ANIMAL REMAINS FROM TELL ASMAR

BY MAX HILZHEIMER

TRANSLATED BY ADOLPH A. BRUX

THE ORIENTAL INSTITUTE OF THE UNIVERSITY OF CHICAGO

STUDIES IN ANCIENT ORIENTAL CIVILIZATION · NO. 20

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STUDIES IN ANCIENT ORIENTAL CIVILIZATION

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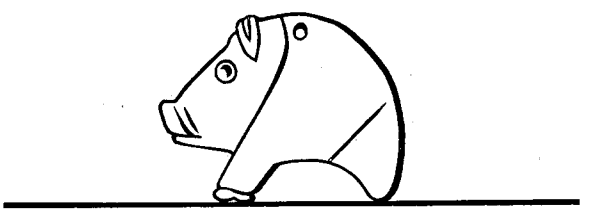

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LIST OF ABBREVIATIONS

AS	Chicago. University. Oriental Institute. Assyriological studies (Chicago, 1931——).
ERV	EBERT, MAX. Reallexikon der Vorgeschichte (15 vols.; Berlin, 1924–32).
JBNHS	Bombay Natural History Society. Journal (Bombay, 1886——).
OIC	Chicago. University. Oriental Institute. Oriental Institute communications (Chicago, 1922——).
OIP	Chicago. University. Oriental Institute. Oriental Institute publications (Chicago, 1924——).
ZS	Zeitschrift für Säugetierkunde (Berlin, 1926——).

C	canine tooth
D or d	deciduous or milk tooth
I	incisor
M	molar
P	premolar

Small numbers above or on the line indicate upper or lower teeth respectively.

INTRODUCTION

Since no animal remains whatever from ancient Mesopotamian sites have hitherto been subjected to scientific investigation, the present collection of such material from Tell Asmar, in spite of the not altogether favorable state of preservation of some of the pieces, assumes a very special significance that calls for a particularly careful study. The results presented here, though they may be as yet rather incomplete, will serve to show what contributions may be expected for science, that is, for zoology, archeology, cultural history, and the history of the domestication of animals, from remains hitherto considered little if at all by archeologists, if in the future the collection of such material, which undoubtedly is capable of giving important information in many directions, is continued. It is hoped that in this respect Dr. Frankfort's example of carefully gathering the animal remains at Tell Asmar and making them available for scientific investigation will prove trail-blazing. I take the opportunity here to thank him for this farsighted undertaking, and likewise to thank the late Professor James Henry Breasted, then director of the Oriental Institute, for having intrusted this valuable collection to me for study.[1]

With one exception the animal remains were all found during the season of 1932/33. Only the antler As. 34:53 from D 17:10 (p. 22) represented the season of 1934/35. The finds came primarily from two main divisions of the site: (1) the Northern Palace and its environs, including a small temple of Abu, in D-F 15–17; (2) an area of private houses in H-K 18–20. Pig remains appeared in P 31 and P 34 also. The finds and their sources are summarized in Table VIII (pp. 49–51).

Most of the bones have a chalky white appearance, like bones that have lain long in sand saturated with water. They contain even now extraordinarily much salt, which crystallizes out in many places. Other particulars concerning their preservation will appear below in the respective descriptions.[2]

[1] Study of actual remains involves of course consideration of the animals depicted on the monuments. The latter have been cited as required. E. Douglas Van Buren's fine work, *The Fauna of Ancient Mesopotamia as Represented in Art* ("Analecta Orientalia" XVIII [Roma, 1939]), did not appear until after this paper had been finished; hence it could not be utilized. In any event it could scarcely have affected the results.

[2] All bone measurements in tables and text are given in millimeters, which designation has, however, been omitted in most cases as being self-understood.

SPECIES IDENTIFIED

Equus onager hemippus LYDEKKER[1]

The wild ass is unquestionably one of the most interesting animals of which remains were found at Tell Asmar. Literary sources concerning the Western Asiatic wild ass, the *Equus onager hemippus* Lydekker, are extremely few. The first ancient author to mention it is Xenophon. Meeting with numerous wild asses in the desert plain east of the Euphrates, approximately opposite modern Mosul, he made the same observation that recent travelers also have made, namely that in flight these animals frequently halt and look about for their pursuers. He writes: "The asses, if one pursued them, ran forward and then halted, for they ran much faster than the horses. They did the same again when the horses approached, and it was not possible to capture them except when the horsemen took positions at intervals and pursued them from one to another. The flesh of the captured asses was similar to venison but more tender."[2] They lived in the plain along with ostriches, just as the zebras in Africa do today. More details concerning the animal society in which wild asses lived are given by Xenophon in connection with a description of a hunt by the young Cyrus in the same region.[3] Here bears, lions, wild boars, panthers, deer, gazelles, and wild sheep are mentioned as companion fauna. In a description of a subsequent hunt on the Armenian border wild asses are again mentioned along with wild boars, deer, and gazelles.[4]

Austen Henry Layard described his encounter with wild asses in a way quite similar to that of Xenophon. Near a small stream between Mihrkan and Mosul, about two days' journey from the latter, Layard and his party saw "what appeared to be a large company of dismounted Arabs, their horses standing by them." On approaching they noticed that the latter all galloped off toward the desert. "They were wild asses. We attempted to follow them. After running a little distance they stopped to gaze at us, and I got sufficiently near to see them well; but as soon as they found that we were in pursuit they hastened their speed, and were soon lost in the distance."[5] In a footnote quoting Xenophon's account of them in the *Anabasis* Layard adds: "In fleetness

[1] See British Museum (Natural History). Dept. of Zoology, *Catalogue of the Ungulate Mammals* . . . . by R. Lydekker, V (London, 1916) 14.

[2] *Anabasis* i. 5. 2. [3] *Cyropaedia* i. 4. 7. [4] *Ibid.* ii. 4. 20.

[5] A. H. Layard, *Nineveh and Its Remains* . . . . (New York, 1852) pp. 265 f.

they equal the gazelle; and to match them is a feat which only one or two of the most celebrated mares have been known to accomplish. The Arabs sometimes catch the foals during the spring, and bring them up with milk in their tents. I endeavored in vain to obtain a pair. They are of a light fawn color—almost pink."[6] Layard does not tell us for what purpose the Arabs captured the foals, though it may well have been for food. In any case he tells us that "the Arabs still eat their flesh."[7]

Further information comes to us from Tristram,[8] who adds also an important biological observation concerning seasonal migrations. Tristram distinguishes three species of asses: *Asinus asinus*, *Asinus onager*, and *Asinus hemippus*. The first is the domestic ass, called *ḥimār* in Arabic. The second appears to be merely the domestic ass turned wild; it too is called *ḥimār* in Arabic, but with the addition *waḥshī*, "wild." The third is designated in Arabic by an entirely different term, namely *akhdar*.[9] From this sharp distinction made by the Arabs it is clear that an entirely different species is referred to. It is the *Equus onager hemippus* of Lydekker's nomenclature.[10] Concerning it Tristram writes: "This,

[6] *Ibid.* p. 266. [7] *Ibid.*

[8] H. B. Tristram, *The Survey of Western Palestine. The Fauna and Flora of Palestine* (London, 1888) pp. 2 f.

[9] The form given by E. W. Lane, *An Arabic-English Lexicon* (London and Edinburgh, 1863–93) is *akhdarī*, which is defined as a wild ass, named thus after *al-akhdar*, a stallion said by some to have been an ass and by others to have been a horse belonging to Ardashir which became wild. The *Encyclopaedia of Islām* (Leyden, 1913——) II 309 states: "There is a breed called *Akhdarīya*, called after a stallion of Kisrā Ardashīr which bred with wild asses or those that had run wild. These are the finest and swiftest among wild asses."

[10] British Museum (Natural History), *Catalogue of the Ungulate Mammals* V 14. I have in this discussion followed Lydekker's nomenclature. Unfortunately the designations of Asiatic half-asses by various authors are very inconsistent, so that it is not always an easy matter to determine which species an author means to designate.

There are in Asia several wild equids which in bodily form stand between horse and ass, some of them closer to one, some to the other, in this or that characteristic. Because of their intermediate position they have been called "half-asses," but their systematic classification has not yet been sufficiently investigated. In general we may distinguish with Lydekker three species: (1) *Equus kiang* Moorcroft of Tibet, the largest and darkest. Bright chestnut in color, with sharply delimited white belly, it is most clearly differentiated from both the others, which are more yellow to cream-colored, with more or less strongly developed white in between. These are (2) *Equus hemionus* Pallas, found in the east, roughly from the Altai Mountains to the Ural-Caspian steppes, and (3) the widespread *Equus onager* Pallas. The last is divided into four subspecies, which are localized as follows: the typical *Equus onager onager* in northwestern Iran; *E. o. castaneus* Matschie in western Mongolia; *E. o. indicus* Sclater in India; and *E. o. hemippus* in Syria and Mesopotamia. The last is the smallest and lightest-colored, with the shortest ears and the most horselike head. It alone occurs in Mesopotamia. It is the animal depicted on the Sumerian, Assyrian, and Babylonian monuments and mentioned in the Bible and by Herodotus and Xenophon.

rather smaller than the true Onager, and confined to Syria, Mesopotamia and North Arabia, very rarely enters the north of Palestine from the Syrian desert, but is still common in Mesopotamia. It does not extend into India, but in summer herds of this animal frequently visit the Armenian mountains. It is the Wild Ass of Scripture and of the Ninevite sculptures."[11]

Henry Chichester Hart[12] does not mention the wild ass at all. Perhaps we may interpret his silence as proof that in his time *Equus onager hemippus* had already died out in North Arabia, if we assume that Tristram's account of its occurrence there is at all reliable.

Today the *hemippus* appears to have become practically extinct. The explorer of Tell al-Halaf, Max Baron von Oppenheim, told me that the severe winter of 1910/11 had killed off these animals completely in the territory covered by his operations. Nevertheless a small herd appears to have remained alive at that time. Professor Warburg communicated to me on a card dated February 9, 1935, the following information from a report by the explorer of Western Asiatic fauna, J. Aharoni, on a Syrian trip made in 1930: The wild ass, of which Aharoni had obtained some skins twenty-two years earlier from near the junction of the Euphrates and the Khabur, has now been exterminated there and in the vicinity of Dair al-Zur according to the inhabitants, who say that its extinction was caused twelve years ago by heavy snow which covered the pasture ground for many days. Today fourteen live on a narrow strip of land that stretches from Mosul southeastward to Iran. During the World War five asses were observed, and one was shot, in the neighborhood of ʿAmman, about ten hours east of al-Salt in Transjordan.

Aharoni's own statement in an article on the mammals of Palestine[13] does not sound quite so sad. According to this "the habitat limits of the species of wild asses (*Asinus hemippus* and *Asinus onager*), which extended to Transjordan, were on account of the movements of Bedouin troops during the World War in general and of Wahhabi hordes in recent years completely effaced, and these extremely wary and liberty-loving animals were pushed into the most central parts of the desert. They show themselves nowadays so sporadically that in recent years many Bedouin tribes have caught no glimpse whatever of them."[14] This implies that here and there a few isolated specimens continue to live on. It is surprising that in this report two species of wild asses are distinguished.

[11] Tristram, *op. cit.* p. 3.

[12] *Some Account of the Fauna and Flora of Sinai, Petra, and Wâdy ʾArabah* (London, 1891).

[13] J. Aharoni, "Die Säugetiere Palästinas," *ZS* V (1930) 327–43.

[14] *Ibid.* p. 330.

A last note is provided by the traveler Raswan. On account of its biological significance I quote it here:

Later in the day, as we galloped on, we sighted in the distance what at first we took for some of our mounted hunters driving wolves towards us. But they did not move.

I thought I could recognize riderless horses, watching us with raised heads. But Sheykh Taiᵓ laughed and cried out to me that they were neither horses nor horsemen, but wild asses. I would not believe him at first, for the animals seemed too high in the leg.

Sheykh Taiᵓ pointed out to me that the troop had a leader and this became apparent when the shy creatures ran off. We did not follow, and they disappeared into the clear distance of the Sinjar Mountains.[15]

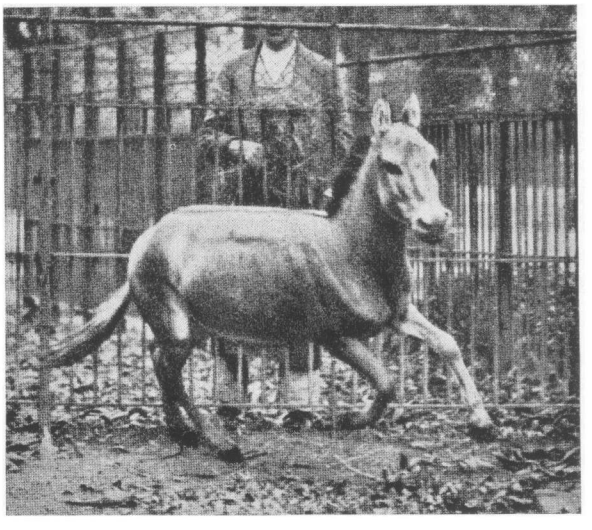


FIG. 1.—A living *Equus onager hemippus* from Syria. After O. Antonius in *Der zoologische Garten* I (1928/29) 20.

This observation was made in the late twenties of this century near the Sinjar Mountains, a chain which lies between Mosul and the upper Khabur. Since that is the region from which come practically all observations of the *hemippus*, we can probably assume that it was the center of dispersion and remains the last refuge of this creature.

In view of the scantiness of our literary sources it is doubly welcome that a number of photographs were made of at least one of the last individuals living in a zoological garden in Europe, namely a male still living in 1928 at Schönbrunn (Fig. 1). Otto Antonius' publication of these photographs together with

[15] Carl R. Raswan, *Black Tents of Arabia (My Life among the Bedouins)* (Boston, 1935) p. 129 (=German ed. [Karl R. Raswan, *Im Land der schwarzen Zelte. Mein Leben unter den Beduinen* (Berlin, 1934)] p. 119).

a detailed description of the living *hemippus*[16] is of particular value because it provides detailed information concerning bodily structure, about which practically no information at all had hitherto been available. To begin with, this account confirms the small stature reported already by Tristram, for in the case of the male at Schönbrunn the height of the withers was only 1 meter. Antonius confirmed a similar surprisingly small stature in the case of a mounted female skeleton in the Vienna Museum. The *hemippus* is therefore the smallest of recent wild equids. Particularly striking is its head. Because of the importance of this feature I shall quote Antonius' account at some length. He begins with the description of two female skulls in the Vienna Museum and finds that the skull of the *hemippus* has the same basilar length (370 mm.) as that of a Shetland pony

and is similar to the latter also otherwise in more than one respect, above all in the very strikingly *concave*[17] profile, the large orbits, and the proportionately very large and decidedly vaulted cranium. . . . . The type of head possessed by the living male is in perfect agreement with that indicated by the two female skulls, except that in the case of the male, as a secondary sex characteristic, the incisive part of the skull may be somewhat more strongly developed. . . . . Of other "exterior" characteristics there remain to be mentioned the *very short*,[17] nimble ears, the splendid large and fiery eyes, and the very disproportionately wide nostrils, which, when the animal is excited, are straightway blown up to trumpet shape.[18]

The illustrations given by Antonius, particularly his Figure 1 (reproduced as our Fig. 1 also), confirm this description. We see an equid with ears that would be short even for a horse, with a finely featured head, large eyes and nostrils, in short a head that in no wise reminds one of the head of an ass but is wholly like that of a horse, indeed like that of a fine Oriental horse.

Similar information we glean from other accounts also. George investigated Isidore Geoffroy's original specimens.[19] These came from the desert between Baghdad and Palmyra, hence from their typical habitat. He writes: "Les oreilles beaucoup plus courtes, et, par suite, la physionomie bien moins différente de celle du Cheval ..."[20] Thus he too emphasizes the similarity to the horse. Further on he writes about the Indian kulan (*Equus onager indicus* Sclater) that it has longer ears and a heavier head than the *hemippus*.[21] At the

[16] Otto Antonius, "Beobachtungen an Einhufern in Schönbrunn. I. Der syrische Halbesel (*Equus hemionus hemippus* J. Geoffr.)," *Der zoologische Garten* I (1928/29) 19–25.

[17] Italics by the present writer.

[18] *Ibid.* pp. 22 and 24.

[19] [Hector] George, "Études zoologiques sur les hémiones et quelques autres espèces chevalines," *Annales des sciences naturelles. Zoologie et paléontologie*, 5. série, XII (1869) 5–48; see pp. 25–33.

[20] *Ibid.* p. 27.

[21] *Ibid.* p. 30.

same time the Indian kulan has, for a wild half-ass, a comparatively light head and medium long ears. Concerning the skull also George writes that it differs from that of the ass and is more similar to that of the horse, the domestic ass being dolichocephalic, the horse brachycephalic, which latter is true of the *hemippus* also.[22] The skull pictured in profile on his Plate II 3 shows well the strikingly deep concavity of the profile.

The repeatedly mentioned shortness of the ears of the *hemippus* seems to impress all who have beheld the living animal as being really specially noteworthy. Henri Milne-Edwards writes: "On voit que par ses formes générales, ainsi que par la coloration de sa robe, cet animal ne diffère que peu de l'Hémione de la race du Cutch [i.e., *E. o. indicus*], mais que ses oreilles sont notablement plus courtes et ressemblent davantage à celles du métis d'Hémione et de Cheval."[23] The ears are thus even notably shorter than in the case of the comparatively short-eared Indian half-ass, the kulan. The illustration given by Milne-Edwards shows indeed the short ears, but it can otherwise hardly be termed successful. To be specific, the color is much too dark, and the characteristic white, or at least light, spot on the buttocks is missing entirely. Apparently the description by Milne-Edwards too applies to one of the original specimens of Geoffroy. The illustration in the earlier editions of Alfred E. Brehm's *Tierleben*, which according to Antonius was made after living specimens in Schönbrunn that had mostly come from Syria, may be called more successful.

The representations on Assyrian reliefs, such as those from Quyunjiq, are very excellent. While these had once been interpreted as representations of wild horses, I had already in 1909 proved that they must be wild asses.[24] At that time I had knowledge only of the Indian half-ass, *Equus onager indicus*, itself very horselike. Of course I suspected that the Syrian *hemippus* was even far more like a horse, but the proof was supplied only by Antonius' photographs of the male specimen living in Schönbrunn. With their aid it has now become possible to judge how exactly and anatomically correctly the Assyrian artists worked. The bodily shape, the finely featured, noble head with its small ears, and also the tufted ass's tail are superbly expressed. And in a scene where a lassoed male is being led away by two men a comparison of the height of the

[22] *Ibid.* pp. 27 and 32.

[23] [Henri] Milne-Edwards in his "Note sur un métis d'hémione et de jument, sur l'hémippe ou hémione de Syrie et sur l'onagre d'Abyssinie," Paris. Muséum national d'histoire naturelle, *Bulletin des nouvelles archives du Muséum* V (1869) 37–42; see p. 40.

[24] Cf. Max Hilzheimer, *Die Haustiere in Abstammung und Entwicklung. Eine natur- und kulturgeschichtliche Darstellung* ("Naturwissenschaftliche Wegweiser," Serie A, Bd. 11 [Stuttgart, (1910)]) pp. 41 f.

animal with that of the men, its back scarcely reaching to their breasts, reveals the small stature.[25] This fact again is important for judging the size of the dogs used for hunting these animals. The dogs can accordingly have been hardly more than 55–65 cm. high at the withers.[26]

I have given special care to the determination of the remains of the equids. Since Woolley's discovery of representations of equids among the ancient Sumerians a controversy has arisen over the question whether they are horses, asses, or crosses between these two. Woolley himself has recently taken the position that the *Equus onager* is meant,[27] and the illustration on his Plate 166 is convincing for this case at least. But in any event these differences of opinion make it necessary to examine every find of Sumerian equid remains especially carefully to determine its species. In the process much trouble arises from the fact that the skulls of horse (*Equus caballus* Linnaeus) and ass (*Equus asinus* Linnaeus) can be distinguished with much difficulty and even then only when complete. The position of the incision of the vomer appears to be a fairly certain mark of distinction; but it loses value, of course, when zebras and half-asses also must be taken into consideration. Under these circumstances nothing can be accomplished with single teeth, in spite of careful investigations such as Duerst undertook.[28] Even the presence or absence of the spur[29] is no dependable criterion. In *Equus asinus*, it is true, the spur appears always to be absent; but it is known to be absent in many domestic horses also, especially in so-called "Orientals." On the other hand, I was able to convince myself in the Berlin Zoological Museum that the spur may be present even in half-asses. Thus in the case of kiang No. 32159 the spur is present in all teeth except the third molar, though in the molars it is merely indicated. In the premolars, however, it is quite well developed, as is true also of No. 32156, though in a less

[25] [See photograph in Bruno Meissner, *Babylonien und Assyrien* I (Heidelberg, 1920) Taf.-Abb. 51. Drawings of this and other wild asses from Quyunjiq are given by George Rawlinson, *The Seven Great Monarchies of the Ancient Eastern World* I (New York, 1885) Pl. CXXI. —ED.]

[26] [Cf. esp. H. R. Hall, *Babylonian and Assyrian Sculpture in the British Museum* (Paris and Brussels, 1928) Pl. LIII (Ashurbanipal).—ED.]

[27] C. L. Woolley, *The Royal Cemetery* (Joint Expedition of the British Museum and of the University of Pennsylvania to Mesopotamia, "Ur Excavations" II [Oxford, 1934]) pp. 272 f.

[28] J. Ulrich Duerst, "Animal remains from the excavations at Anau and the horse of Anau in its relation to the races of domestic horses," in Raphael Pumpelly, ed., *Explorations in Turkestan, Expedition of 1904*, II (Washington, D.C., 1908) 339–442; see esp. pp. 386–89, 405–7, 409 f., and 411–14.

[29] Defined *ibid.* p. 386, n.**, as "the small enamel fold entering from the ant-oblique valley into the ant-oblique lobe (Owen's terminology)."

degree. Unfortunately the only skull of *Equus onager* there available, No. 17574, is not suitable for comparison, for it is that of a female from Iran which had lived in the Berlin Zoological Garden and had worn its teeth down to such an extent that the pattern of the enamel plications is hardly recognizable.

More important therefore in our case than the available skull fragments or single teeth—which will be discussed later—appear to be the metatarsi and the metacarpi. According to my experience these bones appear to be particularly suitable for distinguishing not only horse (*Equus*) and ass (*Asinus*) but also half-ass. Fortunately we have from Tell Asmar one complete metacarpus, found in D 16:10, and the lower ends of two metatarsi, found in E 15:23. One of the latter has been worked, so that not much of consequence remains to be seen on it. The other, however, is preserved to above the middle, so that the parts essential for determining species, namely the diaphysis and the lower end, can be recognized. The difference in the structure of the metatarsi of horse, ass, and half-ass I have discussed elsewhere previously.[30] Here, then, I shall merely point out that I find in the metatarsus from Tell Asmar the same graceful shape and strong curvature of the diaphysis as in the modern comparative skeleton in the Berlin Zoological Museum, No. 7942, a male from the Berlin Zoological Garden. The Tell Asmar metatarsus has also the same flattening of the diaphysis above the lower joint, where it appears to be almost concave—a feature wherein it differs characteristically from that of *Asinus*, which at that point is rather convex. For this reason the Tell Asmar metatarsus, when seen from the side, shows also the decided prominence of the middle ridge of the lower joint toward the front. The backward bend of the lower end is likewise present, and, though less pronounced than in the modern comparative skeleton, is still sufficiently prominent in comparison with that of *Asinus* so that there can be no doubt concerning its belonging to a half-ass, in our case *hemippus*.

As for the metacarpus, the differences are not quite so sharply defined as in the metatarsus, but they are nevertheless clear enough. Apart from the more pronounced gracefulness of the metacarpi of Asiatic half-asses, the flattening of the diaphysis immediately above the lower joint must be emphasized here also, as a result of which the joint, when seen from the side (Fig. 2), stands out toward the front. Two skeletons in the Berlin Zoological Museum, that representing *Equus hemionus* (No. 7942) and one of *Equus kiang* (No. 32172), again served as comparative material. Over against the metacarpus of the African

[30] Hilzheimer, "Ueber den Metatarsus eines *Equus hemionus fossilis* Nhrg. aus Königswusterhausen," Berlin. Gesellschaft naturforschender Freunde, *Sitzungsberichte*, 1921, pp. 140–42.

Equus asinus somaliensis (Berlin Zool. Mus. 30253) those of the afore-mentioned skeletons, when viewed from the front (Fig. 3), distinguish themselves by the weakness of the joints. This characteristic is possessed by the Tell Asmar specimen in an even greater degree. In the case of the latter the joint ends are hardly thickened at all laterally in relation to the middle of the diaphysis, so that the lateral lines continue almost straight (cf. pp. 12 f.). That is

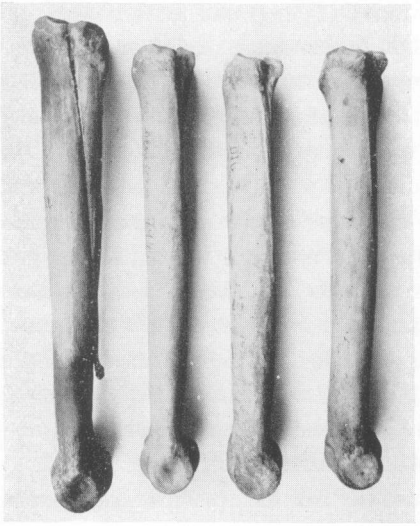


FIG. 2

FIG. 3

FIG. 2.—Side view of metacarpi of (*a*) a male *Equus kiang* (Berlin Zool. Mus. 32172), (*b*) a male *Equus hemionus* (Berlin Zool. Mus. 7942), (*c*) an *Equus onager hemippus* from D 16:10 at Tell Asmar, and (*d*) a female *Equus asinus somaliensis* (Berlin Zool. Mus. 30253).

FIG. 3.—Front view of metacarpi shown in Fig. 2.

probably also the reason why the diaphysis above the joint is narrower than the joint itself. Whether this difference as compared with the modern specimens is due to the fact that the ancient specimen is perhaps from a young animal cannot be decided here because of lack of material.

The flattening of the lower end of the diaphysis of metatarsus and metacarpus described above and the backward curvature of the lower end of the metatarsus appear to be characteristic for the various species of Asiatic half-asses. Their extraordinary narrow-footedness, however, they seem to share with the African asses, except that the Asiatic half-asses frequently are even more narrow-footed than the African asses.

I submit the following comparative figures:

TABLE I*

MEASUREMENTS OF METACARPI OF HORSES, ASSES, AND HALF-ASSES

Horses	Greatest Length	Medial Width	Index	Asses and Half-Asses	Greatest Length	Medial Width	Index
Pinzgau	278[1]	44	15.8				
"	260[1]	43	16.5				
Holland hard trotter	258[1]	42	16.3				
Male, No. 1181	252[1]	38	15.1				
Rixdorf	249[1]†	44	17.6				
Arab mare	244[1]	34.5	14.1				
Pinzgau	240[1]	37	15.4				
Remagen	239[1]†	38	16.6	*Equus kiang*, Berlin Zool. Mus. 32172	237	28	11.8
Westeregeln	235[1]†	41.5	17.6	*E. onager* (kulan)	232[4]	28	12.0
Solutré	235[2]†	41	17.4	*E. kiang*, mare	232[1]	28	12.0
Westeregeln	230[1]†	40	17.4	*E. hemionus foss.*, Quedlinburg	230[1]†	28.6	12.4
"	227[1]†	40	17.6	*E. kiang*	229[4]	28	12.2
"	226[1]†	39	17.2	Anau equid	228[4]	29	12.7
Quedlinburg	226[1]†	42	18.6				
Thiede	225[1]†	34	15.1				
Quedlinburg	224[1]†	41	18.3				
Solutré	224[2]†	35	15.6				
"	222[2]†	37	16.7				
"	221[2]†	38	17.2				
"	220[2]†	36	16.3	Anau equid	220[4]	27	12.3
"	218[2]†	35	16.1	Ass	218[3]	29.5	13.5
"	217[2]†	40	18.4	*Equus hemionus*, Berlin Zool. Mus. 7942	218	27.5	12.6
"	215[3]†	35.5	16.5	*E. onager hemippus*, Tell Asmar, from D 16:10	216	29	13.4
Celtic pony	214[2]	28.5	13.3				
Turkestan mare	210[1]	33	15.7	*E. hemionus*, Paris Mus.	212[4]	25	11.8
Solutré	207[2]†	35	16.9				
Tarpan	207[2]	33	15.9				
Equus caballus robustus	204[2]	35	17.1				
Schlossberg	203[2]	23	11.3	Ass, Märkishes Mus., Berlin	203	27	13.3
La Tène	200[2]	28	14.0	*Equus onager*, Syria	200[3]	23	11.5
Renz pony	200[1]	29.5	14.7				
Lofoten horse	195[2]	32	16.4	Ass	191.5[3]	25	13.0
Exmoor pony	182[1]	25.3	13.9	Ass from Halle, No. 1129	169[1]	24	14.2

* The figures in this table are taken from (1) Alfred Nehring, "Fossile Pferde aus deutschen Diluvial-Ablagerungen und ihre Beziehungen zu den lebenden Pferden. Ein Beitrag zur Geschichte des Hauspferdes," *Landwirtschaftliche Jahrbücher* XIII (1884) 81–160, on p. 130; (2) August Brinkmann, "Equidenstudien" I–II, Bergens Museums *Aarbok*, 1919/20 (Bergen, 1922). Naturvidenskabelig raekke, nr. 5, p. 20; (3) Anton Weithofer, "Ueber ein Vorkommen von Eselsresten in der Höhle 'Pytina jama' bei Gabrowitza nächst Prosecco im Küstenlande," Vienna. Naturhistorisches Hofmuseum, *Annalen* III (1888) 7–14, on p. 8; (4) Duerst, *op. cit.* pp. 391 f. With regard to Duerst's publication it should be noted that his nomenclature does not seem to agree with that adopted here. For example, Duerst's *Equus hemionus* appears to be our *Equus onager;* but, since he gives no further information regarding its habitat, it is difficult to be certain, and I have therefore accepted his nomenclature without change. Weithofer's *E. onager* is almost certainly our *E. o. hemippus.*

The superior numbers following the measurements of greatest length refer to the publications just mentioned. Measurements without a superior number are my own. A dagger following a superior number marks the specimen as diluvial.

The foregoing comparison of the metacarpi of horse, ass, and half-ass respectively seems to lead to the following conclusions: (1) In horses the length-width index varies independently of the length of the metacarpus. Perhaps the metacarpus is just for that reason well suited to serve diagnostic purposes, and in fact attempts have been made repeatedly to use it thus. Of course, the range of variation in the nine Solutré horses, 15.6–18.4, comprises a good part of the range of variation in the entire species. But with only three exceptions the indices of the thirty-three measured metacarpi of horses are at 14 or above. (2) All asses and half-asses are narrow-footed. Except for the metacarpus of one dwarf ass the indices of all measured metacarpi of asses are at 13.5 or below. And in just such half-asses as possess particularly long metacarpi the indices are extraordinarily low, while in horses having metacarpi of similar length the indices are very high. From this it appears to me that the two groups vary independently of each other and overlap but little and even then in the case of rare exceptions only—a fact from which the diagnostic value of this index for distinguishing between horse and ass or half-ass respectively becomes evident. The dividing line seems to be at 13.6, so that all metacarpi having a higher index belong to the species horse (*Equus sensu stricto*), while those having a lower index belong to the species ass (*Asinus*) or half-ass respectively. Perhaps it may even be possible on the basis of the metacarpal indices to establish differences within the last two groups, for it seems that the metacarpi of *Asinus* have a higher index than those of the half-asses. However, the material at my disposal is not sufficient to attain a fair degree of certainty on this point.

In any case the following two conclusions drawn from the foregoing are of importance:

1. The metacarpus from Tell Asmar cannot be that of a horse. Whether it is that of an ass or a half-ass cannot be decided on the basis of the metacarpus alone. In any case attention must be called to the fact that its index agrees better with the metacarpal indices of the asses listed in Table I than with those of the half-asses. The question whether this is a mere accident resulting from the small number of metacarpi of half-asses examined to date or possesses a deeper meaning will have to be reserved for later investigations. Here we wish to point out merely that the Tell Asmar metacarpus possesses certain morphological peculiarities that distinguish it from the other metacarpi referred to for comparison. The latter are all contracted in the middle, so that the ends of the diaphyses stand out prominently. This is especially true in the species *Asinus*, less so in the half-asses. In the metacarpus from Tell Asmar, however, it holds to a particularly slight extent. Perhaps this results from the fact that

the middle of its diaphysis is particularly wide—a feature which would explain also the high length-width index. But the fact that the diaphysis at its widest point below is narrower than the joint argues against this possibility.

2. The second important point is the small length-width index of the metacarpi from Anau. I have often already expressed the surmise that the Anau equid may be not an *Equus caballus*, as Duerst assumed,[31] but a half-ass. The correctness of my surmise is proved by the narrow-footedness evident from Table I, the length-width indices of the metacarpi from Anau being far below those of horses and in the middle of the range of those of asses. This fact

TABLE II

MEASUREMENTS OF THE TELL ASMAR METACARPUS AND RECENT METACARPI OF OTHER EQUIDS

Points of Measurement	Tell Asmar (from D 16:10)	*E. onager* ♂ (Berlin Zool. Mus. 7942)	*E. kiang* ♂ (Berlin Zool. Mus. 32172)	*E. asinus* (Märk. Mus., Berlin)	Mule (Märk. Mus. 3701)
Greatest length	216	218	237	203	270
Medial length between joints	206	.....	.....	.....	.....
Lateral length between joints	209	.....	.....	.....	.....
Greatest width of proximal joint	42	43	43.5	43.5	57
Greatest width of distal joint	42	38	42	38	54.5
Transverse diameter of proximal joint	27.5	29	30.5	27.5	39
Transverse diameter of distal joint ridge	29	30.5	31	30	41
Medial width of diaphysis	29	27.5	28	27	38
Medial transverse diameter of diaphysis	24	21	28	22	30
Greatest distal width of diaphysis	40	39.5	44.5	40	53.5

voids all theories concerning the origin of the horse that are based on an assumed presence of a true wild horse at Anau. It makes untenable also the view expressed by Sewell and Guha that two fragments of lower jawbones found in Mohenjo Daro might be those of genuine horses because of their similarity to remains of the Anau equid.[32] Just because of the small size stressed by the authors the possibility easily exists that the fragments are those of the equid still living in India today, the *Equus onager indicus* Sclater. Lower jawbones, above all when in fragments, can hardly be used with safety for diagnostic purposes. In view of the importance that every such early find has for the history of the horse one should designate unrestrictedly as *Equus caballus* really in-

[31] Duerst, *op. cit.* p. 397.

[32] R. B. Seymour Sewell and B. S. Guha, "Zoological remains," India. Archaeological Survey, *Mohenjo-Daro and the Indus Civilization*, ed. by Sir John Marshall, II (London, 1931) 649–73; see pp. 653 f.

contestable pieces of evidence only and always mark uncertain ones with at least a question mark.

In Table II (on p. 13) are given the measurements of the Tell Asmar metacarpus together with those of several recent metacarpi for comparison. One is struck by the fact that the length-width index (14.1) of the metacarpus of the mule is very small for its length and also by the small width of the diaphysis at its distal end in relation to the width of the proximal joint. Perhaps the influence of the ass is seen in this, whereas the great length is inherited from the horse.

The metatarsus as a diagnostic means was discussed above on page 9. The two Tell Asmar metatarsi available for study are both from the same locus (E 15:23). Both are fragments of the distal part of the bone. One has been worked, the diaphysis having been hollowed out, the ridge of the joint removed, and the sides of the joint fashioned. In this condition it probably served as a handle. The other is preserved to above the middle, and its lower joint is complete. Its measurements are:

Width of distal joint roll	38
Transverse diameter of joint ridge	30.5
Medial width of diaphysis	27.5
Medial transverse diameter of diaphysis	26

I now give the measurements of the other bones of the extremities in so far as they could be taken. Apart from phalanges only fragments are available, so that measurements of length are lacking.

HUMERUS

	From E 15:23	From D 16:10	From F 16:7
Side	left	left	right
Width of articular surface	55	63	.....
Medial height of articular surface	.....	42	.....
Medial longitudinal diameter of lower end	.....	72	90
Lateral height of trochlea	.....	.....	47

FEMUR

Lower ends of two left femurs found in E 15:23:

Greatest width across both condyles	75	.....
Medial longitudinal diameter	93.5	86
Lateral longitudinal diameter	70	70

TIBIA

Lower end of a left tibia found in H 20:18: √

Width	36
Longitudinal diameter	54

PHALANX

		From E 15:23	From H 20:15
Medial length of front side		76	77
Width	above	41	49
	middle	26	27
	below	34.5	34
Transverse diameter	above	32	36
	middle	22	22.5
	below	21	20

Both phalanges are very slender, the first more so than the second.

TEETH

Unfortunately not a single complete skull is available, in fact not even a complete row of teeth. And in dealing with single teeth, unless they are the first or the last molar, it is hardly possible to determine definitely which teeth they are. For this reason I have added in the following the alternatives with "or" in order to indicate which teeth may in each case be in question. Only where for reasons easily to be deduced from the following discussion the identification seems certain has an alternative been omitted.

The only recent skull of *Equus onager* available to me for comparison is that of the female from Iran mentioned above, namely No. 17574 of the Berlin Zoological Museum, which had lived in the Berlin Zoological Garden. As already indicated, its teeth had been worn down to such an extent, and irregularly at that, that not much can be said concerning the pattern of the enamel plications. I have, however, at least taken the measurements and have also sought to attain all possible clarity concerning the interior pillars. On this occasion I should like to point out that apparently no osteological investigations whatever of a more detailed nature are as yet available concerning *Equus onager*, skulls of which, let alone skeletons, are among the greatest rarities in European collections. Most of the osteological investigations that have been published concern *Equus kiang*, though it is frequently named otherwise and in older publications in particular is referred to as *Equus hemionus*. Skeletons and single skulls of this species are not altogether rare. Lacking sufficient material of *Equus onager*, I have drawn on several skulls of *Equus kiang* in the

Berlin Zoological Museum, in order to have at least one other recent representative of Asiatic half-asses for comparison.

The largest and best preserved piece from Tell Asmar is an incomplete skull found in J 19:27. It consists of three separate parts, the occiput and the right and left upper jawbones with palate (Fig. 4); the brain-case cover is missing. The animal was undergoing its change of teeth. The premolars are just breaking through, and it is probable that the crowns of the milk teeth were still in

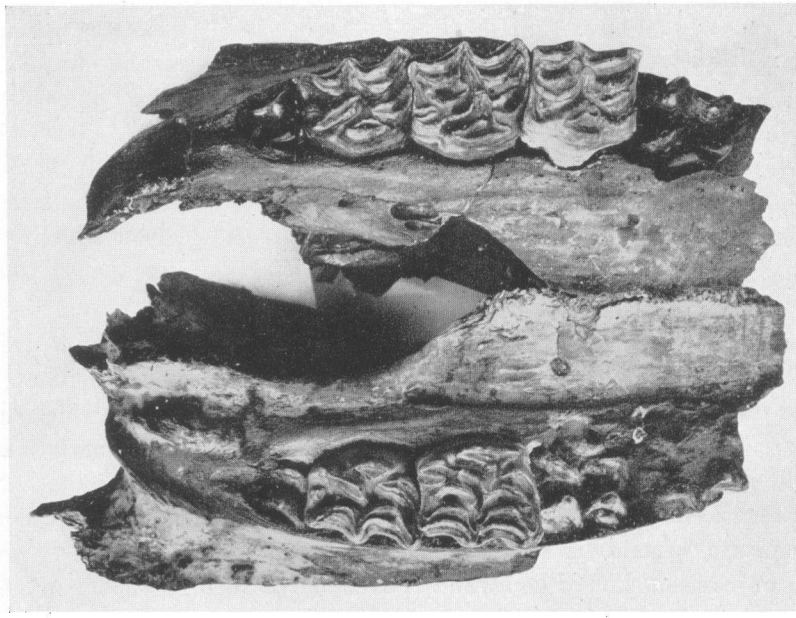


FIG. 4.—Upper jawbones of an *Equus onager hemippus* from J 19:27

position above the premolars, for on the right side the crown of Pd^3 is still present. M^1 and M^2 have broken through and already show wear. The last mentioned, however, is worn so little that the interior pillar is still free and not yet joined to the rest of the grinding surface. P^3 has in its interior valley a suggestion of a spur.[33] In M^1 the spur is present to an even less degree. In addition to the above mentioned female onager, No. 17574, there served for comparison kiang No. A 1.13, which had been bagged by Tafel in northeastern Tibet, between Lake Tossun Nor and the Wahong Range.[34] Its molars are in

[33] Defined on p. 8, n. 29.

[34] Albert Tafel, *Meine Tibetreise* . . . . (2 vols.; Stuttgart, Berlin, and Leipzig, 1914) I 330; on the presence of kiang herds in the regions between lakes Kuku Nor and Tossun Nor and also north and west of Tossun Nor cf. also I 302–3, 325, and II 36. In the one-volume edition (1923) see pp. 193, 209, 212 f.

the same stage of development as those of the ancient specimen from Mesopotamia. To judge by the state of the incisors, the kiang was two years old; and this in turn permits a conclusion a posteriori concerning the age of the ancient onager. Perhaps the kiang is a trifle older than the latter, because in the teeth of the kiang the interior pillar is already joined to the grinding surface. In M^1 of the ancient onager the interior pillar is longer and narrower than in that of the kiang, and its lingual margin is slightly convex, whereas in that of the kiang it is distinctly concave. In the case of the recent onager (No. 17574), as compared with the ancient, the interior pillar is shorter and the lingual margin

TABLE III

MEASUREMENTS OF UPPER TEETH OF ONAGERS

Locus or Berlin Zool. Mus.	Tooth	Length	Width	Length of Interior Pillar
17574	P^1	33	22	7.5
17574	P^2	24	25	9
F 17:6	$P^{2?}$	25	23.5	10
17574	P^3	23	27	9.5
J 19:27	P^3	21	25	10
17574	M^1	21.5	24.5	9.5
J 19:27	M^1	27.5	24	14
J 19:10	$M^{1?}$	27	25	....
D 17:1	$M^{1?}$	24	23	13
17574	M^2	22	24	10
J 19:27	M^2	26	20	14? (incomplete)
D 16:7	M^2	22.5	20	10
17574	M^3	25	21	10
E 15:14	M^3	24	22	12

still more convex, so that the entire pillar appears more rounded than in the ancient specimen. In P^3 likewise the greater shortness of the interior pillar and its more rounded shape as compared with the corresponding tooth of the ancient onager are clearly marked. In both recent specimens there is no trace of a spur; and plication of the enamel of the marks is noticeable in the case of the kiang only, being stronger in M^1 on the mutually facing sides of the marks, weaker in P^3, than in the ancient specimen. The measurements are given above in Table III.

In addition to the foregoing the following separate upper teeth also are available:

A left M^3 from E 15:14. This tooth offers nothing noteworthy; at most it might be mentioned that its interior pillar is situated farther back than in the comparative pieces and has a deeper indentation on its lingual margin.

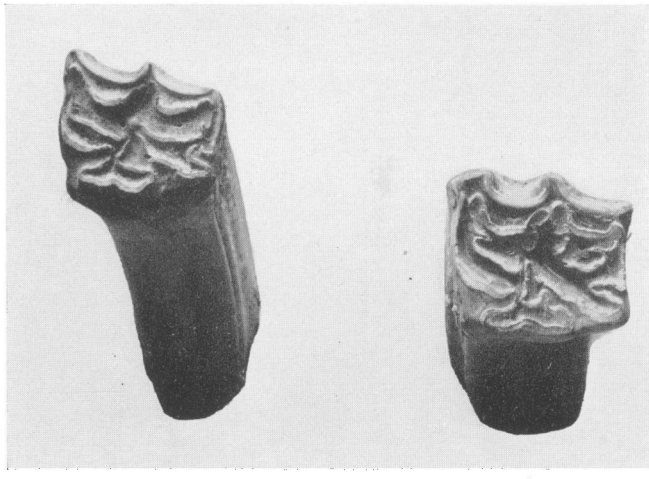
A right M^1 or M^2 from J 19:10. This tooth attracts attention by reason of the shortness of the interior pillar and the deep indentation of its lingual mar-

gin. Unfortunately the length of the interior pillar cannot be measured, because the pillar is somewhat damaged.

A left upper molar from D 16:7 with a very remarkable formation of the enamel; that is, anterior and posterior fossettes join without being separated by enamel walls (Fig. 5 *a*). The tooth is probably an M^2 of a rather young animal.

A left premolar, probably a P^2, from F 17:6. The interior pillar has a very short posterior horn.

A right M^1 or M^2 from D 17:1 (Fig. 5 *b*). The interior pillar has at the back of its lateral margin a spurlike projection into the interior valley.



a *b*

FIG. 5.—Upper molars of *Equus onager hemippus*: *a*, a left molar from D 16:7; *b*, a right M^1 or M^2 from D 17:1.

Lower teeth were found in three loci only. From D 16:10 came several teeth and a fragment of a left lower jawbone with M_3. To this jawbone belongs a loose left M_2. A separate left M_1 appears to belong with a very slightly worn P_2 and a still unused M_2. A right P_3 also was found there. From E 16:17 we have a fragment of a lower jawbone with a somewhat damaged left M_3. In H 20:15 was found a fragment of a right lower jawbone with P_1 and P_2 in position. The formations of the enamel plications are very similar to those found in the teeth of three kiang skulls collected by Holderer and now in the Berlin Zoological Museum. To judge by the state of their incisors, as we would for horses, these kiangs have an age of $5\frac{1}{2}$ years. I find a similarity especially in a small enamel plication at the front on the labial margin of the posterior lake, the great extension of this lake toward the rear, and the nearly

circular shape of the *lobus tertius*. In older kiangs, specimens of which are likewise available to me, the small plication is lacking and the *lobus tertius* is not so sharply set off, because the posterior lake does not extend so far to the rear and the *lobus tertius* appears more square.

TABLE IV

MEASUREMENTS OF LOWER TEETH OF ONAGERS

Locus	Tooth	Length	Width
H 20:15	P_1	30.5	25
"	P_2	27	27
D 16:10	P_3	24	16
"	M_1	30	13
"	M_2	21	15
"	M_3	29	13
E 16:17	M_3	31	15

Of incisors only two were found, a left I_2 and I_3, both from E 16:17. They probably belong together, are extraordinarily narrow, and measure 13 and 11.5 mm. respectively.

Apart from the pieces enumerated above there were found also remains not as yet measurable or remains of younger animals, among them for instance the detached epiphysis of a radius from E 15:23.

According to the foregoing data, on the basis of the lower teeth we have before us the remains of at least three individuals, two of which (one adult and one with teeth undergoing change) are from D 16:10, while a second left M_3 is from E 16:17. The other teeth need not necessarily belong to other individuals. The same holds true of the upper teeth, for even the upper part of a skull from J 19:27 with a milk tooth (see p. 16) need not necessarily indicate an individual other than the younger one of D 16:10. Consideration of all the material and of the diversity of find-spots makes it probable, however, that five or more individuals are involved.

A remarkable thing about these remains is the fact that, so far as age can be determined at all, they belong to animals undergoing change of teeth or to animals in the prime of life. This would indicate that the remains are those of wild animals taken in the chase and brought to Tell Asmar to serve as food; for one utilizes tame horses or asses as long as possible, and in no case does one slaughter them in the prime of life except for sacrifice. For such a custom, however, no indication has as yet been found in Mesopotamia. On the other hand, on the basis of the incomplete skull of a young onager (see p. 16) and in view of Woolley's arguments for holding that the animal on the rein ring and

those on the "standard" are tamed onagers[35] one may also assume that young onagers were caught for taming. If future finds on the spot should prove this to be the case, we should be confronted with a most remarkable fact. We should then have to give the ancient Sumerians full credit for the taming of *Equus onager* and its use as a draft animal for war chariots[36]—an accomplishment all the more characteristic of the ancient Sumerian culture because, so far as we know, the onager has nowhere since been tamed on an extensive scale. There would then remain only the question whether the ancient Sumerians were induced by foreign example to tame the solidungulates native to their country, through having become acquainted with horses or African domestic asses among their neighbors, or were fully original in this. In any event the taming of the onager remained restricted to the Sumerian culture; the later culture apparently knew it no more.[37] It must therefore have been abandoned in Akkadian times. This is further indicated by the fact that all the *hemippus* remains were found in Sumerian loci [Early Dynastic III–Proto-imperial] except for the single tooth from J 19:10 [First Imperial or later] (cf. pp. 49–51). But a single tooth can easily get by chance into a place where it does not belong.

Dama dama LINNAEUS

Of the fallow deer three antler fragments were found. Two of these, from E 16:16, are with burr, each about 50 mm. long and cut off at the distal end. The better preserved piece, with short but complete brow antler, is cut off below the partially preserved burr and hence does not derive from a shed antler but must be considered as coming from an animal bagged in a hunt. The other on being taken from the ground crumbled to such an extent in the region of the burr, of which only an inconsiderable piece remains, that it can no longer be recognized whether this piece also was sawed off or derived from a shed antler. In any case the fact that both fragments are cut off distally proves that the Sumerians must have used the antlers in some way or other, presumably for implements.

The antler fragments described above derive in all probability from *Dama dama* Linnaeus. Besides this species *Dama mesopotamica* Brooke also comes into consideration; however, in spite of its scientific name, it is today restricted

[35] Woolley, *The Royal Cemetery*, pp. 272 f.

[36] On the primitive harnessing see Hilzheimer, "Die Anschirrung bei den alten Sumerern," *Prähistorische Zeitschrift* XXII (1931) 1–18.

[37] Cf. beginning of Hilzheimer, "The evolution of the domestic horse," *Antiquity* IX (1935) 133–39. [Possible vestigial representations of domesticated onagers, mostly on "Cappadocian" seals, are mentioned by Van Buren, *Fauna*, pp. 30 f.—ED.]

to Luristan. The peoples of Mesopotamia have represented both.[38] Interestingly enough, two antler fragments of *Dama mesopotamica* were found by the German excavators at Uruk and are now in Berlin (Staatliche Museen, Vorderasiatische Abteilung 10646). The excavations of Baron von Oppenheim at Tell al-Halaf yielded complete antlers of *Dama mesopotamica*, which are also in Berlin (Zool. Mus. 34509). Since we have no information concerning the

FIG. 6.—Crown antler of *Dama dama* Linnaeus from D 17:10. Scale, 1:2

original distribution of the two kinds of fallow deer, it is hoped that further finds will provide clarity concerning at least the limits of their habitats.[39]

[38] Cf. Hilzheimer in *ERV* XIV (1929) 193 (in his "Vorderasien: Fauna," *ibid.* pp. 190–200), where the difference between the two is also indicated. For a most striking Middle Assyrian (between 1350 and 1000 B.C.) seal design showing deer see Otto Weber, *Altorientalische Siegelbilder* ("Der alte Orient" XVII–XVIII [Leipzig, 1920]) Fig. 538, after William Hayes Ward's catalogue of *Cylinders and Other Ancient Oriental Seals in the Library of J. Pierpont Morgan* (New York, 1909) No. 280. [For this design see now also Henri Frankfort, *Cylinder Seals* (London, 1939) Pl. XXXI *h* and pp. 186–89.—ED.]

[39] [After this paper had been prepared, tools of Natufian age made from antlers of *Dama mesopotamica* were found in Wadi al-Mugharah in Palestine also; see Joint Expedition of the

The third fragment is a crown antler from D 17:10, cut off below (Fig. 6). It is flattened only slightly and does not represent a real broad palm. In this state the determination of species is far more difficult than in the case of the lower ends, since *Dama dama* in its youth, that is, until about its fifth year, is quite similar to *Dama mesopotamica* in having no broad palm but only a moderately flattened crown.[40] In the present case, however, one tine in particular is very short, the upper one too is short, and they are close together. The distance from the fork downward to the point where the beam is cut off is quite large, without even the least trace of a further tine. Finally, the tine above the fork is strongly bent (inward?). All of this argues against its being from *Dama mesopotamica*. In the case of the latter the tines of the crown antler are usually comparatively long, especially the uppermost, and the tine branching off below the fork is usually situated not very far below it. While all this is not complete proof, it nevertheless argues at least for the greatest probability that the antler derives from a young *Dama dama* that fell prey to a hunter in its third to fifth year. It is interesting to note that this piece also was cut off, thus constituting with the other fragments a proof of the extent to which antlers were used for making objects.

Gazella subgutturosa GÜLDENSTÄDT

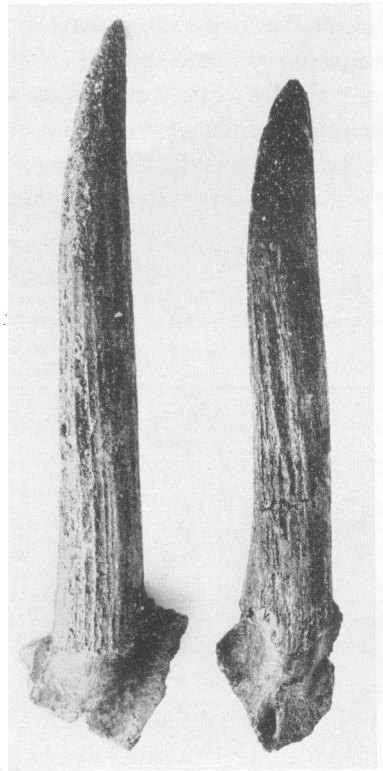
Of this gazelle,[41] native to Mesopotamia even today, twelve horn cores are available, six right and six left (inclusive of one not measurable, from H 20:8). Most of them appear to be separate pieces; only four form pairs. In one pair, that from D 17:1, the attached pieces of frontal bone match in the middle. In the other pair, that from F 17:5, though the frontal bones have been damaged to such an extent that a connection can no longer be established, correspondence in form and dimensions enables us to conclude with the greatest certainty that the completely preserved right horn core and the left one constitute a pair. We have therefore remains of ten individuals. The horn cores, apart from two completely preserved ones (Figs. 7–8), consist mostly of basal parts with pieces of frontal bone attached. In only one specimen, from H 20:8, do we have merely a fragment of the upper half of a left horn core, the meas-

British School of Archaeology in Jerusalem and the American School of Prehistoric Research, 1929–1934, *The Stone Age of Mount Carmel. Excavations at the Wady el-Mughara*, Vol. I, by D. A. E. Garrod and D. M. A. Bate (Oxford, 1937) pp. 15, 37, and 115 and Pl. XV 3.—ED.]

[40] Antlers of both are illustrated by Hilzheimer in Ludwig Borchardt, *Das Grabdenkmal des Königs Śa3ḥu-reˁ* II (Leipzig, 1913) Figs. 28 and 32.

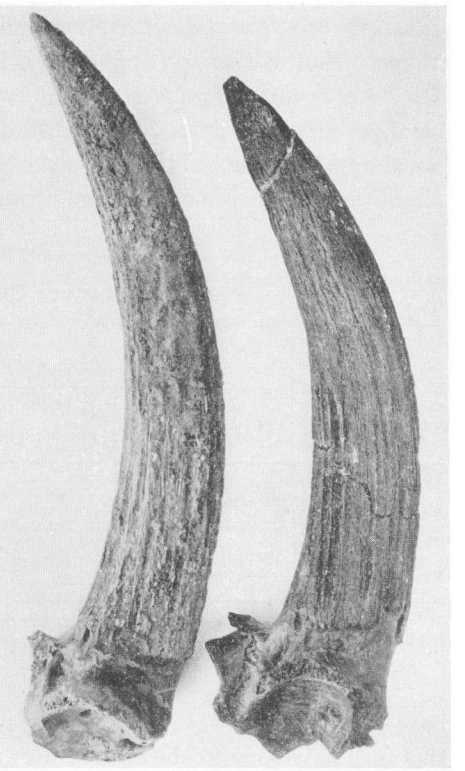
[41] A living specimen is illustrated in *Brehms Tierleben* (4. Aufl.) XIII (Leipzig und Wien, 1916) pl. facing p. 209.

urements of which are of course lacking in Table V. The fracture surfaces of the horn cores are throughout recent, the fractures having occurred during excavation. The fracture surfaces of the frontal bones, however, are probably all ancient, so that it must be assumed that the horns were broken from the



a *b*

FIG. 7



a *b*

FIG. 8

FIG. 7.—Front view of two right horn cores of *Gazella subgutturosa* Güldenstädt: *a* from H 20:3; *b* from F 17:5.

FIG. 8.—Side view of horn cores pictured in Fig. 7, showing the straightness and curvature respectively of their axes.

skulls already in antiquity and were brought to Tell Asmar merely as trophies or for some ritualistic purpose. This view seems to be confirmed by the observation that apart from a left half of a lower jawbone from E 15:23 no gazelle bones whatever were found. Gazelles may therefore not have served as food. In this connection it deserves to be emphasized that likewise in Mohenjo Daro no remains whatever of *Antilope cervicapra* Linnaeus were found,

although this animal, numerous and distributed throughout India, is today considered sacred by the Hindus. On the other hand, bones of *Gazella subgutturosa* were not uncommon at Anau.

The ancient horn cores are of various thicknesses, but they do not exceed the range of variation observed in recent ones. Some, however, show a surprisingly strong deviation from the direction of the long axis; examples are the two from F 17:5, one of which is the complete right core shown in Figure 7 *b*. Others, for example the right core from H 20:3 (Fig. 7 *a*), are almost straight. The rest lie in between. In deviating, the core bends somewhat outward in the middle and inward at the tip. At the same time the tip undergoes a slight turn which, when seen from behind the animal, proceeds laterally from the

TABLE V

MEASUREMENTS OF HORN CORES OF GAZELLES

	Locus						Berlin Zool. Mus.	
	D 17:1	E 15:23	F 17:5	H 20:3	H 20:8	Street SE. of J 19:6	A 102.11	A 4729
Length along front edge	.....	.....	168 *	187	.....	.....	170	165
Longitudinal diameter of base	36 36	36	33 34.5 32	33 32 33.5	31	35	35	32
Transverse diameter of base	25 24.5	24	23 23 21	25 22 22	21.5	24.5	27	20
Position on head	r† l†	r	l r r	r l l	r	l	.....	.....

* The tip is somewhat damaged. At present the over-all length is 170 mm.; it is estimated to have been originally at least 180 mm.

† r=right; l=left.

base of the core outward, that is, toward the right on the right horn. Naturally this turn is lacking in the case of horn cores having merely a saber-like backward bend in a single plane. It is noteworthy as a general fact that the lateral surfaces of the horn cores are flat, whereas the medial surfaces are vaulted, so that right and left horns can thus be easily recognized.

According to the measurements the Mesopotamian gazelle appears to have been very graceful. It might be commendable to draw no further conclusions for the time being, since no modern gazelles from Mesopotamia are available for comparison. Of the two recent skeletons compared in Tables V and VI, A 102.11 came from Transcaucasia, and A 4729, whose native home is unknown, lived in the Berlin Zoological Garden.

Gazelles are obviously very numerous in Mesopotamia. But strangely, in spite of this fact, there appears still to be a lack of a sufficient number of specimens in museum collections, so that the present-day living species are still un-

determined. R. E. Cheesman[42] and C. R. S. Pitman[43] have indeed established that in southern Mesopotamia *Gazella marica* Thomas occurs. But concerning the classification of the northern Mesopotamian gazelle, of which several specimens from the vicinity of Samarra were available to them, they did not achieve clarity. If that was not possible for these scholars, to whom skulls and heads of the animals were available, it is much less possible for me, since I have from Tell Asmar but single horn cores for investigation, and the recent material available in Berlin is wholly insufficient. Moreover it is very doubtful whether in view of the great similarity among horns of the various species of gazelles it is at all possible to undertake a systematic determination of species on the

TABLE VI

MEASUREMENTS OF LOWER JAWBONES OF GAZELLES

LOCUS	ROW OF MOLARS AND PREMOLARS	MOLARS	PREMOLARS	DIASTEMA	M_3		HEIGHT OF LOWER JAW	
					Length	Width	Below Back Margin of M_3	Below Front Margin of M_3
E 15:23	61	41	19	28.5	18	6	28	23
BERLIN ZOOL. MUS.								
A 102.11	68	45	22	38	21	7	31	24
A 4729	65	43	20	.....	20	7.5	30	25

basis of horn cores only. My choice of the designation *Gazella subgutturosa* has been made solely on the ground that Tell Asmar lies within the territory of distribution given for this species by Lydekker.[44] A proper zoological determination of species should not and could not be made.

It would be highly interesting, however, to know where in Mesopotamia the border lies between the habitat of *Gazella subgutturosa* and that of *Gazella marica*. The existing gap in our knowledge is herewith pointed out again most

[42] See pp. 21–23 in his "Report on the mammals of Mesopotamia collected by members of the Mesopotamian Expeditionary Force, 1915 to 1919," Great Britain. Army. Mesopotamian Expeditionary Force, *A Survey of the Fauna of Iraq* . . . . (Bombay, [1923]) pp. 1–24 (reprinted from *JBNHS* XXVII, No. 2 [Dec. 20, 1920]).

[43] See pp. 321–23 in his "Notes on Mesopotamian mammals," *ibid.* pp. 317–23 (reprinted from *JBNHS* XXVIII, No. 2 [Mar. 25, 1922]).

[44] British Museum (Natural History), *Catalogue of the Ungulate Mammals* III (1914) 44. Cf. also J. Aharoni, "Die Säugetiere Palästinas," *ZS* V (1930) 329.

emphatically. Perhaps in case of further expeditions into these regions these animals also might incidentally be observed and a series of specimens be collected by the natives, with time and locality of occurrence carefully recorded.

Canis familiaris

Remains of dogs are very scant and are far from sufficient to permit determination of species. At most one may say that on the one hand the Asiatic jackal, the *Canis aureus*, is out of the question, since it has a much more graceful set of teeth (cf. Table VII), and on the other hand the set is too weak to be

TABLE VII

MEASUREMENTS OF LOWER TEETH OF DOGS

TOOTH	DIMENSION	LOCUS		ASIATIC JACKAL (*Canis aureus*)*
		J 19:10	K 19:2	
P_4	length	.....	12.5	10.5–11
M_1	length	22.5	22.5	18 –19.5
	width	8.5	9.5	6 – 7
M_2	length	.....	9	8 –10

* See Hilzheimer, *Beitrag zur Kenntnis der nordafrikanischen Schakale nebst Bemerkungen über deren Verhältnis zu den Haushunden, insbesondere nordafrikanischen und altägyptischen Hunderassen* ("Zoologica" XX, Heft 53 [Stuttgart, 1908]) Tabelle I.

that of a wolf. The set of teeth is even too weak for one of the larger representatives of the *Canis familiaris inostranzewi* group, if we compare the data given by Wagner,[45] who measured a large number of recent dogs. Such a comparison shows also that dwarf dogs, whose teeth are again too graceful, likewise cannot come into question. Nor can a large greyhound, such as Frankfort may have found depicted on a pectoral from Tell Asmar,[46] since for this the teeth are too graceful. Thus only smaller representatives of *Canis familiaris intermedius* or larger ones of *Canis familiaris palustris* remain as possibilities. The latter group really fits best. To it, that is, to schnauzers, spitzes, fox terriers, and dogs of similar size, are likewise suited what skeletal remains there are, including especially two unfortunately incomplete upper thighbones

[45] K. Wagner, *Rezente Hunderassen. Eine osteologische Untersuchung* (Oslo. Norske Videnskaps-Akademi. I. Matematisk-naturvidenskapelig Klasse, "Skrifter," 1929, 3. Bind [Oslo, 1930] No. 9).

[46] See Frankfort, *Oriental Institute Discoveries in Iraq, 1933/34* (*OIC* No. 19) pp. 29 f. and Fig. 30.

from H 20:3. One may therefore perhaps think of a large spitz as represented on an old Sumerian seal.[47]

Among the remains available for study are a fragment of a right lower jawbone with P4, M1, and M2 from K 19:2 (Fig. 9) and two jugal bones and a fragment of another right lower jawbone with M1 from J 19:10. The measurements of the teeth are given in Table VII, with those of the Asiatic *Canis aureus* added for comparison.

The other remains are: from H 20:3, fragments of two upper thighbones belonging to one individual, each lacking upper end (width at lower end, 31;

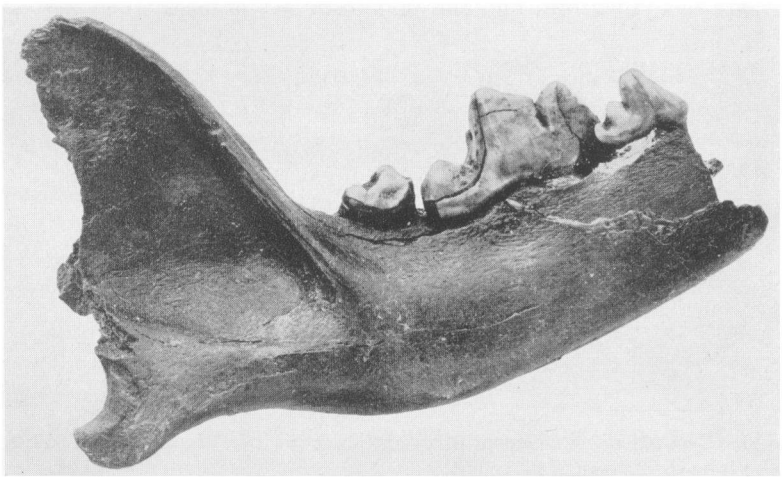


FIG. 9.—Fragment of a right lower jawbone of a dog from K 19:2

transverse diameter, 35[?]; width at middle, 12; transverse diameter, 14); from street 3 meters northeast of J 20:1, two first lumbar vertebrae and four thoracic vertebrae, namely the last three and one from farther forward; from east of J 20:10, a sacrum consisting of two vertebrae (greatest width at front, 46; greatest width of body of vertebra at front, 26; greatest height at front, 17.5).

We have the remains of at least two individuals, since the lower jaw fragments are both from the right side.

Sus

Remains of pigs are very numerous, but they are broken to such an extent that only a few measurements can be taken. To begin with, I list all the available material according to find-spots:

[47] See Hilzheimer, *Natürliche Rassengeschichte der Haussäugetiere* (Berlin und Leipzig, 1926) p. 135, Fig. 62.

D 16:7

Upper end of a left humerus, with the suture below the greater tuberosity still wide open (transverse diameter of upper end, 44; width of head, 34).

D 17:1

Lower jawbone, with a milk tooth, and various other bones of a farrow.

D 17:2

Fragment of right lower jawbone of an aged animal (Fig. 10). P_1–M_3 are indeed present, but badly damaged; thus the crown of P_1 is gone, M_2 has fallen out, and the talonid of M_3 is missing, so that of this

FIG. 10.—Best preserved fragment of a right lower jawbone of a pig from D 17:2, illustrating both its shortness and its height.

tooth only the two pairs of cusps remain. To judge by what is preserved, the pattern of folds on the grinding surface was rather simple. The row of teeth is surprisingly short, being only about 100 mm. long, but the jawbone is very high, being 43 mm. in front of M_3 and 40.5 mm. in front of M_1. Unfortunately the poor state of preservation does not permit the taking of more measurements. In comparison with those of other pigs the shortness and the height of this jawbone are striking. It is similar to the decidedly shortened jawbones of very modern domestic pigs; hence it probably derives from a pig which, according to our conceptions, was to a great extent domesticated.

E 15:23

1. Fragment of a left lower jawbone; M_3 has not yet broken through.
2. Numerous extremital remains of young pigs.
3. Fragment of right lower jawbone of a young pig. The teeth have fallen out of the alveoli; M_3 has not yet broken through.

E 16:18

Remains of a farrow, including skull and extremital bones. It appears that the skeleton was complete, that is, that we have the remains of a whole farrow. The upper jawbone has D^{2-3} and M^1, the lower jawbone M_1. Both molars have indeed broken through the jawbone, but they were not yet in use.

F 15:9

Fragmentary skull of a very young farrow; the occiput and the greater part of the face are missing. Of the teeth, D^{2-3} are preserved; the forward cusps of M^1 are just breaking through the jawbone. The parietal bones are strongly vaulted.

F 17:6

1. Fragment of a left lower jawbone with M_3, the talonid of which had not yet completely broken through. The forward pair of cusps already shows wear; the second is just beginning to show it. The pattern of folds on the grinding surface is rather simple. M_2 is broken off in front of the second pair of cusps. M_3 is 29(?) mm. long and 13 mm. wide.
2. Fragments of two right upper jawbones, one with P^2–M^2, the other with M^{1-2}. M^3 had not yet broken through.
3. Fragments of a frontal bone with orbital margin.
4. A separate lower canine which agrees exactly with that of a wild pig.

H 20:8

Lower end of a right tibia (transverse diameter, 24.5; width, 25).

H 20:15

Fragment of a left lower jawbone with Md_3 and M_1. The talonid of the latter is still in the jawbone, and even the forward pair of cusps hardly shows signs of use.

J 19:10

1. Symphysis of a lower jawbone with right I_{1-2} and left I_1. I_3 has fallen out. C is small (indicating that the jawbone probably derives from a female), and the crown is broken off. P_{1-3} have undergone complete change. The symphysis is very long, turning upward gradually; its profile is slightly concave; its length up to the mid-point between the two I_1's is approximately 67 mm.
2. Symphysis extending to behind the canines, of which, however, only the right one is preserved. The incisors are badly damaged, but the alveoli are well preserved. The symphysis is 60 mm. long, its profile concave.
3. Fragment of an upper jawbone with D^{2-3}. Perhaps a separate M^3 (length, 35; width, 10) which had apparently not yet broken through,

had as yet no roots, and shows no signs of wear belongs to the same jawbone.

4. Front part of a right symphysis with incisors and right canine, the latter not yet fully broken through. The part extends back to P_3. The profile of this symphysis is more concave than that of the preceding ones.
5. Fragment of a left upper jawbone with the last two milk teeth.
6. A separate lower M_3 (length, 35.5; width, 15) which was not yet in use and therefore had not yet broken through.

South of J 19:12

1. Symphysis of a lower jawbone (length, 57). All incisors have fallen out; the crowns of both canines are broken off. The symphysis is extremely short and strongly concave and hence certainly derives from a domesticated pig, perhaps from one belonging to the same species as that from D 17:2. Despite its shortness it probably came from a fully or at least rather fully grown animal.
2. Fragment of left upper jawbone of a very aged animal. M^2 is completely preserved (length, 17; width, 14); M^1 is fragmentary (length, 14).

Twelve meters east of J 20:1

1. Fragment of a left lower jawbone with D_3 and M_1; the forward pair of cusps of the latter is just beginning to show signs of use.
2. The occiput of an apparently aged animal (greatest width across wings of occipital ridge, 63). Remarkably, the upper horizontal part of the occipital ridge points not backward, as in wild pigs, but upward toward the front. This is owing to the fact that the uppermost part of the occipital wall is bent forward. Neither feature occurs in wild pigs, and both are rather signs of domestication.

Below J 20:16

Half of a left lower jawbone with alveolus of I_3 and teeth D_{1-3} and M_1, the last showing hardly a sign of wear.

Outside doorway to P 31:1

Upper part of skull of a young pig (distance of temporal lines from each other in rear before occipital ridge surprisingly small, only 21; greatest width across orbits, 93; distance from middle of occipital ridge to postorbital process, 80).

Street in P 34

Fragment of a left symphysis extending back into the region of P_4. Its length is 78 mm. Of the teeth only C is preserved. This is small and probably derives from a female. The tooth and also the form and size of the symphysis agree fully with the corresponding parts of a small female wild pig from the Hunsrück (Berlin Zool. Mus. 40707).

This survey of the skeletal remains of pigs shows that the remains are predominantly of young animals. In only two cases is M_3 developed, namely in those from D 17:2 and F 17:6; and in the latter the talonid had not yet broken through. The fragment of an upper jawbone from south of J 19:12 is from a very aged animal. The separate M_3 from J 19:10 had in all probability not yet broken through the jawbone. All of the remaining animals were of an age at which the first molar, less frequently the second, was breaking through. Unfortunately, in the case of most domestic animals the time of the breaking through of molars is hardly known, while in accord with the needs of practical farmers detailed observations are available concerning the front teeth. Nevertheless certain data concerning the molars of pigs may be gathered from Nehring.[48] According to these the average age of the majority of the pigs whose remains are listed above may be estimated at not more than one year. The fact that thus almost none but young animals were eaten seems to justify the conclusion that they were domestic pigs, even in those cases in which no marks whatever of domestication could be observed in the skeletal remains. On the other hand we were able in certain cases to establish very extensive influences of domestication. It is possible to draw from these two seemingly contradictory observations the following conclusions concerning pig-raising among the ancient Sumerians: In general, pigs were left to roam about very freely, and possibly interbreeding with wild pigs still occurred occasionally. Hence pig-raising may have been similar to that known to be practiced today in the Malay Archipelago, where half-wild pigs are frequently covered by wild boars. Individual pigs may then, in order to be used as offerings or for fattening or for some other purpose, have been kept in narrower confinement. This would explain the extensive effects of domestication observed in individual cases in which, so far as the formation of the skull with short jawbones is concerned, these ancient specimens are hardly inferior to highly domesticated modern pigs.

An attempt to determine the number of pigs of which we have remains is not a very simple matter. To begin with, the symphyses give us five. To these must be added three or four farrows (from D 17:1, E 16:18, F 15:9, and perhaps E 15:23) to which none of the five symphyses can belong. This would bring the minimum up to eight or nine. If we now take the fragments of lower jawbones (two right and five left), we get seven more, or perhaps six, if the two jawbones from E 15:23 should belong to one individual. Again, none of the symphyses can belong with these lower jawbones. With inclusion of the

[48] In Ottomar Rohde, ... *Schweinezucht* (4. Aufl.; Berlin, 1892) pp. 127–44, esp. the table on p. 144.

farrows, we thus arrive at a total of fourteen to sixteen individuals. Besides the remains listed above we have also several other pieces that have been left unmentioned because they offer nothing of importance. These are: cervical vertebrae and extremital bones belonging to very young animals (two individuals) from E 15:1; a fragment of left tibia of a very young pig from E 16:17; a left astragalus from F 17:6; and a left radius of a young pig from H 20:3. Hence the total given above is certainly not too high.

An attempt to determine the species or even to classify under a group of species I would rather forego because of the extensive destruction suffered by the remains.

Ovis

We must distinguish four different sheep, one wild and three domestic.

The wild sheep.—The kind of wild sheep that occurs in Mesopotamia today or occurred there in the past cannot be determined because of lack of material. According to Lydekker[49] Mesopotamia lies within the range of *Ovis orientalis* Brandt and Ratzeburg, which extends from Cyprus across Asia Minor into Iran. The most easterly point of occurrence of *Ovis orientalis* known thus far is Isfahan, whence the subspecies *Ovis orientalis ispahanica* Nasonov has been reported and described. Farther eastward lies the range of *Ovis vignei* Blyth, and to the south that of *Ovis laristanica* Nasonov, which inhabits southern Iran. On this basis one would surmise that the wild sheep of ancient Mesopotamia belonged to *Ovis orientalis*. But *Ovis orientalis* has a short tail measuring at most 3–4 cm., while *Ovis vignei* has a comparatively long tail measuring about 10 cm. Now on some at least of the ancient Mesopotamian representations the wild sheep depicted are comparatively long-tailed.[50] The heavy horns and the mane[51] must be considered extremely true to nature; hence one is probably justified in assuming that the length of the tail also corresponds with fact. In this case the ancient Mesopotamian wild sheep would have to be assigned to *Ovis vignei*. That would not be impossible, since we know that at that time the range of various other animals, for example the elephant, extended farther to the west.[52] On the other hand, on other representations appear short-tailed wild sheep,[53] which would accordingly correspond to *Ovis orientalis*. Here, then, is an inconsistency that requires clarification; but for its solution our

[49] British Museum (Natural History), *Catalogue of the Ungulate Mammals* I (1913) 78.

[50] E.g. Weber, *Altorientalische Siegelbilder*, Figs. 67, 121, and 544.

[51] See esp. *ibid.* Fig. 544.

[52] Cf. Hilzheimer in *ERV* XIV 190–98 and literature mentioned there.

[53] E.g. Weber, *op. cit.* Figs. 556 and 557 (middle of top row).

fundamental need is recent wild sheep from Mesopotamia—material still completely lacking.

The "Mesopotamia Expeditionary Force 'D' " of 1915–19 brought wild sheep from the Bakhtiari country in western Iran and from the region about Shiraz. The former were provisionally and with reservations assigned by Cheesman to *Ovis laristanica*,[54] which, like *Ovis orientalis*, is short-tailed; the latter were assigned to *Ovis vignei cycloceros* Hutton, with which Cheesman links also the red sheep of the Pusht-i-Kuh.[55] We would thus have a colony of *Ovis vignei* within the territory of *Ovis orientalis*. Such a colony would probably have to be viewed as a relic, and its existence would explain the appearance of representations of *Ovis vignei* on ancient Mesopotamian seals and monuments. According to Blanford, however,[56] the range of *Ovis vignei cycloceros*[57] is believed by Major St. John to extend from Baluchistan to Mesopotamia. Further clarification may be expected only after collections of recent material have been made.

The domestic sheep.—According to our present knowledge three breeds of domestic sheep are to be distinguished in ancient Mesopotamia:

1. Sheep having hair instead of wool and possessing pendent ears. The male has a mane and horizontal corkscrew-shaped horns; the female has neither mane nor horns. The tail is indeed short, but to judge by ancient representations it is still 10–15 cm. long, that is, about half the length of the thigh. The bones found at Tell Asmar apparently derive from this breed. It is discussed more fully below in connection with the bones.[58]

[54] Great Britain. Army. Mesopotamian Expeditionary Force, *A Survey of the Fauna of Iraq*, pp. 23 f. (reprinted from *JBNHS* XXVII, No. 2 [Dec. 20, 1920]).

[55] *Ibid.* p. 23, also pp. 38 and 41 from his "Report on a collection of mammals made by Col. J. E. B. Hotson in Shiraz, Persia," *ibid.* pp. 33–41 (reprinted from *JBNHS* XXVII, No. 3 [Mar. 31, 1921]). B. Landsberger and I. Krumbiegel, *Die Fauna des alten Mesopotamien nach der 14. Tafel der Serie* ḪAR-ra = *ḫubullu* (Sächsische Akademie der Wissenschaften, philol.-hist. Klasse, "Abhandlungen" XLII, Nr. VI [Leipzig, 1934]) p. 70, utilize the foregoing references to the *Survey*.

[56] Quoted by Cheesman, *op. cit.* p. 24.

[57] A living specimen is illustrated in *Brehms Tierleben* (4. Aufl.) XIII, pl. facing p. 227.

[58] In the description of this breed by Landsberger and Krumbiegel, *op. cit.* p. 90, an error has unfortunately crept into their otherwise excellent treatise. In Western Asia "Mähnenschafe" are always domestic animals; wild "Mähnenschafe" do not exist there. But all wild rams also are maned, and naturally they were so depicted by the inhabitants of ancient Mesopotamia. Accordingly all animals designated by Landsberger and Krumbiegel as "wilde Mähnenschafe" are to be classed as wild rams and only *tame* maned sheep as "Mähnenschafe." In North Africa, it is true, there is a wild animal likewise called "Mähnenschaf" in German, but it is not a true sheep; cf. p. 195 in my article "Sheep," *Antiquity* X (1936) 195–206, and p. 49 in my contribution "Zoologische Bemerkungen zu den Tierdarstellungen" in

2. Sheep having wool and a very short, lean tail, at most 10 cm. long. The rams have heavy horns coiled spirally about the erect or pendent ears; the females have no horns. This breed is illustrated by Weber,[59] also in Langdon's report on the excavations at Kish.[60] Moreover, to it might be assigned all sheep that are represented as being milked.[61] In the inlays from Kish no wool is indicated. In prehistoric times the head was strongly convex in profile, as evidenced by figures from Uruk in Baghdad and in Berlin.[62]

3. Fat-tailed wool-bearing sheep. The tail, which exhibits the principal difference between this and the other two breeds, is heavier and longer, extending down to the hocks and having, to judge by the representations, an estimated length of 20–25 cm. The ears are small and erect. The rams are horned

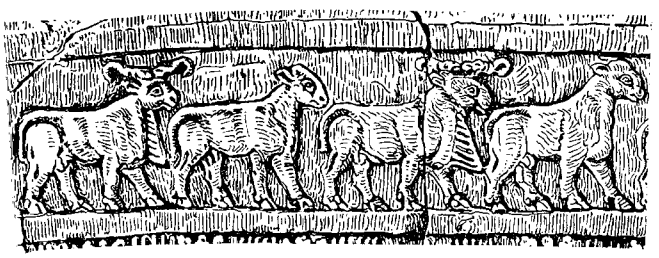


FIG. 11.—Horizontal-horned hairy sheep, primitive form with erect ears, as pictured on a vase from Uruk. Scale, 1:4. After E. Heinrich, *Kleinfunde aus den archaischen Tempelschichten in Uruk* (Berlin, 1936) Pl. 38.

like those just described; whether the females were horned is unknown (but see pp. 38 f.).

It appears that certain time limits can be established for these three breeds of domestic sheep so far as Mesopotamia is concerned. At Uruk the first breed was represented in pre-Early Dynastic art. At Tell Asmar the actual remains described below belong to levels ranging from Early Dynastic III to Gutian.

Ernst Heinrich, *Kleinfunde aus den archaischen Tempelschichten in Uruk* ("Ausgrabungen der Deutschen Forschungsgemeinschaft in Uruk-Warka" I [Berlin, 1936]) pp. 48–52. The latter study treats especially of the first two domestic breeds here described. A more primitive form of the first, with erect ears, occurs on a carved alabaster vase published *ibid.* Pls. 2, 3, and 38; see *ibid.* p. 49 and our Fig. 11. [This vase and the British Museum trough mentioned on p. 39 are dated by Frankfort, *Cylinder Seals*, p. 16, to the Uruk period.—ED.]

[59] *Op. cit.* Figs. 403, 405, 422, etc.

[60] S. Langdon, *Excavations at Kish* (Field Museum–Oxford University Joint Expedition to Mesopotamia I [Paris, 1924]) Pls. XIII 1, XIV 1, and XL–XLI.

[61] *Ibid.* Pls. XIII 1 and XLII.

[62] Cf. Heinrich, *op. cit.* pp. 17–20 and 50 f. and Pls. 4 b, 5, 7 a, etc.

The second breed was likewise represented already in the prehistoric period and continued through the Early Dynastic. Ancient Sumerian dairy farming was in part dependent on it. With the end of that period came also the passing of this breed and discontinuance of the use of sheep as milch animals. In Babylonian and Assyrian times we meet with the third breed alone. It is possible, however, that this breed existed already in Early Dynastic times. At least in the sheep depicted on the well known mosaic "standard" from Ur[63] I have the impression that a fat tail is represented.[64] At a still later time a fourth breed seems to have entered Mesopotamia, namely one with a long fat tail. On sheep of this breed the tail may be so long and heavy that it must be bound on a small trolley in order not to drag on the ground and become chafed, as Herodotus relates.[65] The proof that this is truth and not fiction, as one might well be inclined to believe, I have now received from Miss Neuhäuser, who observed on her travels that in certain sections of Anatolia a sheep's enormous fat tail is for the same reason placed on a trolley.

Since extremital remains of sheep and goats are in general difficult to distinguish, I have here included all that do not clearly derive from goats. I hope, of course, that some fortunate find may make possible in the future the establishment of distinctions between sheep and goats for all bones, at least so far as Mesopotamia is concerned, by yielding connected remains of both kinds, so that we may know in detail the skeletal build of each of the breeds kept in Mesopotamia; for it is conceivable that if we confine ourselves to one definite region we shall find the various breeds kept there distinguished by size, strength, or otherwise.

I now list the material according to find-spots:

D 16:7

Upper end of a left humerus.

D 16:9

Fragment of a lower jawbone of a lamb.

D 17:1

1. Part of a right lower jawbone with M_{1-2}; M_3 had not yet broken through.
2. M_{1-2} from the left side, found separately. Measurements of the grinding surface are: M_1, 14 mm. long and 7.5 mm. wide; M_2, 17 mm. long and 7.5 mm. wide.
3. Several bones of a lamb.

[63] Cf. Woolley, *The Royal Cemetery*, Pl. 91.

[64] Cf. *Antiquity* X 202.

[65] Hdt. iii. 113.

D 17:2

1. Lower ends of three right tibiae (widths, 29.5, 29, and 28.5 respectively; transverse diameters, 23, 22.5, and 22 respectively).
2. Lower end of a left humerus (width, 34; lateral height of trochlea, 24.5; lateral transverse diameter, 28; width of trochlea, 32).
3. Fragment of a right hip-joint socket.
4. Lower end of another left humerus.

E 15:14

A separate lower M_2.

E 15:23

1. Right lower front leg (Fig. 12; lower part of ulna extending beyond radius is missing, so that total length can only be estimated at *ca.* 220; greatest transverse section of olecranon above joint, 28.5; width of ulna, above, 35, at middle, 19, below, without radius, 32; transverse diameter of ulna, above, 16.5, at middle, 12, below, 21).

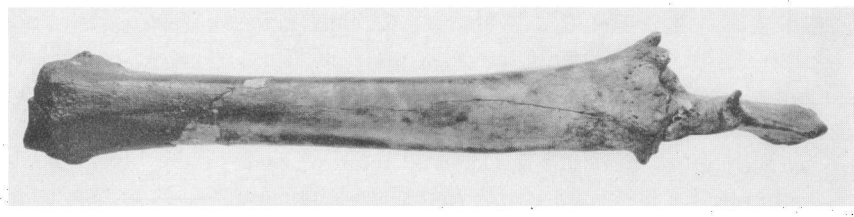


FIG. 12.—Right lower foreleg of a sheep from E 15:23

2. Left metacarpus (least medial length between joints, 103, least lateral length between joints, 102, greatest medial length up to middle distal articular surface, 107; width, above, 22, at middle, 14, below, across both articular surfaces, 24; transverse diameter, above, 15, at middle, 10, at distal articular surface, 15).
3. Lower end of a left tibia (width, 25; transverse diameter, 20).

F 17:5

An astragalus and a cervical vertebra.

F 17:6

Upper epiphysis of a tibia, two young metacarpi, and a left astragalus.

F 17:7

1. Right radius, rather fully grown, but epiphysis detached.
2. Three phalanges.
3. A young right radius.

H 20:3

Fragments of three horn cores: (1) a right core without tip but with part of the frontal bone attached (Fig. 13 *a;* longitudinal diameter of base, 46; transverse diameter, 27); (2) fragment of a left horn core, not measurable (Fig. 13 *b*); (3) fragment of a left horn core (longitudinal diameter of base, at least 50) stronger than the two preceding but less well preserved.

H 20:11

Last two lumbar vertebrae.

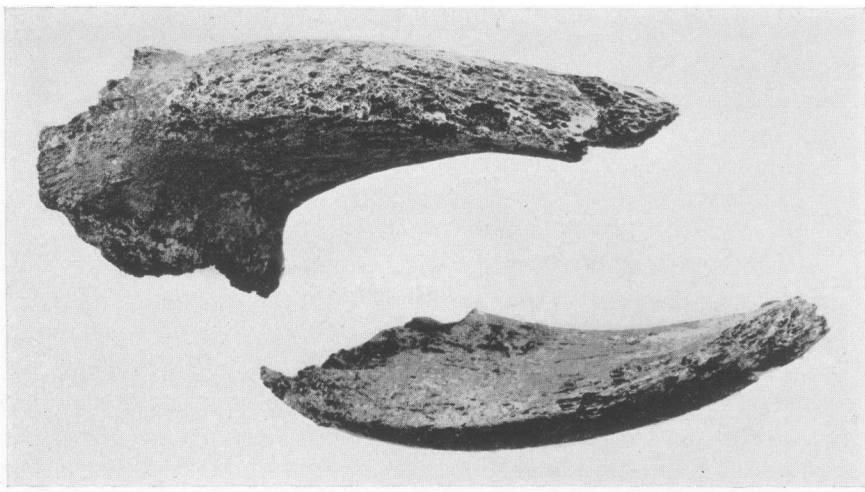


FIG. 13.—Fragments of horn cores of two sheep from H 20:3: *a*, a right core with part of frontal bone, viewed from same angle as the cores in Figs. 15–16; *b*, a left core, viewed even more from behind, so that the edge that is normally above is below in the picture. In direction of upper edge and of rear surface both agree exactly with the cores shown in Fig. 8.

J 19:2

Part of left half of a pelvis (longitudinal diameter of hip-joint socket, 25; narrowest part before the socket, 16; narrowest part vertically before the socket, 15).

J 19:10

1. Incomplete left lower jawbone with milk teeth D_{1-3} and M_1 (D_{1-3}, 30; length of D_3, 17, width, 6.5; length of M_1, 18 [probably longer than it would have been later, after talonid, still present, had worn away], width, 6.5).
2. Fragment of a lower jawbone of a lamb.
3. Second and third premolars and a left radius.

South of J 19:12

1. Upper end of a right upper thighbone (transverse diameter of head, 23.5).
2. An epistropheus (length with dens, 61; without dens, 51; length of upper spinous process, 45; greatest width in front, 47).
3. A lower M_3 (length, 29; width, 9).
4. Fragment of a lower jawbone with M_3.
5. A second phalanx.
6. Detached lower epiphysis of a femur.

Twelve meters east of J 20:1

Lower end of a left humerus (width of trochlea, 35; transverse diameter of lower end, 31).

East of J 20:10

1. Upper end of a right upper thighbone (width, 50; transverse diameter of great trochanter, 26; transverse diameter of head, 21).
2. A sacrum consisting of three vertebrae minus the epiphysis (present length, below, 63; with epiphysis it was probably 65).
3. Three cervical vertebrae.
4. Lower end of a right tibia (width, 29; transverse diameter, 21.5).
5. An epistropheus (length with dens, 61; without dens, 52; length of upper spinous process in middle, 42; over-all length, 46).

From the foregoing list the large number of lambs involved becomes evident. As with the pigs, we are justified in concluding that the sheep were domesticated. Even the horn cores belong to young animals and are not fully developed. This increases the difficulty of race attribution. According to the ancient representations we may expect two breeds of sheep for Sumerian times: a wool-bearing sheep, with pendent or short erect ears and heavy horns coiled spirally about them, and a hairy sheep without wool but having a mane, large pendent ears, and horns extending horizontally from the head. The former is by far the more commonly depicted breed. We find it for example on seals and inlays (see p. 34) and on an incised plaque of Ur-Enlil from Nippur (Fig. 14),[66] where clearly a short tail is depicted. The sheep on the so-called "standard" from Ur, however, appears to have a semilong fat tail (see p. 34). Such a tail appears on later Assyrian representations, always for example on reliefs from the time of Tiglath-Pileser III.[67] On these the sheep always has enormous horns that are coiled about the ears in

[66] First reproduced in Pennsylvania. University. Babylonian Expedition, *The Babylonian Expedition* . . . . Series A. *Cuneiform Texts* I 2 (Philadelphia, 1896) Pl. XVI 37.

[67] Cf. Eckhard Unger, *Die Reliefs Tiglatpilesars III. aus Nimrud* (Konstantinopel, 1917) Pl. VI 3 and 5.

a wide arc, so that the tips of the horns lie far below the conchae in the region of the throat. Since I know of no representation of such wool-bearing sheep without horns, I assume that the females were horned. In the case of the maned hairy sheep with horizontal horns, this was otherwise. The representa-

FIG. 14.—Goat and sheep on plaque of Ur-Enlil from Nippur. From a cast, by courtesy of the University Museum, University of Pennsylvania.

tion of a ram I have published on several occasions.[68] A herd of these sheep (with pendent ears) is depicted on an alabaster trough in the British Museum[69] which shows that the females were without horns.

[68] Cf. Pl. XV 11 in Hilzheimer, "Nordafrikanische Schafe und ihre Bedeutung für die Besiedlungsfrage Nordafrikas," ZS III (1928) 253–77, also *ERV* XIV, Pl. 51 B c.

[69] See H. R. H[all] in *British Museum Quarterly* III (1928/29) 40 f. and Pl. XXII, also W. Andrae, "Steinbecher," Berliner Museen, *Berichte aus den preussischen Kunstsammlungen* LI (1930) 2–4, Fig. 1.

The horns of sheep having normal spiral horns are triangular in cross section with a broad front surface set off at a sharp angle from both the back and the underside (Fig. 15). Of course, the anterior angle is not at all or only slightly

FIG. 15.—Horn core of a recent Sardinian mouflon (Berlin Zool. Mus. 22775), seen from rear.

FIG. 16.—Horn core of a recent horizontal-horned sheep from Timbuktu (Berlin Agricultural College 6737), seen from rear.

developed in earliest youth and in females, so that the horns then appear to be two-edged. What has been said here concerning the horns naturally holds also for the horn cores, which, just as in the present pieces from Tell Asmar, are usually all that remains in the case of fossil and subfossil specimens. In sheep

with horizontal horns, of which a specimen from Timbuktu (No. 6737 of the Zoological Institute of the Berlin Agricultural College; Fig. 16) is available to me for comparison, no anterior angle is developed on the horns. The cross section is approximately crescent-shaped with long transverse axis. In another respect also the horn cores of sheep with horizontal horns differ from those of sheep having normal spiral horns. In the latter the back sides of the cores are almost vertical and extend in a vigorous, strongly lateral curve from the fore-

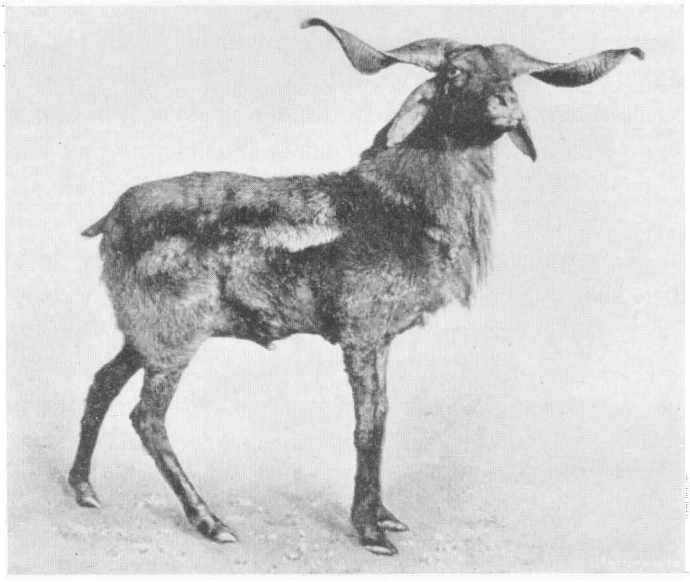


FIG. 17.—Horizontal-horned ram from Abyssinia with mane and pendent ears. British Museum (Natural History). After its *Guide to the Domesticated Animals*.

head (cf. Fig. 15). In cores from sheep with horizontal horns (cf. Fig. 16) the curve is very sharp (i.e., its radius is very short) and at a much more acute angle backward in relation to the forehead, then downward and forward. The back side of the core undergoes at the same time a change of plane from the vertical, the lower edge shifting forward, the upper sharply backward, so that it tips over backward, as it were, and the upper parts, when viewed from above, cover up the lower. In other words, the corkscrew-like axial twist in the case of sheep with horizontal horns begins close to the base of the horns. In all the respects just mentioned the present horn cores from Tell Asmar (cf. Fig. 13) are similar to the horns of the horizontal-horned specimen from Timbuktu and differ from those of normal spiral-horned sheep, including their females and very young rams. On the other hand we must admit that there are sheep with

horns forming such a tight spiral that the entire winding, inclusive of horn tip, is behind and above the ear. In the case of these sheep also the anterior angle of the broad front surface is rounded off and the back side near the base is tipped over backward. A specimen with such horns, a fat-tailed sheep from Iran, is at present living in the Berlin Zoological Garden. Such horns represent in a certain sense a transition from the normal spiral-horned sheep to the horizontal-horned sheep; and in young animals, where the horns are not yet fully developed, one would hardly be able to distinguish between them. But, since such a species is not known to us from Sumerian times, we shall hardly be making a mistake if we attribute the present remains from Tell Asmar to the Sumerian horizontal-horned sheep representations of which have been mentioned above. The three horn cores from Tell Asmar belonged, as their shortness indicates, to young, wholly undeveloped rams. These findings are all the more interesting, since on the basis of frequency of representation the normal spiral-horned wool-bearing sheep was rather to be expected. Perhaps the horizontal-horned hairy sheep, which disappears later from the representations, is the older one. Yet similar types still occur, not only in Timbuktu but in Abyssinia (Fig. 17).

The number of individuals can hardly be computed from the present remains, but there must have been at least four, since we have four right tibiae.

Capra prisca ADAMETZ AND NIEZABITOWSKI

The only bones available are:

E 15:23
Left horn core from an animal somewhat older than the one mentioned below.

South of J 19:12
Right horn core of a young animal.

In spite of their being from young animals these twisted horn cores are clearly recognizable as belonging to *Capra prisca* Adametz and Niezabitowski. They rise vertically from the base and farther up turn outward. Thus they belong to the breed that is usually represented,[70] for example in association with the spiral-horned sheep referred to above, though not with the horizontal-horned breed depicted on the incised plaque of Ur-Enlil (Fig. 14).

[70] Cf. the particularly beautiful illustration in Woolley, *op. cit.* Pl. 87.

Bos

To begin with, we list the available material according to find-spots:

D 16:7

1. A cervical vertebra.
2. A left *os centrotarsale* (width, 58; transverse diameter, 50).
3. A left humerus.

D 17:1

1. Upper end of a left radius (width, 67; transverse diameter, 34.5) and the corresponding ulna.
2. Fragment of a left humerus, upper end missing (medial dimension of lower end in front, 76; greatest width, 84; height of trochlea, lateral, 32, medial, 39).

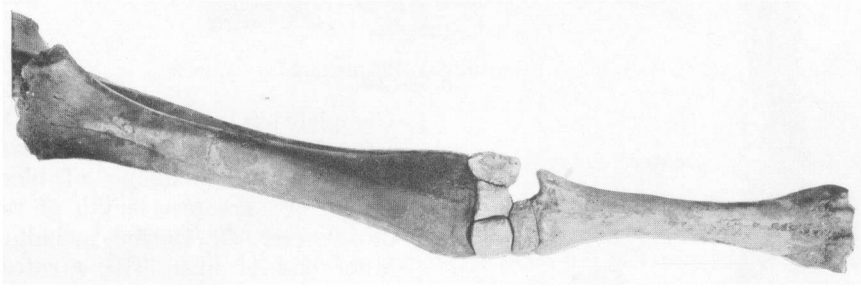


FIG. 18.—Extremital bones of *Bos* that belong together and constitute a complete left lower front extremity from olecranon to distal end of metacarpus. Carpus and metacarpus were found in E 15:14, radius and ulna in E 15:23.

E 15:14

1. Left metacarpus and, of the corresponding carpus, the *os radiale*, *intermedium*, and *ulnare* as well as the *carpale quartum* (Fig. 18, right half), likewise two carpal bones of the right side. Measurements of metacarpus: shortest length between proximal and distal joints, medial, 194, lateral, 195; length along middle of front from highest point of proximal joint to keel of medial articular surface, 204; width, above, 53, in the middle, 28, below, 54.5; transverse diameter, above, 32, in the middle, 23, at keel of medial articular surface, 32.
2. Left astragalus and its corresponding calcaneus (Fig. 19, lower part) with detached upper epiphysis of the calcaneus. Measurements of calcaneus: greatest length, 146; greatest width at the *sustentaculum astragali*, 44; greatest transverse diameter, 64. Measurements of astragalus: greatest length, 74.5; greatest width, above, 47, below, 48; greatest transverse diameter (thickness), 40.

3. Twelve phalanges. Of six of these, three are first phalanges, of which two are held together by a lump of clay. Four of the other six form pairs belonging to a fore and a hind foot respectively. The remaining two belong neither with each other nor with the preceding ones.

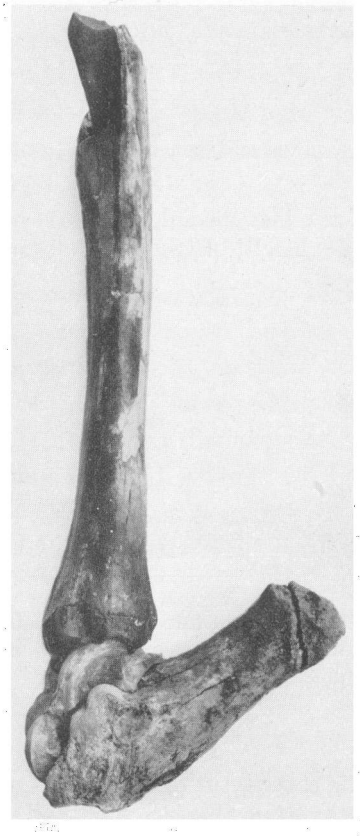


FIG. 19.—Left tibia of *Bos* from E 15:23, with completely corresponding astragalus and calcaneus from E 15:14.

An important fact is that the astragalus fits into the lower joint of a tibia from E 15:23 (see below and Fig. 19) so exactly that it is certain both belong to the same animal. This is true also of the carpus and a complete left lower foreleg from E 15:23 (see below and Fig. 18). Hence the other remains from E 15:14 and those from E 15:23 enumerated below probably belong together.[71] I shall revert to this again below.

E 15:23

1. Complete left lower foreleg (Fig. 18, left half; length of ulna, 336; greatest transverse diameter of olecranon, 60; greatest length of radius, lateral, 278, medial, including lower end of ulna, 275; greatest width of radius, above, 74, in the middle, 36, below, 64; greatest transverse diameter of radius, above, 36, in the middle, 21, below, 43). This lower foreleg and the carpus from E 15:14 fit each other exactly (cf. above and Fig. 18) and unquestionably belong together. Since the metacarpus and some phalanges from E 15:14 also belong with the carpus, we have a complete lower front extremity from olecranon to hoof phalanx.
2. Fragment of a left tibia, upper end broken off recently (Fig. 19, upper part; width of lower end, 70, of the middle, 40; transverse diameter of lower end, 54.5, of the middle, 30).

[71] [Seton Lloyd's account of the Northern Palace (to be published in a future *OIP*) mentions that in the level below its central court (E 15:1) a quantity of bones, "including two complete legs of an ox," came to light within the passage E 15:14.—ED.]

3. Lower end of a left humerus (width, 85; transverse diameter, 90; vertical diameter of trochlea, lateral, 48, medial, 37).
4. Complete left metatarsus (Fig. 20; greatest length in middle of front from highest point of proximal joint surface to lowest point of ridge of medial joint tuberosity, 235, of lateral, 233; shortest length between proximal and distal joints, lateral, 222, medial, 228; greatest width, above, 55, in the middle, 32, below, above both joint tuberosities, 63; greatest transverse diameter, above, 51, in the middle, 33, above ridge of lateral joint tuberosity, 35).
5. Fragment of a right hip-joint socket.

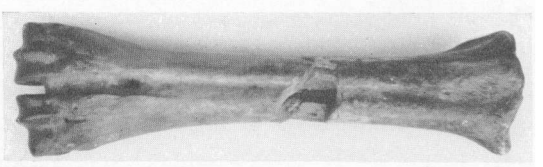


FIG. 20.—Complete left metatarsus of *Bos* from E 15:23

F 17:6

1. Two phalanges (one first, one second) and a fragment of a hoof phalanx.
2. Fragment of lower end of a right humerus (greatest vertical diameter of joint roll, 41; greatest transverse diameter of lower end, lateral, 67).
3. A first phalanx, but not of the same animal as the other two phalanges.

F 17:7

1. Lower end of a left upper thighbone (greatest width, 86).
2. Upper end of a right upper thighbone (greatest width, 118.5; transverse diameter of great trochanter, 80; transverse diameter of head, 48.5).

H 20:8

Fragments of two horn cores. Of one the tip only is preserved. The other is nearly complete, though it lacks the tip and is also damaged at the base. It is quite straight, is not at all twisted about its axis, and is bent in the horizontal plane very slightly only; the longitudinal furrows are weak; it is smooth in front with numerous nutrition holes. On the whole this core gives the impression that it belonged to a young *Bos primigenius*.

J 18:20

Upper end of a right ulna fashioned into an awl (greatest diameter above joint, 56).

Street SE. of J 19:6

Fragment of occiput. The process for attachment of the nuchal ligament is not particularly prominent. A well developed frontal torus is present, and the nuchal line rises strongly toward the middle, which is somewhat bowed forward. In spite of its size the piece therefore probably derives from a *Bos taurus longifrons* or more likely a *Bos taurus frontosus*.

J 19:10

A P^2.

South of J 19:12

Fragment of incisive part of a left lower jawbone.

Twelve meters E. of J 20:1

A first phalanx.

K 19:2

A first phalanx.

The foregoing discussion of the bovine remains has shown that, so far as they are concerned, loci E 15:14 and E 15:23 form a unit. Since the left humerus found in E 15:23 cannot because of its large size belong to the left lower foreleg found there, we have—of course on the unprovable assumption that hind and forelegs belong together—the remains of at least two individuals here. In addition there are a left lower foreleg (upper end of radius with ulna) from D 17:1, another left humerus from D 16:7 which does not belong with either of the two foregoing lower forelegs, and a right humerus from F 17:6 representing still another animal. We have, then, remains of at least four or five individuals.

For race determination the available remains are unfortunately inadequate. Only this may be said, that a middle-sized bovine was kept which belonged most likely not to the group of turbary cattle (*Bos taurus longifrons*) but to the *primigenius*, perhaps even to the *frontosus*, group.

Bones of birds and fish also occurred: the former in D 17:1 and F 17:7; the latter (mostly vertebrae only) in D 16:10, D 17:1 (jawbone), H 20:3, and east of J 18:20. To identify these remains was out of the question for lack of comparative material and in view of our insufficient knowledge of the birds and fish of Mesopotamia.

DISTRIBUTION OF FINDS BY SPECIES

For judging cultural conditions it is important to form an opinion about the proportion of wild to domestic animals on the one hand and of the various kinds of domestic animals one to another on the other. There are two ways possible for doing this. The one perhaps most frequently used is to take the sum total of all available bones that can be identified, as well as the total for each species, and then compute the percentage for the bones of each species. The second method, adopted by me here for perhaps the first time, is to seek to determine how many individuals of each species are represented and then compute the percentage for each species. The possibilities of error are, of course, considerable. For one thing, the bones of large animals will be preserved better than the delicate ones of small animals. Again, the marrowy bones of large animals will be broken to pieces much more than those of smaller animals. It will then easily be possible for several identifiable parts of a much broken bone to be present without their mutual relationship being recognizable. In such a case a single bone would be counted several times. On the other hand, it is conceivable that the bones of some particular animal were not broken to pieces at all because it was not used as food for human beings but perhaps served as a sacrifice or died of disease. In that case determinable bones only would be found of this one animal, whereas bones of another and perhaps far more numerous species might be so thoroughly smashed that none at all or only very few could be identified. The attempts made above at estimating the individuals of a species suffice to show how difficult it is to determine the number of individuals and how uncertain the results are. Nevertheless these two methods are probably the only ones by which one can reach at least some kind of estimate.

The total number of bones and bone fragments present is 286, of which 238 are determinable. The latter are distributed as follows:

	Bones Identified	Percentage of Total Identified
Pig	65	27.3
Sheep or goat	62	26.0
Bovine	47	19.7
Onager	20	8.4
Dog	14	5.9
Gazelle	13	5.5
Fish	8	3.4
Bird	6	2.5
Fallow deer	3	1.3

Before proceeding to discuss the results indicated by this computation we tabulate here the numbers of individuals estimated in the course of the foregoing investigation, arranging them in the order of the numbers of individuals arrived at for each group:

	Number of Individuals
Pig	14–16
Gazelle	10
Sheep or goat	6
Onager	5
Bovine	4–5
Fallow deer	3
Dog	2

If we consider only the domestic animals—pig, sheep or goat, bovine, and dog—we thus arrive in this way also at the same order as by computing the percentages of identified bones. Hence the relative importance of the various species of domestic animals as revealed by these computations may be regarded as being in a measure certain. As a food animal the pig takes first place by far. This is certainly a somewhat unexpected and surprising finding. We must, then, assume that the ancient Sumerians possessed a flourishing pig-breeding industry. Considerably less frequent are the small cattle—sheep and goats—and close behind them the bovines. The latter situation probably agrees with what we might expect on the basis of the representations in Sumerian art. The almost complete absence of wild animals, however, is striking; it is all the more surprising in view of the frequency with which wild animals and what appear to be hunting scenes are depicted. In this respect Tell Asmar stands in sharp contrast to Mohenjo Daro as well as to Anau. Further investigations at other Mesopotamian sites will have to show whether this lack of prominence of game is a characteristic feature of ancient Sumerian culture or is merely peculiar to Tell Asmar. The peculiar circumstances existing with regard to gazelles, of which with one exception only horn cores were found, have already been referred to (p. 23).

DISTRIBUTION BY FIND-SPOT AND PERIOD

If we now arrange the identified bones according to find-spots, with indication of the periods concerned, we can gain a fair idea of the distribution of the animals in question on the excavated site both in Sumerian times and later; and this in turn may contribute to our understanding of some of the buildings in which the bones were found.

TABLE VIII

LOCATION AND DATING OF ANIMAL REMAINS AT TELL ASMAR

Locus*	Description of Locus	Period†	Animal Remains
D 16:7	Room W. of Northern Palace	Proto-imp.	*Bos* (humerus, *os centrotarsale*, vertebra) Onager (molar) Pig (humerus) Sheep (humerus)
D 16:9	Room W. of Northern Palace	Proto-imp.	Sheep (jawbone)
D 16:10	Court N. of Single-Shrine Temple of Abu	E. D. III or later	Fish Onager (humerus, jawbone, metacarpus, teeth)
D 17:1	Cella of Single-Shrine Temple II or III	Proto-imp.	Bird *Bos* (humerus, radius) Fish (jawbone) Gazelle (horn cores) Onager (molar) Pig (jawbone, other bones) Sheep (jawbone, teeth, other bones)
D 17:2	Annex of Single-Shrine Temple I	E. D. III	Pig (jawbone) Sheep (hip-joint socket, humeri, tibiae)
D 17:10	Cella of Archaic Shrine of Abu	E. D. I	Fallow deer (antler)
E 15:1	Court in Northern Palace	Proto-imp.	Pig (extremital bones, vertebrae)

* [For loci P 31:1 and P 34 see Henri Frankfort, Seton Lloyd, and Thorkild Jacobsen, *The Gimilsin Temple and the Palace of the Rulers at Tell Asmar* (*OIP* XLIII [1940] Pls. III and VII. The area covered by the rest is described in Frankfort, *Iraq Excavations of the Oriental Institute, 1932/33* (*OIC* No. 17 [1934]) pp. 1–46 (house area, Northern Palace, Abu Temple); Frankfort, *Oriental Institute Discoveries in Iraq, 1933/34* (*OIC* No. 19 [1935]) pp. 7–23 (Abu Temple); and Frankfort, *Progress of the Work of the Oriental Institute in Iraq, 1934/35* (*OIC* No. 20 [1936]) pp. 1–15 (Abu Temple).—ED.]

† [Early Dynastic I–III are distinguished by Frankfort in his *Progress of the Work of the Oriental Institute in Iraq, 1934/35*. The Proto-imperial period which followed Early Dynastic III brings us down to Sargon of Akkad, who initiated the First Imperial (Akkadian) period. After it came the Inter-imperial period of Gutian control, the Second Imperial period (under the Third Dynasty of Ur), and the Post-imperial (Isin-Larsa) period. Not until Hammurabi's conquest of Larsa did the Old Babylonian kingdom begin. For the terminology here utilized see Jacobsen, *The Sumerian King List* (*AS* No. 11 [1939]) Table II. Professor Hilzheimer's term "Sumerian" summarizes the Early Dynastic and Proto-imperial periods.—ED.]

TABLE VIII—*Continued*

Locus	Description of Locus	Period	Animal Remains
E 15:14	Passage below E 15:1	E. D. III	*Bos* (astragalus with calcaneus, carpal bones, metacarpus, phalanges) Onager (molar) Sheep (molar)
E 15:23	Room below E 15:1	E. D. III	*Bos* (lower foreleg, hip-joint socket, humerus, metatarsus, tibia) Gazelle (horn core, jawbone) Goat (horn core) Onager (femora, humerus, metatarsi, phalanx, detached epiphysis of radius) Pig (extremital remains, jawbones) Sheep (lower foreleg, metacarpus, tibia)
E 16:16	Room in Northern Palace	Proto-imp.	Fallow deer (antlers)
E 16:17	Room in Northern Palace	Proto-imp.	Onager (incisors, jawbone) Pig (tibia)
E 16:18	Room in Northern Palace	Proto-imp.	Pig (extremital bones, skull)
F 15:9	Street E. of Northern Palace	Proto-imp.	Pig (skull)
F 16:7	Room in Northern Palace	Proto-imp.	Onager (humerus)
F 17:5	Room in Northern Palace	Proto-imp.	Gazelle (horn cores) Sheep (astragalus, vertebra)
F 17:6	Court in Northern Palace	Proto-imp.	*Bos* (humerus, phalanges) Onager (premolar) Pig (astragalus, canine, frontal bone, jawbones) Sheep (astragalus, metacarpi, epiphysis of tibia)
F 17:7	Room in Northern Palace	Proto-imp.	Bird *Bos* (upper thighbones) Sheep (phalanges, radii)
H 20:3	Room in House VI, Level V *a*	Proto-imp.	Dog (upper thighbones) Fish Gazelle (horn cores) Pig (radius) Sheep (horn cores)
H 20:8	Room in House VI, Level V *a*	Proto-imp.	*Bos* (horn cores) Gazelle (horn cores) Pig (tibia)
H 20:11	House area, Level V *a*	Proto-imp.	Sheep (vertebrae)
H 20:15	Room in House VI, Level V *a*	Proto-imp.	Onager (jawbone, phalanx) Pig (jawbone)

TABLE VIII—*Continued*

Locus	Description of Locus	Period	Animal Remains
H 20:18	House area, Level V *a*	Proto-imp.	Onager (tibia)
J 18:20	House area, Level IV	First Imp.	*Bos* (ulna)
E. of J 18:20	House area	——‡	Fish
J 19:2	Room in House II, Level III	Inter-imp.	Sheep (pelvis)
Street SE. of J 19:6	House area	——	*Bos* (occiput) Gazelle (horn core)
J 19:10	House area, Levels IV and III	First Imp. and Inter-imp.	*Bos* (premolar) Dog (jawbone, jugal bones) Onager (molar) Pig (jawbones, molars, symphyses) Sheep (jawbones, premolars, radius)
S. of J 19:12	House area	——‡	*Bos* (jawbone) Goat (horn core) Pig (jawbone, symphysis) Sheep (epistropheus, epiphysis of femur, jawbone, molar, phalanx, upper thighbone)
J 19:27	Room in House II, Level V	E. D. III or Proto-imp.	Onager (skull)
Street 3 m. NE. of J 20:1	House area	——	Dog (vertebrae)
12 m. E. of J 20:1	House area	——§	*Bos* (phalanx) Pig (jawbone, occiput) Sheep (humerus)
E. of J 20:10	House area	——‖	Dog (sacrum) Sheep (epistropheus, sacrum, upper thighbone, tibia, vertebrae)
Below J 20:16	House area, Level V	E. D. III or Proto-imp.	Pig (jawbone)
K 19:2	Room in House II, Level III	Inter-imp.	*Bos* (phalanx) Dog (jawbone)
Outside doorway to P 31:1	Gimilsin complex, level of Bilalama	Post-imp.	Pig (skull)
Street in P 34	S. of Southern Building	Post-imp.	Pig (symphysis)

‡Top layer. § Surface. ‖ Top layer and surface.

Was there a difference in the composition of the animal world in Sumerian times and later? To this interesting cultural question I can only answer that, except for *hemippus* (cf. p. 20) and deer, remains of which seem to occur in Sumerian loci only, I have found none, even in respect to the pig. As Table VIII shows, remains of pigs were found in eighteen out of thirty-eight find-spots;[1] of the eighteen, thirteen are Sumerian and five later or undatable. The proportion 13:5 is probably to be regarded as accidental. At least it seems to me wholly improper in view of the small number of finds to draw any conclusion on this point, especially since the prevalence of young pigs in the definitely later loci also (in J 19:10 and outside P 31:1) points to the conclusion that the animals were slaughtered for food in both periods.[2] As to the other animals, once a "mass" of material is gathered, percental differences or differences in breeds will perhaps appear. I suspect such differences in the case of sheep for instance. But there too the material yet available is insufficient.

From the foregoing discussion it will have become clear what importance attaches to bones found in the course of excavating ancient sites. Both zoological and cultural questions may be answered by their help. The reason why a large number of questions could only be broached here without the possibility at present of adequate answers is the fact that so far as Mesopotamia is concerned osteological material has here been subjected to study for the first time. Through future collections further clarification is to be expected. I would therefore emphatically express the hope that in all further excavations the bones also be collected carefully and made available for study.

[1] [The table lists only thirty-six; bones from two others were not identified.—ED.]

[2] [Differences in attitude toward and use of the various animals in successive periods cannot in any event be determined on the basis of race, for the conflicts that led to changes of rule were apparently political only, not racial. See on this point Thorkild Jacobsen, "The assumed conflict between Sumerians and Semites in early Mesopotamian history," *Journal of the American Oriental Society* LIX (1939) 485–95.—ED.]

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