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ART. IX.—*New Tertiary Artiodactyls;* by RICHARD SWANN LULL. With Plate I.

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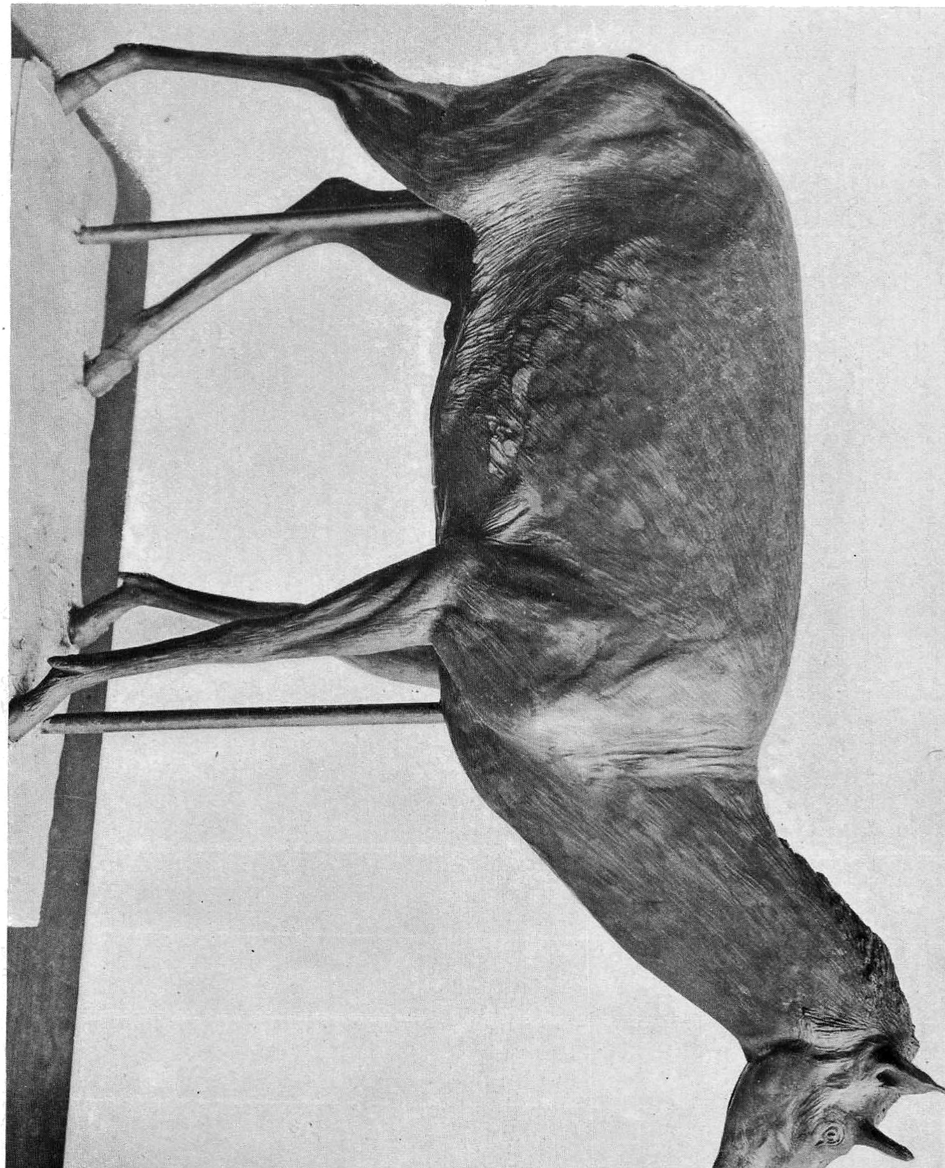
TABLE OF CONTENTS.



INTRODUCTORY.

In 1914 a Yale expedition under the guidance of the writer was working its way westward along the Niobrara River, following, in so far as possible, although in a reverse direction, the route of the very successful Marsh expedition of 1873. While camped near the mouth of Antelope Creek, a tributary of the Niobrara, one of our number, Mr. W. S. Benton, had the good fortune to find on one side of a small tributary canyon, a talus slope literally strewn with bones, many entire, others the more resistant articular ends of limb bones or the centra of vertebræ, jaws and teeth, which, while varying in size, apparently all belonged to the same species of small ruminant, which for want of better identification was called "*Blastomeryx.*" Several days were spent by various members of the party in collecting all of the surface material on the talus slope, and then, the bone-bearing layer being identified, it was excavated for a considerable area, with still more astonishing results, for no fewer than nineteen skulls were obtained in varying degree of perfection.

The locality lies in the northwestern portion of Cherry County, Nebraska, and it is our purpose to reopen the quarry in the near future, as it gives promise of further results. The quarry, "Quarry F" as it is called on our records, lay in a 6-foot bed of hard, light gray sandstone at a level of 106 feet above the surface of the Niobrara River, and 25 feet above the canyon floor. A section prepared by Doctor Malcolm R. Thorpe, another member of the party, is here reproduced.

Talus, fragments of white sandstone	25′	
Fine-grained, grayish, shaly sandstone	15′	
Massive white sandstone. Soft, more or less jointed. Turtle and other (mammal) small bones	19′	6″
Hard, light gray sandstone, jointed. *Aletomeryx* bones.	0′	6″
Talus. *Aletomeryx* bones	25′	

Associated Material.

Besides the specimens of the species to be described in this paper, "Quarry F" also yielded the remains of several other forms, some of which pertain to the actual 6-foot layer in which the ruminant was entombed, others were found either in the talus or on the slope above. Yet

other material came from the opposite side of the small canyon and from the same approximate levels.

Procamelus sp.—Found among the *Aletomeryx* material are portions of a right tarsus, including the astragalus, cuboid, and navicular, and the distal end of the tibia, all of which articulate perfectly, as well as parts of the cannon-bone and the phalanges. These pertain to a camel of moderate size, and may provisionally be referred to *Procamelus* sp. indet.

Rhinoceros gen. et sp. indet.—There is also a portion of a lower molar of a rhinoceros of indeterminate genus and species. Further rhinocerine skull fragments came from the overlying layers.

Chelonia.—There are also the remains of two or three turtles, including a very perfect skull which lacks only a part of the dorsal surface. This Doctor Wieland has identified as *Trionyx,* while the other material pertains either to two different Emyds or an Emyd with one of the Testudinidæ.

Protohippus placidus.—A conjectural association which, were it not conjectural, would be of real value as a time determinant is a horse molar belonging to *Protohippus placidus* or *niobrarensis,* which Professor Buwalda considers as not earlier than Lower Pliocene time. It is labelled as of Quarry F, but differs in color from any of the teeth from the actual 6-foot level, and we have no positive record of its having been found *in situ.* It might have come from one of the overlying beds. On the opposite side of the canyon, but at a somewhat higher level, Mr. F. W. Darby found a lower jaw with teeth so badly worn as to be undecipherable, together with a metapodial and phalangeal bones. They pertain to a horse about the size of that which bore the tooth mentioned above, and may represent the same genus and species, but more probably belong to a *Merychippus.* If correctly identified, they would fix the age as not later than early Pliocene or late Miocene.[1]

ALETOMERYX GRACILIS, N. GEN. N. SP.

The small ruminant, evidently an antelope new to science, may be called *Aletomeryx*[2] *gracilis,* n. gen. n. sp.

[1] Professor Merriam, after inspecting the material, agrees with this opinion concerning its geological age.

[2] From αλήτης, wanderer, and μήρυξ, ruminant. The name is chosen because of the great migratory power indicated by the slenderness of limb, etc.

The material upon which this description is based is practically perfect, although pertaining to many individuals and so intermingled that with the exception of two mandibles of which the teeth show a peculiar and absolutely symmetrical wear, one can not be sure that any two bones belong to the same individual. There is a palate with teeth as well, in which the wear is also identical.

Some idea of the profusion of animals can be gained from certain figures of which the first two represent the minimum numbers possible, not the maximum.

Left astragali	39
Right "	36
Right proximal metapodials	95
Left " "	99

The last, which have not been separated into front and rear, must represent at least 48 and at most 194 individuals. Of skulls, 19 or more are represented, 16 of which, in addition to an endocranial cast, are of diagnostic value.

Out of this profusion of bone, every element of the skeleton has been recognized, including the vestigial second and fifth digits, and the hyoids, the only exceptions being the first cuneiform, certain ribs, sternals, and the caudals. This being the case, it was possible to make a composite mount of the animal embodying every element except the two first cuneiforms, the caudals, and all but two or three sternals and several ribs. This mount, which includes some unusual features, will be discussed in greater detail below.

Much of the material is in excellent preservation, although the skulls have suffered most, both from erosion and from crushing. The limb bones are generally broken. The teeth for the most part are beautifully preserved.

Description of Mount.

The restoration of *Aletomeryx* here shown (pl. I, and text fig. 1) has some unusual features which are, perhaps, worthy of notice. As far back as 1910, I essayed a restoration of the Connecticut Triassic dinosaur *Anchisaurus colurus,* in which the fragility of the bone and obdurate character of the matrix made the removal and mounting of the bones impracticable. I therefore made a model, one third linear dimensions, in which the skeleton

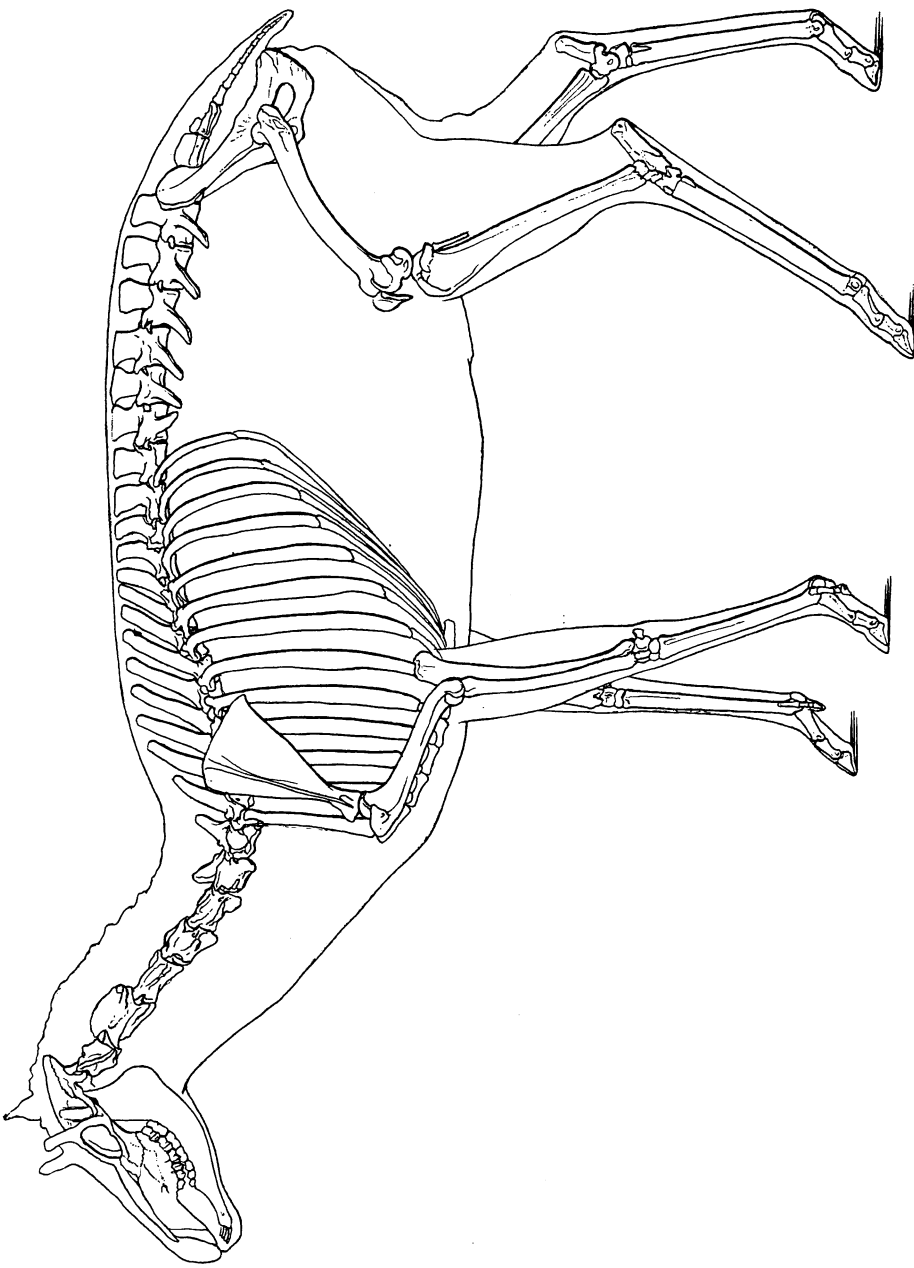


FIG. 1.—Skeleton of *Aletomeryx gracilis*, drawn from the restoration by R. S. Lull. One-fifth natural size.

was modeled in detail on the one side and the flesh on the other. This plan has, I believe, been followed elsewhere (Colorado) in the mounting of the actual bones and modeling the flesh on one side, although I was unaware of it at the time the present restoration was attempted. In both my *Anchisaurus* and the Colorado mount the mistake was made of modeling completely the limbs of the flesh side, leaving the others in their skeletal condition, which made the result incomplete from either aspect. In *Aletomeryx,* therefore, I erected the skeleton, using as few supporting wires as I could, and then modeled the muscles of the right side of the body, head, and all four limbs, so that, viewed from the right, the model is that of a complete animal in the flesh, while the left aspect displays practically the entire skeleton. The bones, with the exception of the skull and pelvis, are nearly all removable and may thus be studied in detail. Sisson's Anatomy of Domestic Animals, and photographs and a mounted head of the prongbuck (*Antilocapra*) were used in the preparation of the model, the musculature of which was studied and rendered with great care.

Morphology.

Axial Skeleton.

Skull (Figs. 2-6).

Holotype, Cat. No. 10732, Peabody Museum Collection. Paratypes Nos. 10747, 10744, 10735, 10734, etc. Two males, two females, and one or more of indeterminate sex, probably males.

The skull of *Aletomeryx* is well proportioned, with an ample brain case, the basi-cranial axis forming an angle of an average of 20 5/7 degrees with the palate, the measurements running 12½, 13½, 16, 23, 23½, 27½, 29 degrees through seven skulls in varying condition of crushing. It therefore somewhat approximates that of *Antilocapra,* in which the average of three skulls is about 23 degrees, with almost no variation among them. *Antilocapra,* however, gives the impression of a greater flexion of the face upon the cranium than does *Aletomeryx.* With the deer the axis of the face is nearly in the same line as that of the cranium. *Aletomeryx,* therefore, in this regard agrees with the hollow-horned ruminants rather than with the deer.

Horns.—The most striking feature of the skull, when preserved, is the horns, differing decidedly in the two sexes as in the prongbuck, *Antilocapra.* These horns arise over the posterior portion of the orbit as in *Antilocapra* and *Dromomeryx,* but differ from those of the former in being triangular in cross-section at their base, the forward angle continuous with the upper, the after one with the hinder rim of the orbit, which is completely surrounded by bone. The outer face of the horn is flush

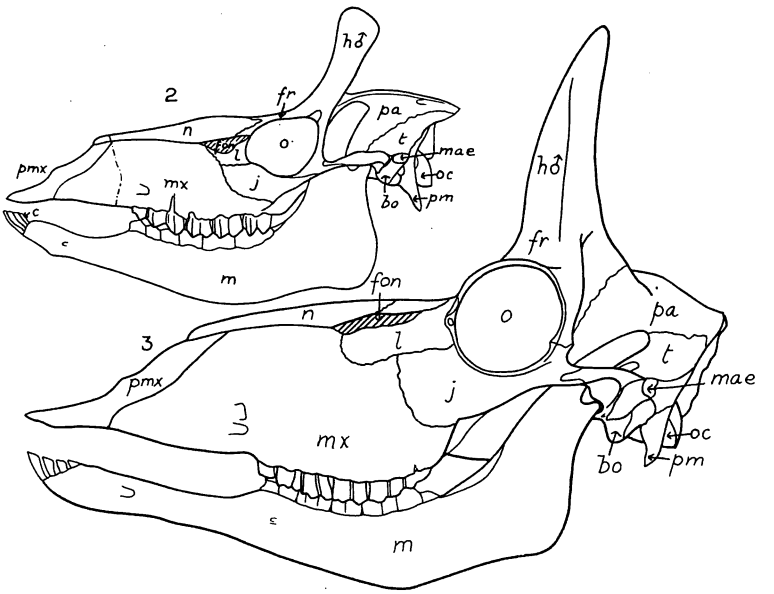


FIG. 2. Skull of *Aletomeryx,* adult male. Left lateral aspect. One-third natural size. *bo,* auditory bulla: *c,* canine tooth; *fon,* fontanelle: *fr,* frontal; *h,* male horn; *j,* jugal; *l,* lachrymal; *m,* mandible; *mae,* external auditory meatus; *mx,* maxillary; *n,* nasal; *o,* orbit; *oc,* occipital condyle; *pa,* parietal; *pm,* paramastoid (paroccipital) process; *pmx,* premaxillary; *t,* temporal.

FIG. 3. Skull of *Antilocapra,* with milk dentition. Left lateral aspect. One-third natural size. Lettering as in fig. 2.

with the rim of the orbit; in *Antilocapra* the rim extends beyond the horn level. The inner angle is prolonged inward as the supratemporal ridge over the top of the cranium, curving backward to meet its fellow and form the parietal crest, which is a thin but low ridge. In *Antilocapra,* on the other hand, there is no crest, as the limitations of the temporal fossæ are wide apart and the rounded hinder edge of the laterally compressed horn

passes into the faint ridge which delimits them. Distally the horn becomes somewhat flattened transversely, but dilated fore and aft, ending in a rounded terminus with an elongated oval section. In *Antilocapra,* the horn-core tapers to a point, the section being flattened with a rounded hinder and sharp forward margin in a young animal (RSL, male) and circular in an older male (Peabody Museum Osteological Collection No. 1518).

In *Aletomeryx* there are faint longitudinal blood-vessel depressions discernible in the older individual, No. 10734, but not in the younger. These impressions occupy the same position as in *Antilocapra,* that is, on the outer aspect, and lodged the artery to the corium or skin of the horn, a continuation of the superficial temporal. In each instance, the artery reaches the horn via the posterior side of the orbit. The superior outline of the orbit is continued upward in the form of a shallow tapering groove 5 mm. or so on the outer aspect of the horn in the male *Aletomeryx.*

The horns of *Dromomeryx* have been described by both Douglass and Scott. Scott's description follows:[3]

"The horns are very peculiar and quite unlike those of any other known genus, fossil or recent. At the base the section forms a spherical triangle, the three sides of which present forward, backward and inward; the anterior face is concave, a feature which is more marked in this species [*Dromomeryx* (*Blastomeryx*) *antilopinus*] than in [*Dromomeryx*] *B. borealis;* the other faces are convex. In the specimen before us the horns are broken away about three inches above the base, but Prof. Cope's numerous skulls of the larger species show that in that form, at least, the horns were remarkably long, perfectly simple and non-deciduous, none of them exhibiting any burr or any tendency to branch. The young stages of *Dicroceros* have a very similar unbranched horn, but the many known skulls of *Blastomeryx* show that this simplicity is not a transitory character in this genus. Faintly marked grooves and ridges may be seen on the surface of the horns, but their smoothness indicates, with great probability, that they were permanently covered with skin. The external angle of the base of the horn in [*D.*] *B. borealis* continued into a wing-like process which extends outward behind the orbit. In the type of *B. antilopinus* this process is broken away, but it can hardly have been so prominent as in the larger species. As in *Dicroceros* and *Antilocapra* the horns rise directly above the orbits, but are more erect than in the former genus."

[3] Scott, W. B., Trans. Amer. Philos. Soc., n. ser., vol. 18, p. 172, 1895.

Douglass thus describes[1] the horns of *Dromomeryx borealis:*

"The horns are nearly circular in section above, but are triangular just above the basal wing-like processes. The latter are directed postero-externally. The antero-external faces are concave and the outer borders thickened."

Douglass restores the horn as tapering to a point, a feature not evident from either description.

In both species of *Dromomeryx,* therefore, the horns are markedly different from those of *Aletomeryx,* in which there is no trace whatever of the basilar wing-like processes, evidently an utterly unique feature of the former genus. Professor Merriam described to the writer orally a specimen in the University of California collection in which the horns are complete, tapering, and curve inward toward the median line of the skull.

Antilocapra is also unique in being the only living ruminant with a deciduous and also a branched horn. The skull before me (RSL, male), a relic of an early expedition to Montana, is that of a young male whose milk incisors and canines had not yet been shed, nor had the third true molars fully erupted. The animal died during the first week in July and upon maceration of the skull a hairy skin was found beneath the horns. In *Aletomeryx* the distal dilatation of the horn precludes the possibility of a dermal horn, for growth on the part of the osseous horn implies either a shedding of the covering as in *Antilocapra* or a shifting outward of the entire structure, additional horn material being secreted within and forming ring-like outcroppings at the base of the older horn, as in the other Cavicornia. It is difficult to see how with a dilated osseous core either of these could be accomplished other than by a splitting of the tegumentary horn. Then, too, the very faint character of the vascular impressions which are relatively much less distinct than in *Antilocapra,* and, indeed, not discernible at all in the younger male, is additional evidence for the absence of any close fitting inelastic covering. The horns are not antler-like, and hence could hardly have been comparable to those of existing deer, except perhaps at the time the antlers are forming and in velvet, when they may also show somewhat dilated termini, as in the fallow deer, comparable to the horn under discussion.

[1] Douglass, Earl, Ann. Carnegie Mus., vol. 5, p. 466, 1909.

The conclusion reached is that the horns of *Aletomeryx* were covered permanently with hairy skin comparable to those of the giraffe or the developing antlers of the deer. This would be a primitive condition leading to that of the prongbuck on the one hand, where the hair develops into a dermal horn by agglutination, or to the deer on the other, where the velvet is shed, laying bare the osseous antler, which in turn is lost. There is no evidence that the horns of *Aletomeryx* were ever shed, nor that they were derived from separate centers of ossification as in the giraffe; they are merely the processus cornuus of the frontal bone. Their surface is not porous as in *Antilocapra* or *Bos,* except on the summit, but in the males is dense and polished like that of the adjacent frontal bone.

Female horns.—The relative development of male and female horns in *Aletomeryx* corresponds to that in *Antilocapra,* as several skulls show. The female horn is merely a low, rounded protuberance with a subtriangular base. Its position is precisely as in the male, which is also true of the axial direction backward and somewhat outward, decidedly so in the old male. The summit of the female horn is finely porous as in *Antilocapra.*

The dimension of the osseous horns are as follows:

	Aletomeryx				
	male 10732	male 10734	male horn 10748/2	male horn 10748/3	female 10735
	m.	m.	m.	m.	m.
Height above orbit	·0265	·0530	·0365	·0300	·0057
Diam. at base, ant.-post.	·0100	·0135	·0115	·0105	·0082
Diam. at base, transverse	·0100	·0174	·0138	·0137	·0080
Diam. at summit,* ant.-post. ...	·0083	·0180	·0188	·0140	
Diam. at summit,* transverse ..	·0060	·0095	·0090	·0100	rounded point.

* Somewhat oblique.

	Aletomeryx		*Antilocapra*		
	female 10747	female skull cap 10748/1	RSL male	male Ost. Col. 1518	RSL female
	m.	m.	m.	m.	m.
Height above orbit	·0100	·0008	·0858†	·0970	·0109
Diam. at base, ant.-post.	·0095	·0095	·0340	·0373	·0167
Diam. at base, transverse	·0097	·0070	·0194	·0225	·0068
Diam. at summit,* ant.-post...	rounded point.				
Diam. at summit,* transverse.	rounded point.		·0055	point.	

* Somewhat oblique. † ·1385 with dermal horn.

Facial and cranial bones.—There is no trace of a suborbital or lachrymal fossa as in most of the deer and antelopes, and herein again *Aletomeryx* agrees with *Antilocapra* and with the Bovidæ.

In the present genus, as well as in *Blastomeryx, Dromomeryx,* and *Antilocapra,* there is on either side of the face a fontanelle closed during life by membrane but now opening into the nasal cavity. This is bounded by the frontal, lachrymal, nasal and maxillary bones. Supraorbital foramina through the frontal into the orbits are also present in each genus. These in *Antilocapra* may be single or divided by a bar of bone into two spaces varying in proportions. In the female *Aletomeryx* skull No. 10747, there are three such foramina arranged in an oblique row on either side of the median line of the skull, while in skull No. 10744 (sex indeterminate), there are but two; again in a third female, No. 10735, one only is present, which is also true apparently of male skull 10734. There is, as in *Antilocapra,* a distinct groove (sulcus supraorbitalis) running from this supraorbital foramen to the fontanelle already mentioned. This is least distinct in No. 10748, where there are three foramina instead of one. This groove marks the course of the frontal vein. (See fig. 4 A, B.)

Just without the supraorbital groove, a little behind the anterior limit of the orbit, is a distinct protuberance which has no equivalent in *Antilocapra* nor in *Dromomeryx.* The fronto-lachrymal suture passes through this eminence, which seems almost like an incipient horn. It is present, though varying in development, in both male and female skulls.

Lachrymal foramina are double as in *Antilocapra,* and lie just within the limits of the orbit, although the anterior one is almost on the margin. "In most deer the orifice of the lachrymal canal is double and situated on the margin of the orbit, whereas in most of the hollow-horned ruminants it is single and placed well within the margin. There are, however, exceptions in both cases" (Flower). Both *Aletomeryx* and *Antilocapra* are among the exceptions.

The frontal bones extend backward to a point a little behind the orbits, much as in *Antilocapra,* but instead of crossing the supratemporal ridge delimiting the temporal fossa, as in the prongbuck, the fronto-parietal suture follows for the most part the very apex of the ridge

until, toward the middle of the skull, the ridges swing backward to unite and form the parietal crest, while with a graceful curve the suture swings across the skull. Thus there is defined a triangular area, bounded in front by the curved suture and on either side by the supratemporal ridges. The sagittal crest is low and very thin,

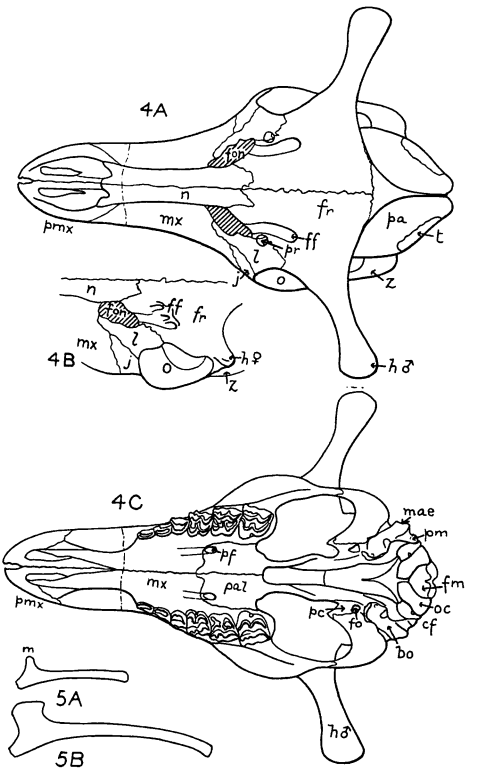


FIG. 4. Skull of *Aletomeryx*. A, male, dorsal aspect; B, frontal region of female, showing horn, *h*, and triple frontal foramen, *ff*; C, male, ventral aspect. *cf*, condyloid fossa; *fo*, foramen ovale; *pal*, palatine; *pc*, pterygoid crest; *pf*, palatine foramen; *z*, zygomatic arch. Other letters as in fig. 2. One-third natural size.

FIG. 5. Hyoid. A, *Aletomeryx*, to be compared with B, *Antilocapra*. *m*, muscular angle. One-third natural size.

almost a knife-like ridge. In *Antilocapra* it does not exist, while in *Dromomeryx* it is low and broad. The temporal ridges are not very well defined, but are roughly parallel with the supratemporal; they fade out entirely on the superior aspect of the skull. A foramen occurs in the left parietal near the sagittal crest in the female skull No. 10735. One can not verify its presence in any

of the other crania because of conditions of preservation. A similar foramen is shown by Douglass[5] and Scott[6] in their figures of *Dromomeryx,* although its position is lower on the skull.

The nuchal crest is generally broken away in the skulls before me. In the holotype, No. 10732, however, it is well developed and overhangs the occiput, so that as preserved it extends about 10 mm. beyond the vertical portion of the occipital bone. To what extent this is exaggerated by crushing, it is difficult to say. Herein again *Aletomeryx* differs from *Antilocapra* and agrees with *Dromomeryx.* The profile of the skull shows a well rounded brain-case, somewhat arched nasals, and a distinct concavity between the orbits just behind the fronto-nasal suture. This is in agreement with *Antilocapra* and to a less extent, perhaps, with *Dromomeryx,* in which the profile is more nearly straight except for the concavity between the orbits in *D. borealis.* Scott makes no mention of this cavity in *D. antilopinus,* but speaks of the "straight upper surface of the skull."

In *Aletomeryx,* there lies between the horns a low but distinct median protuberance corresponding to the frontal eminence of the ox. In *Antilocapra* this frontal eminence is broader, and in the old male No. 1518 forms a transverse ridge connecting the bases of the horns. This ridge lies just behind the frontal depression.

The parietal region of the skull, as seen in profile, is somewhat similar in *Aletomeryx* and *Dromomeryx antilopinus,* curving downward somewhat less than in *Antilocapra.* Douglass restores this portion of the skull of *D. borealis* as though it were nearly straight. His evidence for this is not apparent, and it may have been more as in Scott's specimen and therefore in closer agreement with *Aletomeryx.*

The orbit is somewhat irregular in outline, as shown by the figure, while that of *Antilocapra* and of *Dromomeryx,* to judge from Douglass' figure, is more nearly circular. Scott speaks of the orbit in *D. antilopinus* as being much lower down and farther forward in the face than in *Antilocapra,* its upper border not projecting above the superior contour of the cranium. This is not entirely true of *Aletomeryx,* for while the postorbital region of the skull is relatively longer than in *Antilocapra,* the orbit is relatively high and the upper margin does extend above the superior contour of the cranium.

[5] Op. cit., pl. LIX.

[6] Op. cit., pl. VI.

The jugal below the orbit is expanded transversely and concave inferiorly, as in *Antilocapra* and *Dromomeryx;* in the former, however, it is the postorbital portion of the frontal over which the widest measurement of the skull is taken, in *Aletomeryx* it is the lower margin of the orbit, in *Dromomeryx* it is over the wing-like processes at the base of the horns.

Basicranial portion of the skull.—As compared with *Antilocapra,* the proportions of this area of the skull differ markedly, as the entire after portion is relatively much longer in proportion to the width in *Aletomeryx.* Aside from this, the differences are largely those of detail. The occipital condyles are relatively somewhat broader in *Aletomeryx,* although their proportions vary slightly in the several available crania, which is also true of *Antilocapra.* The condyloid fossa is deep and the condyloid or hypoglossal foramina are apparently single, not double as in *Antilocapra.* In *Dromomeryx antilopinus,* Scott describes the condyloid fossa as being much larger and more deeply impressed than in *Antilocapra.* This is not true of *Aletomeryx.* In both *Dromomeryx* and *Aletomeryx,* however, the paroccipital process is further in advance of the posterior limit of the condyles than in the prongbuck.

The auditory structure is much as in *Antilocapra,* the wedge-shaped paramastoid process being laterally compressed and pointing somewhat backward as in *D. antilopinus,* not forward as in the prongbuck and in Douglass' figure of *D. borealis.*

The relations of the mastoid agree, apparently, in *Dromomeryx* and *Aletomeryx.* Tympanic bullæ are relatively much the same as in *Antilocapra;* the deep groove for the attachment of the stylohyoids of which Scott speaks and which forms a deep pit in the *Antilocapra* skull before me is hardly in evidence in skull No. 10735, but is better developed in No. 10749 and No. 10750. The shape and degree of inflation of the bullæ differ quite markedly in these three skulls. As in *Dromomeryx,* the external auditory meatus is a long tube which is directed more posteriorly than in *Antilocapra,* forming an angle with the axis of the skull of about 60 degrees in *Aletomeryx* to 70 degrees in *Antilocapra.*

The glenoid cavity is comparable to that of *Antilocapra,* except that the anteroposterior diameter is greater and the pterygoid crest is much more developed. The postglenoid process is much more prominent than

in *Antilocapra*. Herein *Aletomeryx* agrees with *D. antilopinus*. The palatine bones show much the same development in *Aletomeryx* and the prongbuck, and the grooves leading forward from the anterior palatine foramina over the surface of the maxillaries are comparable. In none of the crania before me is it possible to recognize the vomers. As preserved, the sphenoid extends clear forward into the posterior nares, forming the only visible axis of the skull (see fig. 4 C), whereas in *Antilocapra* at least one half the basal axis from the hinder margin of the hard palate to the foramen magnum is formed by the vomers. This apparent distinction may be merely accident of preservation. The form of the palate between the cheek teeth varies in the different *Aletomeryx* skulls as it does in two of the prongbuck skulls before me. In the latter, the tooth series form straighter lines in the male than in the female. In *Aletomeryx* I can not see that this variation in the degree of curvature is in any way determined by sex, but on the other hand is a matter of individual variation pure and simple. As in *Antilocapra*, the outline of the palate is generally sharply constricted just in front of the tooth series. In No. 10747 (female), on the other hand, this is not evident. In no skull is the muzzle preserved, so that there is no direct evidence of the presence or absence of upper canine teeth. In all the great profusion of teeth, however, that were recovered from the quarry, some vestige of a canine would surely be present had such been a characteristic of the animal, especially as they were most diligently sought for. It is negative evidence, but to me conclusive in favor of the belief that this genus possessed no such tusk-like canines as did *Blastomeryx* (see fig. 25). The lower canines are present, incisiform, and form part of the incisor series without diastema.

The cranial measurements follow:

	Aletomeryx			
	10732 mt'd. sp'm. m.	10744 mid-adult m.	10749 adult m.	10760 Young unworn dent. m.
Length over all (est.)	·1712	·170	?	?
Width of brain case	·043	·048	·0473	?
Maximum width (zygoma)	·078	ca. ·080	?	ca. ·080
Height ant. to orbit	·032	·035	?	·035
Vert. diam. of orbit	·020*	est. ·027	·020	·026
Occipital height	·0335	·035	·028*	?
Occipital width	·044	ca. ·042	·0445	?
Width of palate at M^2	ca. ·028	·029	·0264	ca. ·032*

* Crushed.

	Antilocapra			
	RSL Young male milk dent.	180 female Adult worn dent.	RSL Young female milk dent.	Ratio 10744 and 180
	m.	m.	m.	m.
Length over all	·2840	·2860	·2550	1·68
Width of brain case	·0700	·0720	·0730	1·50
Maximum width (zygoma)	·1300	·1280	·1250	1·60
Height ant. to orbit	·0650	·0700	·0634	2·00
Vert. diam. of orbit	·0400	·0436	·0400	1·61
Occipital height	·0575	·0570	·0565	1·63
Occipital width	·0825	·0790	·0763	1·88
Width of palate at P^2	·0350	·0305	·0310	1·17
Width of palate at M^3	·0485	·0520	·0485	1·45
				Av. 1·61

Brain.—A very excellent natural cast of the interior of the cranium of *Aletomeryx* exists (Cat. No. $\frac{10765}{1}$), lacking only the olfactory bulbs and certain details of the inferior aspect. Another specimen, however (Cat. No. $\frac{10765}{2}$), consisting of a cranial floor containing a residue of matrix, was cleared and a wax impression taken of its interior. This gave additional data, so that we are lacking only the olfactory bulbs and optic nerves, and these have been restored in the drawings (fig. 6). The endocranial cast differs of course from the brain itself in that it is a replica of the dura mater and not of the cortical surface, hence the fissures are neither so numerous nor so well-defined as they would be in the actual brain. Furthermore, the imprint of the inner surface of the petrous bone, which is so striking a feature of the cast, is lacking on the brain itself. Nevertheless, the relative proportions of parts are clearly shown, although in the inferior aspect (fig. 6 C), instead of cranial nerves one sees the impressions of the several foramina which transmitted them.

The brain is of considerable size, as the figures, which are in their natural dimensions, show, but varies somewhat in proportions as compared, for instance, with that of the ox, in that the portion below the rhinal fissure is relatively larger and the cerebral portion above proportionately less, a more primitive condition in the fossil. The hinder portion of the cerebrum is of ample width as compared with the prefrontal area, showing a relatively high development of muscular control as compared with intelligence. The centers of hearing and sight are also

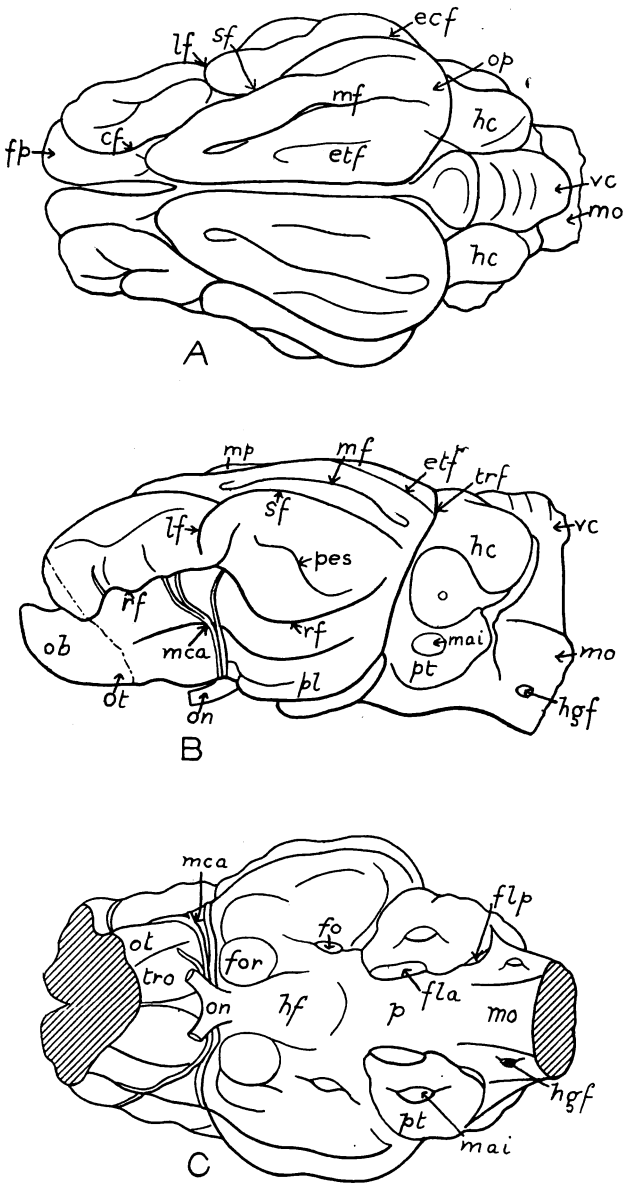


FIG. 6.—Brain-cast of *Aletomerya*. A, dorsal; B, left lateral; C, ventral aspect. Natural size. *cf*, coronal fissure; *ecf*, ectomarginal; *etf*, entomarginal; *ftu*, foramen lacerum anterius; *fip*, foramen lacerum posterius; *fo*, foramen ovale; *for*, foramen orbito-rotundum; *fp*, frontal pole; *hc*, hemisphæria cerebelli; *hf*, hypophysial fossa; *hgf*, hypoglossal foramen; *lf*, lateral fissure; *mai*, meatus acusticus internus; *mca*, middle cerebral artery; *mf*, marginal fissure; *mo*, medulla oblongata; *mp*, marginal pole; *ob*, olfactory bulb; *on*, optic nerve; *op*, occipital pole; *ot*, olfactory tract; *p*, pons varolii; *pes*, posterior ectosylvian fissure; *pl*, piriform lobe; *pt*, petrous temporal impression; *rf*, rhiral fissure; *sf*, suprasylvian fissure; *trf*, transverse fissure; *tro*, trigonum olfactorium; *vc*, vermis cerebelli.

ample in development, as were apparently those of the sense of smell. The cranial cast displaces 45 cc. of water; estimating the specific gravity as approximately 1, it would give a brain weight of ca. 45 grams or 1½ ounces.

Further detailed description is rendered unnecessary by the figures, in which the size, identifiable fissures, and foramina are indicated.

Mandible.

Mandibles representative of more than twenty individuals are present in greater or less degree of perfection. They pertain to individuals of varying age, from very young with milk dentition to aged animals whose teeth were badly worn. The ramus is rather slender, though proportionately less so than in *Antilocapra,* and the shape of the jaw from below the third molar to the angle varies as well, as the figures show, that of *Aletomeryx* lacking the peculiar cut-away appearance of the prongbuck. Thus the whole ascending portion of the ramus is relatively much broader in the fossils, and the coronoid process is more erect. This is in harmony with the longer and more primitive cranial portion of the *Aletomeryx* skull. The anterior part of the mandible changes form somewhat with age as with *Antilocapra,* the rami becoming more slender just behind the symphysis. The symphysis itself also lightens, for in the younger jaws the presence of both milk and permanent incisors, the latter in process of formation, necessitates a greater volume of containing bone. The mental foramen lies just behind the after symphysial limit; the mandibular foramen, which is on the inner face of the ascending process, lies at about the upper level of the teeth in the older specimen, about their mid-height in the younger jaws.

Four alveoli are present at the anterior end of each ramus for the three incisors and the incisiform canine which forms an integral part of the cropping series. In jaw No. 10754 the uncut I_3 and canine are present, in another fragmentary symphysis, $I_{2 \text{ and } 3}$. The unworn tooth crowns as they appear are spatulate with entire rounded margins quite comparable to those of *Antilocapra.* They may have been somewhat more procumbent. Several loose incisors are present in the material, but none that were in use are in position in any of the jaws.

Scott's specimen had no trace of any lower jaws; Douglass, on the other hand, figures several pertaining to *Dromomeryx americanus, borealis,* and *madisonius.* His restoration of the skull of *D. borealis*[7] shows a jaw very different from that of *Aletomeryx* at the anterior end, as it is much more slender and lacks the graceful downward curve of the upper margin. It is possible that the figure may be somewhat in error, especially as the mental foramen is omitted.

The posterior portion of the jaw of *D. borealis* is not preserved. The condyle in *Aletomeryx* shows a saddle-shaped surface comparable to that of *Antilocapra.*

Mandibular dimensions appear below.

	Aletomeryx			
	10754 Unworn	10763 Mt'd. sp'm.	10762	10761 Very old
	m.	m.	m.	m.
Length of ramus	·1330	·1340	·1327	·1250
Depth at P_2	·0130	·0149	·0137	·0128
Depth at M_1	·0165	·0160	·0170	·0144
Depth at M_3, outside	·0218	·0240	·0214	·0180
Length of molar-premolar ser.	·0630	·0640	·0610	·0586
Length of premolars	·0210	·0223	·0200	·0183
Length of molars	·0425	·0426	·0410	·0377

	Antilocapra			
	RSL male milk	180 female	RSL female milk	Ratio 10762 and 180
	m.	m.	m.	
Length of ramus	·2150	·2130	·1960	1·60
Depth at P_2	·0230	·0215	·0200	1·49
Depth at M_1	·0324	·0240	·0324	1·41
Depth at M_3, outside	·0337	·0355	·0345	1·66
Length of molar-premolar ser.	·0775	·0750	·0800	1·23
Length of premolars	·0282	·0240	·0300	1·20
Length of molars	·0490	·0490	·0500	1·20
				Av. 1·39

Teeth (figs. 7, 8).—The dental formula of *Aletomeryx* is $I\frac{0}{3}$, $C\frac{0}{1}$, $P\frac{3}{3}$, $M\frac{3}{3}$, agreeing therein with the Antilocapridæ, Giraffidæ, Bovidæ, and with all Cervidæ in which the upper canine is lacking. The incisiform lower canine is present as in the above families.

The first premolars are of course lacking in each jaw, but the remaining premolars and molars form a compact row in which the teeth show a slight tendency to overlap

[7] Op. cit., pl. LIX.

so that the total length of the series is less than the sum of their individual dimensions.

The premolars in each jaw show no tendency to become molariform. A curious partial exception lies in skull No. 10749, in which the third left upper premolar (P^3) has two inner and but one outer lobe, which, however, is disproportionately long. The equivalent tooth on the right side is normal. This is of course an abnormality, an instance of meristic variation. The cheek teeth show a

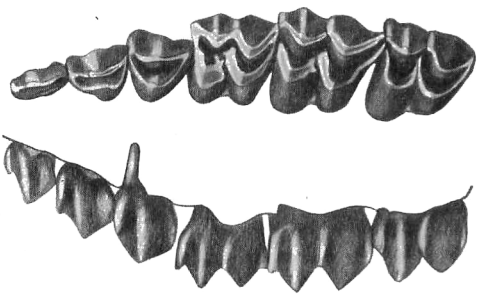


FIG. 7. Upper dentition, crown view and from without, of *Aletomeryx*. Cat. No. 10760. Slightly more than natural size.

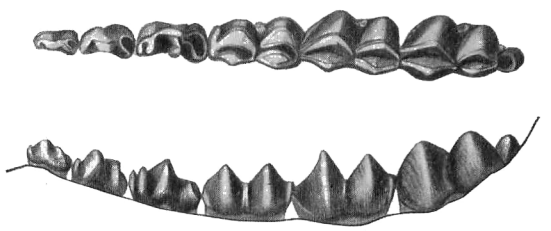


FIG. 8. Lower dentition, crown view and from within, of *Aletomeryx*. Cat. No. 10754. Natural size.

slight tendency to become hypsodont, although not so much so as in the prongbuck. Herein they differ apparently from *D. borealis*, in which "the molars are very brachyodont" (Scott).

P^2 is an elongated oval, somewhat irregular in external outline, and consists largely of a single cusp, the protocone, flanked anteriorly by a pronounced accessory cusp. Internally the deuterocone is the merest rudiment, on a well-developed but narrow cingulum, which is in marked contrast to that of *Dromomeryx*, in which P^2 bears a well-

developed inner lobe. Externally the anterior cusp is buttressed by a pronounced style corresponding to the parastyle of the molars. There is, however, a less decided ridge flanking the protocone than in *D. borealis*. Comparison with *D. americanus* and *D. antilopinus* is impossible from lack of preservation of the tooth.

P^3 is broader in proportion to its length and subtriangular in outline. The protocone is well developed, but the anterior cusp is relatively less pronounced, although well buttressed. Here the deuterocone is present and the inner crescent is no longer like a mere cingulum but is better developed, although in a stage transitional between that of P^2 and P^4. There is practically no trace of a cingulum such as that indicated by Douglass[8] in *D. borealis*. In P^4 the transverse diameter exceeds the anteroposterior for the first time, the tooth being again triangular with a well-rounded internal angle. The internal crescent forms about one third the bulk of the tooth, but the deuterocone has practically merged into the crescent, a faint ridge on the inner concave face of the latter being its only indication. The outer crescent is flanked by an anterior, median, and posterior style, the last being the least conspicuous. P^2 is two-rooted, while P^3 and P^4 are borne upon three each, in conformity with their triangular shape.

Upper molar teeth.—The three upper molars are somewhat similar. The first and second have accessory folds on the adjacent ends of their inner crescents, on both in M^1, on the anterior crescent in M^2. No trace of a cingulum is present, but each tooth bears a very small internal cusp lying between the bases of the inner crescents. This varies in development in different individuals. Externally the parastyle and mesostyle are strongly developed, as is also a buttress flanking the paracone. The outer face of the posterior external crescent (metacone) shows no such buttress. In *Dromomeryx antilopinus* (Scott) the third premolar is the largest of the series, exceeding P^4 in both dimensions, which is not true of the present form, wherein P^4 has the greater transverse diameter and area, although it is somewhat less than P^3 antero-posteriorly. The proportions of the molar teeth agree in the two species, as do the para- and mesostyles. The same is true of the median rib on the antero-external crescent and of its obsolescence on the postero-external. Scott

[8] Op. cit., pl. LXIII, figs. 1, 6.

also speaks of the progressive increase in size of the internal pillar of upper molars 1-3 in *D. antilopinus* and of its being very small or absent on M^3 and larger on M^{1-2} in *D. borealis*. These are variations within the species of *Aletomeryx*, and are probably not of diagnostic value in *Dromomeryx*. Scott also speaks of the relative shortness of the hinder horn of the antero-internal crescent and the curious crenulations of the adjacent horns, which is also true of *Aletomeryx*, although in M^1 as a rule the crenulations are most pronounced, while they may be absent in M^3. In *D. borealis* this crenulation is apparently absent. The chief tooth distinctions therefore between *Aletomeryx* and *D. antilopinus* are the much greater size of the entire series, the relatively greater size of P^3, and the decidedly brachyodont character of the teeth of the latter. From *D. borealis*, the size and brachyodont distinction also holds, together with the distinction of P^2 already mentioned, and the simplicity of the adjacent horns of the inner crescents, although in one specimen referred by Douglass[9] to this species this last distinction does not hold. Cingula are mentioned by Douglass on the anterior face of the antero-interior cusps (?crescents). None are discernible in *Aletomeryx*. He also states that the valleys between the inner and outer crescents are not deep. In *Aletomeryx* they are very deep in the unworn tooth.

Lower dentition (fig. 8).—The premolars increase in size and complexity from P_2 to P_4; their chief distinctions from those of *D. borealis* and *D. americanus* lie not only in the lesser actual size of the teeth, but in the greater simplicity of P_3. The molar teeth in *Aletomeryx* all lack the "*Palæomeryx* fold" on the posterior face of the antero-external crescent; otherwise they also are generally similar.

The lower dentition in *D. antilopinus* is apparently unknown. The degree of hypsodonty in the lower teeth of *D. americanus*, *D. borealis* and *D. madisonius* is in approximate agreement with *Aletomeryx*. The enamel wrinkling of the outer surface of the teeth is much the same. There is here a slight individual variation in *Aletomeryx*, depending in part on the degree of wear.

The tooth measurements are (see also table of mandibular measurements):

[9] Op. cit., pl. LXIII, fig. 1.

Aletomeryx

	10732 M'td. sp'm.	10744	10749	10760
	m.	m.	m.	m.
Molar-premolar ser.	·0498	·0526	·0540	·0567
Premolar ser.	·0250	·0220	·0233	·0250
P^2, length	·0070	·0073	·0076	·0080
P^3, length	·0080	·0080	·0080	·0092
P^4, length	·0087	·0076	·0072	·0085
Molar ser.	·0323	·0334	·0323	·0360
M^1, length	·0085	·0098	·0100	·0118
M^1, width		·0114	·0104	·0118
M^2, length	·0105	·0118	·0115	·0130
M^2, width		·0132	·0124	·0134
M^3, length	·0128	·0121	·0120	·0136
M^3, width		·0129	·0120	·0133

Antilocapra

	RSL male	RSL female a little older than RSL male	180 female adult, worn	Ratio 10749 and 180
	m.	m.	m.	
Molar-premolar ser.	·0732	·0715	·0710	1·31
Premolar ser.	·0320*	·0320*	·0280	1·20
P^2, length	·0097*	·0100*	·0076	1·
P^3, length	·0116*	·0110*	·0095	1·19
P^4, length	·0128*	·0125*	·0090	1·25
Molar ser.	·0428	·0440	·0455	1·40
M^1, length	·0147	·0142	·0130	1·30
M^1, width	·0105	·0105	·0105	1·01
M^2, length	·0157	·0160	·0150	1·30
M^2, width	·0098	·0098	·0114	0·92
M^3, length	·0145+	·0150+	·0178	1·48
M^3, width	·0086+	·0070+	·0110	0·91
				Av 1·19

Milk dentition.—There are three specimens, a right (Cat. No. $\frac{10766}{1}$) and a left (Cat. No. $\frac{10766}{3}$) maxillary and a right mandible (Cat. No. $\frac{10766}{2}$), containing milk teeth. The two maxillaries do not seem to pertain to the same individual, as in one the teeth are somewhat smaller. Each contains three teeth preceded by a single empty alveolus in front of which the bone is broken away. The larger individual contains a portion of another molar, only a tip of which protrudes, while the broken hinder surface of the other specimen shows a very distinct tooth impression. There is nothing distinctive about the two posterior teeth, which are typical molars, except that the external column of the postero-external crescent is more distinct than in the adult teeth. The anterior of the pre-

served teeth, however, apparently Dp^3, is very distinctive, having two external crescents which are quite molar-like, while the single internal crescent, if such it may be called, is complicated by a median fold which in turn bears crenulations and abuts against the space between the two outer crescents. The horns of the inner crescent are extended fore and aft and the posterior one bears an internal crenulation. Anteriorly a fold extends inward from the antero-external crescent to embrace the forward horn of the inner crescent. It forms the anterior border of the roughly triangular tooth.

Lower milk dentition.—Four teeth are preserved. Here the most peculiar feature lies again in the complexity of a single tooth, this time Dp_4, which is not unlike a molar except that it is three-lobed like M_3 reversed, in that the anterior lobe is the smallest. This lobe consists of an external and internal portion connected together broadly by their anterior ends and diverging posteriorly, otherwise they resemble somewhat a miniature replica of the inner and outer crescents of a normal lobe. An external pillar arises from the cingulum in each reëntrant angle between the lobes, making two instead of the normal one.

The measurements of the milk dentition, all maximum, are as follows:

	m.
Upper series.	
Total length of the three teeth	·0300
Dp^3, length	·0106
Dp^3, breadth	·0073
Dm^1, length	·0115
Dm^1, breadth	·0093
M^2, length	·0122
M^2, breadth	·0102
M^2, height of crown	·0098
Lower series.	
Total length of the four teeth	·0340
Dp_2, length	·0055
Dp_2, breadth	·0022
Dp_3, length	·0070
Dp_3, breadth	·0034
Dp_4, length	·0115
Dp_4, breadth	·0055
M_1, length	·0113
M_1, breadth	·0063

Hyoid (fig. 5).—A pair of hyoid elements are present, representing the right and left stylohyals or great cornu. Of these, the right is complete for its entire length. Compared with the equivalent bone of *Antilocapra,* the fossil is somewhat more robust in proportion to its length, the distal end is flatter and more expanded, but while the proximal articular portion is more robust, the muscular angle is much more slender. In *Antilocapra,* this has a marked fore and aft expansion. In *Aletomeryx,* the angle corresponds more nearly with that of the ox. It is the place of origin of the stylohyoid muscle, the action of which is to draw the base of the tongue upward and backward. The significance of the relative development of this muscle is, however, not clear.

Vertebral Column (Figs. 9-13).

The vertebral formula is assumed to be that of the prongbuck[10]—cervical 7, thoracic 13, lumbar 6, sacral 4, caudal?—which in turn compares with the ruminants in general except for the reciprocal variation of 13 thoracic to 6 lumbar or 14 thoracic to 5 lumbar. As there is no complete series of vertebræ pertaining to a single individual, there is here a chance for error.

The vertebral column as a whole is about 700 mm. long, and the regional measurements as compared with those of *Antilocapra* (female) No. 180 follow:

	Aletomeryx	*Antilocapra* No. 180	
	m.	m.	Ratio
Cervical	·0203	·0335	1·75
Thoracic	·0245	·0335	1·364
Lumbar	·0193	·0245	1·464
Sacral	·0066	·0086*	1·30+
Total	·0707	·1001	Av. 1·475

* Four sacrals.

Cervical vertebræ. Atlas (fig. 9).—This bone resembles that of *Antilocapra* very closely, differing mainly in that the outer margins of the wings are more nearly

[10] In both *Antilocapra* skeletons before me the sacrum consists of five vertebræ, but four is the number given in Flower's Osteology.

parallel and the median notch on the antero-ventral margin is much less pronounced. The position and development of both dorsal and ventral tubercles correspond, as do the several foramina. There is of course slight individual variation among the several atlases before me, which I have designated Nos. 1-3. The measurements, all maximum, follow:

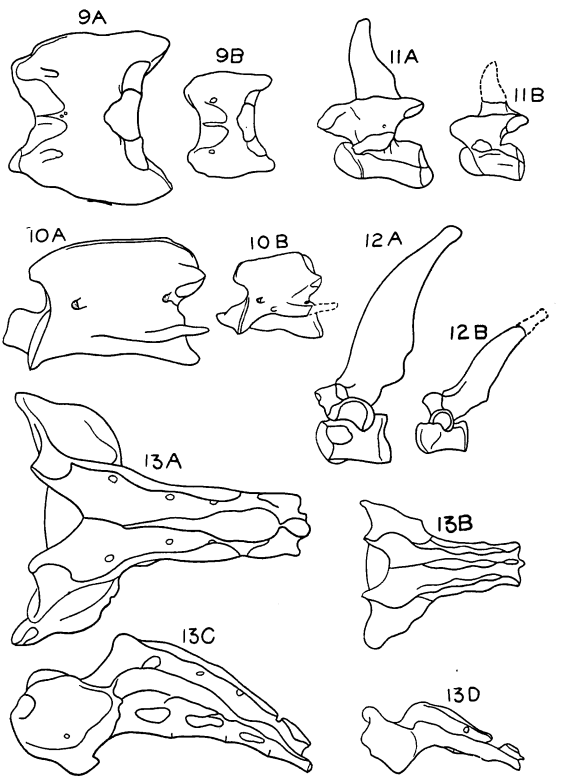


FIG. 9. Atlas, dorsal aspect. A, *Antilocapra;* B, *Aletomeryx.* One-third natural size.

FIG. 10. Axis, left lateral aspect. A, *Antilocapra;* B, *Aletomeryx.* One-third natural size.

FIG. 11. Cervical VI. A, *Antilocapra;* B, *Aletomeryx.* One-third natural size.

FIG. 12. Dorsal I. A, *Antilocapra;* B, *Aletomeryx.* One-third natural size.

FIG. 13. Sacrum. A, dorsal aspect, *Antilocapra;* B, same, *Aletomeryx;* C, left lateral aspect, *Antilocapra;* D, same, *Aletomeryx.* One-third natural size.

	Aletomeryx			Average	*Antilocapra*	
	1	2	3	*Aletomeryx*	180 female	
	m.	m.	m.	m.	m.	Ratio
Length	·0359	·0373	·0360	·0364	·0626	1·72
Width	·0430	·0440*	·0470	·0444	·0693	1.56
Depth over tubercles	·0210	·0243	·0280	·0244	·0458	1·87
Neural canal, width	·0137	·0160	·0145	·0147	·0211	1·44
" " depth post.	.0140*	·0135	·0157	·0144	·0210	1·46
" " " ant.	·0114	·0126	·0110·	0117	·0177	1·51
						Av. 1·59

Indices, length to width, 1·22: 1·10

* Estimated.

Axis (fig. 10).—The axis bones of *Antilocapra* and *Aletomeryx* (numbered 1-3) are again very similar, the only noticeable distinctions being the flatter centrum and more pointed odontoid process and the greater obliquity of the anterior face in the fossil. The foramen transversarium is also more conspicuous in the fossil. Other differences will show in the table of measurements.

	Aletomeryx					
	1 Young	2	3	Average 2 and 3	*Antilocapra*	
	m.	m.	m.	m.	m.	Ratio
Length, centrum	·0410*	·0455	·0469	·0462	·0776	1·68
Width, ant. face	·0255	·0270	·0277	·0273	·0430	1·57
Width, across postzygapophysis	·0190	·0236	·0250	·0243	·0315	1·30—
Depth	·0345	Not preserved.			·0520	
Neural canal, width	·0070	·0097	·0097	·0097	·0145	1.50
Neural canal, height	·0070	·0083	·0085	·0084	·0144	1.76
						Av. 1·56

* Epiphysis lacking.

Cervicals III-V.—Cervical III, as in *Antilocapra,* lacks the spinous process which begins to appear in cervical IV, and is better developed in cervical V but is well at the anterior end of the arch. It reaches its culmination in vertebra VII. The principal distinction between cervical V and the equivalent one of *Antilocapra* lies in the position of the transverse process, which lies relatively further forward in the fossil, and the foramen transversarium is single instead of being paired. The vertebral spine is pronounced as in the other cervicals, and tends to become cleft inferiorly.

The dimensions of cervical V are as follows:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Length of centrum	·0320	·0540	1·69
Width, anterior face	·0127	·0176	1·39
Depth, anterior face	·0110	·0177	1·61
Neural canal, height	·0087	·0123	1·41
Neural canal, width	·0109	·0138	1·26
Width across postzygapophysis	·0220	·0360	1·63
			Av. 1·50

Cervical VII.—This bone again resembles very closely that of the prongbuck, the main distinction being the greater fore and aft extension of the zygapophyses, which is true also of cervical VI (see fig. 11), and, although to a less extent, of cervical V. In this feature there is individual variation, at least one seventh cervical of *Aletomeryx* approximating that of *Antilocapra* in this respect. There are well developed capitular rib facets on the after margin of the centrum, but the ventral spine is lacking in both this and the preceding vertebra.

The measurements of cervical VII are as follows:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Centrum, length	·0245*	·0377	1·54
Centrum, width, posterior face	·0190	·0327	1·72
Centrum, height, posterior face	·0130	·0186	1·43
Neural canal, width	·0123	·0164	1·33
Neural canal, height	·0090	·0140	1·55
Width across postzygapophyses	·0254	·0390	1·54
			Av. 1·52

* Allowance made for lacking epiphysis.

Dorsal vertebræ.—In the fossil the dorsal vertebræ are ill preserved, as the spinous process is rarely present and even the neural arch and transverse processes are generally imperfect.

Dorsal I (fig. 12).—A nearly perfect example of this element, aside from the one in the restoration, lacks only the epiphyses and the tip of the spinous process. Again the resemblance to the equivalent bone in *Antilocapra* is most striking, even to the paired longitudinal ridges on the ventral aspect of the centrum. The chief distinction seems to be a double-ridged low process on the posterior margin of the spinous process just above the

postzygapophyses. This is indicated but faintly in *Aletomeryx*. There is a little distinction in the arrangement of the minute foramina which penetrate the lateral aspect of the centrum. In *Aletomeryx* the postzygapophysial facets are separate, in *Antilocapra* they are confluent.

The measurements follow:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Centrum, length	·019*	·0290	1·53
Height over all	·055†	·0900	(1·63)
Width across transverse processes	·038	·0567	1·49
Neural canal, height, anterior end	·011	·0134	1·22
Neural canal, width	·012	·0160	1·33
			Av. 1·37

* Allowance made for epiphyses lacking.
† Estimated.

Dorsal XIII.—The thirteenth dorsal vertebra again compares closely with that of *Antilocapra*, the principal distinctions being the proportionately less height of the centrum and the relatively lighter rib facets. The spinous process is incomplete but it seems to have been less erect in the portion preserved.

The measurements follow:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Centrum, length	·0205	·0300	1·46
Centrum, width, posterior	·0200	·0280	1·40
Centrum, height, posterior	·0112	·0186	1·66
Height over all	·0430*	·0700	1·63
Width over transverse processes	.0280	·0404	1·44
Neural canal, height, anterior	·0060	·0100	1·67
Neural canal, width, anterior	·0090	·0130	1·44
			Av. 1.53

* Estimated.

Lumbar vertebræ. Lumbar III.—This bone differs from that of *Antilocapra* mainly in the less pronounced ventral ridge, the relatively greater fore and aft extent of the summit of the spinous process, and the less proportionate height of the centrum and of the entire bone.

The dimensions are:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Centrum, length	·0250	·0340	1·36
Centrum, height, anterior	·0140	·0218	1·55
Centrum, width, anterior	·0185	·0220	1·19
Height over all	·0373	·0707	1·89
Width over transverse processes	·0800*	·1070	1·34
			Av. 1·46

* Estimated.

Lumbar VII.—The most remarkable feature of this bone is the relative length of the centrum, which is ·028 m. long compared with ·0315 for *Antilocapra*, a ratio of but 1·12 as compared with 1·36 for the third lumbars. This would seem to be a more primitive feature. The condition of the bone renders other over-all measurements of little value.

The dimensions are:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Centrum, length	·0280	·0315	1·12
Centrum, height	·0122	·0184	1·51
Centrum, width	·0195	·0264	1·36
			Av. 1·33

Sacrum (fig. 13).—Several sacra are present, none of which consist of more than four vertebræ. In the two specimens of *Antilocapra* before me, however, there are five. This number may be due to the coalescence of the anterior caudal. Some of the fossil sacra must have pertained to animals of equivalent age, so that the four-vertebræ condition may also be looked upon as more primitive. In the male prongbuck No. 1518, the summits of the sacral spines are all free, while in the large female, No. 180, they are coalesced and the third and fourth are broadened out laterally as well. In all the *Aletomeryx* sacra there is a coalescence of the first two or three spines to form the median sacral crest, with somewhat broadened summits. The posterior centra are relatively broader and flatter than in *Antilocapra* and the intercentral (ventral sacral) foramina have less fore and aft extent. In both genera there is a very rapid narrowing of the sacrum from the wings backward, variable, how-

ever, in individuals in the fossil. In general the prongbuck sacrum does not taper so much behind the wings as do those of *Aletomeryx*. This greater tapering in the fossil may again be indicative of greater primitiveness.

The measurements follow:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Length over all	·0645	·1000*	1·55
Height over all	·0285†	·0570	2·00
Breadth across wings	·0605	·1000	1.65
Length of centrum I	·0170	·0250	1·47
Length of centrum II	·0155	·0212	1·36
Length of centrum III	·0130	·0200	1·54
Length of centrum IV	·0138	·0180	1·30
Width, posterior end	·0170	·0258	1·52
			Av. 1·55

* Four sacrals only.
† Somewhat crushed.

Caudal vertebræ.—No trace of *Aletomeryx* caudals has been found. It is fair to assume, however, that the tail approximated the average ratio of the vertebral column, about 1·40. Of the caudal vertebræ of *Antilocapra,* No. 180, but two remain. The male, No. 1518, a smaller animal, has a tail ·125 m. long, while the sacrum measures but ·085 m. The sacrum of the mounted *Aletomeryx* measures ·063 m. If the ratio of tail to sacrum were constant, the rule of proportions would give a length of ·0926 m. for that of *Aletomeryx.* This is probably a minimum estimate, as caudal reduction is to be expected in these forms with evolutionary advance.

Ribs.—A number of ribs are present, none of which, however, is complete throughout its entire length. They have no outstanding differences with those of *Antilocapra* except perhaps a less width. At any rate, there seem to be fewer wide ribs in the fossil, but to what extent this apparent difference is due to imperfection of the material is not so clear.

Sternum.—Three sternal elements are present, of which two may pertain to the manubrium; one certainly does. This seems to lack the anterior extremity, otherwise it differs from that of *Antilocapra* in the greater relative volume at mid-shaft, and if correctly oriented, in possessing a dorsal median groove where the prongbuck

possesses a ridge. The mid-shaft in *Aletomeryx* is actually wider than in *Antilocapra*. Another sternal, which may be the fourth, is broad and flat, with dilated extremities and a concave dorsal surface. Ventrally, there is a slight longitudinal ridge which is lacking in the prong-buck.

Relative dimensions are:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Manubrium.			
Length	·0360*	·0550	1·53
Width, posterior end	·0117	·0170	1·53
Depth, posterior end	·0100	·0170	1·70
Least width	·0085	·0080	0·94
Sternal IV.			
Length	·0280	·0410	1·46
Greatest width	·0260	·0334	1·28
Least width	·0140	·0547	3.92
			Av. 1·77

* Incomplete.

APPENDICULAR SKELETON.

Fore Limbs.

Scapula (fig. 14).—Many scapular fragments are present, one pair being in excellent condition. Of these, one, the smaller left, which is on the mounted specimen, is proximally perfect and distally partly restored from the impression in the matrix. The other, right, is left out of the mount, as it would be embedded in the flesh, and is therefore available for description. It resembles that of *Antilocapra,* as the figures show (see fig. 14), differing mainly in being more widely triangular in proportion to the length. The ratio of the last dimension greatly exceeds that of vertebral dimensions, as is apparent from the measurements. The spine is high, with a slightly reflected edge in its upper portion. In *Antilocapra,* the reflected edge extends to the acromion. Muscular impressions are comparable. The posterior margins are slightly different. The same is true of the position of the nutritive foramina. The round ligament is clearly impressed in the glenoid fossa in *Antilocapra.* In *Aletomeryx* there is only a slight marginal notch. The outline of the fossa is somewhat more regular in the fossil.

The measurements are:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Length	·1058	·1990	1·88
Width, vertebral end	·0710±	·1177	1·65
Width, humeral end	·0230	·0426	1·85
Width, least	·0125	·0234	1.86
Index	1 : 0·67	1 : 0·51	
			Av. 1·83

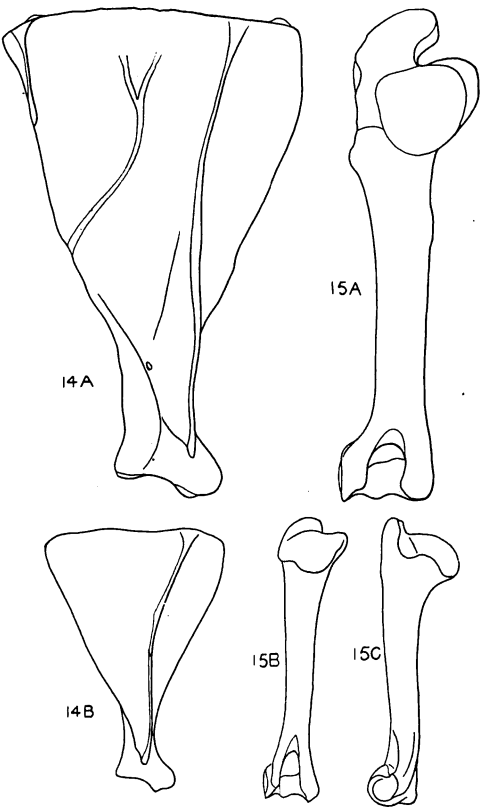


FIG. 14. Scapula. A, *Antilocapra;* B, *Aletomeryx.* One-third natural size.

FIG. 15. Humerus. A, posterior aspect, *Antilocapra;* B, same, *Aletomeryx;* C, external aspect, *Aletomeryx.* One-third natural size.

Humerus (fig. 15).—This bone again resembles that of *Antilocapra* very closely, differing in the relative lightness of the lateral tuberosity in *Aletomeryx* and the greater length of the coronoid and olecranon fossæ which extend higher on the humeral shaft. Other distinctions

are very minute, such as the precise position of the various nutritive foramina and the relative proportions as seen in the following table of measurements.

	Aletomeryx 1 (young) 2		*Antilocapra* female 180	Ratios
	m.	m.	m.	1 to 80
Length over all	·1140	·1159	·2000	1·75
Width, lateral, mid-shaft	·0102	·0095	·0192	1·88
Width, prox. end	·0280	·0275	·0505	1·80
Width, dist. end	·0215	·0217	·0370	1·72
Width, ant.-post., mid-shaft	·0130	·0136	·0250	1·92
Width, ant.-post., prox. end	·0307	·0327	·0564	1·83
Width, ant.-post., distal end	·0189	·0192	·0308	1·63
				Av. 1·79

Radius (fig. 16).—The distinctions between this bone and that of *Antilocapra* are so slight as to be incapable of description, as the figures show. The table of measurements follows:

	Aletomeryx	*Antilocapra* female 180	
	m.	m.	Ratio
Length over all	·1245	·2065	1·66
Prox. end, ant.-post. diameter	·0114	·0225	1·97
Prox. end, transverse diameter	·0197	·0370	1·88
Mid-shaft, ant.-post. diameter	·0080	·0120	1·50
Mid-shaft, transverse diameter	·0134	·0210	1·56
Distal end, ant.-post. diameter	·0134	·0244	1·82
Distal end, transverse diameter	·0195	·0340	1·74
			Av. 1·73

Ulna (fig. 16).—No complete ulna of *Aletomeryx* is present. Several proximal ends, however, are available for study, one of which articulates perfectly with the radius which has just been described. Of this, about half the total length is preserved and it differs from that of *Antilocapra* in two respects. The most conspicuous of these is the grooved character of the summit of the olecranon, so that, as in the dog, it bears three prominences, of which the posterior one is large and rounded and the anterior ones, which bound the groove, are thin and elongated, the outermost being the longest. In the prong-

buck the groove is lacking, as the inner ridge is obsolete. Neither the ox nor the modern horse exhibit a grooved olecranon, but the ancestral horses *Mesohippus* and *Miohippus* do, as do also the dog and sometimes the cat. This character therefore seems to be a primitive one, and hence its presence in *Aletomeryx* does not exclude the genus from the direct ancestry of *Antilocapra*. The shaft of the fossil ulna is not so thin relatively as in the prongbuck, nor does its outline suggest such a degree of reduction of the distal portion as in the modern animal.

The measurements are:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Length over all	·1490*	·2480	1·66
Prox. (olecranon) ant.-post. diam..	·0187	·0290	1·55
Prox. (olecranon) transverse diam..	·0085	·0134	1·57
Mid-shaft, ant.-post. diameter.....	·0057	·0060	1·05
Mid-shaft, transverse diameter....	·0014	·0028	2·00
Distal end	Not preserved.		
			Av. 1·56

* Estimated.

Carpals (figs. 16, 17).—All of the carpalia are present. They differ only in minor details from those of the prongbuck, as the figures show.

Metacarpals (fig. 17).—Metacarpalia I, II, III, and IV are present, the second and third being united into a cannon-bone which again resembles that of the antelope very closely, differing therefrom in dimensions and in the very distinct impression of metacarpal V on the proximal half. The inner side of the cannon-bone shows no such impression. Below, the bone is rounded, nevertheless both lateral digits were present, as they are preserved in the material. To what extent, therefore, the lateral metapodials were developed it is difficult to say, as not more than an inch of the distal end of the inner one is preserved, and merely the articular extremity of the outer. There are impressions of both lateral metacarpals on either side of the distal extremity. No such impressions are visible in the prongbuck, where the lateral toes are entirely lacking.

The measurements of the left fore cannon-bone are:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Length over all.....	·1190*	·2100	ca. 1·76
Prox. end, ant.-post. diam.	·0117	·0203	1·73
Prox. end, transverse diam.	·0160	·0286	1·79
Mid-shaft, ant.-post. diam.	·0088	·0145	1·65
Mid-shaft, transverse diam.	·0100	·0156	1.56
Distal end, ant.-post. diam.	·0107*	·0192	1·80
Distal end, transverse diam.....	·0178*	·0277	1·56
			Av. 1.69

* The distal end is from another individual than that from which the entire shaft with its proximal end was derived.

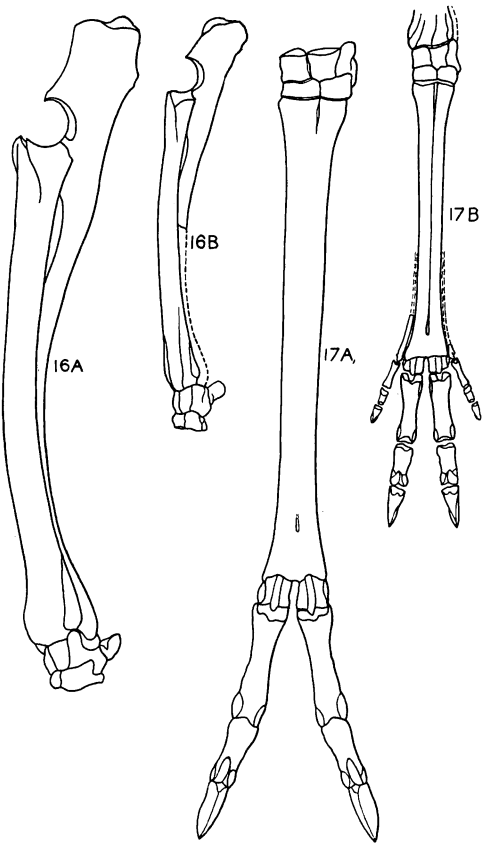


FIG. 16. Left radius, ulna, and carpus. A, *Antilocapra;* B, *Aletomeryx.* One-third natural size.

FIG. 17. Manus, dorsal aspect. A, *Antilocapra;* B, *Aletomeryx.* One-third natural size.

Phalanges (fig. 17 A, B).—It has been extremely difficult to separate the phalanges of the fore feet from those of the hind, the unguals only showing constant differences in a measure comparable to those of the prongbuck. The unguals differ from those of the latter in having an acuminate upper posterior angle, especially in those referred to fore feet, whereas in the prongbuck this angle is always rounded.

Dimensions of the outer phalanges of the left manus follow:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Proximal phalanx.			
Length	·0278	·0500	1·79
Shaft, width	·0064	·0089	1·39
Medial phalanx.			
Length	·0167	·0278	1·66
Shaft, width	·0058	·0086	1·48
Ungual phalanx.			
Length	·0175	·0310	1·78
Height	·0120	·0217	1·80
Width	·0068	·0102	1·50
			Av. 1·63

Lateral digits (fig. 17 B).—Of these there are preserved the distal portion of a metacarpal, together with a proximal, two medial and two ungual phalanges, all from the right side of a foot, but whether they represent the second of the left or the fifth of the right manus I cannot say. There is also the distal epiphysis of the metacarpal and the proximal phalanx from the opposite side of the foot. These seem to be a little larger and more robust than do their opposites, but whether or not this is due to individual variation can not be ascertained. The phalanges are typically flattened on their medial face, and rounded externally. They bear much the same proportions to one another as do those of digits III and IV.

The dimensions are:

	1 m.	2 m.
Length of proximal phalanx	·0105	·01052
Length of second phalanx	·0040	·0040
Length of ungual phalanx	·0082	·0070

Hind Limbs.

Pelvis (fig. 1). Os innominatum.—One fairly well-preserved pelvis and others less perfect are present, the best one being that in the mounted skeleton. It shows few distinctive characters as compared with that of *Antilocapra,* except a greater simplicity of surface, in that the muscle limitations are somewhat less pronounced. Few relative dimensions can be given because of the imperfection of the fossils. Those available are:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Length over all	·1300	·2430	1·87
Right ilium, width, ant. end	·0670	·0988	1·48
Right ilium, least width	·0133	·0223	1·68
Acetabulum, ant.-post. diameter, inside rim	·0160	·0293	1·83
Right ischium, width, mid-length.	·0150	·0237	1·58
			Av. 1·69—

Femur (figs. 18, 19).—Herein again there are very close resemblances between the fossil and the living prongbuck, the differences as usual being of minor importance, such, for instance, as the somewhat greater slenderness of the great trochanter. These distinctions are best seen in the figures, and in the following table of measurements:

	*Aletomeryx** m.	*Antilocapra* m.	Ratio
Length over all	·1460	·2330	1·60
Prox. end, ant.-post. diameter	·0160	·0290	1·81
Prox. end, transverse diameter	·0350	·0575	1·64
Mid-shaft, ant.-post. diameter	·0130	·0193	1·48
Mid-shaft, transverse diameter	·0123	·0200	1.62
Distal end, ant.-post. diameter	·0365	·0580	1·59
Distal end, transverse diameter	·0293	·0455	1·55
			Av. 1·61

* Composite bone.

Patella (fig. 24).—The patella of *Aletomeryx* is a variable bone, but is in each instance prolonged downward into an attenuated point, giving it a more markedly triangular outline.

Relative dimensions of an average *Aletomeryx* patella and that of *Antilocapra* follow:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Length	·0246	·0342	1·35-1·39
Width	·0158	·0237	1·50
Thickness	·0107	·0217	2·02
			Av. 1·62

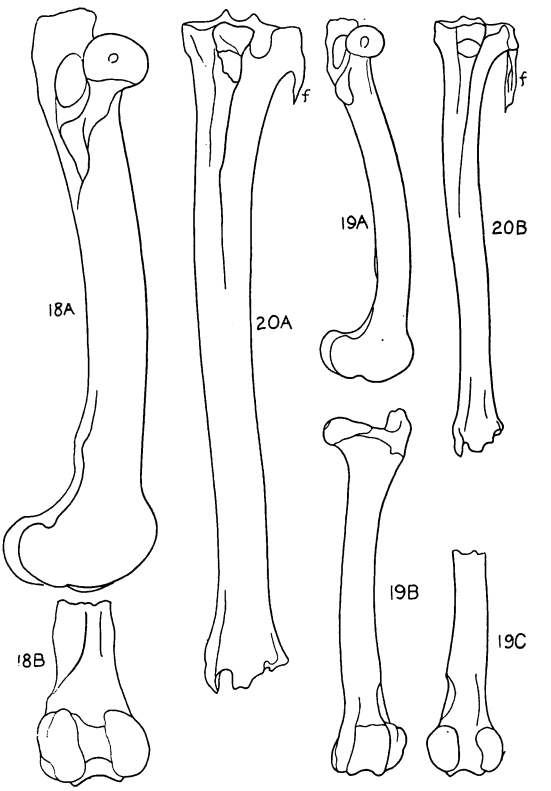


FIG. 18. Left femur of *Antilocapra*. A, inner aspect; B, distal end, posterior aspect. One-third natural size.

FIG. 19. Left femur of *Aletomeryx*. A, inner aspect; B, anterior aspect; C, distal end, posterior aspect. One-third natural size.

FIG. 20. A, left tibia of *Antilocapra;* B, left tibia and proximal end of fibula (*f*) of *Aletomeryx,* anterior aspect. One-third natural size.

Tibia and fibula (figs. 20, 21).—The tibiæ in *Aletomeryx* and *Antilocapra* are quite comparable, as are the distal ends of the fibulæ, which are complete bones in themselves, with the merest vestige of a shaft. Proximally the fibula of *Antilocapra* is reduced to a thoroughly ankylosed bony process depending from the outer posterior corner of the tibial head. In *Aletomeryx,* on the other

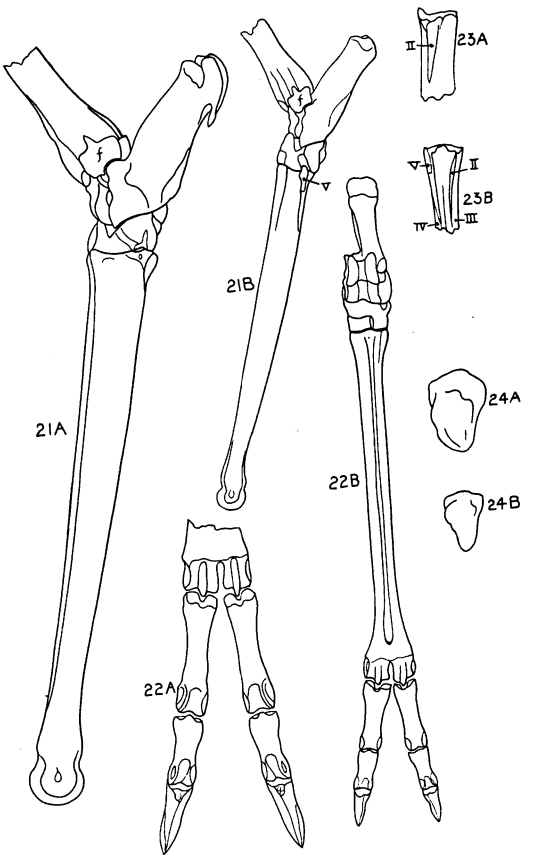


FIG. 21. Left tarsus and metatarsus. A, outer aspect, *Antilocapra: f,* distal end of fibula. B, *Aletomeryx*: *f,* distal end of fibula; *v,* vestige of metatarsal V. One-third natural size.

FIG. 22. A, phalanges of *Aletomeryx,* dorsal aspect; B, left pes of *Aletomeryx,* anterior aspect. One-third natural size.

FIG. 23. A, proximal end of left cannon-bone of *Aletomeryx,* showing vestigial metatarsal II; B, rear aspect of same, showing metatarsals II, III and IV combined, and V, the last being free. One-third natural size.

FIG. 24. Patella. A, *Antilocapra;* B, *Aletomeryx.* One-third natural size.

hand, the proximal end of the fibula was free, articulating by a facet on the equivalent portion of the tibia. About an inch of what is undoubtedly the proximal end of the left fibula is present. The epiphysis is lacking, but the hollow shaft shows within the length no sign of diminution. Its total length, however, one can not conjecture. Several areas for tendinous attachment appear just beneath the expanded summit of the bone.

Measurements of the tibia and fibula follow:

	Aletomeryx	*Antilocapra*	
Tibia.	m.	m.	Ratio
Length over all	·1750	·2720	1·54
Prox. end, ant.-post. diameter	·0333	·0546	1·64
Prox. end, transverse diameter	·0322	·0470	1·46
Mid-shaft, ant.-post. diameter	·0122	·0180	1·46
Mid-shaft, transverse diameter	·0130	·0195	1·50
Distal end, ant.-post. diameter	·0160	·0250	1·56
Distal end, transverse diameter	·0209	·0328	1·58
			Av. 1·53
Fibula, distal end.			
Height	·0090	·0160	1·76
Ant.-post. diameter	·0118	·0177	1·50
			Av. 1·63

Tarsus (figs. 21, 22 B).—This region of the foot again resembles that of the antelope very closely, as does the metatarsus. In *Aletomeryx,* the first cuneiform can not be identified in the fossil material and seems to be about the only element lacking, aside from those mentioned above. That it was present, however, is evident.

Dimensions of the assembled tarsus follow:

	Aletomeryx	*Antilocapra*	
	m.	m.	Ratio
Length, tuber calcis to cuneiform III	·0610	·0930	1·51
Width across calcaneum and astragalus	·0180	·0295	1·63
Ant.-post. diameter, calcaneum and astragalus	·0225	·0370	1·66
			Av. 1·60

Metatarsus.—The cannon-bone (figs. 21-23) differs mainly in the somewhat greater relative width of the distal end and in the very distinct triangular groove for metatarsal V. Two examples of the latter are present, both from the left side and differing considerably in size. Metatarsal II (fig. 23) is present, but coalesced with the cannon-bone. It tapers to a point distally and varies materially in its length and other dimensions.

Dimensions of the cannon-bone are:

	Aletomeryx m.	*Antilocapra* m.	Ratio
Length over all	·1400	·2200	1·57
Proximal end, ant.-post. diameter ..	·0160	·0253	1·58
Proximal end, transverse diameter .	·0157	·0256	1·63
Mid-shaft, ant.-post. diameter	·0107	·0165	1·54
Mid-shaft, transverse diameter....	·0096	·0150	1·56
Distal end, ant.-post. diameter	·0128	·0195	1·52
Distal end, transverse diameter....	·0195	·0280	1·43
			Av. 1·54

Phalanges (fig. 22).—Whether or not lateral digits were present I am unable to say. Certainly the manus bore them, but there is no discernible evidence of their presence either on the cannon-bone or in the material itself, as these elements are extremely rare, due no doubt to their minuteness. The little distinction discernible between the phalanges of manus and pes is discussed above (see under manus). The length of the entire hind limb extended is:

Aletomeryx	*Antilocapra*	Ratio
·537 m.	·850 m.	1·58

Of the extended fore limb:

Aletomeryx	*Antilocapra*	Ratio
·420 m.	·720 m.	1·71

The hind limbs are therefore proportionately longer in *Aletomeryx,* which is in keeping with their relatively more advanced condition as compared with the more conservative four-toed fore limb.

BLASTOMERYX MARSHI, N. SP.

(Fig. 25).

In searching in the Marsh Collection for material for comparison, I discovered a specimen bearing the initials O. C. M. and the date June 27, 1873. This material was collected by the Yale College expedition of 1873, which worked eastward along the Niobrara River from the mouth of Antelope Creek to Fort Niobrara, a distance of 85 to 100 miles, between the dates of June 24 and July 7. We have no record of the number of camps nor of the rate of progress during these two weeks. One would judge that they made about four hauls, certainly not fewer, in covering the distance. The presumption is, therefore, that this specimen collected on the 27th must have been found within 25 miles of the locality of *Aletomeryx* and from an approximately equivalent geologic level.

The specimen, Cat. No. 10756, holotype, consists of a skull and jaws, three dorsal and three lumbar vertebræ, a femoral head, the humeral end of the right scapula, and two rib fragments.

The skull, while in fragments, was nevertheless susceptible of repair, such portions as were absent on the one side being present on the other, so that little that is essential is lacking. The dentition, while rather badly worn, is perfect except for the two median incisors and the second and third, together with the inferior canine of the left side. The upper canines are missing, but their alveoli are present and give indication of their size and curvature. Coupled with the well developed laniary tusks were rudimentary horns comparable to those of the female of *Aletomeryx,* though somewhat larger, or to those of the female prongbuck, from which they differ in their position, overhanging as they do the rim of the orbit, and again in being relatively larger. This creature is evidently a *Blastomeryx* and proves beyond question that *Aletomeryx* belongs to a separate phylum, though probably a local contemporary. The two forms differ very markedly in skull profile, *Blastomeryx* being decidedly convex, while *Aletomeryx* is more nearly straight, correlated with the presence or absence of the canine tusk. The *Blastomeryx* skull, while only slightly larger than that of *Aletomeryx,* has nevertheless a more ex-

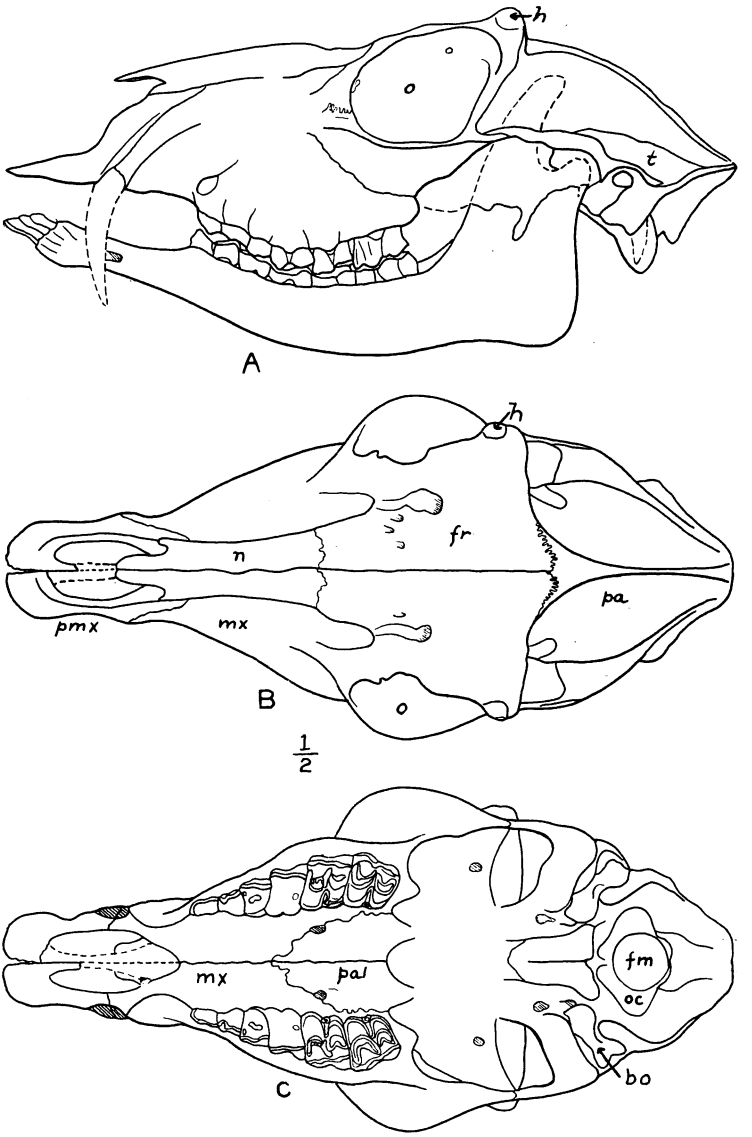


FIG. 25. Skull of *Blastomeryx marshi.* A, left lateral; B, dorsal, and C, ventral aspect. *bo,* auditory bulla; *fm,* foramen magnum; *fr,* frontal; *h,* horn; *mx,* maxillary; *n,* nasal; *o,* orbit; *oc,* occipital condyle; *pa,* parietal; *pal,* palatine; *pmx,* premaxillary; *t,* temporal. One-half natural size.

tended cranial region, and this shows in the brain as well, for not only is the entire organ relatively longer in *Blastomeryx,* but the same proportions are borne out in the individual lobes and convolutions, which are otherwise quite comparable in the two forms, differing only in very minor details. The teeth also are very similar, differing mainly in the relatively larger posterior molar in *Blastomeryx.* They are comparable in length of crown, in the presence of the style between the two inner crescents of the molars, and in the rugosity of the enamel. They also compare in the character of the parietal crest, and in the position of the horns above the posterior limitation of the orbit. This *Blastomeryx* differs from *Dromomeryx* as defined by Douglass in its much smaller size, the character and much smaller size of the horns, the presence of the superior canine, and the fact that the cheek teeth show no tendency toward hypsodonty. The posterior lower molar in the *Blastomeryx* shows a style ("median outer pillar") as in *Dromomeryx.* The others are too much worn to show either this character or the presence of the "*Palæomeryx* fold" if such existed.

Summary.

The genus *Blastomeryx* was proposed by Cope in 1877[11] to include the species formerly described by him as *Dicrocerus gemmifer* from the middle Miocene and which he differentiated from *Dicrocerus* by the fact that in the latter the "true molars [were] without or with one rudimental accessory basal column," whereas in *Blastomeryx the* "true molars [were] with more or less developed basal columns." Matthew in 1908[12] gives a clear description of the generic characters of *Blastomeryx* and summarizes the known species, giving the list as follows:

Lower Miocene: *B. advena* Matthew, *B. primus* Matthew, and *B. olcotti* Matthew. Of *B. gemmifer* he says:

> "The type specimen of *B. gemmifer* is a third lower molar and is a little larger and more robust [than in *B. advena*], agreeing more nearly with *B. primus* and *olcotti,* and not clearly separable from them; but probably if it were better known its stage of

[11] Cope, E. D., U. S. Geog. Surv. West 100th Merid., vol. 4, Palæontology, p. 350.

[12] Matthew, W. D., Bull. Amer. Mus. Nat. Hist., vol. 27, pp. 535-562.

evolution would be demonstrably more advanced, as it is in the referred specimen from the same level and locality, the middle Miocene, Pawnee Creek beds of Colorado."

B. wellsi Matthew[13], considerably larger than *B. gemmifer,* occurs in the upper Miocene of the Republican and Little White River valleys, the type being a lower jaw from the Loup Fork beds near the Rosebud Agency, South Dakota. *B. wellsi* differs from *B. gemmifer* in that the premolars are relatively smaller and simpler in the former; the molars are very similar, and the jaw shorter and heavier in general outline. The molars are larger and somewhat longer-crowned than in either *B. primus* or *B. olcotti.*

In 1890 Professor Scott[14] described a species which he refers to *Blastomeryx* but without specific designation. The horizon he calls Loup Fork, and it is at least upper Miocene and probably lower Pliocene. The main distinctions as given by Matthew in the later paper are the more advanced skull and skeletal structure than in *B. primus,* and the much larger size, with a small or rudimentary antler; the orbits are far more prominent, and the ulnar shaft is reduced to "a mere thread of bone"; the lateral digits are much more reduced and the shafts of the lateral metacarpals incomplete. Matthew goes on to say:

"This can not well be congeneric with the lower Miocene species, whether or not it be regarded as derived from them. If we do so regard it, *B. gemmifer* would probably represent an intermediate stage, as is indicated, in fact, by the little we know of it. In view of the near agreement in size and other characters between *B. gemmifer* and the lower Miocene species, it seems preferable to place the latter in *Blastomeryx,* and regard the species described by Scott as referable to a more advanced genus, with rudimentary antlers and with the lateral digits of the fore foot incomplete. It seems inadvisable to name the upper Miocene [Scott] genus until we know something more definite of its dentition and skull characters and its distinctions, if any, from *Mazama.*"

Four other species have been described: *Blastomeryx antilopinus* Scott, *B. borealis* Cope, *Palæomeryx americanus* and *P. madisonius* Douglass. These, as Matthew

[13] Bull. Amer. Mus. Nat. Hist., vol. 20, p. 124, fig. 17, 1904.
[14] Bull. Mus. Comp. Zool., vol. 20, p. 76.

says, belong to a larger and more brachyodont phylum of Cervidæ, with supraorbital horns of peculiar type. They are distinct from *Blastomeryx,* probably also from the true *Palæomeryx,* but at present of uncertain relationship. These four species Douglass (1909)[15] has referred to a new genus *Dromomeryx,* the characters of which he describes in detail:

Size greater than that of an ordinary specimen of *Odocoileus americana* or *Antilocapra americana,* at least the bones are heavier. Skull long, crest of the occiput produced backward, face quite long, orbit large, malar below the orbit projects outwardly. Horn cores large and simple, and they expand outward below into heavy lateral wings behind the upper portions of the orbits. They stood nearly perpendicular to the upper plane of the skull. There are no lachrymal pits. Oblong vacuity in upper portion of face anterior to orbit. Parieto-temporal suture below the middle of the brain-case. Basi-cranial and basi-facial axis form a considerable angle. Palate quite broad between cheek teeth, narrow anterior to them (probably indicative of absence of canines). Mandible long, not deep, and curves downward beneath molars and premolars. Teeth brachyodont, with a tendency to become hypsodont, and with quite prominent pillars on anterior portions of all the outer crescents of the upper cheek. Lower molars have median outer pillars on teeth and "*Palæomeryx* folds" on the anterior outer crescents. Neck and limbs long but heavier than those of *Odocoileus* and *Antilocapra.* At least vestiges of lower portions of lateral metapodials. Humerus proportionately larger than in *Antilocapra.* Radius and ulna separate, trapezoid and magnum, navicular and cuboid united. Distal keels of metapodials high, unguals high and narrow.

The species of "*Blastomeryx*" described by Scott in 1890 can not be distinguished from *Aletomeryx* from either his description or his figures, except that the ulna of *Aletomeryx,* which is preserved for at least half its length, can not be described as being "hardly more than a thread of bone," as it is well developed, more like a ribbon than a thread (see figs. 1, 16 B). Scott does not describe the character of the horn other than to say that

[15] Ann. Carnegie Mus., vol. 5, pp. 457-479.

it is small or rudimentary, which applies very well to the female horn of *Aletomeryx.*

Matthew's opinion, expressed verbally (December, 1919), is that *Aletomeryx* has for its nearest known relative *Merycodus,* despite the fact that the latter bore a branched antler. The similarities are based upon skeletal characters, and the dentition. He agrees with the author that *Aletomeryx* is related to the true Antilocapridæ, although he does not commit himself as to its direct ancestry with the existing prongbuck. There is, however, no known detail of structure which would debar the fossil from the ancestral line.