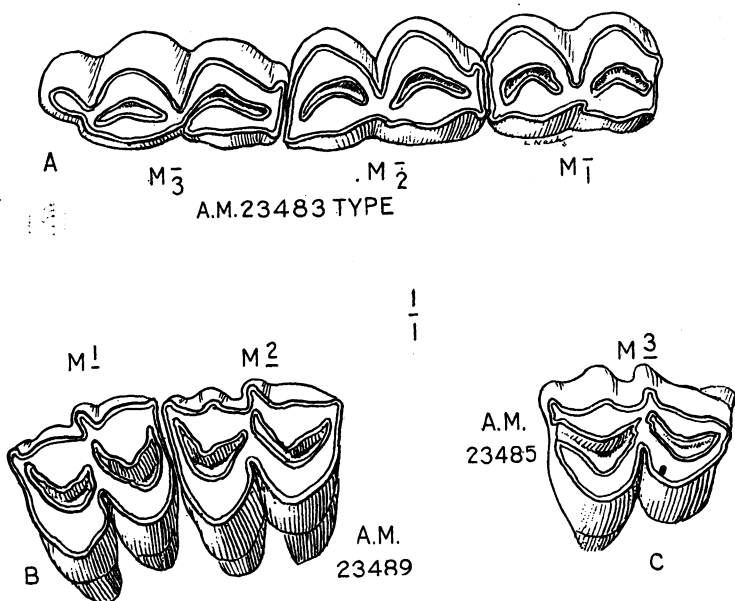


Fig. 17. *Tanupolama mirifica*, new species. A, Left lower molars, crown view. B, Left M^{1-2} , crown view. C, Left M^3 , crown view. Natural size.

"*Camelops?*") found a few specimens at Melbourne. Three species referred to "*Auchenia*" (i.e., *Lama*) were described by Leidy from the Alachua Clays (Proc. Acad. Nat. Sci. Phila., 1886, p. 12), but these were later removed to the genus *Procamelus* (Leidy and Lucas, Trans. Wag. Free Inst. Sci., IV, 53). This reference has been confirmed and the specimens considered as of upper Miocene or lower Pliocene age. Hay, however, considers them to be of Pleistocene age. This matter of age has already been sufficiently discussed. At Seminole, like all localities where conditions leading to possible mixture of faunas are not obviously

present, *Procamelus* is not associated with the Pleistocene fauna, and the camels of this field are quite distinct from Leidy's three Alachua species.

DENTITION.— P_4 is represented by two specimens, which differ somewhat and are not directly associated with molars, but which probably belong to this species. In A. M. No. 23488, P_4 is included in a fragment of jaw with a single alveolus for P_3 . This alveolus measures about 8 by 4 mm. There is also a facet for P_3 on the isolated P_4 , and this tooth (variable in *T. stevensi*, absent in *T. americana* type) may have

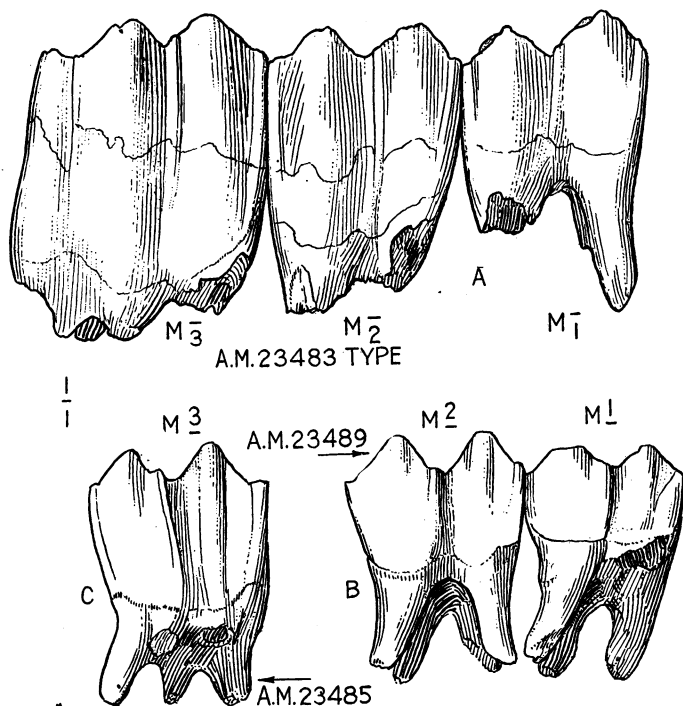


Fig. 18. *Tanupolama mirifica*. Same teeth as in Fig. 17. A, Internal view. B-C, External views (upper molars). All natural size.

been constantly present in this species. In P_4 the outer wall is divided into longer anterior and shorter posterior portions by a narrow vertical sulcus. On the internal side there is a prominent anterior vertical groove. In No. 23484, younger of the two specimens, the bottom of this sulcus communicates with two small but deep folds which form lakes in the worn crown and are separated by a thin vertical plate. On No. 23488 these lakes, if they existed, are worn away and represented only by two narrow anterointernal folds with a ridge between them. The posterior enamel lake is like that of other Pleistocene camels.

On M_{1-2} the internal folds are less prominent than in *Lama*, and the anteroexternal stylar fold, although more definite and prominent than in *Camelops*, is also less prominent than in the llama, having about the same strength as the anterointernal fold. In all these features, as well as in size, these molars are close to those of *T. stevensi*. M_3 is also similar in size, but it shows the characters of the young tooth, and hence does not agree exactly with the descriptions of Merriam and Stock. The third lobe is of the same relative size as in *Lama glama*. In the upper part it is small and elongate and originates from the posterior side of the second lobe, about one third of the distance from the internal angle. It is here separated from the second lobe by a strong sulcus. On the lower part of the tooth the posteroexternal shoulder of the second lobe and the following sulcus become less definite; the attachment of the third lobe becomes broader and reaches farther internally, and the lobe itself becomes more circular in section.

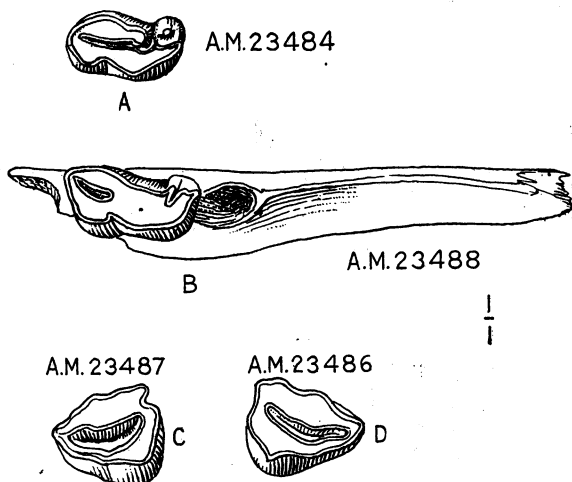


Fig. 19. *Tanupolama mirifica*. A, Isolated right P_4 . B, Right P_4 in jaw fragment. C, Left P_4 . D, Right P_4 . All natural size.

P^3 is not represented in the collections, but there are two specimens of P^4 . They differ markedly from *Camelops* in being strongly triangular, more definitely so than in *T. stevensi*, and the outer side is more oblique. The anteroexternal and posteroexternal corners are sharply angulate. The external wall has two shallow vertical grooves. The posteroexternal and anterointernal walls have also two shallow grooves each, and the internal angle, at least in the upper part, is more prominent and sharp than in *T. stevensi* or most other camelids.

In all three upper molars the anterior lobe is considerably broader basally than the posterior lobe, the difference at the base of M^2 , in distinction from *T. stevensi*, being especially marked. The external folds are slightly more prominent than in the latter species. The parastyle is less developed than in *Lama glama*, but the mesostyle is almost equally strong, and the groove anterior to it is narrower and deeper. All the upper molars are somewhat shorter and wider than in *T. stevensi*.

Camelids, indet.

Other dental remains and some limb and foot bones clearly indicate that at least two and probably three distinct camelids occur in the Seminole Field, although only *T. mirifica*, can now be usefully defined. Two last lower premolars are slightly larger than in this species. The external surface is marked by two shallow and indefinite vertical grooves, and the posterointernal angle is sharp. Anterointernally there is a broad groove, without secondary folds, and anterior to this is a strong inwardly directed lamina, the anterior face of the tooth being plane, not rounded or pointed. In all these characters the teeth resemble *Tanupolama americana*, although inadequate to warrant inclusion of that species in the faunal list. It is unlikely that they belong to *Camelops*, which, in its known species, has quite dissimilar last lower premolars. There are some molars, isolated and fragmentary, which are larger than those of *T. mirifica* and may belong to a different species of *Tanupolama* or to *Camelops*. The latter is suggested by a second right lower molar in which the anteroexternal style is weaker than in known forms of *Tanupolama*. There is also a last upper molar which more nearly approaches *Camelops* in its elongated dimensions than does *T. mirifica*. Other teeth are too doubtful to warrant mention.

The limb material is isolated, with a single exception, and in the absence of association with teeth does not warrant description at present. The exception is a large part of a hind limb, including a broken tibia, four bones of the tarsus, and the metatarsals, A. M. No. 23578. As the following dimensions of the cannon bones show, this is a much stouter foot than in *T. stevensi*:

A. M. No. 23578	<i>T. stevensi</i> No. 12, C. I. T. Coll.
	From Stock
Length.....288 mm.	409.7 mm.
Width of shaft.....38 mm.	28 mm.
Ratio.....7.57	14.63

On the basis of this great difference in proportions it is very unlikely that these two types of cannon bones could be associated with teeth so similar as are those of *T. stevensi* and *T. mirifica*. It is probable that A. M. No. 23578 belongs rather to *Camelops*, which it resembles much more both in proportions and in morphology. It does not appear to belong to a described species, being small and relatively stout even for this genus, but it is not proposed to base a name on this material.



Fig. 20. Camelid, cf. *Tanupolama americana*. Left P₄. Natural size.

More slender, isolated bones in the collection probably belong with *Tanupolama*, but they have little significance until more associated material is obtained.

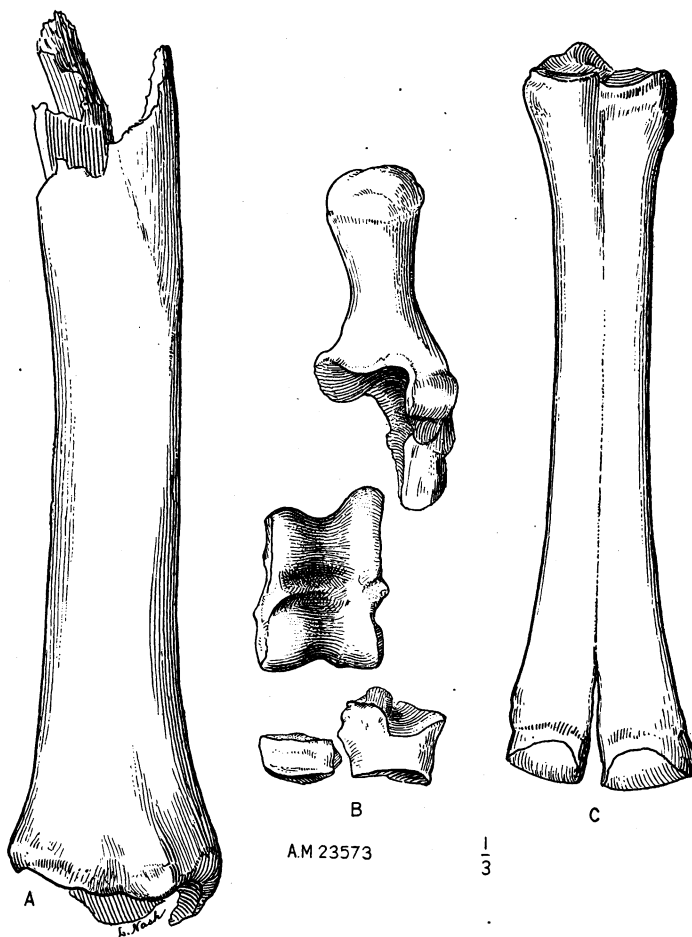


Fig. 21. Camelid, cf. *Camelops* sp. Associated hind limb bones. A, Tibia. B, Tarsal bones. C, Metatarsus. All $\frac{1}{3}$ natural size.

Bison sp.

Remains of bison are common in the Seminole Field. Besides numerous isolated bones, there is a partial right lower jaw with P_2 , P_4 and M_{1-3} , complete lower dentition of another individual, without the jaws

but in association, and very numerous isolated teeth. In almost any other group of mammals this material would be exactly determinable, but the extinct species of *Bison* have been almost entirely based on horn cores, and no horn-cores have yet been found near Seminole. In several of the current species these cores have never been positively associated with the dentitions, while the distinctive characters and range of variation of the latter are poorly known in any case save in *Bison bison*.

Among the Seminole teeth there is much variation, but not more than in the recent species, and all probably belong to one form. All of the teeth are larger than in average *Bison bison*. The morphology and degree of complexity is similar, save that several deeply worn last upper molars have distinct enamel folds in the lakes, especially the posterior

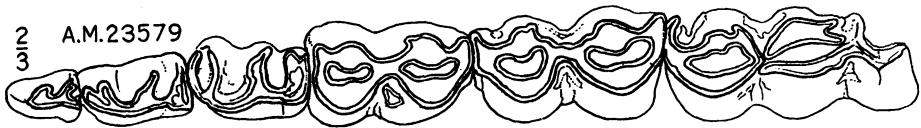


Fig. 22. *Bison* sp. Left lower cheek teeth. $\frac{2}{3}$ natural size.

one. In size the teeth agree in a general way with specimens referred to *B. antiquus* and are rather smaller than most of those which have been referred to *B. latifrons*, although the evidence for referring the teeth figured in the literature to these species is for the most part so equivocal that this may mean nothing as to affinities. In *B. regius* the enamel rims of the upper molar lakes are infolded, but the present specimens cannot be referred to this species, as the infolding is here inconstant, affects only M^3 so far as known, and is not of exactly the same character as in *B. regius*. The Florida bison probably does not belong to any established species, as the dentition is distinctive so far as known. The locality is far from the Pleistocene type localities, and the local differentiation of the genus in the Pleistocene seems to have been more marked than at the beginning of historic times. A figure of the lower dentition is given to assist in the correlation of future discoveries with this one.

