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Early Arabian pastoralism at Manayzah in Wādī Ṣanā, Ḥaḍramawt

LOUISE MARTIN, JOY MCCORRISTON & RÉMY CRASSARD

Summary

Excavations at the site of Manayzah have yielded a small but important sample of animal bones in stratigraphic contexts dated to the sixth millennium BC. The site itself is significant for its excellent preservation of occupation surfaces and features at a rock shelter beside a spring in the upper drainage of the main Wādī Ṣanā channel. As yet, there are no contemporary sites with comparable stratigraphic and organic remains in the archaeological record of southern Arabia, and thus the data from the small-scale excavations at Manayzah play a major role in the interpretation of cultural historical and economic strategies in the first quarter of the Holocene period. Preliminary analysis of the faunal assemblage from Manayzah suggests that the cattle, sheep, and goats were present, most likely as herded domesticates, and their remains exist alongside those of hunted gazelle. In a broader chronological perspective, this picture may provide evidence for early pastoral economies, but it also provides a baseline for the long history of cattle and caprine pastoralism in southern Arabia.

Keywords: Yemen, Neolithic, domestication, animals, pastoralism

Introduction

There are only a handful of Neolithic sites in south-west Arabia with sufficient organic preservation to assess the animal part of the subsistence economy, and to inform on the introduction and role of herded domestic livestock. Preservation is a major problem at many prehistoric sites, with thin deposits, and high water and wind erosion in the later Holocene period, which served to abrade and disintegrate whatever animal remains there may have been (Crassard 2008: 33).

From the sparse current evidence that is available, however, it seems certain that domestic animals (cattle, sheep, and goats) had arrived in the south-west part of Arabia by the fifth millennium BC (Fedele 2008), most likely brought in from the adjacent areas to the north (the southern Levant) or west (East Africa), where domestic livestock are known earlier (Marshall & Hildebrand 2002; Zeder 2008).

Faunal evidence for the earliest Arabian domesticates derives from two distinct geographical areas — eastern Arabia (the Gulf) and the south-west of the peninsula (Yemen). In the Gulf area in the east, the domestic caprine and cattle package is first attested at the fifth-millennium cal BC site of Jabal al-Buhais 18 (Jabal al-Buḥays)

(Uerpmann & Uerpmann 2000; 2008) (Fig. 1). For south-west Arabia, the earliest convincing evidence for domestic animals derives from the Yemeni highlands, and the site of Wādī al-Thayyilah 3 (Fedele 2005; 2008), also fifth millennium cal BC (see Fig. 1). Whether the two areas are linked to the import of separate domestication packages is an open question (Dreschler 2007; McCorrison & Martin, in press).

Another unresolved issue is the extent to which indigenous Arabian fauna may have contributed to the domesticated animals witnessed in the Neolithic, particularly cattle. Until recently it was assumed that the natural distributions of the wild progenitors of domestic cattle, sheep, and goats (*Bos primigenius*, *Ovis orientalis*, and *Capra aegagrus*, respectively) did not include the Arabian Peninsula. Thus, the finding of cattle, sheep, or goat remains necessarily indicated human importation (although goat remains in the form of *Capra ibex* are to be expected in Arabia). The recent identification of *Bos primigenius* at Jabal al-Buhais 18 (Uerpmann & Uerpmann 2008: 104–105) and from the Sa^ʿada (Sa^ʿadah) rock-shelter sites in northern Yemen (Hadjouis 2007: 51) has altered our understanding of the distribution and habitat of this species at least, and it was possibly present in drier and more southerly areas than previously assumed,

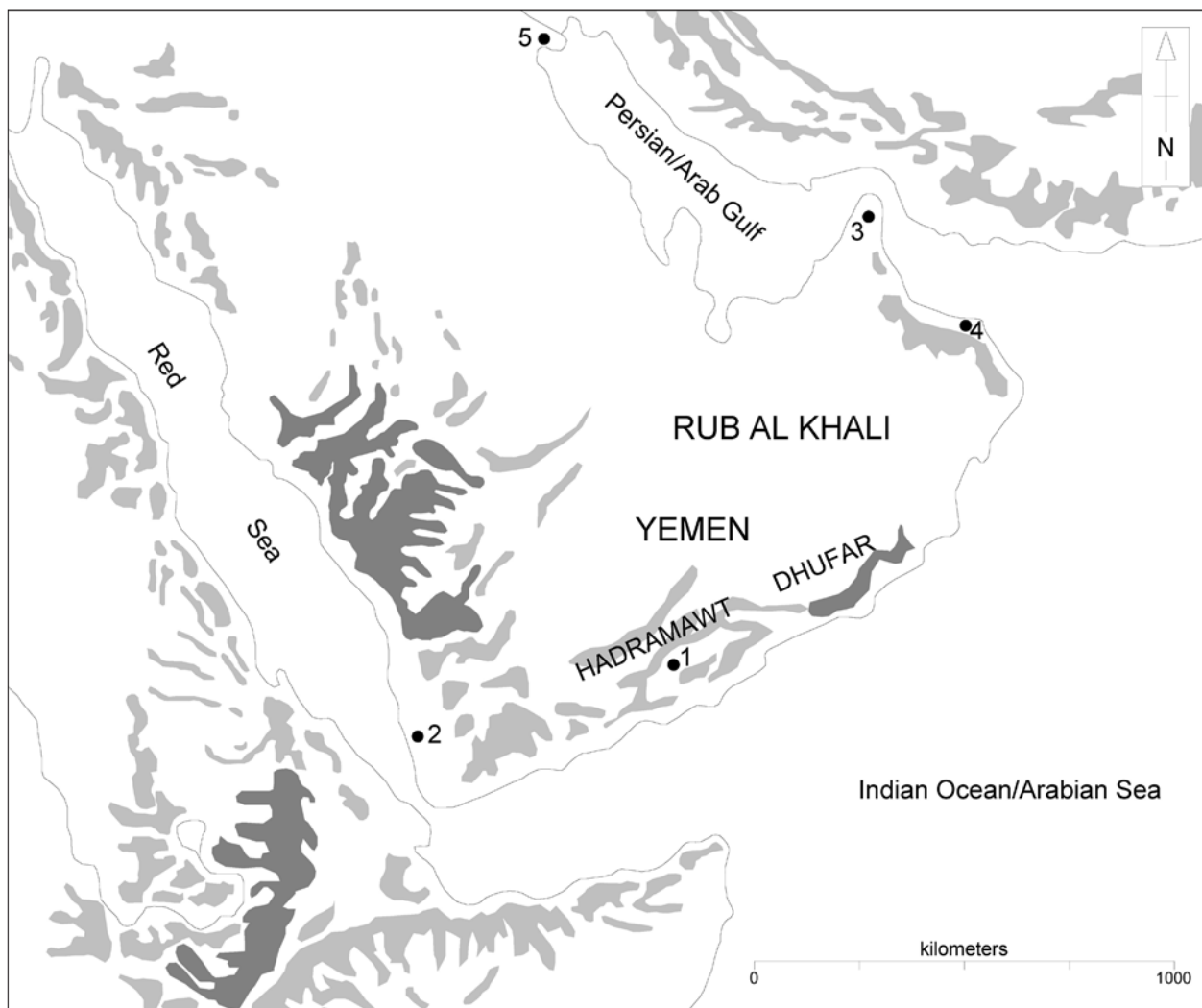


FIGURE 1. A map of Arabia showing the sites mentioned in the text. 1. Manayzah; 2. Wādī al-Thayyilah 3; 3. Ras al-Hamra 4 and 5; 4. Jabal al-Buhais 18; 5. H3 in Kuwait.

including southern Arabia. As a result, cattle finds from prehistoric sites in the region need their domestic status to be demonstrated rather than assumed.

This aim of this paper is to add to the current sparse picture of early prehistoric economies in southern Arabia, by presenting a small but significant faunal dataset from the site of Manayzah in Yemen's southern Jol (Jawl) mountains. The site itself, its setting, the two seasons of excavations, and the lithics analysis have been fully detailed elsewhere (Crassard *et al.* 2006). Here, the stratigraphy and dating of the site will be briefly revisited as a context for presenting the animal bone evidence.

Manayzah

The rock-shelter site of Manayzah is found in the lower (southern) part of Wādī Ṣanā, where the channel is relatively constrained by an ancient deep incision into hard limestone; a deep and relatively narrow gorge has still today a few high seasonal springs which seep along its sides. The cliff face is 40–50 m high at this point, and the archaeological occupation is found on a slope close to the cliff wall, in a narrow rock shelter. The presence of water, via springs in the winter dry season, and the shelter of the rock face would have made this an attractive place

for prehistoric settlement, although wadi flow in the summer would have precluded year-round occupation (Crassard *et al.* 2006).

The site lies slightly higher than the main watercourse of Wādī Ṣanā. Water seeping through the limestone cliffs above has over time deposited a hard calcified crust over the occupation layers, undoubtedly aiding preservation of the sometimes very thin archaeological layers beneath.

Excavations were conducted in 2004 and 2005 by Rémy Crassard, Joy McCorriston, and colleagues, as part of the Roots of Agriculture in Southern Arabia (RASA) project, whose team members had initially found the site during a survey. Apart from having excellent preservation, including that of the organics, Manayzah provides a highly valuable record for several other reasons: the site's spatial exposure, its stratigraphic depth, its well-dated sequence, and its finely documented lithic chronotypology, each briefly outlined below.

Spatial exposure

Manayzah has broad horizontal exposure, with five excavation trenches covering a total of 15 m², and yielding a variety of *in situ* features (2006: 154). For example, stone-lined hearths were found on the same surface (suggesting larger than single household groups), and pits and post holes indicate the presence of wooden structures (2006: 155–156). Ashy dumps attest to processing activities, whilst the often very fine occupation layers inter-digitate with sandy orange-yellow mostly sterile lenses, probably deriving from over-bank flooding when wadi flow was particularly high.

Stratigraphy

A 1×1 m² test pit (K9) probed the stratigraphy to a depth of 2.20 m and bedrock was still not reached. This relatively deep stratigraphy, consisting of approximately sixty often very fine layers (both occupation and wind and water-borne), shows accumulating deposits in a protected niche, rather than deflating surfaces. Thus, the sequence provides a rare opportunity to trace a local chronology from the early to mid-Holocene, and maybe even earlier back into the Pleistocene (2006: 155).

Five radiometric dates taken on wood charcoals from hearths or occupation surfaces (Fig. 2) show the deeper levels of the K9 test pit dating to the later eighth and earlier seventh millennium BC (the K9–020 date), while the rest of the dates cluster around the early sixth millennium BC.

Context	Material	Lab Num.	Intercept (uncal.)	2σ range (uncal.)	Cal. BC
I14, C009-10	Charcoal	AA66684	6,981	7032-6930	5984-5976
L9, A010-15	Charcoal	AA66683	6,987	7044-6930	5986-5746
K9 N ¹ / ₂ , Hearth 1	Charcoal	AA59570	6,902	6943-6861	5886-5716
K9-017	Charcoal	AA66685	7,133	7184-7082	6085-5896
K9-020	Charcoal	AA66686	8,072	8151-7993	7306-6702

FIGURE 2. The radiocarbon dates for the Manayzah rock shelter. (Calibrations with Oxcal 4).

Lithic evidence

Lithic evidence, based on projectile point types and technologies, supports and refines this picture. Together the chronotypology and dating has led to a preliminary phasing for use in grouping the faunal remains, these three phases being lower, middle, and upper. The lower phase (locus 20–24) dates to the late eighth to early seventh millennium BC (2006: 169); the middle phase begins in K9 above locus 20 and continues until the surface in the K9 test pit, but in squares L10, L11, and L12 it stops below locus 143, and in squares K14, J14, and I14 the middle phase extends to loci 128 and 129. This middle phase is dominated by finely worked trihedral points, dating to about 6000 cal BC (see the uppermost four dates in Fig. 2), and this is where most occupation features such as pits and hearths are from. The upper phase containing fluted arrowheads and fluted points, probably dates from about 6000 cal BC to 5500 cal BC (see Crassard *et al.* 2006: 158–165; fig. 9; Crassard 2008: 138, 144, for details).

The animal remains

The faunal remains derive from the clear occupation layers, built up seemingly from frequent, and possibly seasonal, revisiting of this same location. Some of the bone material is highly burnt, a very small amount appears water-worn, and most is highly fragmented, whether from human or natural action. Certain levels show little disturbance to have occurred post-deposition since skeletal elements were still in articulation upon excavation.

Retrieval was excellent (through a 3mm mesh). Of the over 1600 fragments, most were undiagnostic to genus, but the small sample of less than seventy specimens that

	Lower	Middle	Upper
Bos	0	10	0
Gazelle/Caprine	0	20	1
Gazelle	0	18	0
Caprine	0	13	2
Goat	0	3	1
Sheep	0	1	0
TOTAL NISP	0	65	4
Non-diagnostic	3	1500+	c100

FIGURE 3. *The Number of Identified Specimens (NISP) of mammal remains from the three phases at Manayzah.*

could be identified consisted of roughly equal numbers of gazelle and caprines (sheep and goat), with fewer cattle (Fig. 3). The small amounts of microfaunal remains (birds, small mammals) have yet to be identified, and a full taphonomic analysis of the undiagnostic material is a future project; only identified larger mammals are reported on here.

Figure 3 shows that by far the majority of the faunal material was found in the middle-phase layers, with only a few undiagnostic fragments so far coming from the lower phase and a higher number, but still primarily unidentifiable, from the upper phase. Even from the middle phase, the sample is extremely small, and would not normally deserve more than a brief note (since

quantitative analysis is meaningless with such small assemblages) but the presence of cattle, sheep, and goat at this date make the collection worthy of attention.

Cattle

Ten specimens were identified to cattle (*Bos* sp.). Great care was taken with these specimens to consider not only the other larger wild bovids (in the 60–200 kg range) which are known to have inhabited the region, such as the desert-adapted Arabian oryx (*Oryx leucoryx*) (Harrison & Bate 1991: 189), but also others whose presence in the earlier/middle Holocene of Arabia is not certain but cannot be dismissed. Such taxa include the addax (*Addax nasomaculatus*), which is known to have inhabited the deserts of Egypt and Sudan, or the grassland-dwelling hartebeest (*Alcelaphus buselaphus*), which although not known from direct evidence from Arabia cannot be completely excluded (Uerpmann H-P 1987: 83). Similarly, whether kudu (*Tragelaphus imberbis*), native of thicketed habitats of north-east Africa, ever inhabited Arabia is debatable (Harrison & Bate 1991: 192). African buffalo and wild water buffalo have also been reported from Yemen, so required consideration. Comparison of the Manayzah specimens with material from collections at the Institute of Archaeology, University College London, and the Natural History Museum, London, gave confidence that these remains were indeed from cattle rather than other large bovids.

Taxon	Element	Portion	Fusion	Condition	Quadrant	Locus	Analytical Phase
Bos	Radius	prox	Fused	Fair	C	9	Middle
Bos	Metacarpal	distal	Fused	Fair	C	9	Middle
Bos	Calcaneum	fragment	?	Burnt	C	9	Middle
Bos	Sesamoid	complete		Fair	A	4	Middle
Bos	Phalanx 1	complete	Unfused	Burnt	C	9	Middle
Bos	Phalanx 2	distal	Unfused	Fair	K9	posthole1	Middle
Bos	Phalanx 3	complete	Fused	Burnt	C	9	Middle
Bos	Horncore	fragment		Fair	A	1	Middle
Bos	Tooth	fragment		Fair	C	9	Middle
Bos?	thoracic vert	fragment		Fair	K9	14	Middle
BOS TOTAL							10
Gazelle	Calcaneum	complete	Fused	Fair	A	2	Middle
Gazelle	Cuneiform	complete		Burnt	B	2	Middle
Gazelle	Metatarsal	Proximal	Fused	Fair	B	6	Middle

FIGURE 4. *A list of the identified cattle (*Bos* sp.), gazelle (*Gazella* sp.), caprine (*Ovis/Capra*), goat (*Capra* sp.) and sheep (*Ovis* sp.) elements from Manayzah, showing the portion of bone present, fusion status, condition, and context information.*

Taxon	Element	Portion	Fusion	Condition	Quadrant	Locus	Analytical Phase
Gazelle	Metatarsal	distal	Fused	Fair	L9	2	Middle
Gazelle	Phalanx 1	distal		Burnt	D	2	Middle
Gazelle	Phalanx 1	distal		Fair	K9	18	Middle
Gazelle	Phalanx 2	distal		Burnt	C	10	Middle
Gazelle	Phalanx 3	complete	Fused	Burnt	C	9	Middle
Gazelle	Patella	complete		Fair	K9	14	Middle
Gazelle	Max M1/M2	crown		Fair	L8	10	Middle
Gazelle	Max M1/M2	crown		Fair	A	4	Middle
Gazelle	Mandible	fragment		Fair	K9	14	Middle
Gazelle	Man dp4	crown		Fair	K9	13	Middle
Gazelle	Mand P2	complete		Fair	A	4	Middle
Gazelle	Tooth	fragment		Fair	K9	8	Middle
Gazelle	Tooth	fragment		Fair	K9	7	Middle
Gazelle	Tooth	fragment		Fair	A	11	Middle
Gazelle	Tooth	fragment		Fair	A	2	Middle
GAZELLE TOTAL							18
Caprine	Metacarpal	distal		Fair	C	7	Upper
Caprine	Phalanx 1	distal		Fair	C	7	Upper
Caprine	Scapula	Proximal		Fair	K9	7	Middle
Caprine	Scaphoid	complete		Fair	D	2	Middle
Caprine	Semi-lunaire	complete		Fair	D	2	Middle
Caprine	Pyramidal	complete		Fair	D	2	Middle
Caprine	semi-lunaire	complete		Fair	K9	16	Middle
Caprine	capetum-trapezoid	complete		Fair	C	9	Middle
Caprine	Metacarpal	distal	Fusing	Fair	B	10	Middle
Caprine	Femur	Proximal	Unfused	Fair	K9	posthole 1	Middle
Caprine	Max M1/M2	complete		Fair	B	11	Middle
Caprine	Atlas	cranial		Fair	B	10	Middle
Caprine	Phalanx 1	Proximal	Fused	Fair	B	3	Middle
Caprine	Maxilla	complete		Fair	K9	pit 1	Middle
Caprine	Tooth	fragment		Fair	K9	16	Middle
CAPRINE TOTAL							15
Capra	Phalanx 3	fragment	Fused	Fair	C	7	Upper
Capra	Astragalus	complete		Burnt	K9	7	Middle
Capra	Metacarpal	distal	Fusing	Burnt	D	5	Middle
Capra	Phalanx 3	complete	Fused	Fair	K9	16	Middle
CAPRA TOTAL							4
Ovis	Astragalus	complete		Fair	K9	16	Middle
OVIS TOTAL							1
TOTAL							48

FIGURE 4 (continued). A list of the identified cattle (*Bos sp.*), gazelle (*Gazella sp.*), caprine (*Ovis/Capra*), goat (*Capra sp.*) and sheep (*Ovis sp.*) elements from Manayzah, showing the portion of bone present, fusion status, condition, and context information.



FIGURE 5. The Manayzah *Bos sp.* proximal radius (right), from Quadrant C locus 9, with a modern comparative (left). (Proximal view).

The ten identified elements derive from the skull, forelimb, lower limbs, and feet, perhaps suggesting that these large animals were slaughtered relatively nearby (Fig. 4). A minimum of two individuals is represented by the fused distal metacarpal (a late fusing element) and the unfused phalanges (fusing relatively earlier, following fusion sequences in Silver 1969). Thus at least one adult and juvenile make up the remains.

Whether these cattle represent domestic or wild animals is an intriguing question, considering the early date of the deposits. A zoogeographic argument — that finds in southern Arabia are outside the *Bos primigenius* distribution area and hence domestic — can no longer be made, considering the recent claims for wild cattle finds in the Arabian Peninsula (see above). In terms of morphometric data, only two specimens yielded measurements since the others were burnt, fragmented, or young. These two were a proximal radius (Figs 5 & 6) measuring Bp 84.9, BFp 77.7, Dp 44.6, and a phalanx 3 measuring DLS 91.5, Ld 65.5, MBS 32.0. Figure 7 shows the proximal radius measurement plotted alongside those of prehistoric *Bos primigenius* from Denmark (both males and females shown) (after Degerbøl & Fredskild 1970). The Manayzah individual was clearly much smaller than even the females of the Danish wild cattle. This size difference is difficult to interpret: environment-linked size variation is well known to exist in wild mammals, and it might be expected that northerly *Bos primigenius*



FIGURE 6. The Manayzah *Bos sp.* proximal radius (right), the same specimen as in Figure 5, with a modern comparative (left). (Posterior view).

individuals would be larger than those from the south. Yet a single metric from a late Pleistocene Nile Valley sample, from the Kom Ombo plain in Upper Egypt, shows a large *Bos primigenius* radius (Bp 113.2 mm) (Churcher 1972: 84) overlapping with the Danish male sample. This adds some support to the suggestion that the Manayzah radius is far smaller than expectations for wild cattle in the area, and hence most likely comes from a domesticate.

Another comparable measurement comes from the pre-Neolithic levels of Wādī al-Thayyilah 3, where Fedele (2008) describes a cattle proximal radius fragment, measuring Bp 94, BFp 85, as being in the size overlap between wild and domestic animals, although since there are no other domestic animals found in the same levels he leans towards it being wild. This example again shows the Manayzah specimen to be very much smaller than expectations for wild cattle.

Gazelle

Of the eighteen fragments identified to gazelle (Fig. 4), all are either teeth or lower limb elements (foot area). This pattern may be due to the high fragmentation of the assemblage, where meat- and marrow-producing limb bones may have experienced more breakage, rendering them less identifiable. Gazelle remains derive from all through the middle phase loci from square K9, and both adults and juveniles are represented. At this stage, it is not

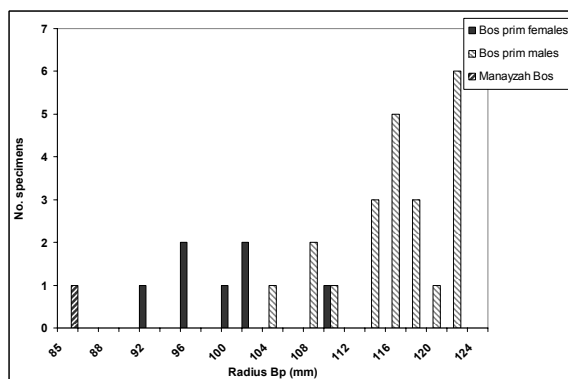


FIGURE 7. The proximal radius breadth (*Bp*) of the Manayzah *Bos sp.* specimen shown in Figures 5 and 6, plotted against *Bp* measurements of prehistoric *Bos primigenius* (males and female) from Denmark. (After Degerbøl & Fredskild 1970).

evident which species of gazelle is represented (*Gazella gazella*, *G. subgutturosa*, *G. dorcas*, *G. bilkis* all being possibilities; Harrison & Bate 1991). What is clear is that the gazelle provides unambiguous evidence of hunting during the middle part of the Manayzah sequence.

Caprines

In terms of the twenty sheep and goat fragments, most ($n=15$) could not be identified beyond the Caprine category (Fig. 4). Of the five that could, four were identified to *Capra* and one to *Ovis* following criteria described by Boessneck (1969). Of these five identifiable to species, all were from the middle phase of the site, except a single *Capra* phalanx 3 from the upper phase.

It is difficult to ascertain whether the Manayzah goat bones come from wild or domestic populations. The Nubian ibex (*Capra nubiana*) is well known in the mountainous areas of Arabia, including the Ḥaḍramawt (Harrison & Bate 1991: 182), and domestic goats are attested at al-Buhais 18 (Uerpmann & Uerpmann 2008) demonstrating their presence in the peninsula by this time. There is only a single measurement on a goat bone from Manayzah (a phalanx 3 measuring DLS 33.5, MBS 4.8), and without better morphometric samples, or horn cores, the status of *Capra* cannot be confirmed. The impression is, however, of one or two large specimens, maybe from wild animals, and a couple of a smaller size.

The single identified sheep bone would certainly indicate an imported domesticate, since sheep from the Arabian Peninsula have never been known in the wild.

The bone, an astragalus, has several characteristics and proportions typical of sheep (described in Boessneck 1969: 350–352, figs 64–66), despite visibility of some criteria being obstructed by abrasion of the bone edges. Figure 8 shows four aspects of the astragalus, with the Manayzah example (right-hand side in each case) alongside a modern sheep specimen. The measurements of the specimen (estimated where shown in brackets due to missing edges) are GLI 29.0, GLm 26.7, DI 16.6, Dm (17.0), Bd 17.8, which is somewhat larger than a domestic sheep astragalus from Neolithic al-Buhais 18 (Uerpmann & Uerpmann 2008: 120, table 18), where the equivalent measurements are GLI 25.7, GLm 24.7, DI 14.5. The Manayzah specimen, however, does fall within the size range of nine measured sheep astragali from the fourth-millennium cal BC Ras al-Hamra 5 (Ra's al-Ḥamrā'), where the greatest length of the lateral side of the bone (GLI) is from 30.1–23.7 mm (Uerpmann & Uerpmann 2003: 236–237, table 9/27), which are interpreted as domestic stock.

On both zoogeographic and metrical criteria, the finding of a sheep specimen at Manayzah implies the presence of domestic sheep, and although caution should certainly be expressed about a single bone, it is quite likely that some of the unseparable caprine category also belongs to sheep. The finding of a single bone also clearly indicates an individual animal, and by implication a breeding stock from imported domesticates. This casts quite a different light on the small assemblage, and would seem to suggest a herding package was present. Whether in the southern Levantine steppes/deserts, Anatolia, Cyprus, Mediterranean Europe, or East Africa, wherever there is evidence for imported domestic caprines, it shows sheep and goats treated as a package, initially at least (Garrard *et al.* 1996; Horwitz *et al.* 2000; Marshall & Hildebrand 2002; Martin 2000; Peters *et al.* 2005; Zeder 2008). It is therefore likely that at Manayzah there were imported caprine domesticates tended together as well, even if there were also wild goats (ibex). That the Manayzah evidence for sheep comes from a relatively deep deposit in the middle phase of the site (K9 16, see Crassard *et al.* 2006: 155, fig. 4) securely dates caprine herding to *c.* 6000 cal BC.

Discussion

Despite the extremely limited faunal assemblage, there is plausible evidence for caprine and cattle herding at Manayzah alongside the hunting of gazelle. Cattle appear only convincingly in the upper levels of the middle

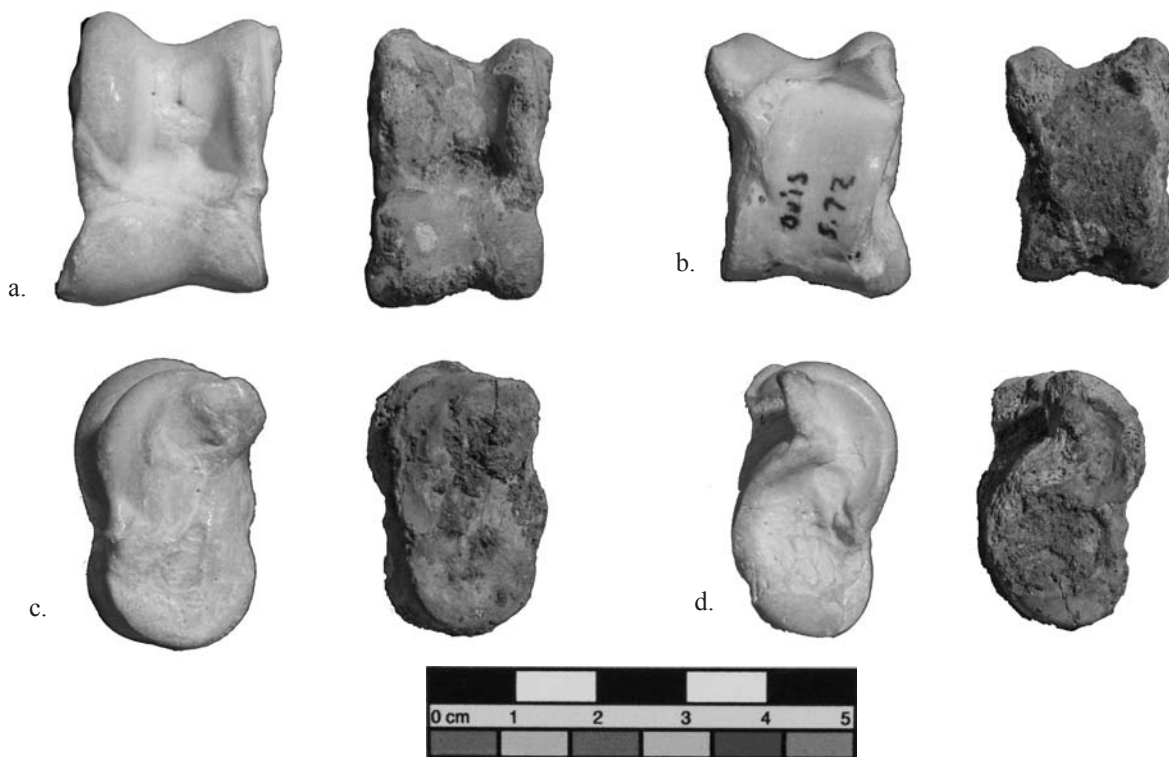


FIGURE 8. Four views of the astragalus from Manayzah K9 locus 16 identified as sheep (*Ovis sp.*), in each case on the right, alongside a modern comparative (left); **a.** anterior view; **b.** posterior view; **c.** medial view; **d.** lateral view.

phase. These same levels also contain gazelle and caprine remains, but whether the deposits were formed by the same social group engaged in both hunting and herding, or by distinct visitors to the site practising different subsistence strategies, will only be established by further excavation and larger faunal samples for analysis.

The faunal analysis adds to the picture we have of Manayzah as a frequently visited campsite, where herders probably also engaged in hunting local game. Occupation of the rock shelter would only have been possible during the dry season since the wadi flow would have been prohibitive at other times, limiting the length of stay. The perennial spring, however, would have attracted both herders and wild game alike during dry seasons. The high density of lithic tools, particularly the *in situ* production of elaborate projective points (Crassard *et al.* 2006), suggests focused attention on hunting technology. Subsistence does not appear highly specialized, but seems to be more of an opportunistic mixed strategy, although it is particularly difficult, even with larger faunal samples, to determine the scale of the herds “on the hoof”

from a probably highly selected sample that becomes the culled and deposited “death assemblage” (see e.g. Halstead 1996). While some of the charred animal dung, resembling sheep and goat pellets, may represent fuel, the dung layer found overlying some occupation surfaces at Manayzah (Crassard *et al.* 2006: 170) attests to animals being sheltered at the site, presumably in close proximity to the hearths and structures. As yet, there is little handle on potential population mobility of groups visiting Manayzah: the only contemporary sites in the vicinity are Khuzmum *c.* 20 km to the north in the Wādī Ṣanā system (McCorriston *et al.* 2005), and HDOR 419 in Wādī Wa‘shah (Crassard & Bodu 2004), both of which lack preserved faunal remains.

In terms of how the Manayzah fauna fits with the current picture of the appearance of domesticates in southern Arabia, and of Neolithic subsistence practices, some comparisons can be made. The large and well-dated assemblage from al-Buhais 18 in Sharjah, UAE, confirms the presence of the domestic package of sheep, goats, and cattle from the fifth millennium BC. Here, caprines (with

roughly equal proportions of sheep and goats) greatly outnumber cattle, and in general herding of domesticates was far more important than the hunting of local wild animals. The site of Jabal al-Buhais 18 itself is interpreted as a station within a mobile herding system, rather than a year-round habitation site (Uerpmann & Uerpmann 2008: 127–131), with other parts of the system perhaps being on the coast, or in the mountains. Also from the Gulf, late fifth-millennium BC Ras al-Hamra 6 in northern Oman has yielded a small faunal assemblage also including domestic cattle and caprines, and by the fourth millennium BC Ras al-Hamra 5 provides substantial samples of the same package of domesticates, incidentally interpreted as being for meat production, rather than secondary products (Uerpmann & Uerpmann 2003). Domestic sheep, goat, and cattle are also mentioned from the site of H3 in Kuwait (Beech & Glover 2005: 99) which is interesting, and may indicate an earlier regional appearance of animal domesticates than previous evidence has suggested, considering the sixth-millennium BC dating of the main occupation of the site (Carter & Crawford 2003). Thus it is clear that by the fifth millennium BC, the three major animal domesticates (cattle, sheep, and goats) formed a dominant part of subsistence systems in the Gulf region, with caprine herding the dominant activity.

A slightly different picture has emerged from the south-west of the Arabian Peninsula. Here, the best case for the appearance of domestic cattle and caprines is from highland Wādī al-Thayyilah 3, dating again to the fifth millennium BC (along with Jabal Qutran [Jabal Qaṭrān] and Najd al-Abyad [Najd al-Abyaḍ]) (Fedele 2008). The slight dominance of cattle at Wādī Thayyilah 3, together with architectural evidence, has led to interpretations of a Neolithic village-based cattle-herding economy (with caprines also present), which later gives way to caprine-dominant subsistence.

Conclusion

The significance of the faunal assemblage from Manayzah is that, despite being an extremely small sample, it provides the earliest morphometric evidence to date of domestic cattle, sheep, and perhaps goats in southern Arabia. The material is well preserved, from stratigraphically secure deposits, and is well dated to the early sixth-millennium BC contexts. The location of Manayzah, bridging south-west and eastern Arabia, make it key to understanding the different trajectories for the introduction of animals and plant domesticates into the region, and it is hoped that further excavation at this highly important site will allow

fuller investigation of the intriguing results that have been uncovered so far.

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Abbreviations

Abbreviated dimensions in this paper are in mm, following the standard by von den Driesch 1976:

Bd	Breadth of distal end
BFp	Breadth of Facies articularis proximalis
Bp	Breadth of proximal end
Dl	Depth of lateral half
DLS	Diagonal length of the sole
Dm	Depth of medial half
Dp	Depth of proximal end
GLl	Greatest length of lateral half
GLm	Greatest length of medial half
MBS	Middle breadth of the sole

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