PRELIMINARY ANALYSIS OF THE ANIMAL BONES FROM TELL ḤESBÂN*

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General

Tell Ḥesbân lies east of the Jordan Valley on the edge of the Transjordanian highland plateau, 10 km. north of Madaba. With an altitude of 895 m. above sea level, the *tell* towers above its surroundings. Five seasons of archaeological excavations have been carried out at this site—whose earliest known occupation is dated ca. 1200 B.C.—by Andrews University together with other institutions affiliated with the American Schools of Oriental Research. In harmony with the broad scope of these excavations, which accorded the questions of natural science the same attention as the questions of history, the animal bones were as painstakingly salvaged as the other archaeological materials unearthed —thanks, in particular, to the initiative and organization of Øystein S. LaBianca. In this an innovation in the archaeology of Jordan has been introduced which is worthy of imitation.

In 1975 LaBianca (see his report in this issue) invited the authors of this report to join him during the post-season "August bone-lab" for the purpose of taking charge of the identification and osteometric analysis of the bones from the fifth, and if time allowed, earlier seasons. Thanks to the Deutschen Forschungsgemeinschaft, which paid for the air travel, and to the expedition leadership for their generosity in providing board and lodging,

* *Note:* A faithful translation from the German was made by Mrs. Irma B. Lidner. Ø. S. LaBianca and the authors rewrote certain sections where clarity was obscured by the German technical terminology.

the proposed undertaking became a reality. We thank Lawrence T. Geraty and Øystein S. LaBianca for the invitation to Jordan and for the outstanding organization of the zooarchaeological work, the hospitality, and the good cooperation.

During August 1976 we worked in very spacious facilities in the auditorium of the Adventist School in Amman, Jordan. First we identified the bones from the 1976 season, according to species, which had already been sorted according to findspot. Since by comparing the weights of the bones of the various domestic species one can determine the importance of the respective species exploited, we weighed all mammal bones (except the bones of small mammals) belonging to the same species and findspot. Thereafter, we sorted the bones of each species according to anatomical element.

In teamwork with LaBianca and Michael Toplyn the individual bones of the more numerous domestic animals—sheep, goat, sheep/goat, cattle, donkey, horse, camel, and pig—were further differentiated. Thus each bone was categorized according to whether it was a longbone shaft fragment or a proximal or distal bone end; whether it was the right or left side; whether it was prenatal, infant, young, mature, adult, or old; and, if possible, whether it was male or female.

Finally, volunteer helpers recorded the findspot information for the individual bones on suitable computer-oriented data sheets for further processing with the help of a computer. The volunteers had to observe and make note of unusual attributes, such as dog bites or traces of fire or incision. The computer processing arrangements are being cared for by LaBianca and Paul W. Perkins.

Bones which had to be measured were returned to us after they had been recorded by the volunteers. (The resulting osteometric data are essential for reconstructing the developmental history of the various wild and domestic animals.) The bones were measured in accordance with the scheme for measuring

animal bones from archaeological sites published elsewhere by von den Driesch (1976).

The exemplary care with which even the smallest fragments were gathered in 1976 resulted in the collection of a large number of bones, totaling 41,500. Consequently there were relatively few comparable bones that could be measured. In order to enlarge the series and thereby to obtain enough comparable bones to ascertain the size of the animals more clearly, we thoroughly searched out the measurable bones that had been stored in Jordan (from the 1974, 1973, and 1971 campaigns) and measured them as well.

Only fragments which seemed to be unidentifiable had been discarded during the earlier seasons. In 1968 all the bones saved, and in 1971 all but a few large mammal bones, had been shipped to the United States. However, following the 1973 and 1974 campaigns, only unusual or rare ones had been sent to the United States, and most of the saved bones had been stored in Jordan. Recently all the bones that had been shipped to the United States have been shipped to us here in Munich. The total number of saved bones from these four earlier seasons is, according to LaBianca, 29,000.

While searching for measurable bones from the earlier campaigns, we simultaneously put aside bones of rare species. However, we have not included in our statistical analysis the bones from these earlier campaigns. The reason for this was not merely lack of time, but our concern that generalizations based on a bone corpus consisting of several incomplete collections (the bones from the 1968, 1971, 1973, and 1974 campaigns) and only one complete collection (from the 1976 campaign) would not be valid.

Although we sorted out all the bones of smaller mammals, birds, reptiles, and fish from the 1976 season's bones and from the available material from the earlier seasons, our list of animal species (Table 4) may still be incomplete because not all the material shipped from the United States to Munich arrived in time to be reported on here.

The chronological arrangement of the bone finds was estab-

lished from information about their archaeological context, such as associated pottery or coins, stratigraphic position, etc. The bone finds span the period from ca. 1200 B.C. to ca. A.D. 1500. By far the greatest quantity of bones comes from the last archaeological settlement phase on the tell, the Ayyūbid/Mamlūk period (ca. 12th to late 15th century A.D.). Relatively numerous also are the finds from the Iron Age (ca. 12th-6th century B.C.).

The periodization of the bone finds into 11 periods–Iron I; Iron II/Persian; Early and Late Hellenistic; Early and Late Roman; Early and Late Byzantine; Umayyad; Abbāsid, and Ayyūbid/Mamlūk–is in accordance with a periodization scheme which has apparently been thoroughly substantiated for Tell Ḥesbân (cf. Boraas and Geraty 1976: 7-14). We must warn, however, that the dating of bones by the roundabout method of archaeological context is not always substantiated in individual cases. Thanks again to the precise excavations, a comparatively large number of bones of small mammals, reptiles, and variegated toads, were collected. The remains of such burrowing animals require special caution, because they dig down through various levels belonging to earlier archaeological periods, not being confined by the subdivisions imposed on the *tell* by the archaeologists.

Especially mole rats, of which several specimens were evidenced by the bone finds, burrowed meter-deep into the *tell*, possibly relocating smaller artifacts into earlier levels and thus confusing the archaeological dating of them (cf. Dieterlen 1969). Animals such as weasels and snakes, moving about seeking prey, appear to have entered the mole rat burrows. For example, the remains of a Coluber snake which had eaten two young mole rats shortly before its death (judging from the circumstances of the find) were found in C.5:161 (Ayyūbid/Mamlūk) where it is thought to have intruded later and died in situ.

It is a mistake, therefore, to impose upon these natural inhabitants of the *tell* the dating which otherwise is attributed to the rest of the archaeological finds, since many of them could

belong to much more recent times. Isolated finds, such as the partial skeleton of a young rabbit from F.30:3, Early Byzantine period, are therefore no proof of the existence of this species in such an early time. This is not to say that the presence of the domestic rabbit in the Early Byzantine period could not have been possible, but merely to register doubt, given the tenuous evidence.

Domestic Animals

Until the computer printouts on the bones from the 1976 season become available, not much can be added to the report on domestic animals by LaBianca (1973) following the 1971 campaign. This list (1973:134) already contains all existing species of domestic animals.

Sheep (*Ovis aries*) and goats (*Capra hircus*) were the most abundant domestic animals from the beginning. In the Iron Age, sheep were more plentiful than goats; on the contrary, during Ayyūbid/Mamlūk times there was a noticeable increase in the number of goats. These findings suggest that the pasturage must have changed from grass to weeds, thus worsening through time.

The fact that cattle (*Bos taurus*) also appear to have been more plentiful during earlier periods supports this interpretation. The whole district has been overgrazed by sheep and goat flocks, so that there is no longer sufficient pasturage around Ḥesbân to support cattle raising. Even though today in the village of Ḥesbân, adjacent to the *tell*, a few black and white milk cows are kept in one of the yards, their presence does not prove the contrary, for these cows were imported and are fed on imported fodder.

Noteworthy among the cattle-bone remains are three thoracic vertebrae with sagittally split spinal processes (see Pl. XXII:5), which—despite certain reservations noted by Duerst (1931:46)—could count as characteristic for humped cattle or *Zebus* (for example, Olsen 1960:8 and Fig. 7, B-3; Epstein 1971 1:521 ff.). These bones were dated as coming from the Ayyūbid/Mamlūk

period, consequently humped cattle must have comprised at least a portion of the cattle population during that period.

This interpretation is supported by the fact that humped cattle are regularly portrayed on mosaics in the region of Madaba already in the Byzantine period—for example, a mosaic uncovered in 1976 at the church on Mt. Nebo (Pl. XXIV:A) and a mosaic from el-Mukhayyet. Furthermore, there are similar mosaic representations of humped cattle throughout all of Palestine (for example, Bodenheimer 1935:115; Epstein 1971, Vol. 1, Fig. 616).

It is necessary to register reservations with regard to the representations of humped cattle on mosaics, however, because it appears that sometimes animal species were represented which were not among the local wild fauna, as, for example, the tiger. On the other hand, it seems unreasonable to discount the mosaics altogether as a source of information about the local fauna. It is unfortunate that not one of the previously mentioned thoracic vertebrae came from the Byzantine period, during which the mosaics with the humped cattle were made. Had that been the case, one single find would have sufficed as clear evidence.

As usual, most of the bones of swine (*Sus scrofa domesticus*) are those of young individuals—a situation which results from the fact that pigs are not used while alive, but are kept only for meat. Noteworthy is the presence of bones of unborn and newly born pigs. Swine keeping apparently reached its greatest economic importance during the Byzantine period, gradually dwindling in importance after that time as Islam made its way into the region. Even though it is often not possible to separate with certainty domestic and wild pig bones where splinters and bones of young animals are concerned, it does appear that swine keeping continued into the Ayyūbid/Mamlūk period at a low level. During this period a comparatively large number of wild-boar bones are present, some with prominent incision marks testifying to the consumption of swine flesh.

In the finds from the Byzantine period the number of equine

bones is also proportionately high. The numerical predominance of donkey remains (*Equus asinus*) in comparison to horse remains (*Equus caballus*), which had been noticeable also in the earlier finds (LaBianca 1973:137), is confirmed. In addition to horse and donkey keeping, mule breeding must be mentioned. A metacarpus from the Roman or Byzantine period (C.5:90) exhibits characteristics which present high possibility of proof for the existence of the mule. It was found in association with the distal radius extremity and the carpal bones of the same leg. Generally, in fact, extremity parts belonging to the same limb were more abundant among equines. This situation speaks against the interpretation that these equine bones were human food wastes. Yet a pelvic fragment showing chip and ax marks (Pl. XXI:2) from the Early Roman period (B.4:258) suggests that occasionally even horse meat was eaten, at least during times when the dietary restrictions of the Jews and Moslems did not prevail in the area.

On the other hand, many camel bones (*Camelus dromedarius*), in their battered condition, have the appearance of human food remains.

There are notably many bones of dogs (*Canis familiaris*) and cats (*Felis catus*) which belonged to animals only a few weeks or months old; some of them more or less complete skeletons. Two of the pup skeletons (B.1:130; B.2:80) are dated Iron II/Persian; another (D.6:36) is dated in the Ayyūbid/Mamlūk period, as is also a kitten skeleton (A.7:5). In contrast to the preliminary observation following the 1971 campaign (LaBianca 1973:138), many more dog than cat bones were found.

Cat bones were encountered from the Roman period onward —three finds—although it would not have been surprising had they been found in earlier periods. Not only the keeping of the house cat, but also the wildcat (*Felis silvestris*) could have been expected in this region already in the Iron Age—the keeping of house cats even more in Hellenistic times. Separation of the

remains of house cats from those of wildcats cannot always be made with certainty because the wildcat of Palestine (*Felis silvestris tristrami*) is comparatively small. Its existence is as good as proved by several bones (Pl. XXII:13a).

Since many of the dogs were not much larger than jackals (*Canis aureus*), one must reckon with the possibility that some of the bones identified as belonging to dogs might instead have been jackal remains, especially where splinters and the bones of young animals are concerned. Furthermore, there are several hyena bones present (see p. 276, below). Collectively the dogs were of medium size or larger, yet not big. In addition, skull parts of a dog from the Early Roman period (C.8:34) suggests the existence of miniature dogs at Ḥesbân.

There is a large quantity of remains of domestic chickens (*Gallus gallus domesticus*). With two exceptions, they begin in the Iron II/Persian period, i.e. 7th/6th century B.C. Whether domestic chickens were kept at Ḥesbân before this period is very questionable. A scapula from B.3:77 and a humerus shaft from D.4:120, which has been dated Iron I (ca. 1200-900 B.C), are the exceptions mentioned above. Such isolated finds are best not considered in a careful interpretation (see Boessneck 1973:104). The presence of these bones may be due to either disturbances in the archaeological strata or to human error in processing the bones following excavation. Extensive chicken farming during the Ayyūbid/Mamlūk period, which was evident following the 1971 campaign (LaBianca 1973:138), was likewise attested by the finds from the 1976 campaign.

Over 100 bones of the domestic pigeon, or house dove (*Columba livia domestica*), of which first only one skeleton had been recognized (LaBianca 1973:138), have been identified in the bone collections from 1971 and the three subsequent campaigns. The difficulty now is to determine whether also the bones of its wild ancestor, the rock dove (*Columba livia*), constitute a portion of the pigeon remains. The local subspecies of the rock

dove (*Columba livia gaddi*) is smaller than the usual domestic pigeon, the so-called Feldflüchter, a fully domesticated pigeon which depends for its livelihood on man, but is free to fly to wherever food is available. In the bone finds all sizes are encountered, from the unequivocal and larger house dove size to the smaller rock-dove size. The difficulty with drawing a line of demarcation is further complicated by the fact that the rock dove, frequently being a civilization follower, exists in all stages, from being perfectly wild doves to being domesticated (house) doves.

Pigeon bones are encountered in the Iron Age material, occur fairly regularly from the Roman period onwards, and are most numerous in the Ayyūbid/Mamlūk material. Remains of young doves are often encountered, both among the isolated bones and among skeletons. Thus, of the two partial dove skeletons from the Early Roman period, one is of a young creature.

Nine goose bones can be added to the ones from the 1971 campaign (LaBianca 1973:138). The new ones, like the earlier ones, begin in the Early Roman period, although it would not have been surprising had they been encountered back in the Iron Age, because the goose was domesticated in ancient Egypt already before the Iron Age (Boessneck 1960, 1962). In this connection mention should be made of the portrayal of geese on ivory artifacts from Megiddo in the 13th/12th century B.C. (cf. Zeuner 1967, Fig. 308; cf. Boessneck 1960:203 with further references). However these portrayals are far less recognizable in the original than in the copy. Since the Ḥesbân environment is not very favorable to geese, only a few were kept at Ḥesbân in either ancient or modern times. Goose keeping certainly never played a large role at this site.

One must allow for the possibility, though a slight one, that some of the goose bones might belong to the gray lag goose (*Anser anser*), wild ancestor of the domestic goose, and a winter visitor throughout Palestine (Tristram 1884:113).

Wild Animals

Our analysis of the wild-animal remains has proceeded more quickly and yielded more information than was possible for the domestic animals, since the wild-animal remains were turned over to us for immediate analysis, not having been included in the material awaiting statistical analysis using the computer. As the list of wild-animal species in Table 4 illustrates, the faunal assemblage reconstructed for Tell Ḥesbân has been greatly enriched, especially by rare and non-hunted species. Except for the porcupine (*Hystrix indica - H. hirsutirostris,* Pl. XXII:8) and the hooded crow (*Corvus corone sardonius;* see p. 279, below), all the wild species listed for 1971 (LaBianca 1973:134)—identified by or with the help of the authoritative expert Dr. J. Lepiksaar of the Naturhistoriska Museet in Göteborg, Sweden—are included in the Table 4 listing. As mentioned earlier, the bones comprising the faunal assemblage from the 1971 campaign have since been sent to us for further evaluation. Where the finds for all five seasons were available, we have reported the definitive count of bones representing the species involved (in Table 4). If no exact report could be made the sign + means one or a few bones; ++ means 10 to 100 bones, and +++ means an abundance of bones (though not in comparison to the far more numerous domestic animals).

Certain of the wild fauna will receive further analysis from other experts; Dr. G. Storch of Frankfurt/Main (small rodents); Dr. J. Lepiksaar (fish); and P. Crawford (1976) of Boston (mollusks).

Wild Mammals

As already observed following the 1971 campaign (LaBianca 1973:138) gazelles were the "most frequently hunted mammals." How far we will be able to go in differentiating the various species of gazelles remains to be seen. Presently, at least two species of gazelles have been recognized, the mountain gazelle

(*Gazella gazella*) and the dorcas gazelle (*Gazella dorcas*). The predominance of gazelles among the wildlife suggests that the landscape around Ḥesbân has been open since ancient times.

In certain spots there must also have been thickets, since deer and wild boar—both evidenced in the finds—require more lush habitats. These animals must have made their livelihood along the Wadi Ḥesbân and especially near the springs and along the stream which is fed by the springs and which flows abundantly throughout the entire year. It flows south and west from the beautiful spring of ʿAin Ḥesbân scarcely two hours' walk northwest from Tell Ḥesbân. The broadened valley downstream from this spring was swampy and covered with vegetation so thick that it was difficult to enter. Here fallow deer (*Dama mesopotamica*) and wild boars (*Sus scrofa*) could survive undisturbed. From here they could spread out to graze on the slopes of the Wadi Ḥesbân and the Wadi el-Majarr, which in ancient times still must have been covered by shrubs and trees, including pistachios and oak trees (cf. Feinbrun and Zohary 1955, Map 6; Zohary 1962, Map 5), which would have provided good nourishment for these animals during the winter.

Most of the fallow-deer bones came from a secondary fill excavated from a large water reservoir in areas B.1 and B.2. Their dating is from the Iron II/Persian period, ca. 700 to 500 B.C. (Geraty 1977:3).

Although it appears that the wildlife was disappearing already in Ayyūbid/Mamlūk times (12th to 15th century A.D.), enough thickets must nevertheless have been found in the region to sustain a population of wild boar, as their bones attest.

While the presence of the Mesopotamian fallow deer had been reckoned with (Boessneck and von den Driesch, 1977), the discovery of bones of the maral—a large oriental variety of the red deer (*Cervus elaphus*)—was surprising. A distal talus half (D.2:44; see Pl. XXII:7) and a distal metatarsus end (D.4:1; Pl. XXI:3a) were found, both probably belonging to males, judg-

Table 4. Wild-Animal Species (Except Fish and Molluscs) Identified in the Finds from Tell Ḥesbân

MAMMALS	
Persian fallow deer *(Dama mesopotamica)*	++
Maral *(Cervus elaphus maral)*	2
Mountain gazelle *(Gazella gazella)* and Dorcas gazelle *(Gazella dorcas)*	+++
Nubian ibex *(Capra ibex nubiana)*	+
Wild boar *(Sus scrofa libycus)*	++
?Syrian onager *(Equus onager hemippus)*	+
Fox *(Vulpes vulpes palaestina)*	++
Badger *(Meles meles canescens)*	7
Ratel *(Mellivora capensis)*	1
Weasel *(Mustela nivalis)*	++
Marbled polecat *(Vormela peregusna syriaca)*	+
Syrian beech marten *(Martes foina syriaca)*	3
Ichneumon (Mongoose) *(Herpestes ichneumon)*	1
Hyena *(Hyaena hyaena syriaca)*	6
Wildcat *(Felis silvestris tristrami)*	+
Lion *(Panthera leo)*	2
Cape hare *(Lepus capensis)*	++
House rat *(Rattus rattus)*	++
House mouse *(Mus musculus)*	+
Tristram's jird *(Meriones tristrami)*	++
Mole rat *(Spalax leucodon ehrenbergi)*	+++
Porcupine *(Hystrix indica = H. hirsutirostris)*	1
Broadtoothed fieldmouse *(Apodemus mystacinus)**	+
Persian vole *(Microtus irani)**	+
BIRDS	
Ostrich *(Struthio camelus syriacus)*	2
White stork *(Ciconia ciconia)*	2
Flamingo *(Phoenicopterus ruber roseus)*	1
Egyptian vulture *(Neophron percnopterus)*	9
Griffon vulture *(Gyps fulvus)*	6
European sparrow hawk *(Accipiter nisus)* or Levant sparrow hawk *(Accipter brevipes)*	1

* Identification by Dr. G. Storch, Frankfurt/Main.

Greater falcon *(Falco spec.)*	1
Kestrel *(Falco tinnunculus)*	3
Lesser kestrel *(Falco naumanni)*	1
Chukar partridge *(Alectoris chukar)*	+++
Arabian sand partridge *(Ammoperdix heyi)*	+
Quail *(Coturnix coturnix)*	(partial skeleton) 1
Crane *(Grus grus)*	1
Corncrake *(Crex crex)*	21
Coot *(Fulica atra)*	3
Great bustard *(Otis tarda)*	4
Houbara bustard *(Chlamydotis undulata)*	12
Dotterel *(Eudromias morinellus)*	1
Stone curlew *(Burhinus oedicnemus)*	2
Sand grouse *(Pterocles spec.)*	2
Palm dove *(Streptopelia senegalensis)*	3
Little owl *(Athene noctua lilith)*	(20)
Skylark *(Alauda arvensis)*	2
Wood lark *(Lullula arborea)*	1
Small lark *(Calandrella spec.)*	1
Blackbird *(Turdus merula)*	2
Corn bunting *(Emberiza calandra)*	+
House sparrow *(Passer domesticus)*	+
Rock sparrow *(Petronia petronia)*	+
Common starling *(Sturnus vulgaris)* or Rose-colored starling *(Sturnus [Pastor] roseus)*	6
Jackdaw *(Corvus monedula soemmeringii)*	3
?Brown-necked raven *(Corvus ruficollis)*	1
Common raven *(Corvus corax)*	9

REPTILES AND AMPHIBIANS

Tortoise *(Testudo graeca terrestris)*	++
Hardoun *(Agama stellio)*	++
Scheltopusik *(Ophisaurus apodus)*	(partial skeleton) 1
Snake *(Coluber spec.)*	++
Variegated toad *(Bufo viridis)*	++

CRABS

Freshwater crab *(Potamon potamios palaestinae)*	1

ing from their strength and size. These bones were dated in the Ayyūbid/Mamlūk period, the most recent archaeological settlement phase at Tell Ḥesbân. This is important because the presence of the maral so far south of its recent distribution area in Anatolia would lead one to expect to find it in this region when the *tell* was first occupied, i.e. since the Iron Age. It is difficult to imagine that such majestic deer were captured and introduced by man into this region. It is more probable that these animals were individuals which strayed south from their original habitat in Anatolia and were killed in the locality of Ḥesbân.

Another possibility is that the remains of the maral at Tell Ḥesbân were imported with the fur trade, the bones being attached to the hide. For example, Schmid (1969:105 and Fig. 5) has reported a method of skinning goats in which the horns and the underparts of the feet remain on the hide. Such an interpretation is rendered plausible by the fact that in the case of the maral bones only underparts were found—the distal half of the transversally hewn-off talus (See Pl. XXII:7) and the distal end of the metatarsus—and not parts from the meat-rich portions of the skeleton.

This interpretation would also help in accounting for the presence in the bone corpus of the distal third of a metacarpus III of an unusually large sheep. Even though rams of modern improved breeds reach this size (for example, Haak 1965, Table 7), and even though robust rams are found also in Palestine, this does not change the impression that this find (Pl. XXII:6b) comes from a wild ram. In prehistoric and early historic times, when domestic sheep were smaller, even exceptionally large domestic rams scarcely grew to such strength and extraordinary size. The fact that it comes from Late Roman times (B.7:27)—and the Romans are known for their good understanding of animal breeding—does not explain the situation either, since the bone is even bigger than those of large domestic rams from this period. The presence of wild sheep (*Ovis ammon*) in the region of

Ḥesbân is scarcely more to be expected than the presence of red deer (cf. Bodenheimer 1958:179). Hence again one can suspect that this metacarpus of a large ram came to Ḥesbân attached to its hide, imported possibly from Anatolia.

This interpretation is further supported by the unearthing, at the same findspot as the above-mentioned wild sheep metacarpus, of two equally large distal metacarpus fragments (Pl. XXII:6a) of male goats, one of them with its first phalanx attached. Comparisons of these bones with skeletons of *Capra ibex nubiana* showed little morphological agreement (even less, by the way, with *Ammotragus lervia*). Thus, before us again is the question of whether these bones are the remains of extraordinarily large domestic goats or of wild goats (*Capra aegagrus*) whose habitat extends from Anatolia southward to Lebanon. The latter explanation seems to have more weight, and the interpretation that the bones had been attached to imported hides has much in favor of it.

A large ox metacarpus from C.3:12, from which the joints appear to have been hewn off, presents even more difficulties with regard to precise species determination and to interpretation. With a greatest length of ca. 238 mm.; greatest proximal width, 64 mm.; and smallest width at the diaphysis, 34 mm.; it has the characteristics of a female aurochs bone, (*Bos primigenius;* see Pl. XXI:1). If the bone had been found in Iron Age strata, one could readily assign it to an aurochs. Given the opportunities for retreat in the thick woods below ʿAin Ḥesbân, the existence of this wild ox—the ancestor of our wild cattle—around Ḥesbân in the Iron Age is not an impossibility. However, like the red deer, this find is dated in the Ayyūbid/Mamlūk period, the most recent archaeological settlement phase, which is too recent to allow for the presence of the aurochs. Nor can we attribute this bone to importation, since the aurochs is not known to have existed anywhere in the Middle East during the Middle Ages. The find does not give the impression of being recent, and even today there

are no cattle of this size in the region. To find long-legged cattle such as this one, one must go into irrigated areas where the Damascus cow is found. According to Bodenheimer (1935:121) this cow is "the best milk producing animal of the native races," measuring 142 cm. high at the withers. This corresponds to the estimated height at the withers of the animal from Ḥesbân, 143 cm., using the length of the metacarpus as an index (cf. von den Driesch and Boessneck 1974:338).

Bodenheimer writes further with regard to the Damascus cow that "the admixture of Zebu blood" is "probable." This suggestion raised our hopes that through comparison with Zebu skeletons we might discover characteristics enabling us to be more certain of our identification of this large ox metacarpus as belonging to a Zebu. Unfortunately, the lack of sufficient comparative materials rendered our attempt at comparison unsuccessful.

Had it not been for the length of this metacarpus – if, for example, we had had only one of its ends – the possibility of including it among the other cattle bones would not have been irreconcilable in respect to measurements of breadth, since transitions to smaller bones exist – and this despite the fact that cattle were not especially large during the Middle Ages. Neither did comparisons with extraordinarily large bones of big oxen from Roman times in Central Europe (Boessneck, et al., 1971, Diagr. XXXII) illuminate the problem, since the metacarpus from Ḥesbân is even longer and remarkably slender. Therefore we must confine ourselves here to the presentation of the find.

The scarcity of ibex remains from Tell Ḥesbân suggests that the hilly landscape in its vicinity was not favorable for the ibex, which in earlier times apparently inhabited the highland ravines of Moab and the mountains of Judea. While the bones of female ibexes are almost unidentifiable in the finds from Ḥesbân, of males one could have expected to find more than just a single horn core (C.4:22, see Pl. XXIV:B). The great strength of the males, indicated by the robust horn core specimen, demonstrates

how easy the identification of metapodials, phalanges, and other large limb bones of the ibex, should have been.

This scarcity of ibexes in the Ḥesbân bone finds accords with the total lack of hyraxes (*Procavia capensis*), for which steep cliffs with natural crevices and caves are lacking as refuges, just as precipitous, craggy gorges are lacking for the ibex.

There are special difficulties in establishing whether the bones of wild equids are included in the collection from Tell Ḥesbân. According to Ducos (1970) true asses (*Equus asinus*) in their wild form must be reckoned with from North Africa to Palestine. On the other hand, the Syrian onager (*Equus onager hemippus*), the smallest form of the onager, may have wandered into the plains of Moab from the (north)east. The individual variation of this small onager, which in our century is extinct, is insufficiently known; there are only a few skeletons available in museum collections. While it is known to have noticeably long metapodials, it is hard to separate out its phalanges (Boessneck 1976, Table 1). Since even the domestic donkeys of semi-arid Palestine are comparatively slender, the identification of wild equids from whole metapodials, and even more from phalanges, can be difficult.

The presence of the onager during the Iron Age at Tell Ḥesbân is suggested by several unusually slim phalanx bones. These bones show unmistakable similarity to phalanges from Mureybit in Syria. Ducos (1971), following a comparison of these Syrian finds with the only available specimen of *hemippus* at the Galérie de Paléontologie in Paris, concluded that they were not the phalanges of *hemippus* but of *Equus asinus*. Later, however, after he had had an opportunity to examine the *hemippus* specimens at the Museum of Natural History in Vienna, he conceded in a letter to me (Boessneck) that the finds from Mureybit may indeed have belonged to the Syrian onager. The reason why museum specimens of this onager species are smaller could be that the skeletons are recent ones and thus from animals

not living under optimal conditions. In fact, most museum specimens come from zoos. Accordingly, genuine wild donkeys (*Equus asinus*) can hardly be expected in the finds from Tell Ḥesbân at all, but rather *Equus onager hemippus* if wild equids are substantiated by the bone corpus at all.

Of predatory animals the fox (*Vulpes vulpes palaestina*) is by far the best represented with more than 60 bone fragments. Even the bones of young foxes, most of them from a skeleton (D.4:58; see Pl. XXII:12a) dated in the Ayyūbid/Mamlūk period, are present in the find. A partial skeleton of an adult fox is also dated in this late period (C.8:13; see Pl. XXII:12b). As expected, the fox remains are of smaller animals. Remarkably small were four metacarpi and two phalanges, which belong together, from C.5:104 (Ayyūbid/Mamlūk). The greatest length of each metacarpus was: Mc II, 30.7 mm.; Mc III, 34.8 mm.; Mc IV, 34.0 mm.; and Mc V, 28.5 mm. Since the presence of a smaller species of fox, the *Rüppell's fox* (*Vulpes rüppellii*), can hardly be expected in the hilly country of Moab, these limb bone specimens must be from a female red fox, unless, of course, we were to attribute their presence to the fur trade as well, whereby the limb bones were imported with the animals' hides.

In the tamarisk belt on the northern shore of the Dead Sea we saw foxes, still abundant today, as well as the jackal, which today is a rare species. Jackals could not be identified in the finds (see above), although they, like hyenas, are civilization followers seeking food in the vicinity of villages like Ḥesbân.

Such palaearctic species as badgers (*Meles meles;* see Pl. XXII:9), and beech martens (*Martes foina*) reach the southern boundary of their distribution in Palestine. A distal end of a femur belonging to a ratel or honey badger (*Mellivora capensis*) from C.1:20 requires further discussion. This bone was identified as belonging to a "Eurasian badger" following the 1971 campaign (LaBianca, 1973:139), but by inspecting comparative materials from several collections, thanks to cooperation from Drs. M. Joos

(Basel), E. Poplin (Paris), and G. Storch (Frankfurt/Main), we were able to identify it positively as belonging to a *Mellivora capensis* specimen. The trochlea patellaris of its femur is not as deep as in *Meles meles*. Furthermore, the medial side, next to the medial rim of the trochlea, projects slightly; and while being the same size as that of *Meles meles*, the distal end of the femur of *Mellivora* is not as high when viewed from its lateral or medial side. Thus, also the honey badger can be reckoned with in the vicinity of Ḥesbân.

The only evidence of the North African mongoose (*Herpestes ichneumon*) is a humerus of a young animal (Pl. XXII:11), judging from the fact that its proximal end is unfused and the epiphysis missing. It is dated in the Iron Age (C.5:180).

Temporary among the natural inhabitants of the *tell* were the marbled polecat (*Vormela peregusna syriaca*), the weasel (*Mustela nivalis*), and certainly also larger predators. Their bones were probably not deposited as a result of human activity, but rather as a result of natural processes (see above, p. 262). The weasel finds deserve special attention because hitherto none have been reported from Jordan. Two completely preserved skulls of males show condylobasal lengths of 42 and 41.3 mm. respectively (see Boessneck 1977). The smaller of the skulls is not yet fully adult, judging from the fact that its nasal bones and upper jaws are still in the process of fusion. Like most of the weasel bones, both skulls come from Early Roman deposits.

Also from Early Roman times is a calcaneus of a lion (B.4:268; see Pl. XXII:10). Although one is inclined to think of lions from the Roman period as having lived in captivity, it is just as likely that lions (*Panthera leo*) were living in the wild (cf. Bodenheimer 1935:113-114; 1958:177), for example, hiding near the *wadis*, and especially in the thickets below ᶜAin Ḥesbân. Mention should also be made of a scapula of a lion cub not yet three months old, which was found in C.8:16 and dated in the Ayyūbid/Mamlūk period.

The presence of whole long bones of hares has enabled us to determine with certainty that the long and slender long bones on hand are not rabbit bones, but hare bones. Differentiation would otherwise have been difficult.

The Ehrenberg mole rat (*Spalax leucodon ehrenbergi*), which is the southernmost and smallest form of a "Formenkreis" of mole rats encircling the Black Sea, appears to have been the most abundant small mammal on the *tell*, and certainly in the excavated materials. As stated earlier, their remains, along with the remains of other small mammals, certain birds, snakes, amphibians, and even unknown quantities of remains of larger animal species, constitute a natural thanatocoenosis — i.e. an assemblage of remains of dead animals which were deposited as a result of natural processes rather than through human activity.

Birds

In dealing with the bird remains, the bones of those species that visit settlements in search of food, such as vultures, ravens, crows, and jackdaws, will be dealt with separately from the remains of game birds.

A laterally pierced clawbone of a Griffon vulture (*Gyps fulvus*) from the Late Byzantine period (C.5:177; see Pl. XXIII:17) constitutes a peculiarity among the vulture remains. Since the piercing does not go through to the other side of the bone, no thread could have been pulled through.

In considering the raven remains, the brown-necked raven (*Corvus ruficollis*) must be reckoned with. Its territory in southern Jordan and Palestine borders on that of the common black raven (*Corvus corax*). Fortunately, the presence of beak bones enables us to separate these two species, since in the common raven the beaks are built stronger. The size of the bones also testifies to their belonging to the common raven. In the case of three bones from F.38:9 and five from D.5:5, the bones belong together. The possibility of the presence of the brown-necked raven among the

raven bones is nevertheless strengthened by an ulna excavated in 1971 from B.1:103 and identified following that season as belonging to the hooded crow (*Corvus corone sardonius*). It is preserved to about ¾ of its full length (Pl. XXIII:19), and its greatest proximal breadth is 11.5 mm. When compared with museum specimens of *Corvus corone cornix* and *Corvus corone sardonius* it was found to be significantly larger than either of these comparative specimens. An estimate of its full length – at least 90 mm. – was possible through approximations based on the intervals between the feather protuberances on the bone. Moreover, the subspecies *sardonius*, whose distribution area includes Palestine, is smaller than *cornix* (Hüé and Etchécopar 1970:521). The brown-necked raven, for which no comparative material was available, is only slightly larger than the hooded crow (ibid. 515, 520; Heinzel, et al. 1972:308, 310). Given the type of environment in the vicinity of Tell Ḥesbân, one could reasonably have expected the hooded crow rather than the brown-necked raven. Yet it is not impossible that a brown-necked raven could have been killed by the inhabitants of Ḥesbân on an occasional flight north by this bird from its customary territory in the southwestern steppes. Mention should also be made of the fan-tailed raven (*Corvus rhipidurus*) which we observed on a visit to Petra, in the southern part of Jordan. This species, however, may have larger and stronger ulnae than has the bone discussed above. M. Alomía (see p. 299, below) watched the hooded crow, the brown-necked raven, and probably the fan-tailed raven in the vicinity of the *tell* around the end of July or the beginning of August 1976.

The jackdaw is a usual winter visitor in the region of Ḥesbân. Its breeding area begins in northern Palestine, extending northward although it could have nested as far south as Ḥesbân in earlier times.

The little owl (*Athene noctua*) is represented by 15 bones from one skeleton (A.9:10) and by a number of other articulated bones – all from the Ayyūbid/Mamlūk period – and probably

not deposited by human agency. These, along with two apparently articulated bones of the stone curlew (*Burhinus oedicnemus*), dated in the same period (A.7:1) are best considered as part of the natural thanatocoenosis of the *tell.*

In ancient times, as today, the most numerous wild fowl around Ḥesbân was the chukar partridge (*Alectoris chukar*), a type of rock partridge. We counted more than 170 bones from the chukar – many of them immature – and only 21 bones belonging to the corn-crake (*Crex crex*), the wild-fowl species apparently next in importance. As discussed earlier, the importance of the rock pigeon is not clear (see p. 267, above). The houbara bustard (*Chlamydotis undulata*) and the sand grouse (*Pterocles spec.*) are more prevalent in the Jordan valley and in the steppes than in the higher regions around Ḥesbân, and the Arabian sand partridge (*Ammoperdix heyi*) is found principally on the eastern edge of the Jordan Valley.

Of the *Streptopelia* species only the little palm dove, a civilization follower, has been identified. Two humeri dated in Iron Age II (B.1:139; B.2:128) and an ulna from the Ayyūbid/Mamlūk period (G.11:6) are on hand. To the metatarsus III trochlea fragment of an adult ostrich (*Struthio camelus syriacus*) reported for A.6:18 by LaBianca (1973:140), another ostrich bone has been added, a metatarsus shaft fragment belonging to a younger bird from the Iron II/Persian period (B.2:73).

Among the wild-fowl species are a series of winter visitors and birds of passage: The white stork (*Ciconia ciconia*) is evidenced by a metacarpus fragment from the Iron II/Persian period (B.2:80) and half of a furcula from the Ayyūbid/Mamlūk period (A.9:1). The distal third of a metatarsus dated Ayyūbid/Mamlūk (A.8:1) comes from the flamingo (*Phoenicopterus ruber*). Found together with the above mentioned little-owl skeleton (see p. 279) were nine quail bones, all from the same individual (A.9:9/10), although they did not appear to be the prey of the owl. The corn-crake (*Crex crex*), mentioned above,

is today rare, but formerly it migrated through Palestine in large numbers, a fact reflected, not surprisingly, by the quantity of its remains. A cut-up distal end of a tibiotarsus from the Iron Age I period (C.1:126) is the extent of the evidence of migrant cranes (*Grus grus;* see Pl. XXIII:16). The coot (*Fulica atra*) is "the most common water-bird in all the waters of the country during the winter" (Bodenheimer 1935:178).

Noteworthy is the presence of four bones of the great bustard (*Otis tarda;* see Pl. XXIII:15), which was omitted in Bodenheimer's more recent account of the birds of Palestine (1935) but not in the older account by Tristram (1884:127) who wrote: "The Great Bustard is not quite extinct in the Plain of Sharon." Even today great bustards occasionally move southward to the open fields of Moab during the winter. Perhaps it is not a coincidence that the four great bustard bones are from the Iron Age and early Roman times, whereas the remains of the houbara bustard (Pl. XXIII:14) are nearly all from the more recent Ayyūbid/Mamlūk period.

Another winter visitor, the dotterel (*Eudromias morinellus*), is represented by an ulna (D.2:38) and dated in the Ayyūbid/Mamlūk period. Whether the humerus shaft of a female sparrow hawk belongs to a European sparrow hawk (*Accipiter nisus*) or to a Levant sparrow hawk (*Accipiter brevipes*) cannot be determined. Both are birds of passage, and the European sparrow hawk is also a winter visitor (Hüé and Etchécopar 1970:164, 167; Heinzel, et al. 1972:74).

The proximal end of a humerus belonging to a falcon and dated in the 'Abbāsid period (C.2:9) presents a peculiarity; it belonged to an immature bird only about four weeks old (Pl. XXIII: 18). A likely explanation is that it must have been removed from its nest by humans in order to train it for the hunt. Judging from the size of the bone, it fits a female peregrine falcon (*Falco peregrinus*). However, since the Barbary peregrine falcon (*Falco pelegrinoides*) and the Lanner falcon (*Falco biarmicus*) are among the varieties that nest in the vicinity of Ḥesbân (Hüé

and Etchécopar 1970:189 ff.; Heinzel, et al. 1972), they too must be considered as possibilities. Since the bones of the Lanner falcon would be too small, the remaining alternative is that this humerus belongs either to a female Barbary peregrine falcon or to a female peregrine falcon.

A pair of humeri of the abundant kestrel (*Falco tinnunculus*) was found in G.4:52/53, dated in the Ayyūbid/Mamlūk period. A small femur from A.10:4, also dated Ayyūbid-Mamlūk, belongs more likely to a lesser kestrel (*Falco naumanni*) and not to one of the migratory species. The lesser kestrel is numerous around Ḥesbân in the summer.

The remains of songbirds are only occasionally encountered in the bone corpus. Starlings, skylarks, and wood larks appear to be winter visitors. Two humeri which are too small for the crested lark (*Galerida cristata*)—a frequent annual bird in the region – but which seem too big for the other larks around Ḥesbân, have been classified as skylark (*Alauda arvensis*). The entire upper skull of a wood lark (*Lullula arborea*) has been preserved from the Early Roman period (G.10:7). From the Byzantine period (G.10:8) the sternum of a small lark – probably a short-toed lark (*Calandrella brachydactyla*) or a lesser short-toed lark (*Calandrella rufescens*) – has been preserved. As a nesting bird the blackbird (*Turdus merula*) has gradually disappeared from the vicinity of Ḥesbân, probably as a result of deforestation. A lower beak belonging to this bird comes from the Early Byzantine period (F.30:2), and a tibiotarsus (G.4:26) was unearthed among the Ayyūbid/Mamlūk remains. The rock sparrow (*Petronia petronia*) is abundant on Tell Ḥesbân.

The carpometacarpus of a corn bunting (*Emberiza calandra*) was identified by Dr. J. Lepiksaar during our visit to Göteborg in April 1977. Several songbird bones have yet not been identified.

Reptiles and Amphibians

Bones of tortoises are present in relatively large numbers and are found in nearly all strata. Since tortoises dig in search of the

burrows of mammals, some of the almost complete tortoise skeletons probably represent intrusions into certain of the deposits, such as the skeleton from B.2:135 (Iron II/Persian) and the two from G.4:11 and G.12:3, both Ayyūbid/Mamlūk findspots. The high arch of a transversally halved carapace is indicative of the subspecies *Testudo graeca terrestris.*

According to Bodenheimer (1935:195) the hardoun (*Agama stellio*), a lizard, is "probably the most common and typical animal of our landscape" (referring to Palestine). The partial skeleton of a Scheltopusik, a legless lizard, appears to have belonged to a magnificent specimen. Of snakes there are thoroughly preserved skeletons (see p. 262, above) as well as single vertebrae, all of them belonging to the genus *Coluber.* They appear to be from the plentiful Syrian black snake (*Coluber jugularis*), although we lack comparative material to check their remains against other large species of *Coluber.*

Of the amphibian species, only the variegated toad has been verified. The lake frog (*Rana ridibunda*) is no doubt as numerous below ʿAin Ḥesbân as is the river crab, of which a piece of a claw was found in C.8:11 (Ayyūbid/Mamlūk). However, the elevation of Tell Ḥesbân rules out the presence of the lake frog as a natural inhabitant of the *tell.* The variegated toad skeletons in F.16:5 (Byzantine period) can surely be attributed to untimely deaths caused by a prolonged drought.

Conclusion

If one visits Ḥesbân in the dry summer or fall one can hardly imagine that this barren land has the vegetation characteristics of a Mediterranean phytogeographical region — that is, macchia, a mixed stand of trees with oaks and pistachios (cf. Feinbrun and Zohary 1955, Maps 5 and 6; Zohary 1962, Map 5, and 1973, Fig. 22; Bender 1968:12) — especially when one sees the rocky slopes surrounding the cultivated lands and the *wadis.* With an annual precipitation of about 300 mm., most of which falls between

November and March, there is nevertheless enough rain to support such a vegetation and to permit dry farming. Even though the macro-climate during the past 3,000 years was probably not much different from today's, better conditions for agriculture and animal husbandry must have existed, especially during the Early Iron Age when the *tell* was first settled. As the early farmers cleared the plateaus and wide valleys in order to exploit the fertile soil, the result was permanent damage; even if the rainfall had been somewhat higher, the forest and thicket could never have grown back because the domestic animals wandered unfenced, devouring the tree sprouts and bushes needed to return the landscape to its forested state. The cumulative impoverishment of the vegetation through time is reflected in the increase of small ruminants, and especially of goats. As the small domestic ruminants and camels advanced farther and farther, trees and macchia increasingly disappeared. With the disappearance of the thicker, higher vegetation as a result of overgrazing, the wild animals dwindled as well – although hunting probably played a secondary role in their disappearance. This widespread devastation of the land around Ḥesbân accounts for the extinction of the larger game as well.

As for the gazelle, their habitat seemed to improve as the land was initially cleared. At first they took up their stand in the Irano-Turanian dwarf-bush-covered steppes toward the slopes of the Jordan Valley, west of Ḥesbân (Zohary 1962, Map 5). There they fell victim to unrestricted hunting (cf. Mountfort 1964, 1965).

The bird population is reduced to a degree that we have found nowhere else in the Near East. Virtually no large birds of prey – eagle, vulture, or buzzard – were observed. Only kestrels and little owls still remain. Coveys of chukar partridges can still be observed in more solitary regions, such as on the rocky slopes and near the precipitous *wadis* of the Jordan Valley. Residents of regions with dense vegetation, such as the blackbird (*Turdus merula*), have disappeared. Residents of the stony, semi-arid

countryside, such as the mourning wheatear (*Oenanthe lugens*) and other wheatear species have since replaced them (cf. Alomía, p. 298, below).

The list of more than 60 wild species not including fishes and mollusks, which has been assembled for Tell Ḥesbân, should not distract from the fact that the exploitation of wildlife played a wholly subordinate role in the economy of the ancients at Tell Ḥesbân. Only gazelles and partridges were hunted on a scale worthy of mention, though during the earlier periods fallow deer may also have been hunted to some extent. When the size of the entire bone corpus is considered – about 70,000 bones – the number of wild-animal finds is trifling, and the presence or absence of evidence of rare or unusual species is entirely accidental. More than half of the established species do not yield even a handful of bones. A considerable portion of the remains were not culturally deposited at all, but were a part of the natural thanatocoenosis of the *tell*. Nevertheless, thanks only to the extraordinary quantity of the excavated animal remains, the finds collectively established a fairly complete picture of how the fauna in the region of Ḥesbân fitted together.

Finally, the scarcity of wildlife even in the earliest strata is explained by the relatively recent date (ca. 1200 B.C.) of the settlement on this site. Before the Iron Age the surrounding region was already populated and the depletion of the soil had begun. In the Iron Age and thereafter, exploitation of the environs of Ḥesbân focused almost entirely on agriculture and animal husbandry, while in the city itself trade had become important.

Further research will concentrate on the great quantity of domestic-animal remains, which promise the possibility of making well founded assertions about the composition of the domestic fauna, as well as about the physical size of the animals and their use.

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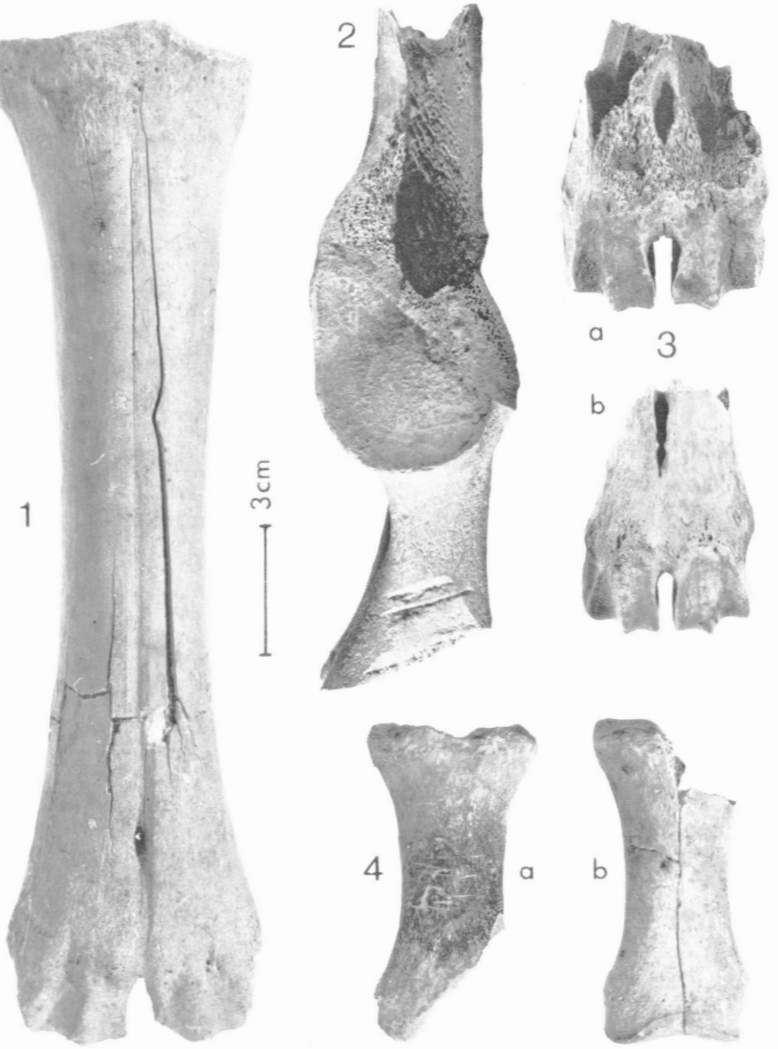
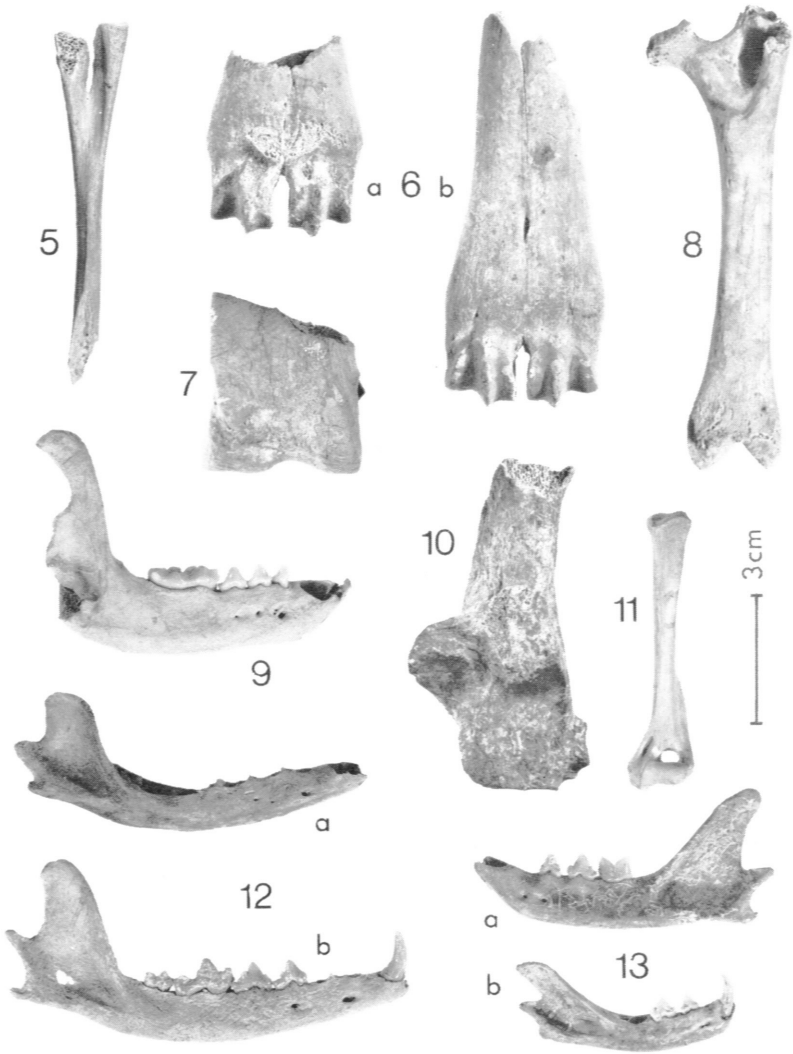
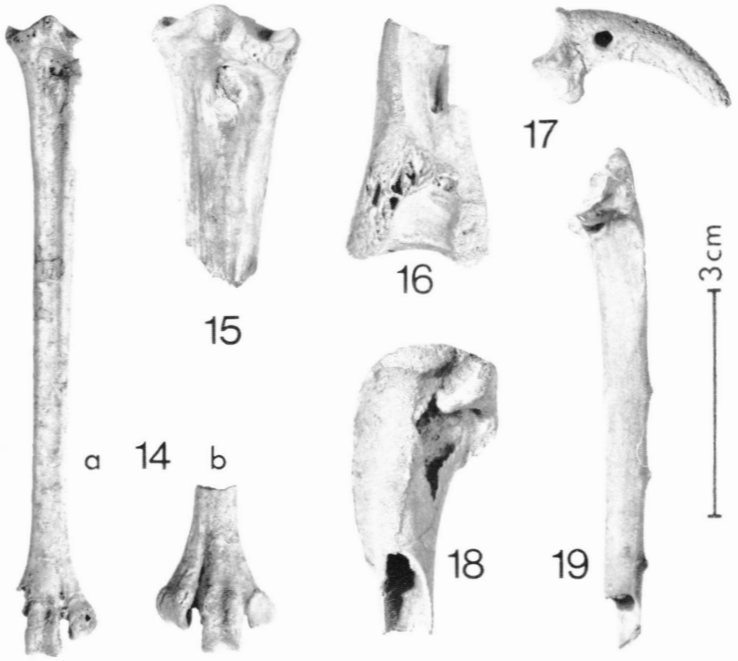


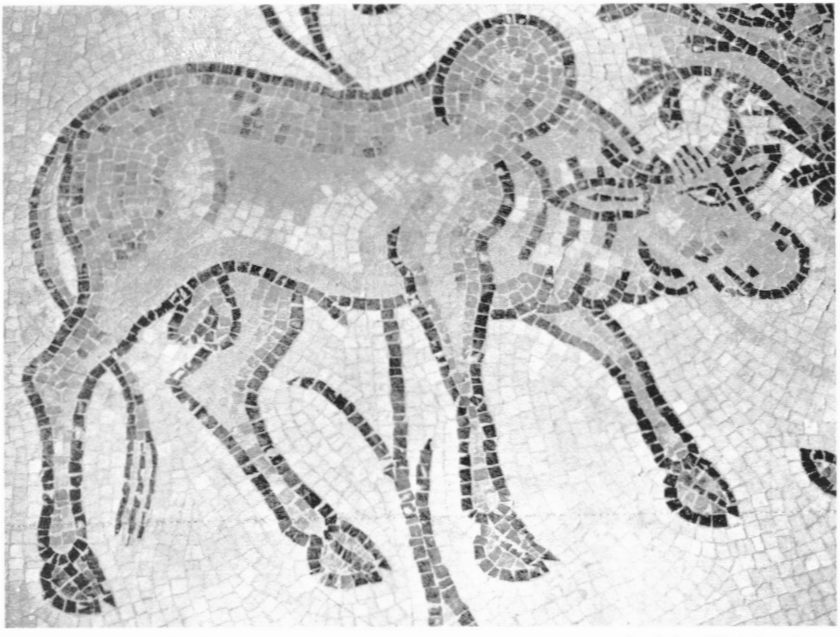
1. Aurochs, *Bos primigenius,* or domestic cattle, "*Bos taurus.*" Metacarpus (C.3:12). Greatest length, ca. 238 mm.
2. Domestic horse, "*Equus caballus.*" Portion of pelvis with traces of chipping and chopping (B.4:258).
3. Maral, *Cervus elaphus maral,* male (a); and Mesopotamian fallow deer, *Dama mesopotamica,* male (b). Metatarsi, distal (D.4:1 and B.1:143). Greatest distal breadth, 49 and 40 mm.
4. Syrian onager(?), *Equus onager hemippus*(?). Phalanges primae (D.4:98 and C.1:110). Greatest length, ca. 76 and 77 mm.; minimum breadth of diaphysis, 23 and 23.5 mm.



5. Zebu(?), "*Bos taurus indicus*"(?). Thoracic vertebra with split spinal process (C.5:111).
6. Wild goat, *Capra aegagrus*, or domestic goat, "*Capra hircus*," male (a); and wild sheep, *Ovis ammon*, or domestic sheep, "*Ovis aries*," male (b). Metacarpi distal (B.7:27). Greatest distal breadth, 36 and 36.5 mm.
7. Maral, *Cervus elaphus maral*. Talus, distal half (D.2:44). Greatest distal breadth, 37 mm.
8. Porcupine, *Hystrix indica*. Femur shaft (D.6:33).
9. Badger, *Meles meles canescens*. Mandible (C.1:131). Length: C'Alveolus, rear edge to M_2'Alveolus, rear edge, 39.5 mm.
10. Lion, *Panthera leo*. Calcaneus (B.4:268).
11. Mongoose, *Herpestes ichneumon*. Humerus without proximal epiphysis (C.5:180).
12. Fox, *Vulpes vulpes palaestina*. Mandibles. a) Young animal (D.4:58); b) adult animal (C.8:13). Length of the checktooth row (P_1-M_3) of b), 52 mm.
13. Wildcat(?), *Felis silvestris tristrami*(?) (a); and domestic cat, "*Felis catus*" (b). Mandibles (D.2:28 and A.9:77). Length of the checktooth row (P_3-M_1), 21 and 18 mm.



14. Houbara bustard, *Chlamydotis undulata*. Tarsometatarsi.
    a) Female (findspot undesignated). Greatest length, 85 mm.;
    b) Male (C.7:1). Greatest distal breadth, 15.8 mm.
15. Great bustard, *Otis tarda*, female. Tarsometatarsus (C.1:140). Greatest proximal breadth, 20.2 mm.
16. Crane, *Grus grus*. Tibiotarsus, distal (C.1:126).
17. Griffon vulture, *Gyps fulvus*. Cross-bored claw bone (C.5:177).
18. Young peregrine falcon, *Falco peregrinus*, female, or *Falco pelegrinoides*, female. Humerus, proximal (C.2:9).
19. (?)Brown-necked raven, *Corvus ruficollis*. Ulna, proximal (B.1:103). Greatest length, at least 90 mm.



A. Portrayal of a zebu from the Byzantine mosaic unearthed in 1976 in the church on Mount Nebo. Photo: A. von den Driesch (with the approval of the excavation director).

B. Nubian ibex, *Capra ibex nubiana,* male. Horncore (C.4:22). Photo: Alvin Trace.