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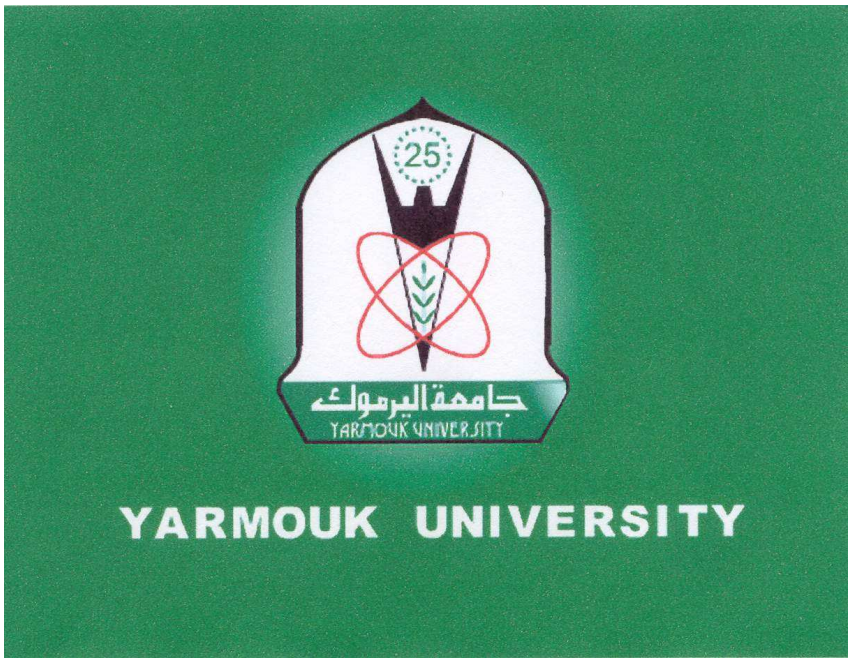

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Contents

THE QUESTION OF MOBILE PASTORALIST CAMPSITES IN ARCHAEOLOGY: THE CASE OF TUWAH KHOSHKEH

Marjan Mashkour[1] and Kamyar Abdi[2]

Abstract

Tuwah Khoshkeh, a Middle Chacolithic site in the western part of Iran (Zagros region), is one of the rare archaeological cases displaying features of a mobile pastoralist campsite. These features are discussed from an archaeological and archaeozoological point of view. The analysis of kill-off patterns and metrical data for caprines yield evidence supporting the identification of a mobile pastoralist campsite.

Résumé

Tuwah Khoshkeh, un site Chalcolithique moyen, situé a l'ouest de l'Iran (région de Zagros) est un des rares cas archéologiques présentant les caractéristiques d'un camp de pasteurs/nomades. Ces caractéristiques sont débattus dans cet article d'un point de vue archéologique et archéozoologique. Pour ce dernier, le profil d'abattage des caprinés apportent des données intéressantes en faveur d'un campement de pasteurs transhumants.

Key words: Iran, Chalcolithic, Mobile pastoralism, Transhumance, Caprines, Kill-off patterns, LSI diagrams.

Mot-clés : Iran, Chalcolithique, Pastoralisme mobile, Caprinés, Profil d'abattage, Diagrammes de Log ratio.

Introduction

Mobile pastoralism has played a crucial role in the development of Near Eastern civilizations. This paper will concentrate on the type of mobile pastoralism involving transhumance of the variety practiced in the Zagros Mountains.

Here it is useful to provide a definition of the terms used in this paper: By 'campsite' it is meant a type of settlement with temporary dwellings occupied for a limited time. By 'pastoral' it is meant a mode of production concerned with the exploitation of domestic animals, in this case ovi-caprines. Pastoralism occurs in a continuum from fully sedentary (village-based herding) to fully mobile (nomadic pastoralism). By mobile pastoralism it is meant a form of pastoralism which involves movement of herd beyond agricultural zone, usually one to a few day's walk from the village. By 'transhumant pastoralism' it is meant a specialized form of mobile pastoralism which is still based on sedentary settlements but involves seasonal movement of the herd between pastures involving some use of campsites. The extreme form of mobile pastoralism is 'nomadic pastoralism', by which it is meant a mode of subsistence (i.e., a way of living) primarily relying on pastoralism involving high mobility and changing dwellings throughout the year, living in a succession of campsites.

Archaeologists are just beginning to develop techniques for identifying sites representing early forms of pastoral activities, especially those with higher mobility (cf. Hole 1978, 1980; Cribb 1994). This can partially be blamed on a major preoccupation in Near Eastern archaeology with sedentary populations, whose settlements created *tell*s, *tappeh*s, or *höyük*s, and especially with the higher echelons of society. On the other hand, ephemeral occupations, shallow deposits, and poor surface evidence cannot be dismissed as reasons why mobile pastoralist sites have been neglected in regional surveys.

In the past three decades there has been increasing attention paid to the archaeological evidence for mobile pastoralists, and the place of mobile pastoralism in the socio-economic organization of the

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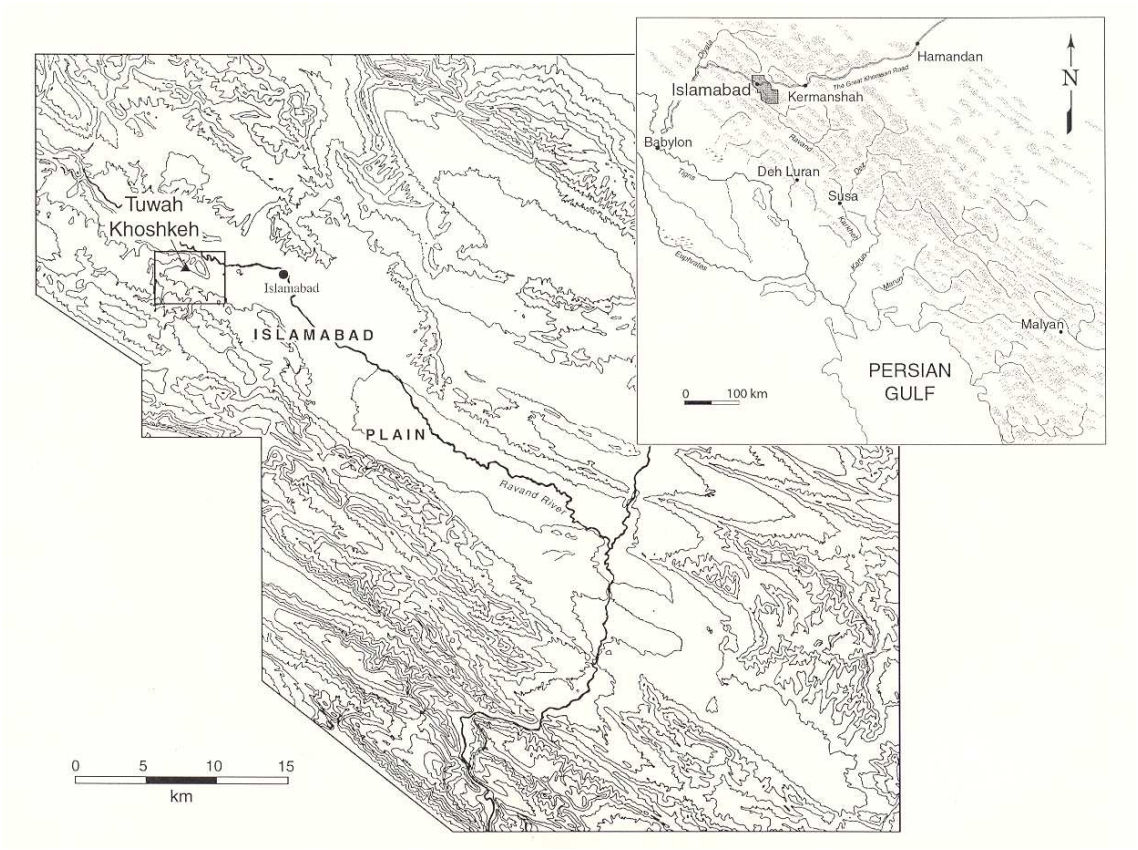

Fig. 1. Map of the Kermanshah region and the Islamabad plain with the location of Tuwah Khoshkeh.

ancient Near East (cf. Hole 1974, 1978a, 1978b, 1980; Wright 1987; Cribb 1994; Sumner 1994). Thanks to these studies we have now isolated a number of criteria, mostly archaeological, for identifying sites of mobile pastoralist nature in the Zagros region (Hole 1978):

1. Mobile pastoralist sites should be located with respect to seasonal pastures and migration routes rather than with regard to arable lands and close proximity to major sources of water,
2. Mobile pastoralist sites should provide evidence for repetitive seasonal occupation,
3. Mobile pastoralist sites should show evidence for small groups of temporary dwellings built with minimum investment of time and labor,
4. Artifacts from nomadic pastoralist sites in particular should represent a range of activities associated with a self-sufficient household. Those from tranhumant pastoralist sites may be more limited.

The study of Tuwah Khosheh, a small site from the 5th millennium BCE in the Central Zagros Mountains, provides an opportunity to apply and evaluate some of these criteria and develop an integrated suite of methods for identifying and evaluating mobile pastoral sites. In this paper, we will initially evaluate the archaeological evidence for the mobile (i.e., temporary) nature of Tuwah Khoshkeh, and then shall focus on faunal remains as a possible indicator of pastoralism.

The case study

Tuwah Khoshkeh is a small site located in a valley of the same name to the west of the Islamabad Plain in the Central Western Zagros Mountains in western Iran (Fig. 1). The site was discovered during the second season of survey in the Islamabad Plain in October 1999 (Abdi 2000). The site initially appeared as a low, natural rise at the foot of the rocky cliffs forming the north side of the valley, but upon closer inspection we discovered a pit and debris left by clandestine diggers in a futile attempt to

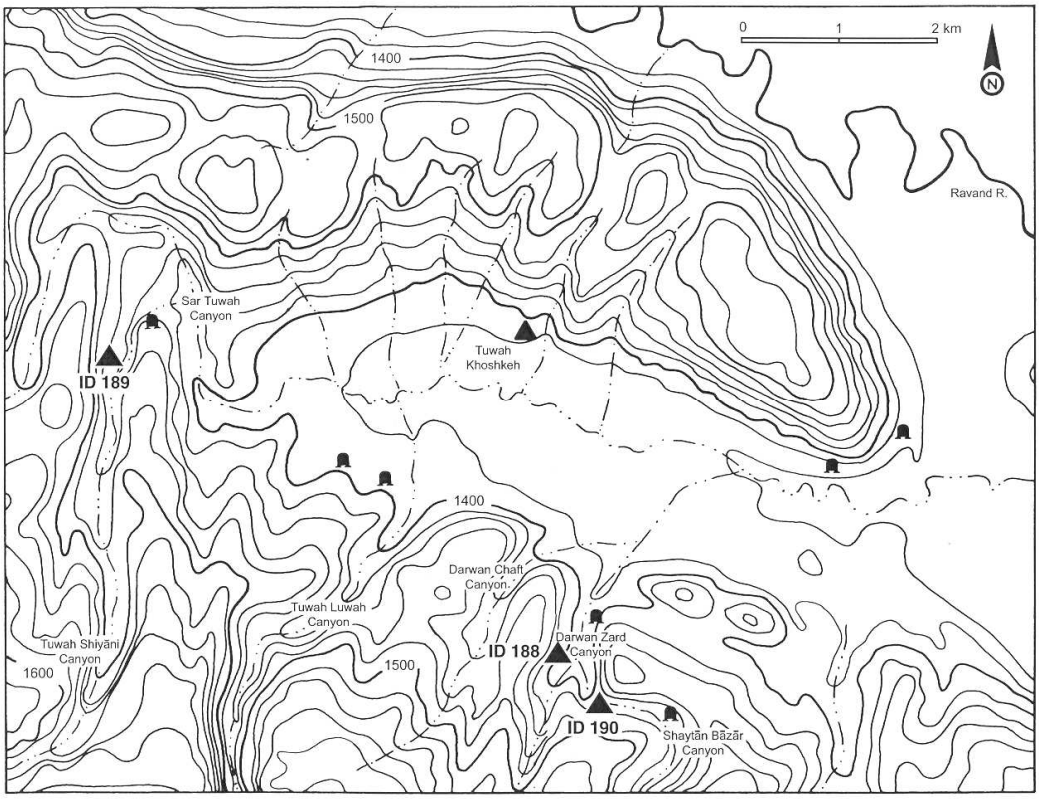

Fig. 2. Topograpical map of the region around Tuwah Khoshkeh and location of the prospected sites.

find ancient artifacts. In and around the pit and debris we found a few pot-sherds and some small pieces of bone. Most sherds were too weathered and undiagnostic to be dated. There was however, one sherd which seemed to be a coarse ware from the Chalcolithic period, as well as another small painted sherd which also seemed to belong to the Middle Chalcolithic painted tradition of the region. The site was recorded as ID 108, named Tuwah Khoshkeh (*Dry Valley* in the local Kurdish dialect) after the valley, and made a note of it as a possible mobile pastoralist campsite because of its configuration and marginal location, dating it to the 5th millennium BCE based on the ceramic evidence (Fig. 2).

In July 2000, test excavations were carried out at Tuwah Khoshkeh as part of ongoing research on the origins and development of transhumant and nomadic pastoralism in the Central Zagros (Abdi 2002a). There were five main research objectives envisioned for the test excavations at Tuwah Khoshkeh: (1) to recover structures and features to establish whether or not it was a temporary site, (2) to recover faunal and floral samples and to establish whether or not it was a mobile pastoralist site, (3) to recover artifacts pertaining to subsistence activities to see the degree to which the inhabitants relied on pastoral versus agricultural products, (4) to recover items of daily use with decorative elements to assess the social relationships of the people in this small community with those in larger centers in the region, (5) to recover items obtained in exchange to assess whether or not the inhabitants either transported goods from their region to other sites and large centers or received goods from them.

The opportunity was also taken to study the environmental setting of the site and contemporary human occupation in the area (for a comprehensive report see Abdi 2002b).

Test excavations

Three locations were excavated at Tuwah Khoshkeh (Fig. 3): (1) Operation A, a 5x5 m square at the highest point on the site; (2) the Long Trench, a 1x15 m rectangle on the southern slope of the site; and (3) the Deep Sounding, a 1x1 m square where clandestine diggers had already dug a pit. Since

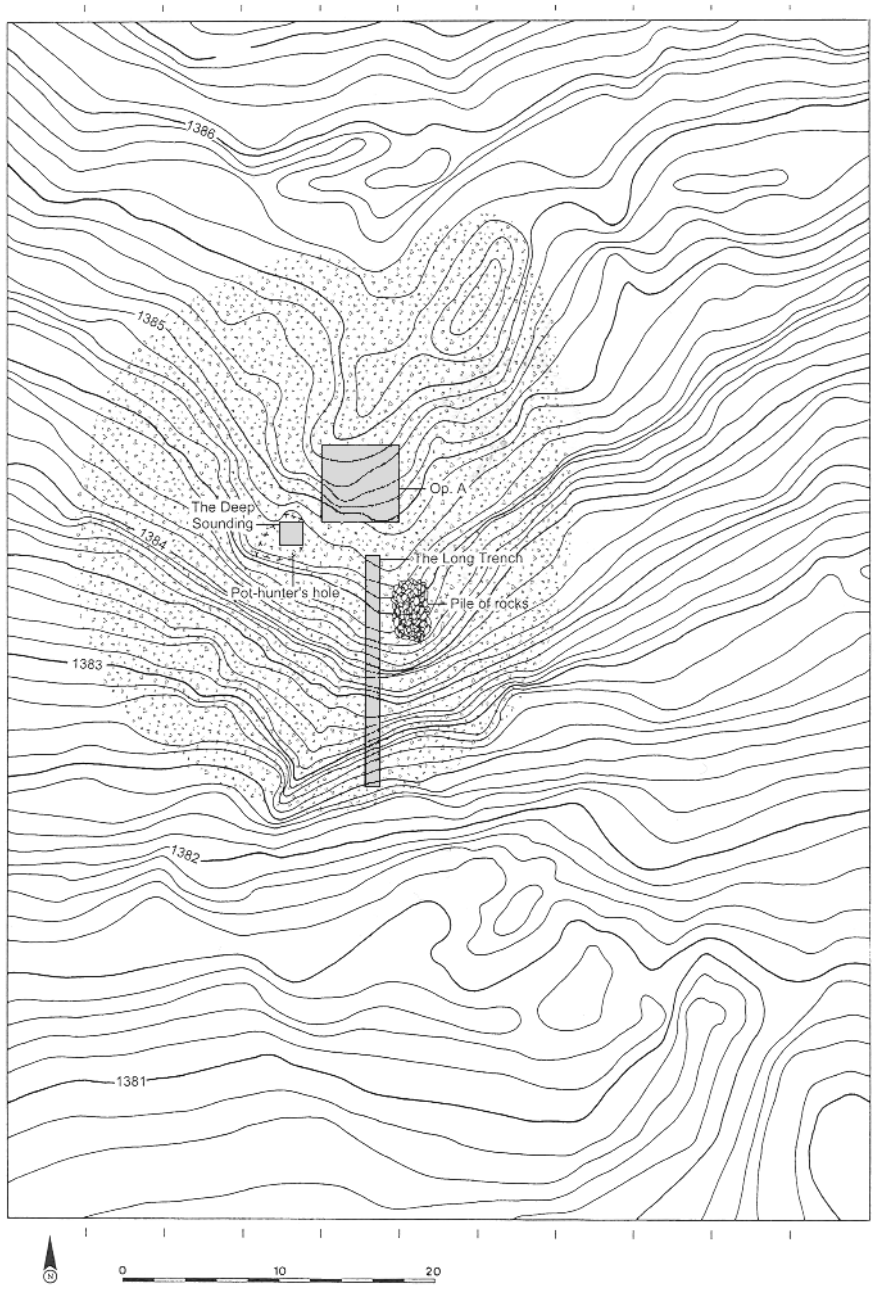

Fig. 3. Topographic map of the site of Tuwah Khoshkeh and the excavated areas.

this paper is primarily concerned with faunal remains from Operation A, we shall focus on this area and only briefly discuss the remains from the Long Trench and the Deep Sounding.

The Long Trench began 2 m south of Operation A and extended all the way to the valley floor. In all, the Long Trench measured 1x15 m. In the Long Trench, we encountered piles of irregular rocks right below the surface soil. Most rocks were large boulders, stabilized by putting smaller cobbles between them. The matrix surrounding these rocks consisted of gravely sediment mixed with some archaeological material.

To the southwest of Operation A, work was begun to clear the debris and collect *in situ* archaeological materials from an area of 1x1 m within the clandestine pit, exposing courses of rock. Excavations in the Deep Sounding continued to a depth of 210 cm below the surface. Four layers of deposits were found, of which only layer 2 consist of irregular courses of rocks that may be parts of consecutive stone alignments.

Operation A, the largest area excavated, was placed on the highest part of the site in hopes of finding architectural remains in order to take samples from well-defined contexts. In this area, only about

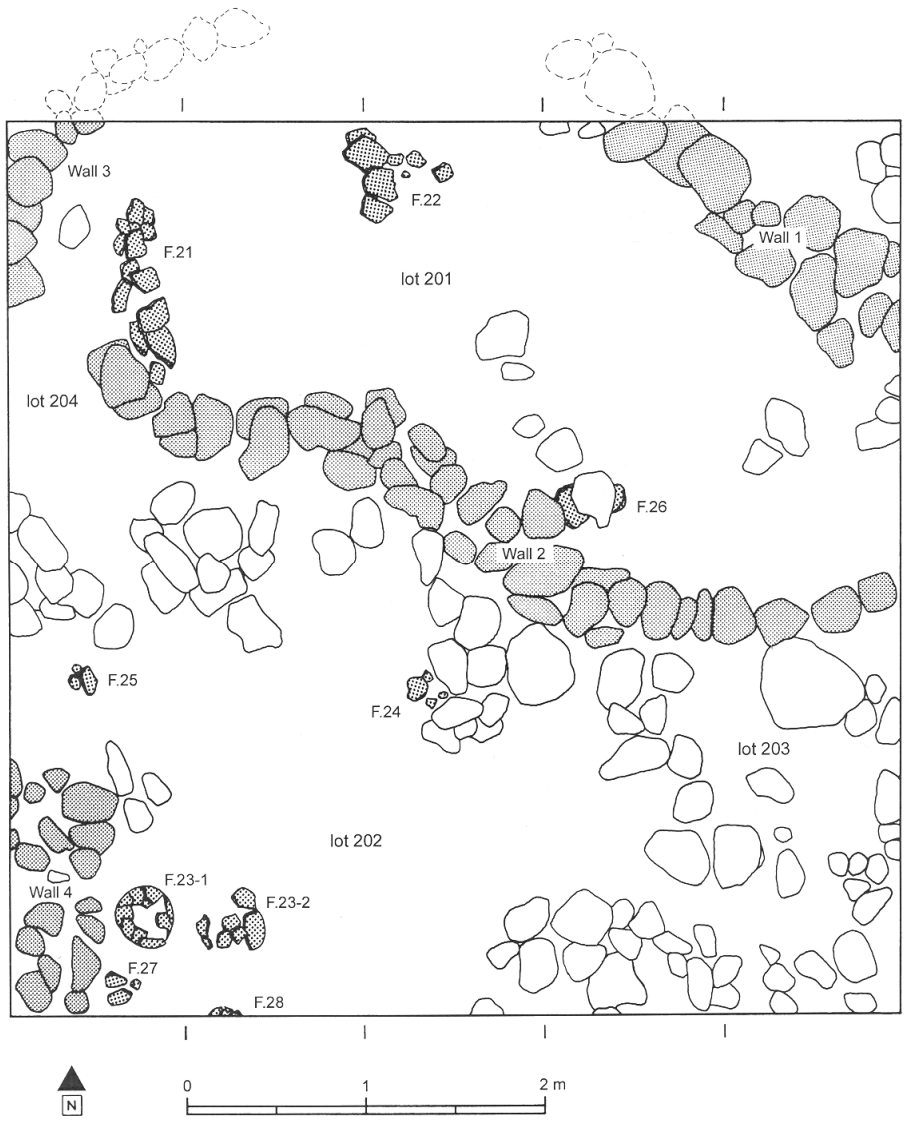

Fig. 4. Aligned dry stone walls at Tuwah Khoshkeh

15 cm below the surface, we exposed a scatter of rocks with little identifiable pattern. The matrix in which these rocks were located was a gravely sediment mixed with substantial numbers of sherds and some pieces of bone labeled as Layer I. Once the 'loose' rocks were removed, a pattern of stone alignments became visible (Fig. 4). We cleared and recorded deposits around these alignments as Layer II. As excavations went deeper, the patterning in the rocks became clearer with more alignments becoming visible, which were labeled Walls 1 to 4. Further down, crushed *in situ* jars were found in several loci, usually next to the stone alignments, as well as a few other features that did not quite fit the definition of architectural remains, but which could easily have been remains of other walls.

Material culture

Almost 440 kg of potsherds, 75 lithic artifacts, 6 small finds, and over 800 bone specimens comprised the finds from the three excavation areas at Tuwah Khoshkeh.

The pottery can be divided into two general types based on the overall quality of the paste: Coarse Ware (CW) and Fine Ware (FW). The greater part of the pottery is composed of CW. CW is characterized by a relatively soft fabric tempered with both large and small fragments of plant matter and oc-

casional small bits of whitish grit (probably limestone). The CW paste ranges in color from light buff to light reddish pink. CW is poorly fired, thus, the core is only partially oxidized, especially in larger specimens. The surface is covered with a thin slip, medium buff in color. Common forms of CW include short-necked jars, medium-necked jars, restricted bowls, medium bowls with a flat base, oval basins, and ring-based shallow basins.

Fine Ware (FW) is characterized by a hard, well-fired fabric, with fine sand inclusions, and is slipped. The FW fabric ranges in color from buff to reddish pink, but the slip is usually buff colored. FW occurs in both plain and painted variants. Common forms include small to medium bowls with a variety of forms including simple open examples, deep forms with edge rims, constricted forms, and bell-shaped forms, as well as small to medium jars or pipkins with vertically perforated lugs. The painted designs are predominantly geometric and executed in very dark brown to black ferrous oxide paint. The absence of large jars used for longer storage and/or the preparation of large both wares is noteworthy.

Seventy-five lithic artifacts were found at Tuwah Khoshkeh. The bulk of the lithic artifacts are made from various types of chert and a few pieces made from siliceous sandstone and other stones. The small valley of Tuwah Khoshkeh has no chert sources. However, some lithic artifacts are made from chert types found in various locales in the Islamabad Plain (Biglari and Abdi 1999: 6), as well as from chert found on the southern slope of the Maiwaleh Mountain to the north of Kermanshah Plain,

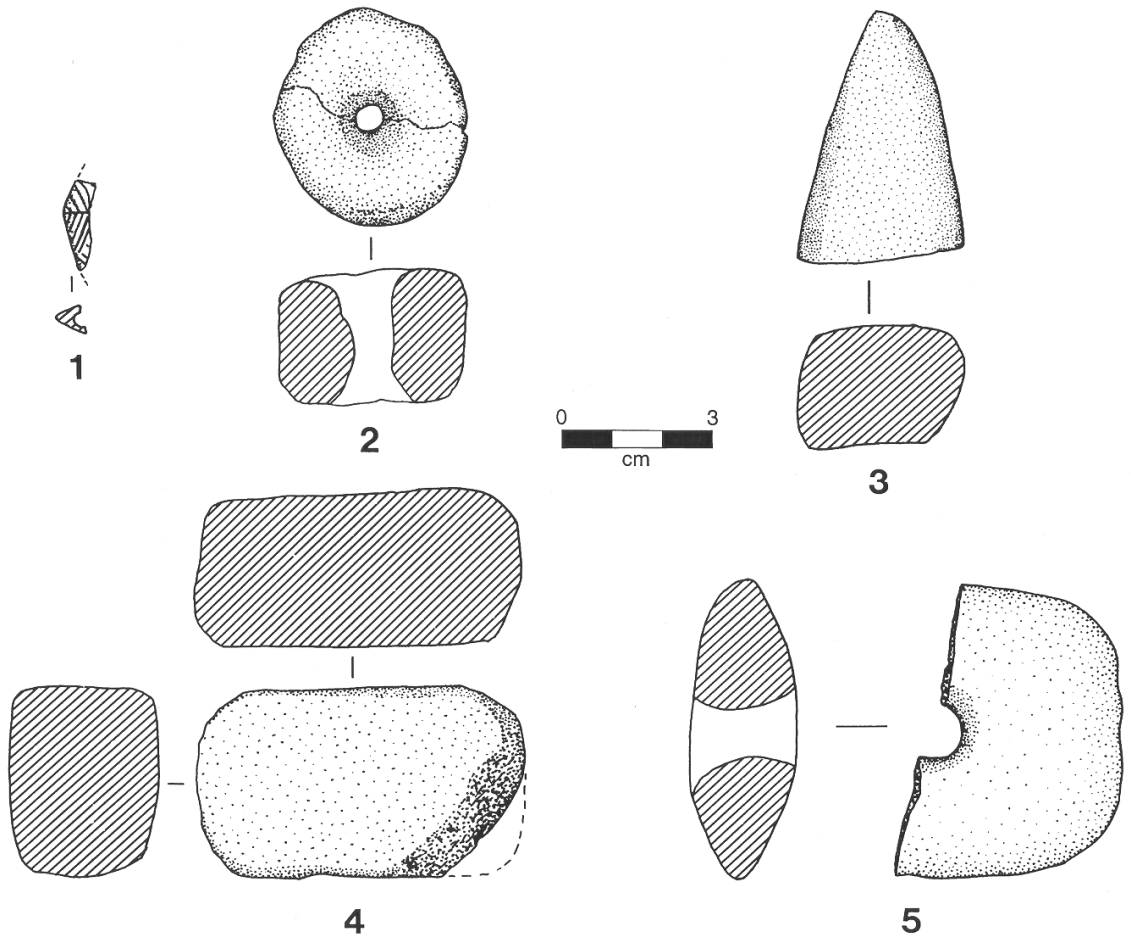

Fig. 5. Small finds from Tuwah Khoshkeh: (1) a rhomboidal stone 'bead-seal', longitudinally perforated, probably with an incised double-diamond design on one surface, (2) a rounded and perforated potsherd with chipped circumference, made of typical coarse, straw-tempered ware, with some limestone and fine sand inclusions, (3) an elongated, pyramidal piece of sandstone with a rectangular broken base, (4) a rectanguloid piece of sandstone with one edge chipped off, and (5) a perforated semi-rectangular-shaped piece of broken limestone.

about 80 km to the northeast of Tuwah Khoshkeh. However, there may be more local sources for this particular chert type which have not yet been discovered. There are also artifacts made from chert common in Posht-i Kuh, about 140 km southeast of the Islamabad Plain. There is only one piece of obsidian (a broken bladelet), which has the greenish hue typical of Nemrut Dag in eastern Anatolia, 630 km to the northeast.

Of the 75 lithic pieces, six are blades and flakes with polish. These artifacts have nicking which co-occurs along the edges with polish and may have been caused by use. Except for one broken flake with a polished stripe 5 mm wide, all tools display polishing as a narrow stripe of 1-3 mm along one or both edges on both the ventral and dorsal faces. Based on experiments by Korobkova (1999) reaping domestic cereals results in a 3-7 mm polishing along both faces, while tools used for reaping wild cereal and grass have a narrow polishing stripe of 1-3 mm. This observation leads us to suggest that, due to their narrow polishing stripe, tools discovered at Tuwah Khoshkeh, were used for reaping wild cereals and/or grass for fodder. Determining their exact function, however, will require future microwear and phytolith analyses.

In summary, the Tuwah Khoshkeh lithic assemblage is characterized by a high proportion of blades and flakes with polishing and notching as well as denticulated pieces in tool groups which may indicate some specialized activities related to cutting and sawing animal tissues, grass, or wood. If these artifacts were used for reaping cereals or fodder, the presence of the blades and flakes with polish indicates late spring - early summer occupations at Tuwah Khoshkah.

Only five small finds were recovered from excavations at Tuwah Khoshkeh (Fig. 5), four of which came from Operation A: (1) a rhomboidal stone 'bead-seal', longitudinally perforated, probably with an incised double-diamond design on one surface, (2) a rounded and perforated potsherd with chipped circumference, made of typical coarse, straw-tempered ware, with some limestone and fine sand inclusions, (3) an elongated, pyramidal piece of sandstone with a rectangular broken base, (4) a rectanguloid piece of sandstone with one edge chipped off, and (5) a perforated semi-rectangular-shaped piece of broken limestone.

The ethnographic evidence

Contemporary nomadic pastoralists pass through the Tuwah Khoshkeh Valley on a seasonal basis along their migratory route. In fact, during our excavations at Tuwah Khoshkeh approximately 15 nomadic families utilized pasturage in the Valley. These families were from various sections of the Kurdish Kalhor confederacy, who winter in the nearby lowlands to the west and southwest (*garmsir*), pass through the Tuwah Khoshkeh Valley in the spring, some remaining into the summer, while others move farther south or southeast to higher summer pastures (*sardsir*). Most nomadic households pitch their tents on the northern foothills of the rocky hills to the south of the Valley (see Fig. 2). Upon inquiry, these nomads explained that there are four main reasons for their choice of location: (1) the slope of the rock bedding in the latter area is down towards the south. Consequently, underground water emerges close to the tents, (2) the surface soil in the area is rather shallow, and thus, unsuitable for agriculture. Therefore, villagers from the nearby Amirabad village have no claim on the land and the nomads can use it freely, (3) The area receives slightly more precipitation due to its somewhat higher elevation, and therefore has better pasture, (4) The area is closer to the passes nomads use in their seasonal migration.

What the archaeological evidence and ethnographic observations suggest

In the introduction to this paper, we laid out a number of criteria for identifying nomadic pastoralist sites. Briefly, these criteria include the location, repetitive seasonal occupation, temporary constructions, archaeological remains, and faunal remains. Based on these criteria we will now assess the archaeological/ethnographic data on Tuwah Khoshkeh

The location of the Tuwah Khoshkeh may provide some clues as to its nature. The site enjoys several important advantages: (1) it is centrally located with immediate access to different parts of the Valley; (2) the soil around the site is finer grained and of better quality than the rest of the Valley,

thus providing better plant cover and better pasture; (3) the site's location in the southern foothills provides ample sunshine; further (4) under wetter climatic conditions of the Middle Chalcolithic period, with more oaks and more springs, there would probably have been more water sources and therefore better pastures on the north side of the valley (Abdi 2002a). Nowadays, nomadic pastoralists pitch their tents opposite the site on the northern foothills, in the southern part of the Valley (see above). However, in conversations with the nomads, they alluded to the fact that they would in fact have preferred the area around the site of Tuwah Khoshkeh to the place they currently resided, but it was out of bounds to them because the northern part of the Valley is owned by villagers from Amirabad and under regular cultivation. Any infringements by the nomads would create tension between them and the Amirabadis.

Structural remains and construction techniques at Tuwah Khoshkeh remind one of a characteristic temporary construction method known as *khoshkeh-chin* (literally 'dry-laying') as no mortar is used in building the wall. This method is usually applied where people, especially nomads, wish to spend as little time and effort as possible on building temporary structures. In summer pastures, such as in the Tuwah Khoshkeh area, common nomadic construction method entails building a circa 2 m high circular structure, similar to the structure marked by Walls 2 and 3 in Layer 2 in Operation A (see Fig. 4), by laying larger rocks widthwise at the bottom, smaller rocks in several courses above them, and filling in the gaps with smaller rocks without any mortar. This kind of dry stone structure does not have an oven, a water jar, or any other domestic facilities, and is only used as a lamb pen. An opening in the wall provides the herd with a way to enter and exit the structure. Residential structures, on the other hand, are more elaborate. Initially, a rectangular structure, the size of the tent, is constructed using boulders to protect the inhabitants from cold and wild beasts. Walls of this structure are usually 50 cm wide and about 1 m high. Afterwards, the interior and exterior surfaces of the wall are plastered with mud and straw plaster (*kah-gel*) to keep insects and rodents away. Further, a shallow channel of about 20 cm is usually dug around the outer wall of the structure to divert rain water. The interior edges of the wall are also covered with *chikh*, a short fence made with shoots. These residential structures usually have an oven inside for cooking.

Contemporary nomadic pastoralists in the Tuwah Khoshkeh valley form entire households including women and children. If we assume that domestic units will have a similar range of people and activities in the past, we can argue that similar settlement characterisitics existed in the Middle Chalcolithic period, and we would expect to see a material culture exhibiting the whole range of activities associated with a complete household, including food procurement and processing, craft production, and social activities. Obviously, we excavated only a portion of the site, but even in this small area one would expect to see a sample of artifacts used in different activities, considering that in Layer II, a large portion of one structure, a smaller portion of another structure and a considerable portion of the open area between them were brought to light.

However, the material culture is limited. Of course we no longer have access to the part of the material culture made from perishable materials that might have provided a rather different picture of the range of activities carried out at the site. However, what there is indicates a limited range of activities. The pottery from Tuwah Khoshkeh has a narrow range of forms and larger vessels associated with production and storage of food for larger numbers of people is missing. Among the small finds, no. 2, the perforated pottery disk, is perhaps a spindle whorl, and find no. 5, the local workers pointed out, resembles similar objects used by nomads for tying their leather bags. Further, the lithic assemblage consists of primary tools used for a limited range of activities, or tools used for reaping and butchering. One should especially consider the narrow polishing stripe of 1-3 mm on some blades suggesting they were used for reaping wild cereals and grass. This in itself may point to provisioning of fodder for the flock rather than full-fledged agricultural activities. But more important is the absence of any processing utilities (e.g., grinding slabs, mill stones, querns, abraders, pounders, etc.) one would expect to see associated with a self-sufficient nomadic household, even one dependent more on pastoralism than agriculture. Therefore, based on the archaeological evidence, Tuwah Khoshkeh seems more likely to have been a settlement by transhumants, rather than one used by full-fledged nomads.

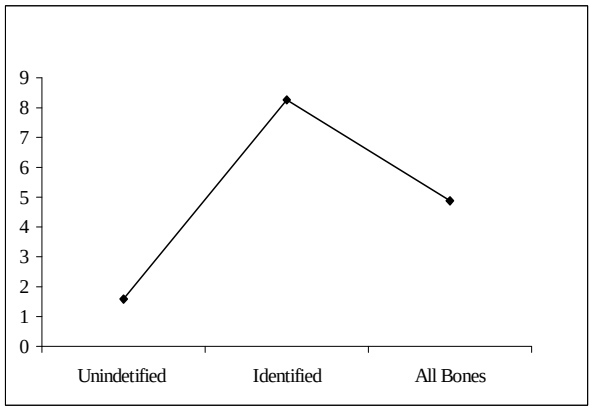

Fig. 6. Average weight of bone fragments in grams.

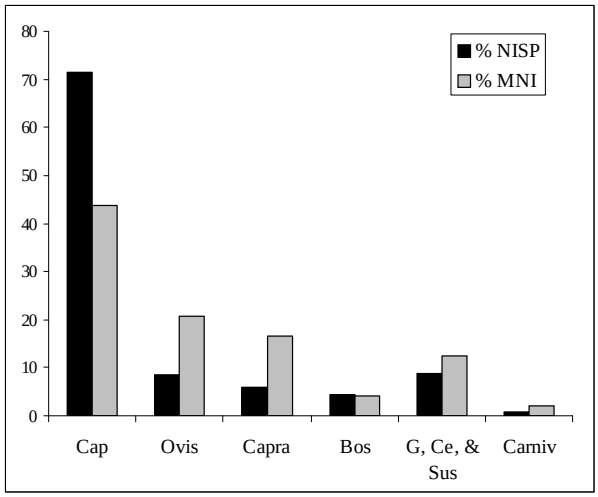

Fig. 7. Number of Identified Specimens (NISP) = 365, Minimum Number of Individuals (MNI) = 48
Cap= Caprinae, G = Gazelle, Ce= Deer,
Carniv = Carnivores

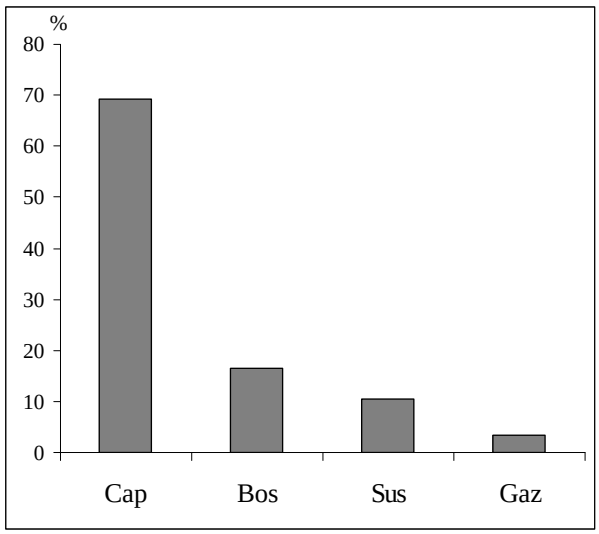

Fig. 8. Relative bone weight per taxonomic group.
Total bone weight = 3015 g

The faunal remains

The fifth criterion used to recognize mobile pastoralist sites would be the faunal remains. Two elements should theoretically be examined: the taxonomic composition of faunal remains, with an expected high proportion of caprines – the principal domesticate – herded by Middle Eastern pastoralists; the seasonality of the occupation, ideally reflected by the kill-off patterns for sheep and goat.

In the following part, the analysis of faunal remains will show the extent to which archaeozoological data can contribute to the characterization of a mobile pastoralist site.

The archaeological campaign of summer 2000 at Tuwah Koshkeh yielded more than 800 animal remains. The main archaeozoological studies were undertaken at the Archaeological Institute of Tehran University. Osteological remains came from Operation A and the Deep Sounding sections.

Bone preservation is not very good. Only 50% of the remains could be identified in the first examination of the sample. The average bone weight in this site is 4 g (Fig. 6). Identified bones weigh, on average, 8 g and unidentified bones 1.5 g. Fragmentation seems to be important at this site. Moreover, the high percentage of unidentified bones is also related to the presence of concretions on the bones.

Most of the bones (750) come from Operation A, and 50% have been identified to the level of genus (Fig. 7). The majority of the remains come from caprinae (85%) of which 17% could be assigned to sheep (10%) and goat (7%). Cattle bones are also present at Tuwah Khoshkeh and represent only 5% of bone remains. It is worth noting that 10% of the remains belong to wild medium and large mammals at Tuwah, with wild boar (*Sus scrofa scrofa*) being most common, followed by the goitred gazelle (*Gazella subgutturosa*). A single cervid bone (cf. *Cervus elaphus*), was also found at the site. A few bones of carnivores were identified in the remains, one of which comes from a dog (*Canis familiaris).*

The domestic caprinae constitute the most important meat resource at the site as confirmed by the relative amounts calculated on NISP and bone weight (Fig. 8). They are followed by cattle, boar and gazelle. The imposing percentage of domestic caprine exploitation can be considered a pastoral signature and constitutes a special feature of the Tuwah Khosh-

kek faunal assemblage. Actually, a statistical approach to a global characterization of Holocene faunal assemblages from Iran (34 sites analyzed) looking at relative proportion of species, has been attempted using a Correspondence Analysis (CA) (Mashkour 2001: figs. 55, 57 61) and the subsequent Hierarchical Discriminant Analysis (Mashkour 2001: fig. 62). These tests indicate the presence of one major juncture, defined by hunting on the one hand and husbandry on the other. Within the husbandry group of sites another distinction can be made on the basis of the relative importance of cattle or caprinae. Tuwah Khoshkeh may be classified among the second group, suggesting a pastoral character. In this particular context, given the environmental and geographical situation of the site, the question of seasonal movements can then be raised. Seasonal movements are practiced traditionally by nomadic or semi-nomadic people (Khazanov 1994), generally defined in the Zagros region within the term 'vertical transhumance'. Vertical transhumance is still practiced today and has been analyzed in the ethnographic literature (e.g. Barth 1961; Digard 1981 and Black-Michaud 1986). It is born of necessity from the topographic and climatic configuration of the Zagros mountains as the nomads seek lush pastures for their caprine herds (Hourcade *et al.*1998).

Archaeozoology offers several methodological tools for investigating the issue of seasonal movements. One possibility is ageing by the thin-sectioning of teeth, which requires a very time consuming and sophisticated technical approach (Lieberman, 1994; Lieberman *et al.* 1990) with unequal results for mammals (Rissman n.d.; Burke and Castanet 1995). Another tool for understanding herd management strategies and by extension, the question of seasonal movement, is the assessment of kill-off patterns using the evidence of dental wear (Ducos 1968; Payne 1973; Vigne & Helmer, n.d.).

The estimation of kill-off patterns for caprinae were carried out using the tooth wear stages after Payne (1973). The percentages of age classes were then corrected to randomize the effect of under representation of young animals compared to adults, with their more resistant teeth (Vigne 1988).

Forty-nine teeth, coming from 12 individuals could be analyzed in this study (Fig. 9). Obviously, the peak of killing-off young sheep occurred between the ages of 0-12 months, and mostly between 6-12 months. The information for juvenile goats is very scanty. A relatively greater percentage of the animals were killed at 2-3 years and with another peak between 4-6 years. No kill-off could be observed for animals between 3-4 years. Old animals of 8-10 years are rare but present in the sample.

The survivorship curve which is a demographic expression of the Tuwah Khoshkeh caprinae flocks (Fig. 10) suggests that 60% of the herd lived until the age of two years but survivorship decreased after the age of 6.

On the basis of this information, it appears that the people of Tuwah Khoshkeh practiced a mixed exploitation of animals for meat and secondary products, more particularly for dairy products than wool.

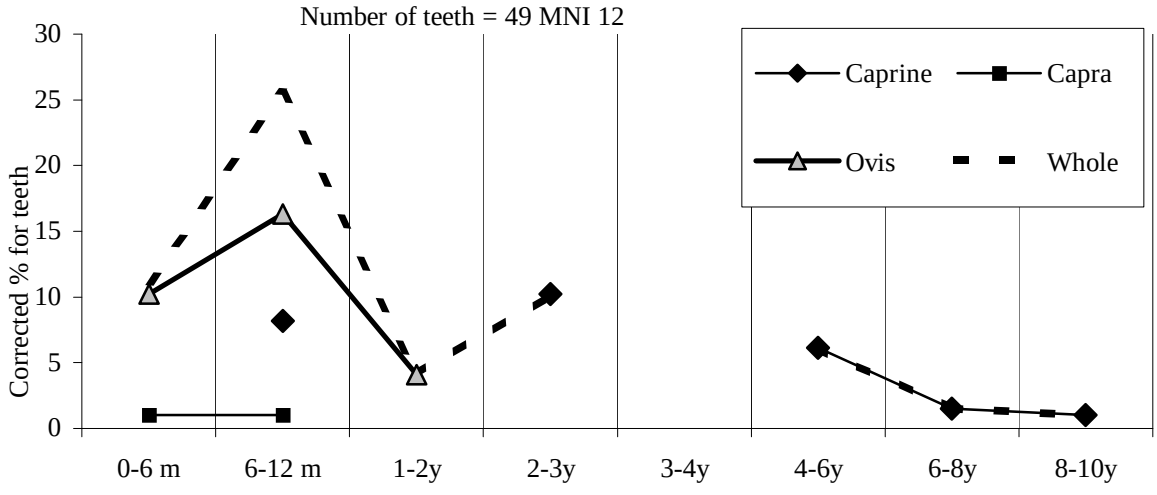

Fig. 9. Kill-off pattern for Caprinae (m = month, y = year)

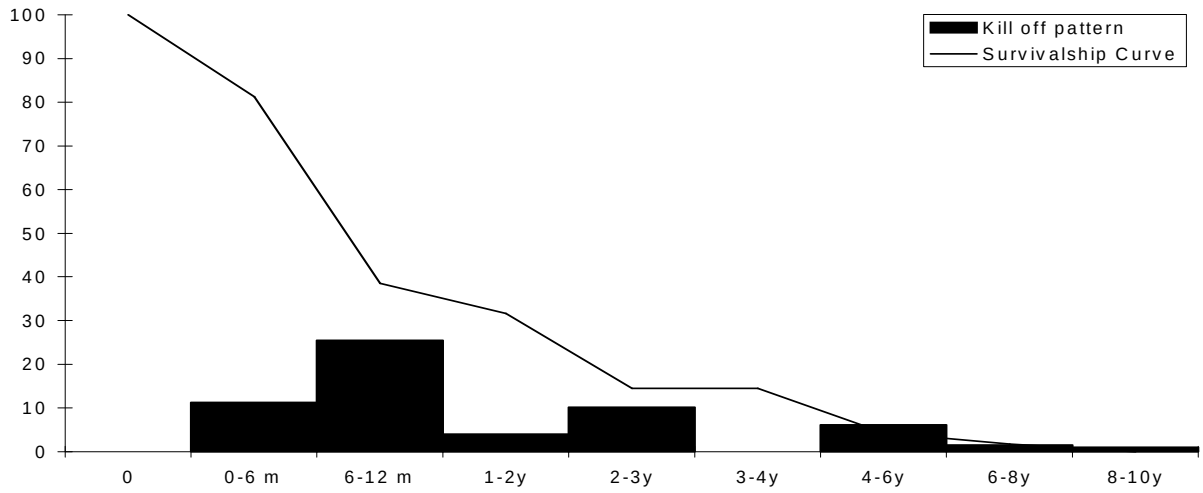

Fig. 10. Theoretical mortality profile of Caprinae herd

Metrical analysis

The major measurements in the assemblage come from the caprinae but cattle, pigs and gazelle bones have also been measured although their low numbers allow no statistical approach (Table 1).

The distinction between *Capra* and *Ovis* is based on criteria described by Clutton-Brock *et al.* (1990). LSI diagrams were processed following Uerpmann and Uerpmann (1994) (Figs. 11a and 12a). In total, only 27 bones from the caprinae could be used for the analysis. All obtained indices are lower than that of the wild reference (Uerpmann & Uerpmann 1994). Nevertheless, the interesting point is that the sheep seems to be closer to the reference than the goat, which displays very low values. For a better understanding of the LSI profiles, the diagrams were broken down by anatomical element (Figs. 11b and 12b). Since all bones belonging to young and adult animals have been measured, an overall age profile for the two assemblages can be observed in both diagrams. The goat assemblage seems to show a younger profile than that of the sheep. Despite the limited data, this difference also suggests that sheep were used more for meat and goat for milk. The use of metrical data has been shown to be useful and complementary to the limited data in the tooth assemblage.

Discussion

The recently excavated site of Tuwah Khoshkeh, displaying the archaeological characteristics of a transhumant pastoralist campsite, certainly contributes to the general understanding of the prehistoric human settlement within the Zagros mountains (Wright 1987; Hole 1987 a & b; Abdi 1999). Archaeologists still do not agree on the origins of mobile pastoralism. Estimates of date for the origins of seasonal movements of prehistoric people varies from the Neolithic (Mortensen 1972; Zagarell 1975) to the Late Chalcolithic period (Henrickson 1985). At this point, the archaeological data appear to provide indirect clues to herd management strategies. It may eventually be possible to document this delicate cognitive question related to human behaviour as a consequence of intertwined economic, environmental, demographic and territorial factors, all of which are critical for understanding this phenomenon (Gilbert 1983). Meanwhile, the interpretation of demographic herd structures is not easy to make when the data are so limited (50 teeth for Tuwah Khoshkeh) and when they represent a long chronological phase (Middle Chalcolithic, covering several centuries). The poor and imprecise nature of the data combined with the complexity of the animal management strategies for producing meat, milk and secondary products as well as the indirect image archaeozoologists get from the kill-off profiles, mean that there are serious handicaps in the way of posing solid arguments for seasonal exploitation of caprine herds during the occupation of Tuwah Khoshkeh.

Also, a major problem in treating the seasonality of human occupation and by extension transhumance and nomadism through archaeozoological data is that we still do not have, as far as we know, a prehistoric reference model for what a nomadic campsite kill-off pattern for sheep and goat would be like. Ethnographic documentation exists but such data have not been gathered with the aim of answering archaeozoologcal problems, which would require long term statistical observation in the field in order to make a demographic analysis such as that attempted by Dahl and Hjort (1976). Even though these data would be accessible for modern nomads, it should be emphasized that there is not necessarily a direct relationship between the present day exploitation of animals with that which occurred in prehistoric times, simply because of the dramatic social changes and the demands of a market economy (Gilbert 1975 and the personal observations of one of the authors – M.M. – with the Bakhtiari tribe in 2001).

The complexity of the interpretation of data is evidenced in Cribb's work (1984) based on his surface collection of sheep/goat mandibles from a summer camp of tent-dwelling Yörüks of southern Turkey. However, because of its archaeological context, the site of Tuwah Khoshkek merits a thorough analysis.

The site of Tuwah Khoshkeh was discovered during the excavation season at Chogha Gavaneh, a Neolithic to Iron Age sedentary site nearby in the Islamabad Plain (Abdi, 1999). The two sites show relations during the Middle Chalcolithic period. The faunal remains from the first season, corresponding partly to the Chalcolithic phase, have been analyzed by Richard Redding (Redding, unpublished). The kill-off pattern for the middle Chalcolithic period has been reconstructed for comparison with Tuwah Khoshkeh (Fig. 10). The dental remains are not abundant (n = 38). The two profiles nevertheless display some differences. In Chogha Gavaneh, the exploitation of the caprinae herd seems to have a more mixed character, probably dairy products being of lesser importance. Only 10% of the animals are killed in class A & B compared to Tuwah Khoshkeh where they represent almost double the numbers. Also the exploitation of wool is more clearly demonstrated at the settled site as revealed by the higher percentage of animals in the old age classes (H & I). Thus, it can be concluded that Chogha Gavaneh shows a more diversified exploitation of animal products from caprinae than Tuwah Khoshkeh where it seem to be slightly more specialised. These data should be nevertheless used with caution because of the small number of available bones. Having admitted this weakness, and considering the difference between the two profiles and given the archaeological context of both sites (at least for Chogha Gavaneh as a sedentary settlement), it is possible in contrast to propose that the kill-off pattern seen at Tuwah Khoshkek represents only a more partial image of the exploitation of the herd.

The analysis of metrical data suggests that there was a differential exploitation of caprine herds at Tuwah Khoshkeh. This may be an indication of the seasonal occupation of the site, since young animals are better represented in the *Capra* assemblage. Because of severe winters, shepherds in highland Iran only allow the sheep to give birth during the spring. If an exploitation of milk an objective, young males are slaughtered within the first six months, depending on the techniques used to prevent suckling (i.e. Digard 1981). Thus, given these different approaches, it can be assumed that the site was occupied during the summer. Very suggestively, the valley is still used today as a stopping place for mobile pastoralists in the summer. Considering all the alternatives in the interpretation of archaeozoological data, it is necessary to devise new approaches. Such a new approach is currently under investigation (Mashkour, in prep. and Bocherens *et al*. 2001). It employs bio-chemical markers (stable isotopes $\delta^{13}C$, $\delta^{15}N$, $\delta^{18}O$) for detecting cyclical movements in herds. This method aims at documenting the origin of vertical transhumance in the Zagros region. The project is based on an experimental program involving modern animals from a nomadic context (the Bakhtiari tribe in southwestern Iran), in order to build up a reference model for archaeological applications. Intra-individual analyses of the tooth enamel from 30 modern sheep and goat from the Bakhtiari region in southwest of Iran have shown that vertical transhumance can be distinguished in modern material (Mashkour *et al.* submitted). Tuweh Khoshkeh and Chogha Gavaneh are among the candidate sites to document the archaeological applicability of this method.

Table 1. Metric data for Tuweh Khoshkeh (measurement codes after Von den Driesch, 1976)

Origin	Taxa	Estimated Age	Bone	GL	Bp	Dp	Bd	Dd	Sd	BT	Hp	Glm	Gli
DS	Bos		Phalanx 2	36.0	29.5	29.0	24.0	27.0	23.5				
opAL2'	Bos		Tibia				61.0		39.0				
opAL2'	Bos		Radius		78.0	37.0							
opAL2'	Caprinae		Femur				33.0						
opAL2'	Caprinae	Juvenile	Femur				37.0						
opAL2'	Caprinae	Juvenile	Femur				43.0						
opAL2'	Caprinae	Juvenile	Humerus							23.0	12.0		
opAL2'	Caprinae		Humerus							27.5	16.5		
opAL2'	Caprinae		Humerus							27.5	17.0		
opAL2'	Caprinae		Metacarpus		22.0	15							
opAL2'	Caprinae		Metacarpus		21.0	15							
opAL2'	Caprinae		Metacarpus		24.0	16.5			13.0				
opAL2'	Caprinae		Metacarpus						17.0				
opAL2'	Caprinae	neonat/foetus	Metacarpus	(45)					8.0				
opAL2'	Caprinae		Metatarsus		20.5	20.5			12.0				
opAL2'	Caprinae		Metatarsus		20.0	19.0			18.0				
opAL2'	Caprinae	Juvenile	Metatarsus		15.5	14.0			8.5				
opAL2'	Caprinae	Juvenile	Metatarsus		17.0	16.0	19.0	11.0	10.5				
opAL2'	Caprinae	Juvenile	Metatarsus		18.0	17.0	23.0	11.0	12.0				
opAL2'	Caprinae	Juvenile	Metatarsus		19.0	18.0	23.0	14.0	12.0				
opAL2'	Caprinae	Juvenile	Metatarsus		18.5	18.0			11.0				
opAL2'	Caprinae	Juvenile	Metatarsus				21.0	13.0	11.0				
opAL2'	Caprinae	Juvenile	Metatarsus						15.0				
opAL2'	Caprinae		Phalanx 1	32.0	11.0	13.0	11.0	9.5	10.0				
opAL2'	Caprinae		Phalanx 1	35.0	11.0	13.0	9.0	9.5	8.5				
opAL2'	Caprinae		Phalanx 1	31.0	10.0	12.0	10.0	9.0	7.5				
opAL2'	Caprinae		Radius				28.0	19.0					
opAL2'	Caprinae		Radius				28.9	17.0					
opAL2'	Caprinae		Tibia				26.5	21.0	14.0				
opAL2'	Caprinae	Recent epiph.	Tibia				25.0	19.0					
opAL2'	Caprinae	Recent epiph.	tibia				23.0	19.0					
opAL2'	Capra		Humerus							28.5	17.5		
opAL2'	Capra		Humerus							28.0	16.0		
opAL2'	Capra		Humerus							28.5	17.0		
opAL2'	Capra		Humerus							29.9	18.0		
opAL2'	Capra		Humerus							28.5	16.5		
DS	cf. Capra		Humerus							27.5	17.0		
DS	cf. Capra		Humerus							29.5	17.0		
opAL2'	Capra		Phalanx 1	31.0	11.5	13.0	11.5	10.5	11.0				
opAL2'	Capra		Radius		28.0	15.0							
opAL2'	Capra	Juvenile	Radius		23.0	13.0			13.0				
opAL2'	Capra	Juvenile	Radius		23.0	12.0			12.0				
DS	cf. Capra		Humerus							29.5	17.0		
opAL2'	Capra	Juvenile	Radius		26.0	14.0			15.3				
opAL2'	Capra	Juvenile	Radius		26.0	15.0							
opAL2'	Ovis		Humerus							31.5	19.3		
opAL2'	Ovis		Humerus							32.0	20.0		
opAL2'	Ovis		Humerus							29.0	18.0		
opAL2'	Ovis		Humerus							29.0	18.0		
opAL2F21	Ovis		Metacarpus				20.9	16.0	13.0			ind a	
opAL2'	Ovis		Metatarsus				25.0	17.0					
opAL2F21	Ovis		Phalanx 1	35.0	11.0	12.9	10.5	9.9	9.9			ind a	
opAL2'	Ovis		Phalanx 1	33.0	13.0	15.0	12.0	11.5	12.0				
opAL2'	Ovis		Phalanx 1	33.0	12.0	14.0	10.5	10.0	9.5				
opAL2'	Ovis		Phalanx 1	35.0	12.0	13.5	12.0	10.0	11.0				
opAL2'	Ovis	Juvenile	Phalanx 1	28.0	11.0	13.0	11.0	10.0	9.0				
opAL2'	Ovis	Juvenile	Phalanx 1	27.0	11.0	12.5	11.0	9.5	9.0				
opAL2F21	Ovis		Phalanx 2	21.5	11.0		9.0		7.1			ind a	
opAL2'	Ovis		Radius		32.0	15.0			17.0				
opAL2'	cf. Gazelle		Tibia				26.5	21.5					
opAL2'	cf. Gazelle		Tibia				26.5	22.0					
opAL2'	cf. Gazelle		Tibia				26.5	23.5					
opAL2'	cf. Gazelle		Tibia		38.0								
opAL2'	Sus		Metacarpus 4		17.0								
opAL2'	Sus		Astragalus									36.5	40.0
opAL2'	Sus		Humerus				33.0			27.0	32.5		
opAL2F21	Sus		Phalanx 2	22.0	16.0	14.0	15.0	13.5	13.5				

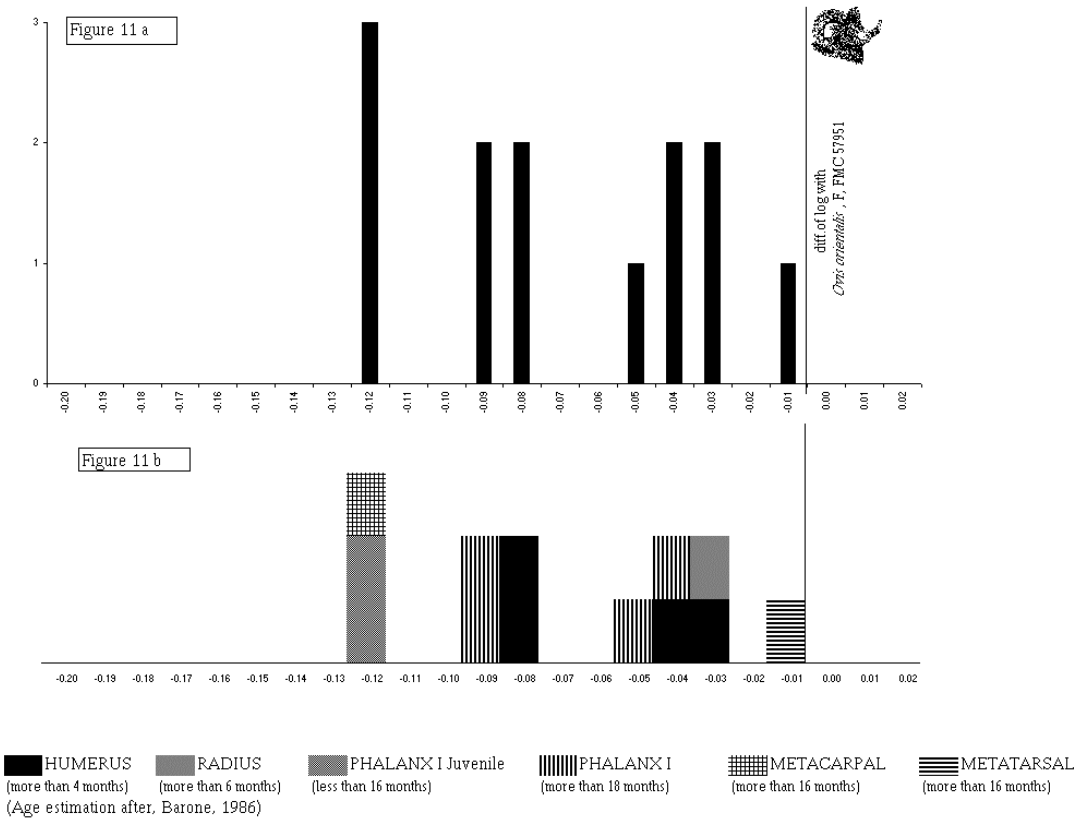

Fig. 11. LSI diagram for *Ovis* (a) and its breakdown by anatomical element (b)

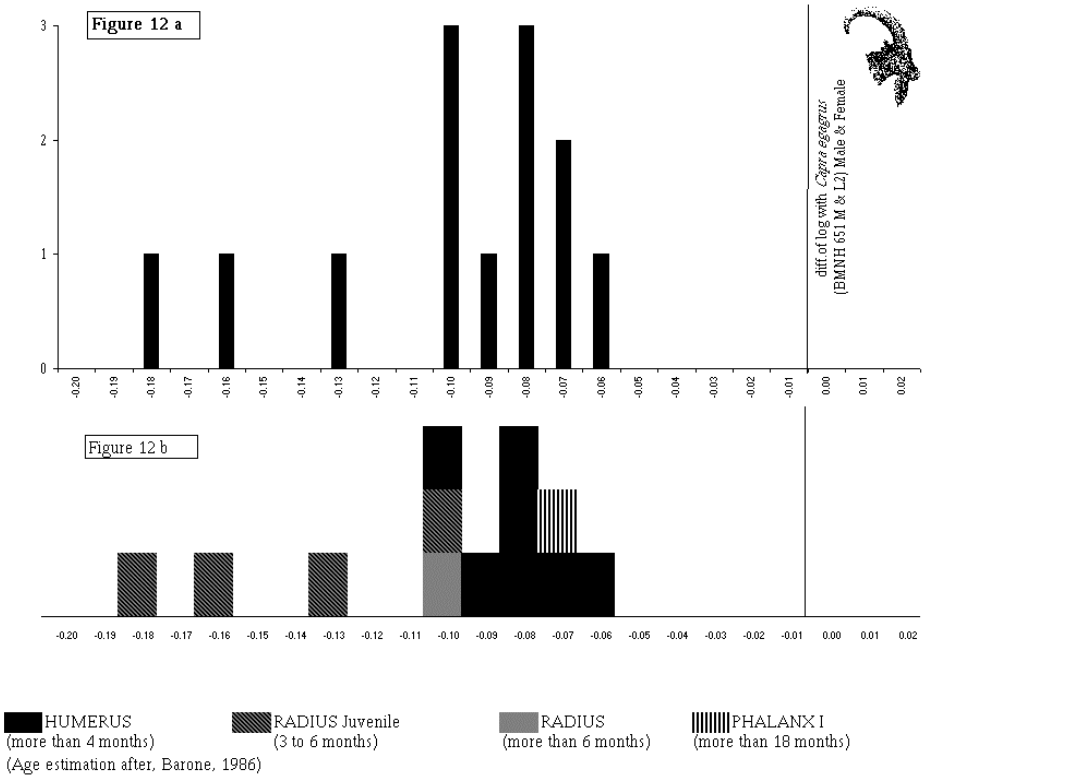

Fig. 12. LSI diagram for *Capra* (a) and its breakdown by anatomical element (b)

Conclusion

Pastoral production has always been an integral part of the ancient Near Eastern society and economy. As such, a study of different forms of pastoralism and their changes should provide a useful measure for investigating the evolution of ancient Near Eastern societies. Archaeology is equipped with the field techniques, analytical frameworks, and long-term diachronic bodies of data that can be used in studies of past forms of pastoralism and its social consequences. As a cultural behavior for an economic means in a social framework dictated by environmental conditions, a study of pastoralism should incorporate the full range of archaeological data and methods at our disposal. These include paleo-environmental studies, regional surveys, test excavations, and analyses of the whole range of archaeological material including faunal assemblages.

This paper is an early attempt to combine archaeological and archaeozoological evidence to devise archaeologically detectable criteria for identification of mobile pastoralist sites. Application of our perspective on pastoralism and mobility to the archaeological and archaeozoological data from excavations at Tuwah Khoshkeh support the inference from survey evidence that this was a mobile campsite, and specifically is likely to have been a transhumant pastoralist site.

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