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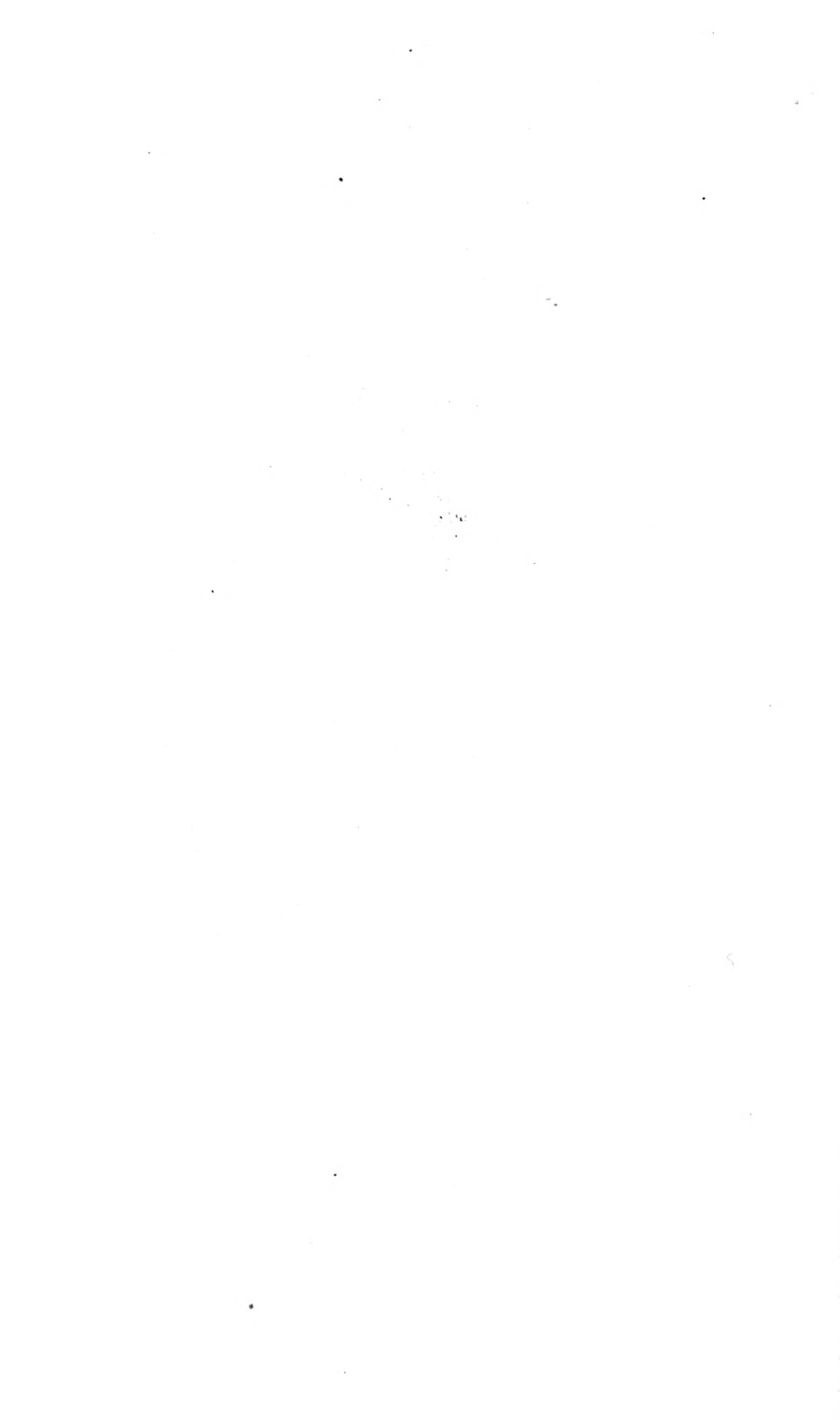
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GEOLOGICAL SERIES  
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No. 17

MOUNTED SKELETON OF HOMALODOTHERIUM

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The skeleton of *Homalodotherium* figured on page 235 has been reconstructed from a specimen in Field Museum previously described by Professor William B. Scott. Since the publication of Scott's monograph (Field Mus. Nat. Hist., Geol. Mem., 1, No. 1) the specimen has been carefully worked over by James H. Quinn, Assistant in Paleontology, and a number of smaller bones, not before described, have been recovered. Much restoration has been found necessary in mounting the skeleton; this restoration has been done by careful comparison with specimens of other related animals. While the vertebral formula cannot be determined from the specimen in hand, and the number of ribs is therefore conjectural, most other features of the skeleton may be taken as definitely determined.

The specimen of *Homalodotherium*, Field Museum No. P13092, was collected by the First Marshall Field Paleontological Expedition to Argentina and Bolivia in 1923. It was found by the present writer in blocks of tufaceous sandstone at tide level of the Atlantic coast, some twenty miles north of Cape Fairweather, on the sheep farm of Don Pedro Montes. The blocks containing the specimen had fallen from the face of the sea-wall, apparently some eighty feet above the level of high tide. This would place the horizon near the middle of the Santa Cruz beds.

The parent ledge was not approachable by ordinary means because of the steepness of the cliff. On the beach the waves had worn the fallen mass into two rounded blocks, with sections of lower jaws, leg bones, and ribs appearing at the surface. The action of the waves was thus fast destroying a specimen which probably had consisted of an entire skeleton. A single femur of *Nesodon* associated with the specimen led to its being at first recorded under that name.

The specimen was removed from the matrix by the late J. B. Abbott, veteran preparator and member of the expedition which collected it. The unusual structure of foot and leg was recognized

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as soon as they were brought to light. By mutual arrangement the specimen was sent to Professor Scott at Princeton University for study, and his splendid monograph resulted. The skull, being quite well known, was not submitted to Professor Scott for study; likewise, the left half of the pelvis was not sent to him.

Six years after Scott's monograph had been published it was decided to restore the skeleton and to mount it. The former preparator having meantime died, the specimen was placed in the hands of Mr. Quinn. The fragments remaining, after the first preparation, were again carefully worked over. In this process the trapezium, the pisiform, and a vestigial first metacarpal were recovered. These were not seen by Scott and have remained undescribed until now.

A detailed list of the bones of *Homalodotherium* now known to belong to skeleton No. P13092 are as follows:

*Skull*: abraded in the facial region so that the nasals, the frontals and the superior portion of the parietals are lost; the palatal surface, including the maxillaries, with molar-premolar dentition, the basi-cranial region with condyles, the supraoccipital, and parts of the zygomatic arches are preserved.

*Mandibles*: posterior halves of both rami, including the second and third molars, the condyles and the coronoid processes are preserved from one side or the other.

*Cervical vertebrae*: the seventh only.

*Dorsal vertebrae*: Nos. 1, 3, 4, 5, 6, 11, 12, 13, 14, 15—ten in all.

*Sacral vertebrae*: none.

*Caudal vertebrae*: none.

*Ribs*: eight rib-heads and parts of three shafts from the right side; eight rib-heads, part of one shaft from the left.

*Scapulae*: right, articular surface, section of lamina, including posterior margin; left, spine and parts of superior and inferior lamina.

*Clavicle*: left, entire.

*Pelvis*: right half almost entire; left ilium lacking part of crest, pubis entire; ischium, posterior section from tubercle to margin of obturator foramen.

*Humerus*: left, distal half.

*Radii*: left, entire; right, lacking the distal epiphysis.

*Ulnae*: left, entire.

*Carpus*: left series entire save trapezium; right, distal row only.

*Metacarpals*: right, 1, 3, 4; left, 3, 4.

*Phalanges*: right fore foot, digit III, 2, 3; left fore foot, digit III, 1, digit IV, 2, 3.

*Femora*: right distal end and shaft as far as the margin of the digittal fossa; left, head and trochanter lacking crest and one-third of shaft, including digital fossa, entire.

*Patellae*: none.

*Tibia*: right, entire.

*Fibula*: right, entire; left, distal half only.

*Tarsus*: right, complete except calcaneum; left, all save cuboid and cuneiforms 1 and 3.

*Metatarsals*: right, II, III, IV, V; left, II, III, IV, V.

*Phalanges*: right, digit V, 1, 2; left, digit V, 2.

*Sternebrae*: five segments, including manubrium and ziphisternum.

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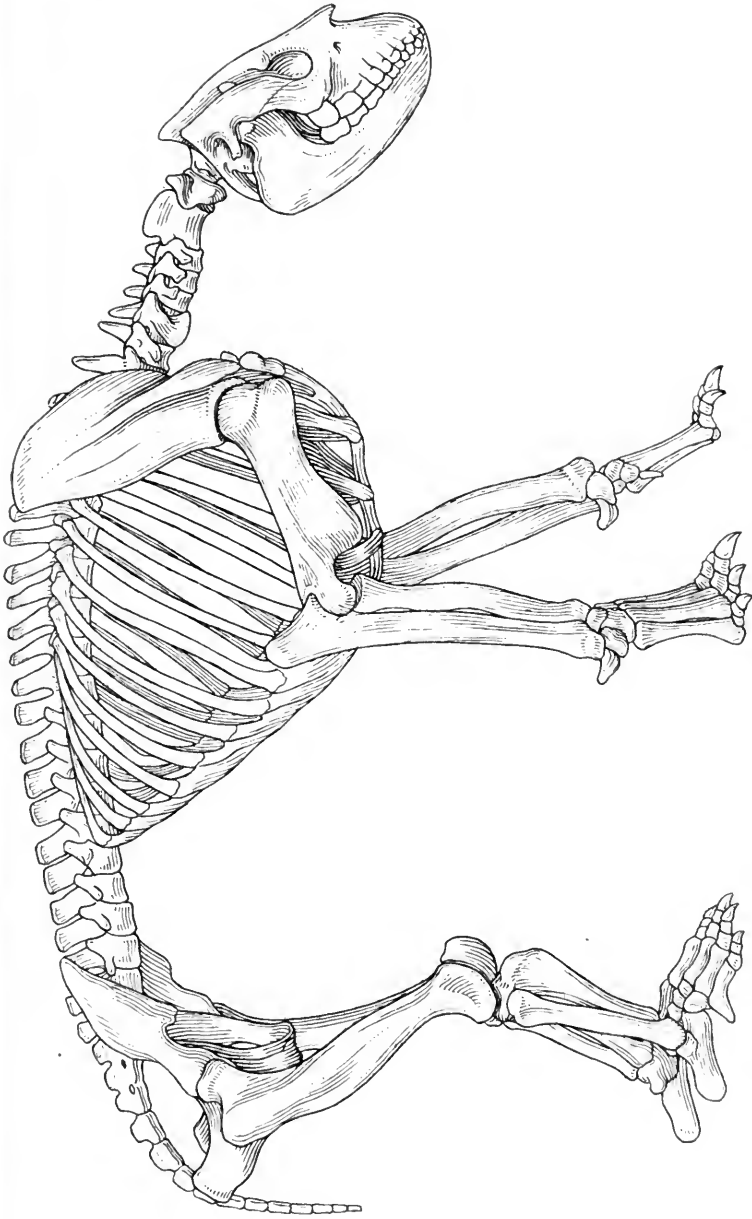


FIG. 55. Skeleton of *Homalodotherium curvinghami* Flower, from the Santa Cruz beds of Argentina, mounted in Field Museum. F.M. No. P13092.  $\times 1/12$ . Drawing by C. F. Gronemann.

The specimen is an important one, not only as the unique skeleton of its kind, but as a highly specialized member of a rare family. For that reason it has appeared desirable to mount the skeleton, even though important sections of the vertebral column are missing from it and had to be reconstructed. The vertebral column as restored has fifteen dorsal and seven lumbar vertebrae, according to the formula given *Tomashuxleya* by Simpson. The sacrum is restored by comparison with an undescribed specimen of Pliocene *Zotodon* (P14440) in this Museum. The caudal series is restored according to the general toxodont type. The missing and broken ribs are reconstructed by comparison with others in the same series. The only other parts remaining in doubt are the proximal half of the humerus, the second metacarpal, the first metatarsal, the patella, and the unguals of the pes.

The skull, as explained above, is abraded in the frontal and parietal regions, but beautifully preserved in the palatal aspect. It has recently been figured by Patterson from this view (*The Internal Structure of the Ear in Some Notoungulates*, Field Mus. Nat. Hist., Geol. Ser., 6, No. 15, 1936). From the lack of reduction in the first premolar tooth, and from comparative measurements, this specimen has been referred to the species *H. cunninghami* Flower. A series of measurements is given below.

MEASUREMENTS OF DENTITION		MM
P <sup>1</sup> , a-p diameter	.....	18.0
P <sup>1</sup> , trans. diameter	.....	20.0
P <sup>2</sup> , a-p diameter	.....	20.0
P <sup>2</sup> , trans. diameter	.....	27.0
P <sup>3</sup> , a-p diameter	.....	22.0
P <sup>3</sup> , trans. diameter	.....	29.0
P <sup>4</sup> , a-p diameter	.....	21.5
P <sup>4</sup> , trans. diameter	.....	33.0
M <sup>1</sup> , a-p diameter along ectoloph	.....	33.5
M <sup>1</sup> , a-p diameter at center of tooth	.....	29.0
M <sup>1</sup> , trans. diameter	.....	36.0
M <sup>2</sup> , a-p diameter along ectoloph	.....	43.5
M <sup>2</sup> , a-p diameter at center of tooth	.....	36.0
M <sup>2</sup> , trans. diameter	.....	41.5
M <sup>3</sup> , a-p diameter along ectoloph	.....	43.5
M <sup>3</sup> , a-p diameter at center of tooth	.....	33.0
M <sup>3</sup> , trans. diameter	.....	38.0
Length, P <sup>1</sup> -M <sup>3</sup> along ectolophs	.....	185.5
Length, P <sup>1</sup> -M <sup>3</sup> across centers of teeth	.....	177.0
Length, P <sup>1-4</sup>	.....	81.0
Length, M <sup>1-3</sup> along ectolophs	.....	111.0
Length, M <sup>1-3</sup> across centers of teeth	.....	97.0
M <sub>7</sub> , trans. diameter	.....	22.0
M <sub>7</sub> , a-p diameter	.....	48.5
M <sub>7</sub> , trans. diameter	.....	20.0



MEASUREMENTS OF SKULL		MM
Skull, basilar length.....		411.0
Cranium, length from condyle at anterior border of orbit.....		263.0
Width of exoccipitals.....		127.0
Length of zygomatic arch, from posterior border of glenoid cavity.....		160.0
Width of cranium at postorbital constriction....		62.5
Width of face at anterior border of orbits.....		141.0
Palate, length in median line.....		233.0
Palate, width at P <sup>1</sup> .....		56.5
Palate, width at M <sup>2</sup> .....		64.0
Mandible, depth at anterior border of M <sub>3</sub> , external		61.5
Mandible, height of condyle.....		164.0
Mandible, height of coronoid.....		235.0
Mandible, length from angle to M <sub>3</sub> .....		138.5

*Sternum*.—Some question was raised by Scott with regard to the sternal series, particularly the presternum. In mounting the skeleton the segment designated by him as the presternum has been reversed so as to place the rounded extremity forward and the broad flattened end in contact with the next segment, which also is quite broad. In this position the difficulty disappears. The pits for the first pair of costal cartilages are near the anterior end of the presternum; the rounded end of the clavicle, with some allowance for interclavicular cartilage, fits the rounded anterior end of the presternum. While this arrangement leaves a rather wide space between the first and second pairs of costal cartilages, it appears to be the natural articulation of these elements. The bones can be made to articulate reasonably well in no other way. The five sternal segments preserved may or may not constitute the entire number, but they have been mounted in series.

*Clavicle*.—The element designated as the clavicle of this specimen is a short bone having no distinct articular ends; the proximal end is expanded, round and rugose at its extremity, evidently for cartilaginous connections. The opposite extremity is broad and flattened, with one surface oblique, somewhat rugose, and likewise fitted for cartilaginous attachment. The shaft is quite rounded and moderately curved. It bears on its surface an oblique ridge which extends from the margin of the flattened extremity along the convex surface of the shaft and disappears at a point well past its middle. The bone is clavicle-like in its form and proportions; it has the texture and appearance of the other bones of this specimen. There is no other element of the skeleton for which it might be mistaken; neither is there a reasonable probability that it might belong with the solitary femur of *Nesodon*, which was found in association with

this specimen. It may, therefore, be determined as a clavicle and as belonging to the specimen under consideration. The presence of such an element in *Homalodotherium* is consistent with the use of the claw-bearing fore foot as observed in this specimen and in other specimens of this genus. It is likewise consistent with the

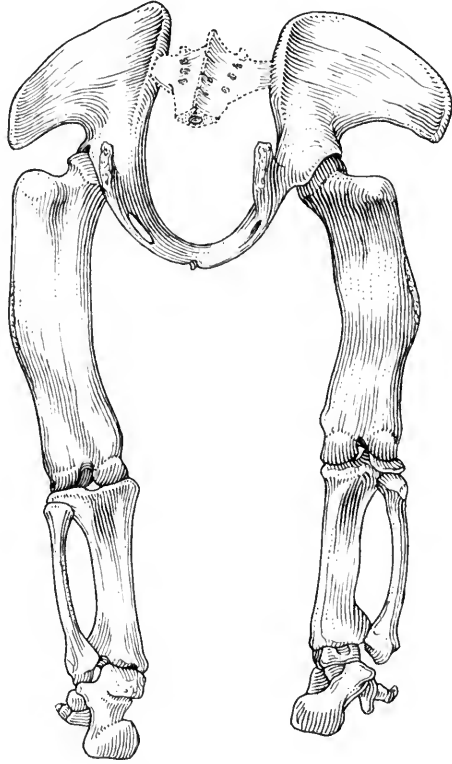


FIG. 56. Posterior view of pelvis and hind legs of *H. cunninghami*. F.M. No. P13092.  $\times 1/12$ . Drawing by C. F. Gronemann.

fossorial habits attributed by Lydekker and by Scott to *Homalodotherium*, and concurred in by this writer.

*Pelvis* (fig. 56).—The pelvis is broad across the ilia and encloses a wide pelvic aperture. The articulation with the sacrum is of limited extent and apparently admitted of some freedom of movement. The ischiatic protuberances are unusually prominent.

*Femora*.—The structure of the femur in this specimen has been well described by Scott (op. cit.), but doubt was left as to the exact length of this element. Although both femora are incomplete,

the shaft of the right bone is preserved, as far as the inferior margin of the digital fossa, and the proximal end of the left bone includes the entire margin of the same. This gives a common point in the right and left bones of the same animal from which the length of this element has been computed with full assurance of accuracy.

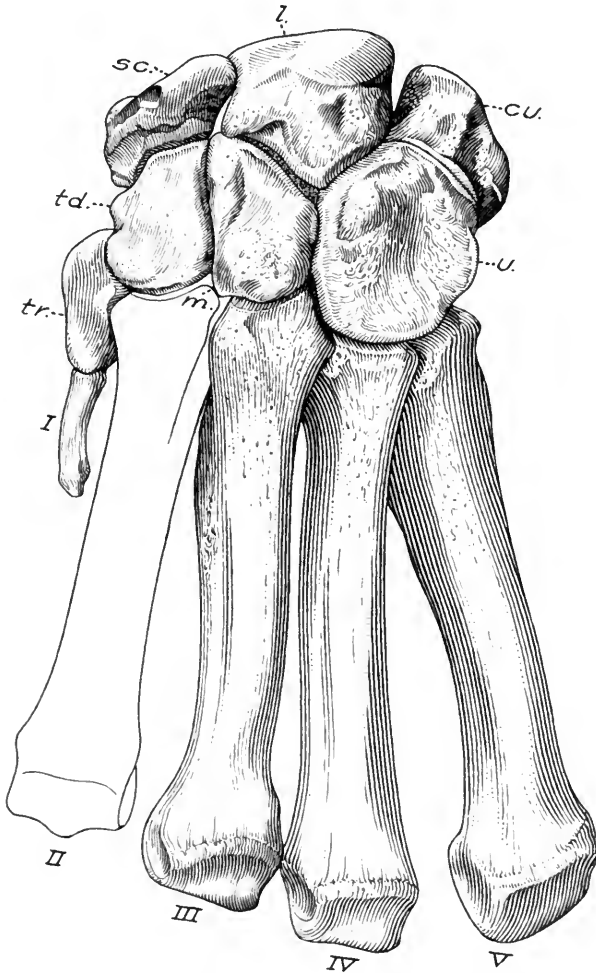


FIG. 57. Fore foot of *H. cunninghami*, showing entire carpal series and relative size of Metacarpal I. *sc.*, scaphoid; *l.*, lunar; *cu.*, cuneiform; *td.*, trapezoid; *m.*, magnum; *u.*, unciform; I, II, III, IV, V, metacarpals. F.M. No. P13092.  $\times 1/2$ . Drawing by C. F. Gronemann.

*Fore foot* (fig. 57).—While the fore foot of *Homalodotherium* has been variously figured by Ameghino and by Scott, none of the figures

published have been entirely correct; neither is the foot-structure of any member of this genus entirely known from a single individual at this time.<sup>1</sup>

The most important features in the composition of the carpus of *H. cunninghami* are: The scaphoid and lunar articulate closely;

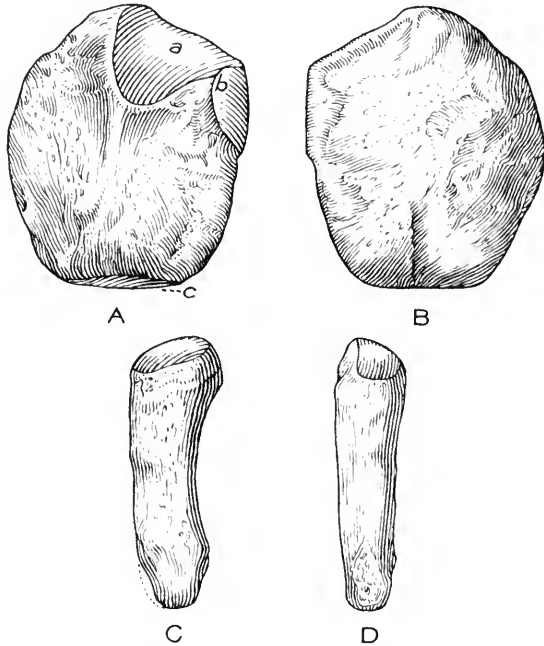


FIG. 58. Trapezium. A, lateral view, showing facets for articulation, (a) with the trapezoid, (b) with Metacarpal II, (c) with Metacarpal I; B, mesial view showing articular facets; C, D, Metacarpal I, mesial and anterior views. F. M. No. P13092.  $\times 1/1$ . Drawing by C. F. Gronemann.

their proximal surfaces, as seen from the anterior view, form a continuous, convex outline. The trapezoid and magnum are similar in size and from the front view their outlines are almost symmetrical

<sup>1</sup>The figure of Ameghino (Rev. del Jardin Zool. de Buenos Aires, T. II, 1894), while poorly drawn and lacking the scaphoid entirely, shows the lunar, the cuneiform, pisiform, magnum and unciform essentially the same as in the Field Museum specimen. The trapezium and trapezoid are shown so much in profile that their outline and relations to other elements can not be well determined. The first metacarpal, restored as bearing a functional digit, is entirely inconsistent with the specimen under study. The figure by Scott (Princeton Expeditions, 6, Pl. XXX, fig. 1), though beautifully lithographed, does not consistently represent the lunar, magnum, trapezium, trapezoid, or first metacarpal. The later figure by Scott (Field Mus. Nat. Hist., Geol. Mem., 1, No. 1, Pl. III, fig. 12) has corrected all of the former errors except that in Metacarpal I, but does not figure the trapezium or the pisiform. The scaphoid and the trapezoid have been allowed to drop down out of position.

to the line of their inter-articulation. The scaphoid is supported entirely by the trapezoid, the lunar rests between the magnum and the unciform. The magnum presents only a narrow facet to the second metacarpal. The first metacarpal is reduced to a vestige and bears no distal articulation to support phalanges.

*Trapezium* (fig. 58).—The trapezium of this specimen has not been previously described. It is a strong bone subpentagonal in its mesial aspect and bears three relatively small facets for articulation and a prominent tubercle at the posterior margin. The facet for the trapezoid is triangular in outline and oblique to the long axis

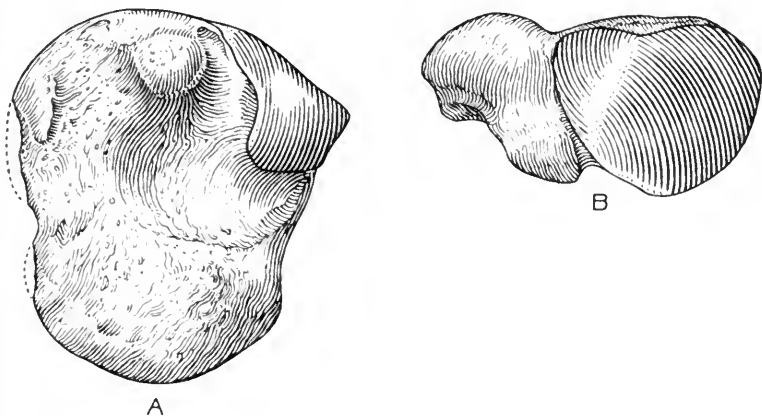


FIG. 59. Pisiform bone of *H. cunninghami*. F.M. No. P15242.  $\times 1/1$ . A, inferior view; B, proximal view. Drawing by C. F. Gronemann.

of the bone. A small D-shaped facet for articulation with the second metacarpal appears at the antero-superior margin and forms an obtuse angle with the facet for the trapezoid. A small oval facet at the distal extremity gives articulation for the vestigial first metacarpal.

*Pisiform* (fig. 59).—This is a strong bone almost as wide as it is long. It presents a broad, convex facet to the cuneiform and a minor facet to the ulna. The lateral tubercle is smaller by half than the distal end. The latter bears a strong rugosity which extends over one-third of the inferior surface.

*Metacarpal I* (fig. 57).—This element was figured by Ameghino from the proximal half of a specimen and was assumed to indicate a functional first digit. It now appears probable that the bone so figured was introduced and did not belong to *Homalodotherium* at

all. While perpetuating this error in the published drawing, Scott's description of the Field Museum specimen explained that no specimen with first metacarpal had been found at that time. The specimen in hand is barely two-ninths as long as Metacarpal III, as shown in fig. 57. It has no distal articular surface and bears the usual marks of a vestigial metacarpal. It articulates with the trapezium by a small oval facet at the distal margin of that bone. The entire lateral surface is rugose, indicating a ligamentary attachment with the second metacarpal.

### GENERIC CHARACTERS

The following distinguishing characters of the genus may be given: Dentition,  $I\frac{3}{3}$ ,  $C\frac{1}{1}$ ,  $P\frac{4}{4}$ ,  $M\frac{3}{3}$ ; canines little differentiated from incisors; molar and premolar dentition, brachyodont and intergrading; molar crowns trapezoidal with cingulum. Clavicle present; fore leg capable of rotation; fore foot digitigrade and claw-bearing; hind foot plantigrade. Digits IV–IV with vestiged Mc. I and Mt. I.

#### MEASUREMENTS OF SKELETON

	MM
Skeleton, height as mounted.....	1090
Skeleton, length in projection.....	1900
Femur, computed length.....	480
Pisiform, greatest length.....	51
Pisiform, greatest breadth.....	46
Trapezium, greatest length.....	38
Trapezium, greatest breadth.....	32
Metacarpal I, length.....	36

### PROBABLE HABITS OF HOMALODOTHERIUM

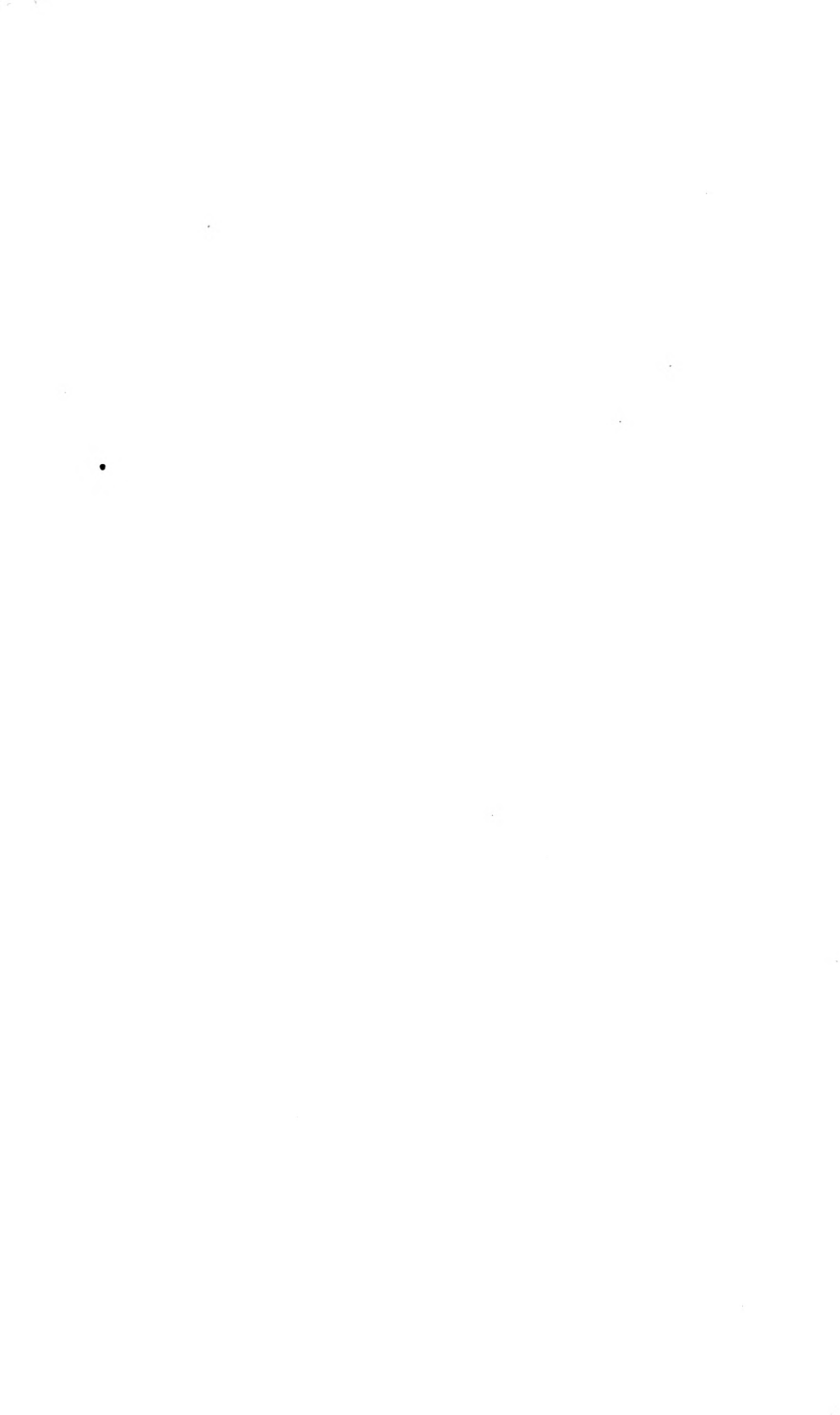
This animal had the proportions of a huge bear, uplifted in front by the digitigrade position of the fore feet. Great strength in the shoulders is evidenced by the proportionate size of the humerus and the extension and prominence of the deltoid area. Freedom of movement is apparent in the structure of fore arm and fore foot. These characters, taken with the presence of a functional clavicle and a claw-bearing foot, indicate a prehensile member capable of digging in quest of food or of pulling down branches of trees in order to feed upon the fruit or foliage. Such habits are usually attributed to the ponderous gravi-grade sloths, but in *Homalodotherium* we have an animal much more slender than they and one having an arm and hand modeled in a much higher type of structure.

The hind legs are relatively short and stout, longer in the thigh and shorter in the lower leg. Armed with plantigrade feet capable of being firmly planted, these members are well calculated for

supporting the body, either in the badger-like act of digging or in an upright posture, in which the fore legs would be given entire freedom in gathering fruits or foliage from trees. The prominent ischiatic projection offers a broad anchorage for the adductor muscles, which play an important part in supporting the body in the upright position. From its size, as well as from structural characteristics, *Homalodotherium* is not to be considered as a burrowing animal, but, like many of the edentates of South America, and like the oft-cited *Moropus* of North America, this animal appears to have been fossorial as well as arboreal in its feeding habits.







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