FAUNAL MATERIAL AND THE URUK EXPANSION:
A LOOK AT NINE SITES IN GREATER MESOPOTAMIA

by
Shahira Ann Ashkar

A Thesis Submitted to the Faculty of the DEPARTMENT OF ANTHROPOLOGY
In Partial Fulfillment of the Requirements For the Degree of MASTERS OF ARTS
In the Graduate College
THE UNIVERSITY OF ARIZONA

1995
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APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

Carol Kramer
Professor of Anthropology

April 26, 1995
Date
ACKNOWLEDGEMENTS

I would like to thank the members of my committee, Prof. Stanley Olsen, Dr. Mary Stiner and Dr. Carol Kramer, for their comments and support. Dr. Kramer, as my committee chair, was particularly helpful. Dr. Gil Stein of Northwestern University was also instrumental in helping me to decide on a topic. Later, he pointed me in the right direction and allowed me to use unpublished data from Hacinebi Tepe.
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ABSTRACT

In recent years, there has been considerable debate regarding the degree and nature of the Uruk influence outside the Mesopotamian alluvial plain during the fourth millennium B.C. Algaze's (1991) ideas regarding the powerful influence of the Uruk expansion on sites in the peripheries of Mesopotamia are examined here by looking at nine sites in greater Mesopotamia. The published faunal reports are utilized to get an insight into this underused category of archaeological data. The implications of the faunal material are compared with ceramic and artifactual data. In conclusion, it appears that the influence was probably not quite so pervasive as hypothesized by Algaze and that environment may have been a major factor in the species and ratios of animals kept and utilized.
1. INTRODUCTION

Until relatively recently faunal data have not been adequately utilized in the archaeology of the Near East. Faunal reports often appear as laundry lists or as confirmation of a foregone conclusion that the inhabitants were farmers or hunters. The clear exception to this rule occurs with research on the Neolithic. Apparently after the animals are fully domesticated, archaeologists just lose interest in them. In fact, the management of animals is a very important part of village economies. In ancient sites, a good portion of the economy consisted of livestock. Therefore, it seems reasonable to assume that the social and political organization of sites would be reflected in their economic structure.

The examination of political and social organization through faunal data can be approached in several ways. Subsistence patterns can be indicative of ethnic and social affiliations. If nothing else we can detect a change, over time or through space, in food preferences. Management of animals can be represented by the types of animals present and their relative numbers, as well as by the offtake rates, or patterns of slaughter. Here, the Ubaid and Uruk periods will be considered, because these two time periods straddle the development of state societies and the onset of urbanism.

The Ubaid period begins around 5500 B.C. and has been divided into four phases. The initial division was made by Joan Oates (1960) and was based on the
pottery from Eridu. The type site of al ‘Ubaid is located near Ur and was excavated by Wooley early in this century. The Ubaid period is often overlooked for two reasons. First, it falls between the "Neolithic Revolution" and the "Rise of Civilization" and is often overshadowed. Second, Ubaid sites are difficult to find, particularly in the south where they are buried under meters of alluvium.

Generally, the Ubaid can be looked upon as the foundation for the Uruk period and the rise of states. "Complexity" is already evident in monumental architecture. At Eridu, there are large buildings which we term temples based on their resemblance to later Mesopotamian temples. Irrigation agriculture was practiced and Huot (1989) argues for communal grain storage at Tell el Oueili. Ubaid style pottery enjoys a very large distribution, and is quite standardized.

The Uruk culture arose in southern Mesopotamia in the second half of the fourth millennium B.C. (Adams and Nissen 1972). The type site of Uruk, or Warka, is the first urban development. It is unlike any site before it. At nearly 400 hectares, its size alone represents a difference in kind. The material culture represented at this urban site spread widely throughout the Middle East in the second half of the fourth millennium.

Contact between the Mesopotamian alluvium and the surrounding highlands in the Uruk period is not unlikely. Evidence for trade in obsidian in the Neolithic is present (Wright 1969). In later periods, trade with the north and the east is documented. The second millennium B.C. witnessed a complex trading
system, the Old Assyrian network (Larsen 1987). During this period Old Assyrian traders established residences in trading colonies in Syria and Turkey. These settlements were governed in part by local rulers. From these residences they oversaw half of the trading network between the resource poor alluvium and the resource rich highlands. Resources obtained from the highlands included gold and silver. Other imports must have included timber, utilitarian stone and precious and semi-precious stones. In return, the alluvium exported textiles and tin. Where the tin came from is under debate, but possibilities include Susa, Elam, Afghanistan or somewhere beyond the Zagros (Larsen 1987).

Objectives

For the purposes of this paper, I will look at the published faunal reports for Uruk (or Warka), Ras al Amiya, Tell el Oueili, and Tell Rubeidheh in Iraq, Tepe Sabz and Tepe Farukhabad in Iran, and Hacinebi Tepe, Hassek Hoyuk, and Hayaz Hoyuk in Turkey (see Figure 1). I will consider NISP (Number of Identifiable Specimens) of sheep, goats, sheep/goats, cattle, and pigs. These basic presence-absence and frequency data will also be useful for comparing the relative proportions of wild versus domestic animals. Making this distinction does not present that much difficulty because by this time sheep, goats and cattle are fully domesticated. The most problematic aspect is distinguishing between sheep and goat, particularly since I do not have access to the actual bones. Different
Site Locations: Syria and Adjacent Regions

1. Hassek Hoyuk
2. Hayaz Hoyuk
3. Hacinebi
4. Ras al Amiya
5. Uruk/Warka
6. Tell el Oueili
7. Tell Rubeidheh
8. Tepe Sabz
9. Tepe Farukhabad

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Figure 1. Map of the Near East. Numbers represent sites examined. Letters represent other sites of importance. (From Porada, et al. 1992; Voigt and Dyson 1992)
authors rely on different characteristics to distinguish these species.

A good deal of information can be gleaned simply by examining the species present. Which animals are represented in the faunal record can shed light not only on which species were eaten, but also on which were more important in the diet. The absence of particular species may indicate cultural avoidance, environmental constraints, or a conflict of economic interest (as some have argued for pigs, as is discussed below). Introductions of new species to the local economy may indicate the influence or intrusion of people from another area. The presence of wild game may indicate hunting, which in turn may tell us something about the sociopolitical organization and land use patterns of a community. The presence of domestic sheep and goats often indicates herders. Close examination of these remains can indicate specialized herders and sometimes even strategies of herd management. Of course, the species present, wild and domestic, also indirectly yield information about the climate.

The ratio of sheep to goats will prove important in looking at herding practices. It may also indicate a new presence, as different cultures often utilize herds with differing sheep/goat compositions (cf. cattle and buffalo ratios in Gavli herds in India; Malhotra and Gadgil 1984). The sheep/goat ratio may also bear on herding strategies, which can be examined through the kill-off patterns of sheep and goats.

Body part distribution and butchery patterns can reflect aspects of social
status, craft specialization, importation of meat, and possibly ethnicity (Zeder 1991). To examine these factors, however, one must have good control over intra-site variation in distribution of body parts. Standardized butchery techniques can indicate specialized butchers and possibly centralized control of meat resources. Body part distribution can indicate social status and whether the access to animal resources is direct or through an intermediary, such as a market. Body part representation at the site level could point to relationships between sites, or between a site and its "hinterland". For instance, the presence of only meat-bearing elements might indicate that the population of a site was being supplied with meat from an external source, be that another site or pastoral nomads.

However, body part distribution is particularly sensitive to formation processes. Smaller parts are easily destroyed or moved. Dogs seem particularly partial to epiphyses and thus these skeletal parts tend to be selectively destroyed in assemblages in which carnivore gnawing is prevalent (Binford and Bertram 1977). The bones of young animals are not only smaller, but also unfused, more delicate and prone to disintegration. Teeth are made up of enamel which is a harder material than bone and preserves better. Some bones are curated by people more than others. Antlers are often used in tool making, teeth and horns in jewelry. Some foot bones have been used as gaming pieces and metapodials from certain artiodactyls make good awl blanks. These parts, therefore, may be
preferentially removed from the archaeological record. Thus, while the
differential representation of body parts can indicate butchery outside the site,
social status or even ethnicity, it can also represent the actions of water, acids in
the soil or carnivores. Of course, there are ways to control for this. One can
look at the remainder of the assemblage for carnivore gnawing, or take soil
samples to determine the acidity of the soil, and examine the rate of
decomposition of bone as a function of tissue density (Lyman 1984).

Synchronic and diachronic variation in these variables are of primary
interest for the purposes of this paper. Changes over time and through space in
these categories should say something about control of animal resources before
and after the Uruk presence. This in turn should shed some light on the
organization of a site before and after the Uruk expansion, revealing, at least in
part, some of the impact of the intrusive Uruk presence in the periphery.
Changes over time, particularly in northern and eastern sites, may help reveal the
nature of the Uruk influence or intrusion on the indigenous populations. It has
been argued that the initial impact was favorable, bringing prosperity for the local
Late Chalcolithic cultures (Algaze 1993). The reason that the indigenous cultures
did not seem to suffer the decline that most peripheries do under these
circumstances is that the Uruk system collapsed before the decline began in the
peripheries.

What might one expect a state pattern to look like from a faunal
perspective? Zeder (1991) predicted that production would become more specialized with urbanism, and she looked at what kinds of regulation and control might be evidenced for different species of animals. I would expect that there would be an increase in the frequency of ovicaprids and bovids in a state society, as opposed to pigs. Pigs are difficult to raise in large numbers, but make a good garden crop. Bovids may be expected to be represented in smaller numbers, as they were probably valued for draft, as well as for meat and dairy purposes.

There are some questions that I hope to answer, or begin to answer, through this examination of faunal reports. Is there an Uruk, southern or state pattern evident in the faunal assemblages examined here? Is there a Syro-Mesopotamian pattern? Perhaps the faunal remains can shed some light on the indigenous population of Syro-Mesopotamia and on the social and political organization of the settlements. Any differences in the patterns of faunal assemblages of the south and Syro-Mesopotamia would be of great interest and may reflect the relationship between the two populations. Patterns in the Ubaid (or pre-Uruk) period can be used as a standard by which to judge the effects of state organization.

The Uruk Expansion

In Mesopotamia there is a recurrent cycle of centralization, expansion and eventual collapse (Algaze 1989). Periods of internal coherence are usually
preceded by an increased level of resource procurement and followed by an expansion, presumably in an attempt to control critical lines of communication and trade. Examples of this cycle are to be seen in the Ur III dynasty (Hallo and Simpson 1977), the Akkadian period (Larsen 1979) and, earliest, in the Uruk period.

In the fourth millennium, Uruk peoples were branching out to the north and east, presumably to acquire the resources that were lacking in the southern alluvium. The evidence for this branching out, or expansion as it is often termed, comes in the form of Uruk material culture in distant areas. Sites in modern Syria, Iran and Turkey have yielded characteristic Uruk pottery types, Uruk style glyptics and record keeping paraphernalia, as well as Uruk style public architecture.

That there was an Uruk expansion is apparent. The question is, what was the nature of the relationship between Mesopotamian people of the Uruk period and the indigenous populations of neighboring regions. The possibilities range from an armed Uruk intrusion to the mere borrowing of southern material culture. Both of these alternatives are extremes on a continuum.

The Uruk presence appears to have had a different character in the east than in the north and northwest. On the Susiana plain of Khuzestan, the Uruk presence seems to have represented a colonization of the area, according to Algaze (1993) and others (Lamberg-Karlovsky 1985; Nissen 1983). Sites of very
different sizes yield the same material culture. Algaze (1993:17-18) points out that this incursion did not cause the demise of indigenous cultures, but took advantage of their disintegration, filling a settlement void in the area.

Located in west central Iran, Godin Tepe appears to have been a Susiana trading post in the Late Uruk period (Weiss and Young 1975). Excavations have yielded evidence of foreign influence. Foreign artifacts which most closely resemble material from Susa were found concentrated at the summit of the site within an oval enclosure wall. Weiss and Young (1975) contend that foreign traders occupied the structures within this enclosure wall in Period V (3200-3000 B.C.). There is no indication of indigenous resistance to this foreign presence, even though the residence area was built over local housing. The purpose of this trading post would have been to control and further the flow of trade along the Khorasan Road. A similar arrangement could have been in operation in the northwestern and eastern highlands.

In Syro-Mesopotamia, the Uruk expansion took the form of a selective incursion, that is, the Uruk sites are strategically located (Algaze 1993). Uruk sites can be divided into two basic categories: (1) those characterized by a cultural assemblage that is overwhelmingly Uruk in type and southern in origin and; (2) those containing isolated Uruk objects within the context of an otherwise local Chalcolithic cultural assemblage. The latter site may be viewed as having had contact with Uruk sites. The former can be divided into three types of sites.
According to Algaze (1989:577-580), *enclaves* are large sites of urban character located at strategic points where overland east-west trade routes and north-south waterways intersect. They are surrounded by a number of smaller, satellite villages. *Stations* are isolated Uruk settlements. They are smaller and are situated in more remote areas, along overland trade routes. *Outposts* are similar to stations but located deep in the highlands along very important trade routes and are only found at the end of the expansion phase.

Algaze (1993) sees this incursion into Syro-Mesopotamia as an effort to control the flow of goods and resources from the highlands to the alluvium and back. The exploitation of local agricultural resources by Uruk administrators would be evidenced by a more extensive settlement pattern in highly productive agricultural areas. This is not the pattern in Syro-Mesopotamia, where many sites are located in defensible but agriculturally marginal locations. If the goal were political control, one would expect to find dispersed administrative facilities and garrisons within important local population centers. In addition, stations and storehouses should be equally spaced along east-west overland routes.

Schwartz (1988) believes that the Uruk expansion to the north involved more than the control of lines of trade. He notes that sites the size and complexity of Tell Brak and Habuba Kabira are "more likely to be central places controlling large agricultural areas than strategic control points" (Schwartz 1988:9). He draws comparisons to ancient Greek colonies, noting that this
colonization took place during a period of major social change, stating that, "While the conduct of long-distance trade may not have been a 'prime mover', it was undoubtedly a concurrent process in the Uruk/Jemdet Nasr expansion" (Schwartz 1988:9-10). He constructs a functional typology of the sites of the northern periphery, which is similar to that later established by Algaze (1993). He also notes that the Uruk contact in the northern periphery must have led to major changes in the local societies; however, those changes "need not have involved an increasing complexity of political organization" (Schwartz 1988:12) and there is no evidence that northern Mesopotamian society experienced urbanization or state development until centuries later (Schwartz 1985).

**Faunal Approaches**

One source of information about early states that has been neglected is that from faunal assemblages. Until recently, faunal material has been mostly ignored in the Near East. Even when faunal reports were published, they took the form of laundry lists, simply listing the species present. Locating published faunal reports with sufficient information has been a problem. Even publications as recent as 1984 ignore the faunal material, despite the fact that there is much information to be gained from faunal remains.

There are three models for production and consumption of animals (Crabtree 1990:162). First, it is important to remember that "animals killed" is
not synonymous with "animals kept" (Martin 1987). But mortality profiles, which reflect which age categories are most commonly killed, can indicate patterns of production and consumption. In sites where animals are both produced and consumed, one expects to see all ages represented in the mortality profile. In a producing economy, one expects to find neonatal mortalities, accidental and disease related deaths, as well as older animals culled from the breeding stock. A consuming economy, in which animals raised locally are supplemented by animals brought in from outside the site, can be recognized archaeologically by an abundance of market-age animals and few in their reproductive years. Comparing the age profile for ungulates from a particular site to these three models may indicate whether animals were being produced within or outside the settlement. Faunal assemblages, as correlates of consumption and production behavior, therefore potentially indicate types of organizational positions within the settlement system.

Mary Martin (1987) looks to the Tauran region of the central Iranian desert for an ethnographic example. In addition to examining the keeping and managing of flocks, Martin documents the slaughter of animals. The offtakes rates average 20% per year (Martin 1987:158). She notes that this percentage is low, and that, if the goal is simply to maintain existing herd size, the offtake could be as much as 32% (Martin 1987:158). She concludes that offtake rates vary depending on access to grazing away from the village, quality of the grazing range,
and the size of the herd (1987:163). Martin (1987:163-164) brings up important points regarding the representation of animals in the faunal record. Only animals killed for local consumption and those that died of sudden illness would be represented in the faunal record of the site. Some age/sex categories of animals will be absent or under-represented as a result of patterns of trade. She also notes that more sheep were consumed than goats (68% and 32% respectively), and that this does not reflect the composition of the living herd (50% sheep and 50% goats).

Melinda Zeder (1994) considers the faunal remains of a Halafian site in the Khabur drainage of northern Syria and comes to the conclusion that the Neolithic revolution was not complete and irreversible. She notes a correlation between the environment and animal utilization. Where dry farming is possible and where an independent economy is feasible, communities rely on the production of domestic resources, while sites in marginal areas tend to rely more heavily on wild resources. A flexible subsistence system is the primary means of risk reduction for peoples living in these marginal regions, while stockpiling resources and maintaining social ties between farming villages are the means of risk reduction for post-Neolithic societies in the dry farming zone.

When it can be determined that animals are domesticates, the mortality profiles can indicate the culling strategy of the herder (Payne 1973:281-282). The age at which an animal is killed depends on the environment, the value of
products and the character of the stock. Herds of sheep and goats can be managed for meat, milk or wool. In meat production strategies, most of the young males are killed when they reach the optimum weight gain in early adulthood. This usually occurs within the first two or three years of life. For milk production, young males that are surplus to the breeding stock are killed as soon as the milk yield is no longer in jeopardy. Wool production is characterized by a shift in emphasis from the young to the adult animals. Males not necessary for breeding are castrated, creating a wether flock. Castration can be detected in the archaeological record by measuring long bones because this practice alters an animal’s hormone regime. Castrated animals grow larger than unaltered animals as a consequence.

There are several difficulties associated with studying herd management strategies through mortality patterns. One is that a pure strategy is very rare in real life; it is unusual to find a herder using the herd to produce only meat, or milk, or wool. Usually the herds are used for some combination of these products. The goal of the herder may be simply herd security. Another potential problem arises in situations where animals are sold, or traded, thereby leaving no trace in the local archaeological record. Despite these difficulties, mortality data can still be useful.
Difficulties in Working with Bones

Ideally, one would look at the faunal remains from different areas of a site. However, the use of published faunal reports will preclude this, and hence, I will concentrate on diachronic change, looking more at the changes occurring over time at a particular site and the differences between sites.

Sampling problems are inherent in all aspects of archaeology and faunal analysis is certainly no exception. The fact that excavations concentrate on only a small area of a site precludes a representative sample for all artifact classes, including faunal material. For instance, there are differences in the faunal material recovered from indoor and outdoor areas (Meadow 1978). Presumably there are differences between areas of the site as well, such as between living quarters and garbage dumps. Another problem is that bones are not as resistant to decomposition factors as other classes of material. They don’t hold up as well as either lithic material or pottery. They are often burned during the course of processing in antiquity, which affects their stability either negatively or positively depending on circumstances and soil conditions. Additionally, bones are often not recovered as conscientiously as other materials.
2. DOMESTICATION AND DOMESTICATES

Defining Domestication

Any discussion of domestic animals and their exploitation must include a definition of domestication and a discussion of the process of domestication. By 5000 B.C., the Near Eastern suite of domesticates was firmly established. Sheep, goats, cattle and pigs show physiological signs of domestication. Because of this, the discussion of domestication will be comparatively brief.

Domestication has been defined in many ways. Webster’s New World Dictionary defines domesticate as, "2. to tame for man’s use" (Guralnik 1983:183). For our purposes this definition is too general. Bokonyi offers a more zoological definition.

"The essence of domestication is the capture and taming by man of animals of a species with particular behavioural characteristics, their removal from their natural living area and breeding community, and their maintenance under controlled breeding conditions for mutual benefits" (Bokonyi 1989:22).

Bokonyi views the man-animal relationship as symbiotic. Ducos (1989:29) states, by contrast, that "...domestication is not a natural state - it exists because humans (and not animals) wish it". Ducos believes that because the features which distinguish a domestic animal from a wild one stem from human society and not from the evolutionary dynamic of the animal, the definition of domestication should be more cultural and less physiological.
"Domestication can be said to exist when living animals are integrated as objects into the socio-economic organization of the human group, in the sense that, while living, those animals are objects for ownership, inheritance, exchange, trade, etc., as are the other objects (or persons) with which human groups have something to do" (Ducos 1978:54).

Meadow also focuses on the human half of the equation, but concentrates less on the economic aspects. He defines domestication as

"a selective diachronic process of change in human-animal relationships involving, at the very least, a change of focus on the part of humans from the dead to the living animal and, more particularly, from the dead animal to the principal product of the living animal - its progeny" (Meadow 1989:81).

Clutton-Brock offers a more pragmatic definition of a domestic animal as

"one that has been bred in captivity for purposes of economic profit to a human community that maintains complete mastery over its breeding, organization of territory and food supply" (Clutton-Brock 1989:7).

Hecker favors abandoning the term domestication altogether in favor of "cultural control" which, like Ducos' definition, would encompass a wide range of human-animal relationships. Cultural control refers to

"...that array of human behaviors that has a profound effect on some aspect of the exploited animal population’s natural behavior and dramatically interferes with its movements, breeding schedule or population structure in such a way as to make the animals more 'accessible' to humans" (Hecker 1982:219).

This process must be continued over a sufficiently extended period of time and deal with an entire herd. The above definitions differ in content and in viewpoint.
In these definitions domestication is viewed as both a process and a state. In this respect, Hecker (1982) is correct when he says that the definition of "domestication" has become imprecise. In the evolutionary sense of the term, domestication is a process. Hesse (1983:261) divides this process into two steps, taming and herding. While the factors underlying taming are rooted in animal behavior, those underlying herding are also rooted in human social organization and economic behavior. The transition from hunting to herding represents a change from ideals of sharing to ideals of saving (Hesse 1983:244).

Domestication is a state as well, and it is in this sense that we can actually detect domestication in the archaeological record.

Some researchers contend that the state of domestication represents a point on a continuum of human-animal relationships from hunting to herding (Hecker 1982; Ducos 1978). Others believe that herding or domestication "reflects not the end of a continuum but a complete change in human attitudes towards animals" (Meadow 1989:81). Hesse seems to agree (see above). When the difference between herding or domestication and other human-animal relationships is viewed as one of degree it becomes difficult to decide where to draw the line. For instance, Hecker's definition could include the selective hunting of herds passing through an area over a period of years. It can also include herd following. It is true that there are close human-animal relationships
that do not fit into many standard definitions. I see no reason why every close human-animal relationship must be classified as domestication.

Several aspects of domestication are particularly important here. It is important to recognize that domestication is not always what is best for the individual animal. While humans "protect" their domesticates, they also increase the need for that protection. One of the first things to change upon domestication is coloring (Clutton-Brock 1989a:22). Camouflage is lost, making animals more vulnerable. Many domestic plant species are incapable of reproducing without human intervention. And from the perspective of aggregates, humans control the movement, both daily and yearly, of domestic herd animals. Control of breeding is also important in domestic herd animals.

For the purposes of this paper, domestication is defined narrowly. I define a domestic animal as one with which humans have a close and controlling relationship, in which humans both take care of the animal (feeding it, protecting it and ensuring its survival and reproduction) and utilize either the domesticate's labor or its physical products. By the fourth millennium, sheep, goats, pigs, and cattle were fully domesticated and their remains show morphological signs of this. Equids were represented primarily by onagers, which were wild. Domestic asses were present in small numbers and do not appear to have been utilized as food. Dogs were, of course, fully domesticated and present in small numbers. However,
only food animals and livestock will be considered in depth here, as our primary concerns are economic.

**Characteristics of Domesticates**

The characteristics of Near Eastern domestic ungulates may have important implications for how their relative importance in human economies have shifted through time and over space. Because this is an important premise for this research, these species specific characteristics are reviewed here.

Garrard (1984) identifies ideal characteristics for domestic livestock. Potential domesticates should be palatable and have a high yield as measured by a ratio of meat and secondary products (output) to food and time (input). In addition, they should produce a reasonable number of offspring and should have limited agility. Furthermore, a wide environmental and dietary tolerance is an important characteristic. Candidates for domestication should be gregarious and polygamous. Herds organized along hierarchical lines are desirable because they are easier to control. Solitary animals often do not do well when confined, as territorial behavior can cause problems, although territoriality can occur in herd animals as well. Persistent group membership (closed groups) will help to minimize the risk of losing animals to wild herds and to reduce the risk of cross fertilization with wild populations. Garrard, however, does not address all the factors desirable to humans. There are products, other than meat, that people
have been using for millennia. The desirability of hides, milk, horns, and even bones, should be considered.

The factors enumerated above separate neatly into two categories. Animal behavior determines whether an animal can be domesticated or not and some sort of a cost-benefit ratio determines whether the animal would be worth domesticating. Factors such as palatability, number of offspring and yield fall into the cost-benefit category. So do factors such as agility and environmental and dietary tolerances. These factors combined relate to the ease of domesticating and keeping the animals and can be overcome through human effort or labor, by construction of shelters or enclosures, or supplemental feeding. Factors such as herd organization, mating strategies, and temperament in general, fall into the category of behavior. These factors, as opposed to agility and environmental and dietary tolerances, can not be easily overcome.

Clutton-Brock (1989a:7) points out that domestication reflects basic evolutionary processes, in that a founder population is set in reproductive isolation. There are morphological changes associated with domestication, as well as behavioral changes and biogeographic considerations. Biogeography can often be helpful in recognizing domesticates, as these animals may occur outside their natural range. Demographic changes may be represented by age and sex profiles. These profiles are often used to infer domestication, but there are problems with inferences based on these data. Not only do we not know the actual age and sex
profiles of the ancient herds, we do not know the age and sex ratios of wild herds.

Sometimes species can not be separated archaeologically, wild from domestic or sheep from goat. Morphological changes caused by selective breeding do not necessarily appear quickly, and we are not certain how long it takes for these morphological transformations to be expressed. Certainly, behavioral changes would be expressed first. Bokonyi (1989:25) estimates that it might take 30 generations for the morphological consequences of domestication to become evident, although it is important to remember that we are referring to animal generations, which can be as short as two or three years. Meadow (1989:87) estimates a few hundred years for the changes caused by selective breeding to become apparent. These physical changes include size decrease, changes in bodily proportions, crowded teeth (usually resulting from a shortening of the face), hornless skulls (which may occur in wild sheep, but are unknown in wild cattle or wild goats), and certain pathologies (Bokonyi 1989:25). Pathological conditions are often developmental in nature and can result from keeping animals in a confined area or from dietary changes. These changes can be apparent immediately, as they are not genetic and can manifest in the bones of the animal (Meadow 1989).

There are morphological changes in domesticated animals that we cannot see archaeologically. Changes in pelage are often among the first morphological
changes to occur and are sometimes represented in ancient depictions of animals. This is also apparent in observations of modern domesticates. There are also internal characteristics, or soft tissue changes, that will be invisible archaeologically (Clutton-Brock 1989a:23-24). For example, sense organs are reduced, and there are metabolic differences in the distribution and relative volumes of fat. Such differences often may not be readily apparent in the living animal.

Advantages of Domestication

There are several theories explaining why domestication evolves. Hunting and gathering is an easy and long established way of making a living, even in seemingly marginal environments (Lee and Devore 1968). Why adopt agriculture and animal husbandry? This is an enormous question that can not be answered here. It is nonetheless significant that domestication appears to have taken place in different locales and at different times. In the Levant, it appears to have taken place in sedentary agricultural villages, while in other areas domestic animals appear to have preceded agriculture. Bokonyi (1989:23) hypothesizes that the basis of large scale domestication lies in specialized hunting. Specialized hunting would lead to increased knowledge of the animal’s biology and behavior. However, specialized hunting was probably a way of life for thousands of years before the process of domestication began, and only a minority of these
circumstances led to domestication. Some believe that food production was adopted when foraging became less profitable (Russell 1988:12). Applying this assumption to the study of ungulate domestication would imply that it became difficult to hunt particular animals, so the hunters attempted to keep the animals nearby, controlling the herd. This could be accomplished by something as simple as providing a salt lick (Hesse 1983:260). Domestic animals can be looked upon as a security measure, a "walking larder" (Clutton-Brock 1989b), a safeguard against agricultural shortage or environmental catastrophe. Garrard (1984:117) points out that while secondary consumption (eating herbivores) is less energy efficient than primary consumption (eating plants), if livestock can live off vegetation that humans cannot consume, the economy is more viable. Herbivores convert energy that is unavailable to humans in plant form into available energy in animal form is energy efficient from the human perspective.

It is important to note that when an animal is domesticated it in some way becomes more useful, or constantly accessible, to humans than it was when it was hunted. There is some human energy and time put into tending the animals, but some domesticates produce products that hunted animals do not. Hunted animals yield meat and hides, while domesticates can provide additional resources, including milk products, hair/wool, traction, transportation, fuel/dung, and more animals (offspring).
Near Eastern Ungulates

In the Near East the suite of domesticates consists mainly of cattle, sheep, goats, pigs and donkeys. Donkeys are not common in this time period. Camels are important in the Middle East today, but were apparently not yet domesticated in the fourth millennium B.C.¹ A discussion of each species is in order, specifically where and when they were domesticated, the original distribution and natural habitat of the wild ancestor, and the biological advantages and limitations of the domesticate in an arid to semi-arid environment like the Near East.

Bos

All humpless domestic cattle are descended from *Bos primigenius*, the aurochs (plural aurochsen). Prior to its extinction in the wild in 1627, *Bos primigenius* ranged throughout Europe and Asia (Uerpmann 1987:71-72). The northern limit of its range coincided with the broad leaf forest. In the Middle East, the aurochs is neither restricted to the post-Pleistocene nor is it indicative of forest vegetation (Uerpmann 1987:71). The primary morphological change that cattle have undergone is a diminution in size, also true of pigs, which may have been related to the lower overall level of nutrition and lack of necessary diversity in the diet (Meadow 1989:86). Under these conditions, smaller individuals,

¹ There is some discussion regarding the date of camel domestication. For further information see Bulliet 1990.
needing less food, have a better chance of survival. It has also been suggested that smaller cattle were selected for breeding because they may have been easier to control, at least in the initial stages of animal keeping (Tchernov and Horwitz 1991). It seems obvious, from observations of modern cattle, that docility has been considered a positive attribute.

Early evidence of cattle domestication is found at Catal Huyuk (6200 B.C.) and Hacilar (Clutton-Brock 1989a). Early domestic cattle have also been found at Tepe Sabz (5500 B.C.) and Banahilk (5000 B.C.; Reed 1968:371). Clutton-Brock (1989a:67) believes it is probable that cattle were not fully under human control until approximately a millennium after sheep and goats were domesticated, that is by roughly 6000 B.C. Russell (1988:145) proposes an early date for the domestication of cattle, roughly at the same time as sheep and goats, around mid-eighth millennium B.C. He points out that too often only size change is considered and that domestication no doubt began before size changes became apparent.

Cattle are grazers. And they graze almost constantly. Cattle must be contained at night if they are kept near where people raise crops, and because they graze nearly continuously, they must be foddered when they are contained. Cattle also need a significant amount of water. They lower their body temperature primarily by sweating, and panting is secondary (Russell 1988:56-57). In hot conditions, both sheep and goats fare better than cattle. Cattle begin to
reproduce at three to five years of age (Russell 1988:61). With a nine month
gestation period, a cow can produce one offspring every 14 to 24 months (Russell
1988:61). Sheep and goats are both faster reproducers than cattle. Like sheep
and goats, cattle provide meat and milk, but cattle also supply traction. And
while all animals supply dung that is useful for fuel, it could be argued that cattle
supply it in more conveniently collectible packages, as cattle are not as wide
ranging as sheep and goats.

The low frequency of cattle bones found in most Near Eastern assemblages
relative to sheep and goats is usually taken to mean that cattle were less
important economically. From the perspective of relative energetics, however,
sheep and goats would be preferentially slaughtered over cattle (and later camels)
precisely because cattle were of more economic importance for traction (Russell
1988:146). Cattle are more "expensive" in that they reproduce less quickly and
they require more care. Another possible factor is the size of the animal; fewer
cattle need to be slaughtered to supply the same amount of meat.

Sus

All domestic pigs are descended from Sus scrofa, the wild boar, an Old
World species, that is distributed throughout temperate Eurasia, tropical Asia,
and sub-Saharan Africa (Uerpmann 1987:42; Vaughan 1986:198). All wild pigs in
the New World are introduced animals gone feral, illustrating the transient nature
of the morphological characteristics of domestication in this species. (Javelina are members of the family *Tayassuidae* whereas pigs are members of the family *Suidae.*) Suids usually inhabit forested or brushy areas, though one member of the family, the warthog, inhabits open savannah or grassland environments (Vaughan 1986:199). *Sus scrofa* does not fare well in dry environments. They do not sweat and, without benefit of wallowing, they will sunburn. Thus pigs are adapted to more temperate or riverine environments and, in antiquity, it is likely that pigs inhabited the riparian habitats of Mesopotamia.

Swine make good domesticates (Clutton-Brock 1989a:71-76). Pigs are omnivores and can be let loose to feed. They can be trained to come when called. While they are not true herd animals, they huddle together, so tight quarters are not a problem for small numbers of animals. Pigs are not territorial, but will fight if overly crowded. Young pigs will imprint on humans and they are easy to obtain, as the females leave them unattended in a bedding area while they feed (Redding 1994:10). They feed continuously for many hours and then sleep for many hours and so, unlike cattle, they need not be foddered at night. By the same token, if people are growing crops and keeping pigs, they must fence off either the animals or the crops. Due to their fecundity and growth rate, pigs are superior producers of protein relative to all other domesticates except the chicken (Redding 1994:9). According to Harris (1985:67), pigs convert 35% of the energy in their feed into meat, compared to 13% for sheep and 6.5% for cattle. Most
authors are quick to point out that pigs do not, however, provide the secondary products yielded by sheep and goats (Zeder 1994:111; Redding 1991:22-23).

Another disadvantage of pig domestication stems from their physiology. Pigs are not ruminants and do not have the complex stomachs necessary to digest fibrous material. It is for this reason that pigs often come into direct competition with humans for digestible food, unlike sheep, cattle and goats, which can digest the grasses that humans can not. Harris (1985:73) offers this as a possible reason for the taboo on pork in parts of the Middle East (1985:73).

There are morphological differences between domestic and wild pigs. The most obvious changes are body size reduction and shortening of the face. Flannery offers two possible explanations for the shortening of the snout in domestic pigs (1983:166-167). One is that there is reduced selective pressure for a long muzzle for grubbing and rooting. However, it should be noted that if pigs were left to forage for themselves, a long snout would still be beneficial. Another possibility is that the reduced snout is a pedomorphic characteristic associated with selection for early sexual maturation. Early sexual maturation means that greater fecundity, which is an advantage to humans keeping pigs, is possible.

Numerous characteristics go along with a shorter face in pigs (Crabtree 1993:224). One of the most useful for zooarchaeologists is the shortening of the jaw which leads to a reduction in dentition and a crowding of the teeth. Thus, measuring molars is one of the more reliable ways to distinguish domestic pigs
from their wild counterparts. Measurements have been established for European pigs, as well as for Near Eastern pigs (Flannery 1983). Flannery (1983) notes that there is some overlap of measurements of wild and domestic pig molars, but that the overlap is small and the means for the two categories are statistically distinct (1983).

Evidence of early pig domestication may be found at several sites in the Middle East and Greece. In Jarmo, in Iraq, domestic pigs are inferred to have been present by roughly 6000 B.C. based on a rapid increase in the relative number of pig remains in the archaeofaunal assemblages (Flannery 1983:173-175). In Iraqi Kurdistan, there is evidence of domestic pigs at roughly 5000 B.C. from Gird Banahilk (Flannery 1983:176). There are domestic pigs in Greece in the late seventh millennium B.C. at Nea Nikomedeia and Argissa Magula (Crabtree 1993:225). Stein (1989:91-92) notes domestic pigs from the seventh millennium at Gritille in southern Anatolia, and Redding (1994) believes there are domestic pigs at Hallan Cemi in southeastern Anatolia, by roughly 8,000 B.C.

Redding's (1994) article should be discussed briefly here. There is no morphological or demographic evidence for the domestication of sheep or goats at Hallan Cemi. Redding did, however, find evidence for the domestication of pigs. The morphological evidence for pig domestication is based on 334 identified specimens. The characteristics of domestication are restricted to the skull, and the best way to distinguish domestic from wild pigs is by measuring the upper or
lower third molars. Three measurable suid molars were recovered from Hallan Cemi. Two of the Hallan Cemi molars are lower third molars which fall into the metric overlap between domestic and wild measurements established by Flannery (1983) for Middle Eastern pigs. The remaining molar is an upper second molar which falls within the range for domesticates. This upper second molar was recovered three meters below the surface. The other two were recovered from the uppermost meter of deposit. According to Redding (1994:6), these teeth "...indicate that the process of domestication may have been underway"; he believes that by the time the domestic phenotype is present the majority of the animals in the herd are domesticated. The survivorship curve for the pigs of Hallan Cemi, which was based upon long bone fusion, indicates domestication with 29% of the animals under one year and only 35% over three and a half years. Only seven specimens were sexed, but six were male, a pattern possibly consistent with consumption from a domestic herd. There is also an increase in the relative abundance of pigs through time. While this may sound convincing, it is important to remember that the sample sizes upon which Redding's interpretations are based are very small. It is also important, when looking at the survivorship curve, to remember the easy accessibility of young wild pigs.

More interesting than the actual data is the premise regarding risk reduction that Redding sets forth. He posits that pigs were important just prior to and, in some cases, during the development of food production (Redding
When people were not producing food, pigs were desirable because of their high return and low maintenance. They were later replaced by sheep and goats, because sheep and goats do not threaten crops, and are easily herded to distant pastures, when the land near the settlement is being used for agriculture. Thus, Redding suggests, albeit tentatively, that the pattern in southeastern Anatolia and the northern Zagros was different than the pattern observed in the Levant. "Sedentism develops in the absence of the intensive use of cereals and the earliest domestic animal is the pig" (Redding 1994:13).

The domestic equids in this part of the world in the fourth and fifth millennium B.C. are probably donkeys or asses. The ancestor of the domestic ass is an African species, *Equus asinus*, making it the only domesticated animal from Africa, with the possible exception of the cat (Clutton-Brock 1989a:91). Both the horse and the donkey were introduced to Western Asia as domestic animals during the early third millennium. Hybrids became common around 2500 B.C. (Clutton-Brock 1989a:101). The most important equids for the purpose of this paper are the ass and the onager, *Equus hemionus*. Most of the equid bones present in the sites examined here are classified as onager bones, with the notable exception of ass remains at Tell Rubeidheh, in the Jebel Hamrin.
There are five subspecies, or geographic varieties, of onagers (Willoughby 1974:316-331). These are the Kulan, the Kiang, the Persian Onager, the Indian Onager (or Ghorkhar), and the Syrian Onager (or Achdari). The Syrian Onager is the subspecies mentioned in the Bible and is most likely the subspecies referred to in ancient texts and represented in ancient depictions. Today the Achdari is completely extinct; the last one died in the late 1920's in Vienna's Schonbrunn Zoo (Groves 1974:102).

Onagers closely resemble mules and horses. However, they are somewhat smaller than horses, ranging from approximately a meter to a meter and a half at the shoulder. The most obvious skeletal difference between onagers and donkeys is in the limb bones. Onagers are appreciably taller at the croup (rear) than at the withers (shoulder). The limb bones are also more slender than those of horses and asses (Clutton-Brock 1989a:94). Some varieties, including the Syrian onager, have raised nasal bones, producing a bump on the snout and hence a "Roman" profile.

The range of the onager used to be much greater. Today the distribution of these animals is uneven because of the absence of suitable habitats due to the encroachment of humans. As late as the beginning of the twentieth century, the range of the onager was virtually continuous from the Gobi Desert to Iran and the deserts of Palestine and northern Arabia (Groves 1974:97). Presently, there are four small discontinuous patches of onager habitat. The former range of the
Syrian onager extended from Palestine, northern Arabia and perhaps southern Turkey, east across Mesopotamia to the Zagros.

As is evidenced by the areas they occupy, onagers are adapted to arid, harsh habitats. They share with asses a preference for dry desert-like habitats and an aversion to moist environments (Willoughby 1974:320). The ranges of onagers and asses overlap, partly because they are adapted to different terrains (Uerpmann 1987:35). Asses live on stony to rocky ground, while onagers prefer firm, not so stony soil. Both species do well in deserts as long as the ground is firm, as they do not do well in sand.

It appears that onagers were not domesticated, but were kept in captivity in small numbers during the third millennium to interbreed with donkeys in order to produce hybrids (Clutton-Brock 1992). Onagers are "wild and restless" in captivity (Groves 1974:105) and are not as easy to control or train as donkeys or horses (Clutton-Brock 1992:90). They were hunted as wild animals and valued for their meat and hides but there is no evidence that they were ever used as draft animals.

As with the horse, it is difficult to distinguish the domestic animal from its wild predecessor (Clutton-Brock 1989a:91). This can be attributed to the fact that the use of the animal is not too different from its life in the wild. Horses are strong, good runners and in using them for transportation, humans capitalize on a
natural asset. The same can be said of donkeys, which are used primarily to carry humans and their belongings.

*Ovis-Capra*

In this paper and in many faunal reports there is a taxonomic category called "O\C\G" or *Ovis\Capra\Gazella*. This is a very useful category because it is difficult to distinguish these three species from one another using much of the skeletal material usually available to faunal analysts. Gazelles can sometimes be ruled out because they tend to be more gracile and because human settlements are often beyond their range. This reasoning may seem somewhat circular, but gazelles are not good domesticates because they are territorial and very nimble. There are some characteristics by which the faunal analyst can separate sheep and goat remains and these are discussed below.

Sheep and goats belong to the subfamily *Caprinae*. They vary significantly in appearance, both between and within genera. Wild sheep are not woolly. There are at least 40 races of wild sheep described (Clutton-Brock 1989a:53) and the most probable ancestor of the domestic sheep is the Asiatic mouflon, *Ovis orientalis*. Four groups of goats exist and they can be distinguished by the shape of their horns. The most probable ancestor of the domestic goat, *Capra hircus*, is the bezoar, *Capra aegagrus* (Clutton-Brock 1989a:58).
Both wild sheep and wild goats are widespread. They live in both flat and hilly terrain, warm and cold climates. Body build varies among caprine species with terrain. Animals that prefer flat or undulating terrain are built for speed, with longer legs and a slimmer frame (Schaller 1977:85). Animals that prefer steep, rugged terrain tend to be built for power, with a stockier frame and robust forequarters (Schaller 1977:86). Ovicaprids are flexible feeders and complement one another. Goats are rather indiscriminate grazers and browsers, eating herbs, leaves of trees and bushes, and grasses (Kingdon 1990:158). Sheep are grazers and prefer short grasses and herbs, but, in some cases, will browse on leaves, buds, and shoots (Kingdon 1990:162). Sheep may live up to 20 years, although 10-15 years is more common (Kingdon 1990:162). Goat life expectancy is roughly 10-15 years as well (Kingdon 1990:159).

Sheep and goats are ideal domesticates. They are gregarious, non-territorial herd animals that are easy to control. Sheep and goats are often herded together because their feeding habits are complementary and because goats in the herd aid the shepherd in controlling the sheep (Baskin 1974).

By the seventh millennium B.C. sheep and goats were domesticated in Anatolia. The remains of domestic sheep and goats can be distinguished from their wild counterparts by size, skeletal robusticity, and age and sex ratios. Often depictions of domestic animals and paraphernalia confirm that they are domestic. Hoof prints on mudbricks found at Ganj Dareh (in western Iran) indicate that
there were caprids, presumably domestic, in close proximity to the settlement (Cram 1984:230).

Sheep and goat are ubiquitous in the Middle East today and apparently were in antiquity as well. Early evidence for sheep under human control is found at Jericho at 8000-7000 B.C., Zawi Chemi Shanidar at roughly 8000 B.C. (Clutton-Brock 1989a:56). Bouqras (late seventh millennium) also have early evidence of the domestication of sheep (Crabtree 1993:220). By 7200 B.C. sheep had extended beyond their natural range; sheep remains have been found in Greece at Argissa Magula and Nea Nikomedeia (Crabtree 1993:220; Clutton-Brock 1987:56).

Morphological changes in sheep are seen in the later Neolithic, in the sixth and fifth millennium B.C. (Clutton-Brock 1989a:57). These changes include hornless females, shortening of the limb bones, and changes in horn shape. Other changes cannot be seen in the faunal remains, but are often illustrated in representations. These include fattiness and length of the tail and the change from hair to wool, which may have taken place as early as the sixth millennium B.C. (Clutton-Brock 1989a:57).

Goats are somewhat more hardy than sheep. They are browsers and inhabit the high altitudes of the mountain ranges of Europe, Asia, and Ethiopia (Clutton-Brock 1989a:57). They do not range as far north as mountain sheep, and they did not cross the Bering Strait to the New World. They have very
versatile feeding habits and will thrive under extremes of temperature and humidity (Clutton-Brock 1989a:57).

Morphological changes in domestic goats are similar to those in domestic sheep (Clutton-Brock 1989a:60). Hornlessness in females is less common in goats than it is in sheep. Limbs are shorter and lighter in domesticates and there is a medial flattening of the horn cores (Hesse 1983:247). There are no substantial changes in hair quality.

Evidence of domestic goats is found at numerous Near Eastern sites. There are early goat remains from the eighth millennium at Jericho. They are abundant in the Bus Mordeh phase at Ali Kosh (roughly 8,200 B.C.) and are identified as domestic by the high proportions of yearlings (Voigt and Dyson 1992; Reed 1968:372). Goats are also found at Beidha, in southern Jordan, outside of their range, around 7,500 B.C. (Reed 1968:372). Goats appear to have been more popular than sheep at this early stage (Clutton-Brock 1989a:59). This could be attributed to the fact that goats are hardier and easier to herd. Sheep may have become more valuable after people began to utilize wool.

By the sixth millennium B.C. sheep, goats and cattle were all fully domesticated in greater Mesopotamia, and therefore in the sites examined here. Pigs in this period, on the other hand, may have been either wild or domestic, and equids were usually wild.
Animal keeping replaced hunting and gathering, probably when hunting became less feasible or when people's needs relating to the animal changed. Agriculture and animal husbandry are primary components of ancient sedentary economies in the Near East. By looking at the patterns of animal keeping and consumption, we should be able to gain some insight into the internal organization of these ancient economies and possibly into the social and political organization of the community.

Before examining the sites and the data, it is necessary to understand the nature of the faunal record and the methods that zooarchaeologists have used to interpret it.
3. THE NATURE OF THE FAUNAL RECORD

The faunal assemblage that the archaeologist deals with is not a direct representation of the animals on the site. It has been through a number of transitions. Five stages in the taphonomic histories of recovered bones have been defined by Payne (1993:123-126). The first stage is the living community, that is the herd, flock, or population of animals present in the time period under consideration. Second is the death assemblage, that is whole carcasses, though these entire carcasses are not necessarily present at the site at any time. The third is the deposited assemblage and is defined as what is left when bone accumulation and modification agents have ceased to operate. The fourth stage is the fossil assemblage, that is, what has survived until recovery. Finally, stage five is the sample assemblage and consists of what is actually recovered by the archaeologist.

At every one of these transitions some information is lost or some bias is introduced (Ringrose 1993:124; Gilbert and Singer 1982). At the first transition, between stage one and stage two, various causes of death introduce selective biases, and information regarding the proportions of long lived, slow breeding

\[^{2}\text{Taphonomy refers to what happens to an object between the time of its death or disposal and time of its burial, fossilization or entry into the archaeological record. It is a complicated subject and will not be discussed here. For a discussion of taphonomy see Behrensmeyer and Hill 1980.}\]
animals in relation to short lived, fast breeding animals is lost. Transportation by humans, carnivores, water and other agents and butchery introduce bias into the record at the second transition, between stages two and three. Information is lost at the third transition due to soil conditions, trampling, burrowing animal activity, decomposition, etc. Some bones survive into the fossil record and others do not. The last transition, that is, what is collected by archaeologists, is affected by the part and percentage of the site excavated and the excavation and recovery methods. At this transition, locational information is often lost and small bones are often missed.

The sample that the archaeologist works with is by no means a perfectly representative sample. It is not directly representative of the animals in the living community nor is it even necessarily representative of the animal bones present in the site. The first instance is a result of factors beyond the archaeologist's control, which must, of course, be considered. The latter is the result of recovery procedures. Experiments reveal that excavators often miss considerably more than they realize. Tests at Sitagroi in northern Greece confirm this (Payne 1975). Water sieving revealed nine species of fish and 14 species of birds, while not a single fish or bird bone was recovered through standard means (Payne 1975:13). Awareness of these biases, and their magnitude, is very helpful, and it may not be necessary to water sieve all the deposits to gain environmental information.

Bias in samples can be recognized partly by examining the skeletal
elements present. Badly biased samples can usually be recognized by the scarcity of carpals, tarsals and phalanges in relation to limb bones (Payne 1975), as well as by differential representation caused by bone tissue density (Lyman 1984; Binford and Bertram 1977). The investigator should also be suspicious when there is a scarcity of unfused epiphyses in relation to diaphyses or when single teeth are rare (Payne 1975). If a very high proportion of the bones are identifiable or a high proportion of the bone fragments are large, the sample is likely to be biased by archaeological recovery procedures. In a representative sample, there are usually quite a large number of bone fragments that are too small and fragmentary to identify as more than mammalian.

One difficult task for faunal analysts working with Near Eastern material is distinguishing between sheep and goats. In his 1969 article Boessneck notes many osteological differences between domestic sheep and domestic goats. The skulls of the two species are quite easily distinguished. There are numerous differences in the skull, the most obvious of which are differences in the sutures. They are Y-shaped in sheep and T-shaped in goats. There are also differences in the shapes of the first two vertebrae, the atlas and axis. These can also be used for sexing animals. Because they support the head, these vertebral elements are larger and more robust in individuals with large horns, primarily males. The distal epiphysis and neck of the scapula, which are the most often recovered parts of this element, are slimmer in goats than in sheep. There are differences in both
the distal and proximal ends of the humerus and the articular surfaces of the
distal radius differ in shape between the two species. The pelvis is more helpful
in establishing sex, but on the whole, the pelvis of the goat is longer and narrower
than that of the sheep. The articular head of the femur is more ball shaped and
better defined against the slender neck in goats than in sheep. There are fairly
easily distinguished differences in the astragalus and the calcaneum. Metapodials
and phalanges are also diagnostic, particularly the third phalanx. In the goat, the
third phalanx is "pointier" than in the sheep. The main point here is that while
there are many differences between sheep and goats and while these differences
occur on nearly every element, the differences are small, and often ones of
degree. Thus, they can be hard to see and there is often overlap. Most of these
differences do not apply to young animals. Often the bones that
zooarchaeologists deal with are too fragmentary to see these diagnostic features.

Age ratios, body part distribution and butchery can yield information. Age
ratios and mortality patterns can shed some light on herd management. The age
at which animals are killed is usually determined by what the herder wants from
the herd.

A mortality profile details the relative number of animals killed in different
age cohorts. There are two common age structure patterns (Stiner 1991:6-9).
When the number of individual animals in each of a series of consecutive age
cohorts are plotted in a histogram format, the structure of a living population is
shaped like a staircase. This pattern is also found in "catastrophic" mortality profiles, as a natural disaster might produce by suddenly killing an entire population. The other mortality profile commonly found in natural assemblages is the U-shaped or attritional pattern. This is produced by various "natural" causes of death. There are fewer prime age individuals represented, as the probability of dying is significantly lower in the prime years. These mortality profiles consequently show larger numbers of juveniles and old individuals.

Age and sex of animals can be determined from bones. The sex of an animal can be indicated by something as obvious as horns, antlers or a baculum (penis bone). The pelvis, skull and often canine teeth can also be used to determine sex. It is sometimes possible to obtain a sex ratio through skeletal measurements (Hesse 1983). Age can be determined through the examination of epiphysial fusion or tooth eruption and wear. Mammalian bones grow at both ends of the shaft, and the ends, or epiphyses, fuse to the shaft when the bone is fully grown. The bones of the body fuse in a genetically established order. For individual species and particularly individual populations, the age of fusion of bones can therefore be established. The recovery of unfused bones indicates the presence of immature animals and ages can be estimated by the relative representation of unfused elements. There are a few problems with using epiphyseal fusion to establish mortality profiles. First, bone fusion ends fairly early in life. The last elements begin to fuse at 42 months in pigs, sheep and
goats and cattle (Bokonyi 1972; Silver 1969). Secondly, unfused elements are less likely to be preserved (i.e. make it into the sample assemblage). Tooth eruption and wear are often preferable to bone fusion data, since teeth preserve well and are abundant in most sample assemblages. Most useful for ageing ungulates are mandibular molars and premolars. Just as in humans, teeth erupt in a particular order and the age of eruption can be reliably established for particular species. When a tooth erupts, it is completely covered by enamel. As it begins to wear, enamel on the occlusal surfaces of molars wears away, exposing darker dentin. The patterns formed by this wear can be separated into a number of sequential stages for particular species. There are, of course, difficulties in using this technique. Tooth wear is not a constant process, as some stages cover a longer period of time than others. Tooth wear rates are not constant among populations; differences in grazing and feeding can produce a difference in the rate of tooth wear (Gifford-Gonzalez 1991). Deniz and Payne (1982:196), looking at modern Turkish Angora goats, noted that wear is more variable than eruption and that wear on molars is considerably less variable than wear on incisors. They noted differences between male and female goats and among the three herds they examined. Teeth erupt sooner and wear more rapidly in males (Deniz and Payne 1982:196). Despite these differences, Deniz and Payne (1982:196) estimate that, given some basis for estimating rates of eruption and wear, age estimates are probably accurate to within 10% or 20% at the 95% confidence level.
Animal bones are classified in a number of ways. In a 1994 article, Lyman defines over 100 terms referring to the quantification of animal bones recovered from archaeological sites. However, 17 are synonymous, or nearly so, with NISP and 11 with MNI. Some of terms are meant to measure degrees of fragmentation, some to measure bone weight and some to estimate meat weight. Defining and discussing all these terms would be futile and uninformative. Rather than drowning in an alphabet soup, it seems more reasonable to concentrate on some of the more common and useful terms and indices, especially with regards to this study. The most helpful in this instance is NISP (number of identifiable specimens). A more complete discussion of these topics is offered by Grayson (1984).

NISP or number of identified specimens is a commonly used term. The advantages of NISP are those of convenience. The NISP can be calculated when the identification is done. The results are also additive and therefore easy to calculate and modify. Most importantly, NISP is least subject to aggregation errors in inter-assemblage comparisons (Grayson 1984). There are disadvantages. Some animals have more bones than others, introducing a bias to the system. It assumes that all specimens are equally affected by fragmentation and is, therefore, sensitive to bone fragmentation.

MNI (minimum number of individuals) remedies some of the problems of
NISP, but introduces many new ones (Grayson 1984). The minimum number of individuals is not sensitive to fragmentation and the number of bones in an animal do not affect the results. However, this variable can exaggerate the importance of rare species and it can be tedious to calculate. MNI is very sensitive to aggregation error, dependent on the clusters of faunal material from which they are defined (site, unit, pit, room, bag). There is no consensus on how to calculate MNI, and, therefore, results are usually not comparable between samples. Some researchers pair elements, that is they distinguish between left and right and use this in their calculations. Another source of variation is the treatment of fragmentary bones. While these seem to be small differences in the way the data are treated, the effects are cumulative and lead to disparate results.

Both MNI and NISP share a "basic conceptual weakness" in that they ignore the skeletal parts that are present in an assemblage (Klein and Cruz-Uribe 1984:31). Skeletal part representation is the result of cultural behavior, which is what we are really after. Binford's solution to this is to concentrate on the element rather than on the complete animal (1984:49-52). He points out that the presence of an element does not necessarily mean that the entire animal was ever present at the site. MNI assumes the equivalence between a part and the whole. MNE, minimum number of elements, is an estimate of the minimum number of an element represented by fragmentary remains of that element, assuming that a complete element was originally present. Thus MNE takes the level of
assumption from the whole animal (MNI) to the level of the individual element. MAU (minimum animal unit) is the MNE divided by the number of elements in the living animal.

For the purposes of this paper, NISP is deemed the most useful measurement because all faunal reports examined here list NISP and it is least affected by aggregate error. MNI can also be useful, but several sites examined here are represented by such small samples that MNI is misleading. MNE and MAU are not utilized because in looking at already published accounts, there are many instances in which the necessary raw data are not available. Often the NISP for each species is published but which elements are represented is not included in the report.
4. THE SITES EXAMINED

For this study I have looked at nine sites (Figure 1). They are:

Farukhabad, Hacinebi Tepe, Hassek Hoyuk, Hayaz Hoyuk, Tell el Oueili, Ras al Amiya, Tell Rubeidheh, Tepe Sabz, and Uruk. These sites represent two "cultural" periods (the Middle and Late Chalcolithic, and the Uruk; see Figure 2) and three geographical areas (southern Mesopotamia, the northwest and the east) (See Table 1). The sites were chosen using several criteria. First and foremost, it was necessary that they have a published faunal report. This is true in all cases, except that of Hacinebi, where I utilized the faunal data generated by Jeffery Nicola (a student at Northwestern University). Two sites, Farukhabad and Hacinebi, contain components representing both "cultural" periods. This is the ideal situation for this research, but it is rather uncommon. There are six sites with Uruk material: Farukhabad, Hacinebi, Hassek Hoyuk, Hayaz Hoyuk, Tell Rubeidheh and Uruk. There are five sites with local Late Chalcolithic or Ubaid material: Farukhabad, Hacinebi, Tell el Oueili, Ras al Amiya and Tepe Sabz. The "Late Chalcolithic" material varies from area to area. At Tell el Oueili, it is Ubaid, while at Farukhabad it is divided into the Mehmeh, Bayat and Farukh phases and at Hacinebi it is referred to simply as the local Late Chalcolithic. At some sites this material represents the Middle, as well as Late, Chalcolithic.
Figure 2. Chronology of the sites examined separated by geographic area.
When speaking of the time period in general, it is easier to speak of it as the Late Chalcolithic (approximately 5500 - 4500 B.C.).

<table>
<thead>
<tr>
<th>SITES EXAMINED</th>
<th>Southern Mesopotamia</th>
<th>&quot;East&quot;</th>
<th>&quot;North&quot;</th>
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<tbody>
<tr>
<td>Uruk</td>
<td>Uruk</td>
<td>Tell Rubeidheh Farukhabad</td>
<td>Hayaz Hoyuk Hassek Hoyuk Hacinebi</td>
</tr>
<tr>
<td>Late Chalcolithic Farukhabad</td>
<td>Ras al Amiya Tell el Oueili</td>
<td>Farukhabad Tepe Sabz</td>
<td>Hacinebi</td>
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Table 1. The sites examined by time period and geographical area.

The three general geographic areas are represented by three sites each, including at least one of each period. One geographic area is referred to here as southern Mesopotamia. The sites representing this area are Ras al Amiya, Uruk and Tell el Oueili. All are located below the modern city of Baghdad, between the Tigris and Euphrates rivers. A second general geographic area is referred to here as "east". The sites representing this area are Tepe Sabz, Farukhabad and Tell Rubeidheh. These sites are located in modern western Iran and eastern Iraq. Tepe Sabz and Farukhabad are situated on the Deh Luran plain, and Tell Rubeidheh is further north in the Jebel Hamrin. The final general geographical area is referred to here as "northwest" and is represented by Hacinebi, Hassek
Hoyuk and Hayaz Hoyuk. These sites, located in southeastern Anatolia, lie along the banks of the northern Euphrates.

These geographic areas correspond roughly to Algaze’s divisions of areas of Uruk contact. They also represent differences in environment. Southern Mesopotamia is a flat alluvial plain. The "northwest" and the "east" represent higher elevations, approaching foothills in some areas.

Southern Mesopotamia is a treeless alluvial plain. Elevation is roughly 40 meters above sea level and annual rainfall rarely exceeds 150 mm, which is insufficient for rainfed agriculture (Postgate 1992). The primary sources of water are the two large rivers. Canals were sometimes cut, though the Tigris tends to be deeply incised, making irrigation from it more difficult (Postgate 1992). The water table is fairly high and the land does not drain well, creating a problem with soil salinization. Generally, the Mesopotamian alluvium is hot and arid.

The Deh Luran plain of Iran is a shallow trough bounded on the southwest by Iraq’s Jebel Hamrin and on the northeast by the beginnings of the Zagros mountains. It is roughly 150 meters above sea level. Several rivers cut through the area. Rainfall averages roughly 200 mm. annually. Both sites located on the Deh Luran plain would have access to a number of ecological zones, some conducive to agriculture and some to grazing. Farming would probably have been carried out on the alluvial fans and river banks.
The nearby Hamrin Valley is a bit less agriculturally secure (Killick 1988:1-8). It is roughly 100 meters above sea level. Approximately 250 to 300 mm of rain falls a year, but the timing and quantity of rain is extremely variable. Soils tend to be gravelly in this area and most of the cultivatable land is located to the east of the Narin River. Tell Rubeidheh is located to the west of the Narin River. The water table is fairly low. Sites in the area are shallow, perhaps indicating that only short-lived settlements were possible because of the unreliable resources.

The northwestern area examined here is a bit harder to characterize because the sites are located along a river which is descending from its source. The more northern sites are considerably higher in elevation. All of these sites typically receive more than 400 mm. of rainfall annually and are located on a river which could be utilized for irrigation. Temperatures are lower and vegetation ranges from steppic to deciduous and mixed forest.

At this point it will be useful to discuss these periods in more detail. Sites are usually dated using ceramics and architecture. Therefore, these are two categories of materials which are most regularly and thoroughly documented. Generally, there seem to be Ubaid influences throughout the areas discussed here during much of the Middle and Late Chalcolithic. There do appear to have been
local assemblages and, therefore, "cultures". An inventory of these and other classes of material from the sites examined here will aid in understanding the increasing complexity from the Ubaid to the Uruk periods. Additionally, it can help to establish the degree of southern influence in both earlier and later sites.

The "Ubaid" Period

The Ubaid period, is best known from southern Iraq and is named after the type site, al 'Ubaid. Northern Ubaid traditions are found in northern Mesopotamia, Syria, Anatolia and Iran (Roaf 1990). The Ubaid period begins roughly 5600 B.C. and is usually divided into four (or five) phases.

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<tr>
<td>4500-4000</td>
<td>Ubaid 4</td>
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<tr>
<td>5000-4500</td>
<td>Ubaid 3</td>
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<td>5200-4800</td>
<td>Ubaid 2</td>
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<td>5500-5000</td>
<td>Ubaid 1</td>
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<tr>
<td>5600-5500</td>
<td>Ubaid 0</td>
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<tr>
<td>5500-5000</td>
<td>Eridu</td>
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<tr>
<td>5200-4800</td>
<td>Hajji Muhammed</td>
<td></td>
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<tr>
<td>5000-4500</td>
<td>Levels XII-VIII</td>
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<tr>
<td>4500-4000</td>
<td>Levels VII-VI</td>
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^"Cultures" refers to groups of people living under similar sociopolitical structures and sharing common beliefs and ideals and can include ethnic or religious groups, or "nationalities".
Halaf pottery, by which the Halaf period is defined, is best known from northern Syria and Iraq, and southern Anatolia, from 5300 to 4500 B.C. (Watson 1983). Halaf ceramics, mentioned below, are sometimes used to synchronize northern Syria and Anatolia with Mesopotamian chronology. Ancient chronologies are rarely simple, and this is no exception.

Because the Ubaid period is defined largely on the basis of pottery and its periodization is determined by changes in style and form, it is necessary to briefly discuss Ubaid pottery. It is essentially a type fossil for the period. Ubaid pottery is characteristically a hard, high-fired buff or red paste with small geometric designs in black paint (Porada et al. 1992:86). It is often fine and handbuilt. Nissen (1988) notes the preference in the decoration of late Ubaid pottery (Ubaid 3 and 4) for circular bands and simple repetitive filling patterns and offers the possible connection to a technical innovation, a rotating platform or slow wheel. He also notes that the geographic distributions of pottery styles increase in the prehistoric periods in the Near East, culminating in the Ubaid period, with a very large distribution. This type of pottery is found at sites from the Arabian shield and Gulf to southeastern Anatolia, from central Iran to western Syria. Pottery from different phases of the Ubaid can be distinguished, though most other artifact classes cannot be divided as readily.

Joan Oates (1960) examined the pottery from Eridu and noted four divisions in the Ubaid period. She termed the first pottery group Eridu. These
ceramics are characterized by more intricate decorations than are usually associated with Ubaid pottery. Eridu corresponds to what is often termed Ubaid 1. Hajji Muhammed phase pottery at Eridu is named after Qal‘at Hajji Muhammed, a small tell near Uruk. This type bridges the gap between Eridu ware and the types more commonly associated with Ubaid pottery. It has an overall dark appearance due to all over patterns and thickly painted decorations. Zigzags in reverse are characteristic of Hajji Muhammed ware and are sometimes scratched into the paint. Ubaid 3 is represented by Levels XII-VIII. The patterns are less busy and the decoration is generally simpler. Finally Ubaid 4 pottery corresponds to Levels VII and VI. This phase is marked by the appearance of Uruk pottery and the absence of anything resembling Eridu phase pottery. There is an increase in bold, sweeping designs. The criteria for these divisions are form, fabric and decoration, though only decoration is discussed here. Oates notes that there are no sudden breaks in any of these categories but that the changes are gradual and she suggests that these phases be referred to as Ubaid 1 through Ubaid 4.

There are numerous "type fossils" for the Ubaid period and some of these categories of artifacts should be discussed here. Some characteristic artifacts of the late Ubaid are bitumen artifacts, bent clay nails, clay sickles, stamp seals (Uqair and Tello), figurines (Uruk and Eridu) and engraved terra-cotta and stone beads (Oueili). Some of these artifact categories require some explanation.
Bitumen is a tar-like substance that is often used in construction, or as a sealant or adhesive, and possibly as packing material as well. It is a primarily southern material. There are sources in southern Mesopotamia and in the eastern areas. Bent clay nails are something of a mystery (Stronach 1961:107). Also called mullers, they may be large decorative wall cones, though, to my knowledge, none has ever been found in a wall. They may also be pestles. At Ras al Amiya one was found beside a stone mortar in a house with no other pestle and another was found with a very worn base that may have been used for rubbing or grinding. Another explanation is that they were pottery anvils (Flannery, Hole and Neely 1969:112).

Ubaid architecture is of mudbrick. A monumental structure at Eridu is termed a temple because of its resemblance to later Mesopotamian temples. It could indicate the foundations of temple architecture in the Ubaid 1 phase. The earliest buildings with T-shaped central halls, a style which continues into the Uruk period, date to the Ubaid 2 phase (Porada et al. 1992:88). In the Ubaid 3 phase, the temple sequence at Eridu shows the change from regular buttresses to decorative pilasters and thickening of the walls (Porada et al. 1992:89). There is also the first appearance of the plan of a cella flanked by four rooms. This pattern continues through Ubaid 4 and into the Uruk period.

In southeastern Anatolia, the corresponding periods are referred to as the Middle and Late Chalcolithic. Ceramically, the Middle Chalcolithic is
characterized by the Halaf tradition (see Table 2). Amuq E and F/G pottery can be considered part of the local Anatolian assemblage. Amuq E pottery in this area is Ubaid in character. It is characterized by painted and monochrome wares and scraped bowls are prominent (Mellink 1992:210). The Late Chalcolithic in this area is characterized by Amuq F/G pottery of a chaff-faced light fabric with a light to orange slip (Mellink 1992:210). The transition between Amuq E and F is unclear at best (Braidwood and Braidwood 1960:175-177). Amuq E is characterized by a dark-faced burnished ware and a dark faced unburnished ware, along with small amounts of other pottery types. Amuq F is characterized by the appearance of a smooth faced fine grained series and a chaff-faced series. There is also the appearance of some wheel made pieces (Braidwood and Braidwood 1960:229). Local types are of fine paste and consist of a range of functionally distinct vessel types. Local wares also include a red-and-black burnished ware, a chaff-faced dark burnished ware and vesicular burnished ware (Mellink 1992).

During the terminal Late Chalcolithic there is much evidence for intensive Uruk contact along the Turkish Euphrates south of the Taurus mountains.

The "Ubaid" period on the Deh Luran plain is divided into a number of phases. Here we concentrate on the Mehmeh (4500-4100 B.C.) and Bayat (4100-3700 B.C.) phases, as those are the ones represented at Tepe Sabz and Farukhabad which correspond most closely to the time periods that are being examined in the south and north. There are many similarities and links with
southern Mesopotamia. These strong ties are visible in the Mehmeh phase (ca. Ubaid 3) in the presence of Hajji Muhammed ware. Mehmeh phase pottery has also been found in Mesopotamia at Ras al Amiya. The same parallels can be found in the Bayat phase (ca. Ubaid 4). Other characteristic Mesopotamian artifacts found on the Deh Luran plain include bent clay nails.

The Uruk Period

The Uruk period is characterized by a light colored, unpainted often wheel made ware, a red slipped pottery and a grey ware. It is difficult to place artifacts other than pottery into Early, Middle and Late divisions of the Uruk. Uruk pottery forms include straight spouted jars, double mouthed jars with globular bodies, four-lug (handled) jars, droop spouts, conical cups with string cut bases, miniature vessels, and the infamous bevelled rim bowl (Porada et al. 1992:96-99). Reserved slip decoration is common. Architecturally, the Uruk period is characterized by tripartite plans and niche and buttress design of public buildings (Porada et al. 1992). These public buildings were often decorated with clay wall cones. In the Middle and Late Uruk, there are temples in southern Mesopotamia of limestone with gypsum mortar (Limestone Temple, Stone Cone Temple, and the Steingebaude at Uruk). This may indicate trade with areas to the north and east, as the Mesopotamian alluvium lacks these resources. Cylinder seals carved with a mechanical drill are another type artifact. The motifs are also helpful in
assigning these to the Uruk period. Seal impressions are found on several kinds of objects, including jars, tablets and bullae. Another class of artifact typical of the Uruk period are tokens, which are sometimes sealed in bullae.

Two of these artifact classes have been postulated to be directly correlated with accounting and state control of resources. Tokens are geometric shapes fashioned out of unbaked clay. They are believed to stand for some commodity (sheep, grain, etc.). Tokens have been found enclosed in clay envelopes (bullae) which sometimes bear the impression of the tokens inside, in addition to a seal impression on the outside. Schmandt-Besserat (1986) proposes that tokens and bullae were used as pneumonic devices for accounting and were the foundations for writing. There are some problems with this theory. Michalowski (1993; 1994) argues that the use of these tokens is very uncertain, as they are found in places where writing does not emerge and they are not found in all places where writing does in emerge in greater Mesopotamia. They are also found in some contexts that seem unlikely for counting devices, such as children's graves at Tell Abada. Tablets, however, are often accounting "sheets", particularly early numerical tablets. Seals (stamp and cylinder) are used as signatures, rolled over clay to ensure contents or mark ownership. Materials sealed include jars, doors, tablets, and bullae.

Bevelled rim bowls (BRB) are a signature artifact of the Uruk period, but their purpose remains unknown. The most current argument seems to be
whether they served as ration bowls or not (Beale 1978; Johnson 1973). Beale presents arguments against Johnson's interpretation of them as such, noting that the volumes are not constant and that they would be too small to feed a man for a day (basically, wages are too low). Also, the shape of the bowl would be inconvenient for transport and most bevelled-rim bowls are found near temple or administrative precincts. Beale proposes that they were presentation or votive bowls, harking back to some of the original interpretations. Other uses offered have been crucibles and curd separators. This question is quite important because the use of bevelled-rim bowls as ration bowls would mean that where bevelled-rim bowls were found, Uruk administrators were paying employees. If they are votive bowls, it could imply shared ideology or religion over large geographic areas.

The Uruk presence in southeastern Anatolia and the Deh Luran plain and Jebel Hamrin is characterized by the presence of the above mentioned artifacts of the Mesopotamian Uruk. The Uruk presence in southeastern Anatolia seems to have manifested in the Late Chalcolithic or Late Uruk. Probably the best example of an Uruk site to the north is Habuba Kabira. Unfortunately, I was unable to locate a detailed faunal report for this site. It appears that a large Uruk settlement was built over a small short-lived occupation. The Uruk settlement was pre-planned, urban, and included a number of large public buildings. Nearby Jebel Aruda is significantly smaller but was built on virgin soil
and centered on two large public buildings. Even domestic architecture at this site is very large. The surrounding area would not have been very productive agriculturally, which has led some to speculate that these two sites were Uruk administrative centers (Algaze 1993).

An Uruk presence appeared somewhat earlier on the Deh Luran plain and the Jebel Hamrin. By the Middle to Late Uruk, the Susiana plain had become "part and parcel" of the Mesopotamian world. This date can be roughly extrapolated to the Deh Luran plain, as it is geographically intermediate between Mesopotamia and the Susiana plain. These same dates are attested at Tell Rubeidheh in the Jebel Hamrin (Killick 1988). Similarities are noted between southern Mesopotamia and these sites in the east. There are typical Uruk pottery styles and other distinctive artifacts, including clay cones, tokens and bullae.

The Sites

Ras al Amiya

Ras al Amiya is a small site in central Mesopotamia that was discovered quite by accident. Located about five kilometers north of Kish, midway between the Tigris and the Euphrates, it was discovered while digging irrigation canals. In the summer of 1960, David Stronach excavated the area (Stronach 1961). The sides of the vertical cut of the canal were cleaned and excavated back along a distance of over 100 meters and one small, adjacent, horizontal trench was
excavated. The entire site is completely covered with alluvium. The highest point of the site is still 1.2 meters below the present surface. The excavators estimate the site to cover roughly 2.16 hectares in area (120 by 180 meters). Ras al Amiya appears to have enjoyed a short Ubaid period occupation. The faunal analysis was carried out by K. Flannery and I.W. Cornwall (Hole, Flannery and Neely 1969).

The pottery at Ras al Amiya illustrates the transition from the comparatively closely painted pottery of the Hajji Muhammed phase (=Ubaid 2) to the more sparsely decorated pottery of the later Ubaid (Stronach 1961:96) and it can be divided into three groups; heavy ware, ordinary ware, and fine ware (Stronach 1961:108-109). Slips are extremely common, as is burnishing. On some of the finest vessels, wall thickness is only 1.5 millimeters. Paint is of good quality in all these wares and an enormous variety of colors were used, but not together, so there is no true polychromy (Stronach 1961:109).

Because of the small area of exposure, there is no complete building plan, but something can be said about the architecture at Ras al Amiya (Stronach 1961). It is usually of tauf or pise, with some mudbrick found in level II. The buildings seem to be oriented in the same direction. Rooms are irregular in shape, that is, some are square, some rectangular and some oval. Features such as ovens and pits are located within buildings. Small finds include flint, stone and obsidian tools, a few bone tools, terra cotta spindle whorls, and the normal array
of household objects. However, there was no shell and there were no human figurines, although some animal figurine fragments of terra cotta were recovered. No clay sickles were found, but there were bent clay nails. Unfortunately, no grain samples or carbon (for radiocarbon dating) were recovered.

Tell el Oueili

Tell el Oueili, a village site located on the east bank of the Euphrates river in southern Mesopotamia, is the southern-most site examined here. The site was probably initially occupied around 5500-5600 B.C. (Huot 1989:23). The sequence at Tell el Oueili begins with the Ubaid 0 period and continues through the Ubaid 4 and Uruk periods. Excavations began under the directions of Huot in 1976 and Jean Desse is the faunal analyst.

From the beginning of the occupation at Tell el Oueili, houses are large scale constructions, 200 meters square and more in area, with complex, multicellular plans (Huot 1989:32). They are constructed of plano-convex mudbricks. Wall facings are sometimes daubed. Things seem to change more ceramically than architecturally through time at Tell el Oueili. In the early levels, pottery is diverse. Huot characterizes the early phase pottery as "rude" (1989:33-37). By the late Ubaid, however, the pottery is very different and more uniform. There appears to be a unification of pottery techniques and a standardization of painting procedures. The dominant designs are single or parallel horizontal
bands, and twisted handles are common (Lebeau 1983:38). There is also a relative increase in bitumen artifacts and fragments. The Ubaid 0 levels yielded only 4 samples of bitumen, which becomes common in the Ubaid 3 and 4 levels. The two sources of bitumen in the area are separated from Tell el Oueili either by marshes (Ain Qir) or by sheer distance (400 kilometers) in the case of Hit (Huot 1989:37-38). The source of the Oueili bitumen is unknown. Other small finds include anthropomorphic and animal figurines, stamp seals/amulets (geometric designs), and clay sickles (Lebeau 1983:50-55).

Huot (1989:39) argues for an economy based on the production and redistribution of cereals because of what he interprets as large public grain storage facilities. Stock raising and fishing were important. The primary plant grown was six-rowed barley, though some einkorn wheat was found (Huot 1989:26). One grain of flax and traces of date palm were found in the Ubaid 4 levels. The low relative abundance of wild animal remains indicates that hunting was of little importance (Desse 1985). In summary, Huot (1989:39) notes that exchanges with peripheral areas were minimal and apparently involved bitumen and obsidian.

**Tepe Sabz**

Tepe Sabz is located 7.5 kilometers south-southwest of the modern village of Deh Luran in southwestern Iran. Tepe Sabz was apparently originally almost
square, measuring about 120 by 140 meters (1.68 ha.), but roughly one third of the tell has been eroded away (Hole, Flannery and Neely 1969:50). Excavations indicate that the site is roughly 10.5 meters deep, extending about three meters below the current surface of the plain. It was excavated in 1963 by Frank Hole, Kent Flannery and James Neely, along with some other sites in the area. Roughly 260 cubic meters were excavated (my estimate). The site was occupied from the Sabz to Bayat phases, roughly corresponding to the Ubaid 0 through Ubaid 4 phases. Here we are particularly interested in the Mehmeh phase (4500-4100 B.C.) and the Bayat phase (4100-3700 B.C.). The faunal analysis was conducted by Kent Flannery.

There is some differentiation between the two phases. Ceramics in the Mehmeh phase overlap with phase C of the Susiana sequence and have strong ties with early Ubaid assemblages at Eridu and Ras al Amiya (Hole, Flannery and Neely 1969:361). By the Bayat phase, the pottery at Tepe Sabz falls squarely within the Ubaid tradition (Hole, Flannery and Neely 1969:364). Houses got bigger through time. Cultivated crops included 2-row and 6-row barley, free-threshing wheat, lentils, vetch, and flax (Hole, Flannery and Neely 1969:361). Representations of bows and arrows (Hole, et al. 1969:361), and a considerable quantity of gazelle bones, indicate that hunting played an important economic role. Characteristic Ubaid artifacts recovered at Tepe Sabz include bent clay nails, stamp and cylinder seals, and seal impressions.
Hacinebi

Hacinebi is a low mounded, 3.3 hectare site located on the east bank of the northern Euphrates in the Sanliurfa province of southeastern Turkey. The southern-most of the Anatolian sites considered here, it is located near an historic river crossing at Birecik. The climate is semi-arid and the landscape is predominantly rolling hills that are now deforested and support pistachio orchards. Excavations began at Hacinebi in 1992 and continue under the direction of Gil Stein of Northwestern University and Adnan Misir of the Turkish Ministry of Culture.

Hacinebi was occupied during the Late Chalcolithic period (3500-3000 B.C.). The site has both local and Uruk contact levels, referred to as pre-contact and contact phases. These levels are overlain by a Hellenistic occupation and some ephemeral evidence of a Roman presence. The pre-contact levels will be examined with the "Ubaid" sites, as they precede evidence of an Uruk influence.

The local Southeastern Anatolian ceramics are chaff-tempered and are represented by two types of pottery (Stein et al. n.d.) Coarse and medium wares are usually hand built and unevenly fired at relatively low temperatures. Wheel made fine wares are well fired and are represented by carinated bowls and small jars. Architecture in pre-contact levels is constructed of mud brick or undressed stone and is sometimes quite large and substantial. Other artifacts recovered at Hacinebi in the pre-contact phase consist of a clay sickle, a chlorite pendant
(exotic material) and a mold with small amounts of copper adhering to it (Stein et al. n.d.).

The appearance of Late Uruk pottery forms marks the contact phase, though local Late Chalcolithic (Amuq F/G) types continue. Typical Uruk forms found at Hacinebi include conical cups, ladles, red slipped wares, chaff tempered trays, storage jars and bevelled rim bowls. Late Uruk types such as 4-lugged jars with short necks, bottles with droop spouts and jars with twisted handles are rare. This could indicate a Middle Uruk date for the contact. The appearance of Uruk pottery coincides with a major architectural re-organization in the northeastern portion of the site, the area with the highest concentration of Uruk ceramics (Stein et al. n.d.). Niche and buttress buildings are present from the contact levels. Bitumen is also found in association with Uruk pottery. It is a southern product and is very rare in southeastern Anatolian sites in the Late Chalcolithic. Bitumen-lined pottery was not uncommon in the contact levels. Other distinctive southern artifacts recovered at Hacinebi include a bulla (1993 field season), tokens, Uruk style cylinder seal impressions, wall cones, and a numerical tablet (1994 field season). Additionally, Anatolian style stamp seal impressions have been found, indicating that there were local administrative activities.
Tepe Farukhabad

Tepe Farukhabad (referred to as Faruk in Figures 3-9) was a small center on the Deh Luran plain of southwestern Iran, occupied in the fourth millennium B.C. The mound measures roughly 190 by 140 meters (2.66 ha.) and rises some 30 meters above the present flood plain and 20 meters above sterile soil as determined by the excavations (Wright 1981:4). Excavations were conducted in 1968 and have uncovered materials from the Bayat phase (4100 B.C.) through the Uruk period to the Elamite and Partho-Sassanian phases (1300 B.C.). The total area excavated in that one field season was 520 cubic meters, of which 246.6 cubic meters were screened (Wright 1981:7, Table 1). The area of Tepe Farukhabad is desolate today, but it appears to have been wetter in the past. The presence of the Indian gerbil, which inhabits moist soils and dense stands of grasses, may be an indication of irrigated fields and/or a wetter climate (Redding 1981:259). The faunal analyst at Tepe Farukhabad was Richard Redding.

I have divided Tepe Farukhabad into two periods. The "Ubaid" period consists of the Bayat and Farukh phases. The other period is the Uruk. Buildings in the "Ubaid" period are of mudbrick and some walls appear to have been plastered (Wright 1981:17-22). The brick work is often haphazard, though there are examples of careful brick-laying. The walls generally face the cardinal directions and there is an absence of internal features (hearth, bins, pits). Room blocks are surrounded by long narrow alleys. One large, very clean, carefully
constructed building is located on a low platform. The buildings of the Uruk period are built of smaller bricks and the patterns of bonding are different (Wright 1981:76-84). No brick platforms were found under buildings, and there is no evidence of the compound walls and alleys or halls around room blocks that occurred in the Farukh phase. The rooms appear to be larger and contain features (bins, ovens, hearths, pits, burials). "Simple" and "elaborate" buildings are distinguished differently by Wright in the two periods. In the Bayat and Farukh phases elaborate buildings are marked by the workmanship of the walls and the presence of a platform. In the Uruk phases, "elaborate" buildings have thick walls, sometimes with additional embellishments.

Ceramics in the Bayat and Farukh phases are represented by a simple range of forms and a complex variety of painted designs (Wright 1981:23-42). Khazineh red ware is present in only one form, a medium sized, hole mouthed, globular jar. It is hand built and often exhibits black oxidized cores and black smudges on the exterior. Bayat red ware has a compact paste and there is only one vessel form, an open bowl. Burnished black ware is represented by fragments of small open bowls. The material is compact, reduced, and highly burnished. A fine black-on-tan ware is also present at Tepe Farukhabad. There are numerous examples of Susiana buff ware, the dominant ceramic type at the site. It may have been wheel made, and the firing was well controlled. There are various forms, and various sizes of bowls and jars.
Several types of ceramics are evident in the Uruk Period (Wright 1981:91-135). Sargarab ware is dominant in the beginning of the period and continues through the Middle Uruk. The temper is varied, from straw to crushed calcareous minerals. Likewise, technique, "quality", and forms vary. The earlier examples of Uruk ware are often coarse with traces of straw and calcite. Otherwise, the temper is sand and the firing is well controlled. It is mostly wheel made. The best known piece of Straw Tempered ware is the bevelled rim bowl. This is usually a coarse ware. First appearing in the Late Uruk, grey ware is tempered with calcareous material (sometimes mussel shells) and built from clay rings or slabs. Most of these vessels are jars.

Other artifacts from Farukhabad in the Bayat and Farukh phases include spindle whorls, a ceramic figurine, some sealing clay, two beads (one of calcite, one of faience), an alabaster ring fragment, a button seal (geometric) and a dozen bitumen artifacts or fragments of artifacts (Wright 1981:43-54). Miscellaneous artifacts from the Uruk period at Farukhabad include a painted stone ovoid, a bone stamp seal (Middle Uruk), clay sickle fragments, a clay cone, ceramic beads, animal figurines, a bulla, jar stoppers, and 24 bitumen artifacts.

The only cultigens recovered at Tepe Farukhabad are cereals and they date to both periods (Miller 1981:227-232). They are six-row barley, emmer wheat and einkorn wheat. An increasing dependence on barley may indicate increasing soil salinization.
Uruk

Uruk, or Warka, is the type site for the Uruk period. It is located on the east bank of the Euphrates in southern Mesopotamia, just upstream from Tell el Oueili. It is a very large site, covering some four hundred hectares by the Early Dynastic and roughly 100 hectares in the Late Uruk (Roaf 1990:59-60). Uruk has a long history of excavation (Boehmer 1991:465). The first excavations were conducted by W.K. Loftus in 1857. In 1912, Julius Jordan led an expedition, but was interrupted by World War I after only one campaign. Between the wars, eleven campaigns were conducted, beginning in 1928, under the joint directorship of J. Jordan, A. Noldeke, E. Heinrich and H.J. Lenzen. Excavations resumed in 1953 under the direction of H.J. Lenzen and continued until 1967. H.J. Schmidt was the director between 1967 and 1977. In 1980, R.M. Boehmer took over the excavations. The faunal analysis was done by J. Boessneck, A. von den Driesch and U. Steger.

Being the type site, all the characteristic Uruk features are present. The Eanna Temple complex consists of a number of public buildings with niche and buttress architecture, of tripartite plan and decorated with wall cone mosaics. The ceramics at Uruk consists of red slipped pottery, grey ware and characteristic Uruk forms, including conical cups and bevelled-rim bowls. Other diagnostic artifacts include so-called eye idols, cylinder seals, tokens and bullae, wall cones and tablets.
Tell Rubeidheh

Tell Rubeidheh was a small agricultural settlement that spanned the Middle and Late Uruk periods. It is located on a strip of land between the Narin River (a tributary of the Diyala) and the Jebel Hamrin (in Iraq) and was included in the Jebel Hamrin Salvage Project undertaken prior to the damming of the Diyala river. R.J. Killick conducted two short excavation seasons there in 1978 and 1979. The tell rises 2.8 meters above the plain and measures roughly 150 by 125 meters (1.9 hectares). Tell Rubeidheh receives barely 200 mm of rain annually, and is thus barely within the zone for rainfall agriculture. The soil is not particularly good and tends to be rocky, leading Killick (1988:3) to speculate that there must have been a greater reliance on animals than at other sites. No paleobotanical remains were recovered and water sieving was not employed, presumably due to time constraints. The faunal analysis was carried out by Sebastian Payne.

Ceramics at Tell Rubeidheh consist of Uruk Red and Grey wares, non-mass produced ceramics and bevelled-rim bowls (Adams and Mynors 1988:39-76). The ceramic assemblage of Tell Rubeidheh is essentially southern Mesopotamian in character. Bevelled-rim bowls appear to be the only mass produced pottery type, representing 40% of all diagnostic sherds. They are hand made of local clay, while most other pottery is wheel made. Non-mass produced wares have features which are generally considered to be temporally diagnostic. In the
Middle Uruk, these features consist of a rocker pattern, wedge and triangular impressions and finger impressed ribs, while in the Late Uruk, temporally diagnostic features include twisted handles, rim swellings, drooping spouts and cross hatched triangles. Together Uruk Red and Grey ware sherds form less than 10% of the ceramic assemblage from Tell Rubeidheh. There is some evidence of a small amount of imported pottery made from the alluvial clays of southern Mesopotamia.

Architectural remains at Tell Rubeidheh are poorly preserved and very fragmentary. Structures were built of mud brick and tauf, but they provide no clue as to the importance or function of the site. Small finds include baked clay and stone beads, spindle whorls, stone vessel fragments, stamp seals with geometric designs and two fragments of sickle (flint set in bitumen). Crawford notes that if bevelled-rim bowls are not viewed as ration bowls, there is "very little evidence for administrative activity, for craft specialization or for a stratified society" at Tell Rubeidheh (1988:137). It appears that Tell Rubeidheh represents a small, self-sufficient agricultural village of the Uruk period.

Hassek Hoyuk

Hassek Hoyuk is the northern-most of the Anatolian sites considered here. Located on the east bank of the northern Euphrates in the northwest area of the Sanliurfa province of Turkey, the settlement probably covered 350 by 150 meters
(5.25 ha.), before it was cut by the Euphrates. It was occupied in the Late Chalcolithic and Early Bronze Age. The excavations began as a salvage project in 1978. They were undertaken by M.R. Behm-Blancke of the Deutsche Archäologische Institut and continued in 1979 and 1980. The faunal analysis was done by J. Boessneck and A. von den Driesch.

Ceramics at Hassek Hoyuk include Amuq G wares and reserve wares. These appear to have been wheel-made and mass produced (Behm-Blancke 1981:17). Roughly 50% of the ceramics recovered from Hassek Hoyuk are Uruk types.

Buildings at Hassek Hoyuk are of mud brick, often with stone foundations. Both domestic and public architecture have enclosure walls. Small finds include stamp and cylinder seals, clay wall cones, clay tokens and an eye idol (Behm-Blancke 1981:24-25; Schwartz 1988:7). Schwartz (1988:11) classifies Hassek Hoyuk as a trading post or colony, along the lines of a karum of the Old Assyrian period.

Hayaz Hoyuk

Hayaz Hoyuk is a small tell located on the right bank of the northern Euphrates near the Kalburcu confluence in Adiyaman province of southern Turkey. It rises about 17 meters above the modern river bed. From north to south the tell measures roughly 60 meters, but the east to west dimension is
uncertain, as part of it may be covered by the modern village of Hayaz Koy (Roodenberg 1979). Hayaz Hoyuk was occupied from the Chalcolithic to the Middle Bronze Age and then again in the Byzantine period. It was excavated by J. Roodenberg, the director of the Netherlands Historical Archaeological Institute in Istanbul, from 1979 to 1983. The faunal analyst is H. Buitenhuis. The environment around Hayaz Hoyuk consisted of deciduous and mixed forest vegetation, though it is deforested today (Buitenhuis 1985:61).

The pottery from Hayaz Hoyuk is characterized by local materials with the occasional Uruk element. Local pottery has strong affinities with Amuq F and G. One bevelled-rim bowl was recovered, indicating some Uruk contact. Glenn Schwartz puts Hayaz Hoyuk in his category of local sites in the vicinity of Uruk trading posts or colonies (1988).

Comments

All of these sites can be seen to fit generally within the realm of typical sites for these periods. Ubaid pottery and architecture types are widespread, though the influence seems to be less pervasive than the later Uruk influence in the northwest and east. It is noteworthy that even in places where there is little Uruk pottery, there are bevel-rimmed bowls. The Uruk influence appears in the Late Chalcolithic (or Middle to Late Uruk) in the north and in the Middle Uruk in the east, in both cases during the second half of the fourth millennium B.C.
That all the later sites examined here have Uruk pottery is a function of the way they were selected and the way they are identified. To look at the Uruk expansion I wanted to look at Uruk sites. Uruk sites are identified primarily by pottery and architecture. There are sites in the east and particularly in the northwest during this time period with no Uruk material. Pottery types and southern artifacts are summarized in Table 3. Comparing the presence or absence of these southern artifacts and ceramics may shed light on the nature of the southern influence in both periods.
<table>
<thead>
<tr>
<th></th>
<th>Local wares</th>
<th>Southern wares</th>
<th>Artifacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ras al Amiya</td>
<td>(Southern Site)</td>
<td>Hajji Muhammed</td>
<td>clay nails, animal figurines</td>
</tr>
<tr>
<td>Tell el Oueili</td>
<td>(Southern Site)</td>
<td>Ubaid 0-4</td>
<td>bitumen, clay sickles, amulet/stamp seal, figurines</td>
</tr>
<tr>
<td>Tepe Sabz</td>
<td>Mehmeh Red-on-Red</td>
<td>Ubaid Tradition</td>
<td>clay nails, cylinder seals, stamp seal and impressions, copper pins</td>
</tr>
<tr>
<td></td>
<td>Susiana Plain Buff</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Susiana Black-on-Buff</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bayat Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farukhabad -</td>
<td>Susiana Red (dominant)</td>
<td>Ubaid Tradition</td>
<td>bitumen, sealing clay, figurine, &quot;button&quot; seal</td>
</tr>
<tr>
<td>Ubaid</td>
<td>Khazineh Red, Bayat Red, Burnished Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hacinebi -</td>
<td>Chaff-tempered (Amuq F/G-like)</td>
<td></td>
<td>clay sickle</td>
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<tr>
<td>Pre contact</td>
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</tbody>
</table>

Table 3a. Artifacts, and Local and Southern Pottery at the "Ubaid" or pre-contact sites examined.
<table>
<thead>
<tr>
<th></th>
<th>Local wares</th>
<th>Southern wares</th>
<th>Artifacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uruk</strong></td>
<td>(Southern Site)</td>
<td>Red and Grey ware</td>
<td>eye idols, cylinder seals, tokens, bullae, wall cones, tablets</td>
</tr>
<tr>
<td><strong>Farukhabad</strong></td>
<td>Sargarab ware</td>
<td>Uruk Grey ware</td>
<td>clay sickle, bulla, bitumen, clay cones, stamp seal</td>
</tr>
<tr>
<td><strong>Tell Rubeidheh</strong></td>
<td>(Southern Site)</td>
<td>Red and Grey ware, chaff tempered</td>
<td>beads, stamp seals</td>
</tr>
<tr>
<td><strong>Hacinebi</strong></td>
<td>Chaff-tempered (Amuq F/G-like)</td>
<td>Middle Uruk types</td>
<td>bitumen, wall cones, table, cylinder seal impressions, tokens, bulla</td>
</tr>
<tr>
<td><strong>Hassek Hoyuk</strong></td>
<td>Amuq G, Reserve, Red-Black Burnished</td>
<td>Uruk</td>
<td>stamp &amp; cylinder seals, clay wall cones, tokens, eye idols</td>
</tr>
<tr>
<td><strong>Hayaz Hoyuk</strong></td>
<td>Amuq F/G affinities</td>
<td>1 BRB</td>
<td></td>
</tr>
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</table>

Table 3b. Artifacts, and Local and Southern Pottery at the Uruk period sites examined.
5. FAUNAL ASSEMBLAGES FROM THE SITES CONSIDERED

Faunal reports on which this comparison is based range from species lists to in-depth analyses. All offer at least the raw numbers of domestic animal remains and some quantification of wild mammals and non-mammalian remains. I have had some difficulty in deciphering some tables and a few I have abandoned as totally nonsensical (e.g., Desse 1985:Table 1). In this section, I will not only summarize the faunal data from each site (see Table 4-6), but also any conclusions the analysts have reached.

It is necessary to discuss, briefly, how these taxonomic categories were formed. The OCG or *Ovis-Capra-Gazella* category includes all bones that could belong to any of these three genera, except bones that are identified as gazelle. The OCG category includes bones that are sheep, goat, sheep/goat and sheep/goat/gazelle. The pig and cattle categories include only those pigs and cattle that are domestic. The domestic category includes the three above mentioned categories, but not canids or equids. Only one site has domestic equids. Tell Rubeidheh has 78 equid bones, 36 of which appear to be domestic ass and do not appear to have been food debris. The wild equids present are presumed to be onagers. The wild category consists of possible food animals, such as deer, onagers, gazelle, wild pigs and goats, and hare. Carnivores are not included, nor are non-mammals. The numbers of non-mammals are small and
Ras Al Amiya (Flannery and Cornwall 1969)

Ras Al Amiya is represented by one of the smaller faunal assemblages of the sites that are examined here. A total of 194 bone fragments was recovered, perhaps due to the fact that the excavations at Ras Al Amiya were very limited. Of the 194 bone fragments recovered, 92 could not be identified. All of the identifiable bones were mammalian, with the exception of four river mussel (*Unio* sp.) shell fragments. The complete absence of bird and fish bones should be noted, but because of the limited excavation and exposure at this site, it should not be too surprising. The excavator mentions the inexperience of the workmen and the time constraints (Stronach 1961). Both of these factors undoubtedly guaranteed the absence of these categories of faunal material.

Domestic herbivores make up over 80% of the assemblage and cattle outnumber caprines, an unusual situation in the Middle East. The cattle were domestic. Very few caprine specimens could be assigned to either sheep or goat. Though no horn cores were found, the animals are presumed to be domestic. Today, wild ovi-caprids are not found within 150 kilometers of the site. It is interesting to note that cattle also predominate in the Ubaid levels at Eridu and Oueili, both southern sites. This pattern is not evident in any Uruk period sites examined here.
Tell el Oueili (Huot 1989; Desse 1986)

Tell el Oueili has been divided into two periods, 0-3 and 4. Both belong to the Ubaid period and the differences between these two periods are those of degree. From phases 0 to 3, 683 faunal specimens were recovered. This faunal report was of limited utility, as I find that the numbers do not add up (154 mammalian + 51 non-mammalian = 205 total, not 206). Of these, 205 were identified. Non-mammalian faunal remains included 39 splinters of tortoise shell, one lizard dentary, and 11 fish bones. Five of the fish bones were identifiable and all were caught in the spring. Desse notes that 4.6% of the mammalian faunal remains were from wild animals but does not give any raw figures or a list of the wild animals.

Domestic animals in the Ubaid 0-3 phases at Oueili consisted mostly of cattle (45.5% - NISP=68), followed by pigs (37.6% - NISP=55) and Lastly, sheep/goats (16.8% - NISP=25). In a discussion of the faunal remains, Huot (1989:27) notes that two thirds of the pigs are young. While this could indicate domestication, it is important to remember how easily young wild pigs can be captured. The cattle are all adults, and Huot offers the possibility of a concentration on dairy production (Huot 1989:27).

The faunal remains of the Ubaid 4 phase at Tell el Oueili are represented by 1486 identified (or total?) specimens, 508 of which were from mammals. The non-mammalian fauna consisted of "many" fish bones and amphibians. Of the
domestic animals present, cattle are most abundant (57.9% - NISP=294), followed by pigs (36.9% - NISP=187) and ovicaprids (5.6% - NISP=28). Huot notes that there is "no fundamental difference" between what we can observe and say about phases 0-3 and phase 4.

**Tepe Sabz** (Hole, Flannery and Neely 1969)

A total of 651 bones and bone fragments were identified, and 85% of all the bones recovered were unidentifiable. 25 Rodent bones (NISP=25) and red fox bones (NISP=10) were identified. The non-mammalian fauna includes four birds, three of which could not be identified to species. The fourth bone was from a heron, not strictly a winter visitor to the area. Reptiles were represented by 11 freshwater turtle bones and 10 lizard bones. One unidentified fish bone and 5 freshwater mussels shell fragments were recovered. Wild fauna consist of 50 gazelle bones and 15 onager bones. With the exception of one mandible in the Bayat phase, the pigs appear to have been wild. Of a total of five pig bones, 3 are possibly domestic and come from a single individual. The domestic fauna are dominated by ovicaprids (NISP=164). There is also an Ovis-Capra-Gazella category with 307 specimens. Cattle are represented by only 26 bone fragments. Additionally, 18 canid specimens were recovered.

The sheep to goat ratio appears to be about 50/50, though there were more goats in earlier periods. The fusion data for ovicaprids is based on a very
small sample. There are some articulated metapodials and phalanges, which indicate that feet may have been discarded as whole anatomical units (Hole, Flannery and Neely 1969:290-291). An even higher frequency of articulations occurs in young animals, and whole limbs of very young animals (4 to 6 months) were found articulated.

**Hacinebi** (Nicola 1994)

The sole northern representative of the pre-Uruk period is Hacinebi. From pre-contact levels 1225 fragments were examined: 410 were identified to genus (33%) and 343 were unidentified (Nicola 1994). The remaining 475 bones were identified only to "mammal" and to a size category. The only identified non-mammal specimen was a fish bone (genus unknown). Ovicaprids were most abundant (NISP=177), followed closely by pigs (NISP=110) and cattle (NISP=106). Wild mammals are quite rare and represented by gazelle (NISP=1), *Dama* sp. (fallow deer, NISP=1) and *Cervus* sp. (red deer, NISP=5). Five carnivore bones were found, including one canid and one ursid bone fragment. One rodent bone was identified. The ovicaprid mortality profiles and fusion data illustrate the presence of all age groups and suggest a generalized economy. Nicola (1994) notes that the data for cattle indicate management for dairy purposes.

The contact phase is represented by 1038 bones and bone fragments. Of
these, 313 were unidentified and 575 were identified as "mammal" and to size. In this phase ovicaprids were considerably more abundant (NISP=96) than pigs (NISP=32) or cattle (NISP=19). One equid bone was identified as onager. One canid bone and one cervid bone were also found. There is a near total absence of wild animals in this period.

The total absence of bird remains and the paucity of fish and rodent sized animals is most probably explained by recovery biases. While select deposits were screened, wet screening was not employed. There was not a great deal of rodent disturbance at the site, but one rodent bone seems rather low. The location of the site at the edge of the river makes the presence of only one fish bone seem odd. Because of its location, one might also expect to see some remains of water fowl.

**Tepe Farukhabad** (Redding 1981)

In the Farukh and Bayat phases the non-mammalian fauna include one unidentified fish vertebra and two reptile vertebrae. One bird bone was recovered, belonging to a cormorant (*Phalacrocorax carbo*), a winter visitor to the area. Wild mammalian remains include 10 rodent specimens, 3 *Vulpes* sp. specimens, 17 equid bones (presumably onagers), and 14 gazelle bones. The *Ovis-Capra-Gazella* category dominates the assemblage with 309 specimens. Only six bones could be distinguished as sheep and six as goat. Cattle are represented
by only 10 bones and pigs are completely absent.

In the Uruk levels, non-mammalian fauna include 2 fragments of a ray (possibly from the Tigris), 9 reptile specimens, 20 fish fragments and seven avian specimens. The reptiles are represented by 1 plastron of an unidentified turtle, 1 reptilian vertebra and 7 unidentified reptilian bone fragments. Of the 20 fish bones, one could be identified as a carp-like fish, *Varicorhins* sp. Three of the seven birds could not be identified. The other four were a moorhen (*Gallinula chloropus*), a pigeon/dove (*Columba* sp.), a gull (*Larus* sp.) and a passeriformes (songbirds). Wild mammalian fauna include 3 fox specimens, 10 gazelle bones, 78 onager bones, 2 fallow deer specimens (*Dama* sp.) and 2 rodent bones. There are 398 specimens categorized as *Ovis-Capra-Gazella* and 13 specimens could be distinguished as sheep and 16 as goat. Cattle are much less abundant with 12 specimens and pigs are completely absent. Canids are represented by 10 specimens.

Redding notes the absence of game animals. The fallow deer remains show no sign of butchery or cooking. Hares, jackals and wild goats might be expected as game animals in this area, but all are absent from the assemblage.

*Uruk* (Boessneck, von den Driesch and Steger 1984)

A total of 87 bones were identified. The non-mammalian fauna is represented by 1 unidentified bird, one fish (*Barbus* sp.) and two fresh water
mussel shell fragments \((Unio tigridis)\). The wild mammalian fauna consists of four wild pig fragments. Two equid bones may represent asses or onagers. Domestic animals are represented by 30 cattle bones, one domestic pig bones and 44 sheep/goat bones. Of the latter, 12 could be identified as sheep and four as goats. Two canid bones were recovered. Given the long history of work at the site, the sample from Uruk is astonishingly small.

**Tell Rubeidheh** (Payne 1988)

Roughly 800 bones were recovered at Tell Rubeidheh. The non-mammalian fauna from Tell Rubeidheh includes one mussel shell, one soft shell turtle specimen \((Trionyx euphraticus)\) and three monitor lizard bones \((Varanus sp.)\). No bird or fish bones were recovered. Wild faunal remains consist of one canid bone (possibly fox), 2 long eared hedgehog specimens \((Hemiechinus sp.)\), three rat sized rodent bones, and 18 gazelle bones. 93 bones were assigned to the \textit{Ovis-Capra-Gazella} category. Of 78 equid bones found, 36 were identified as domestic ass. Ovicaprid bones were most plentiful (NISP=550). The large bovid bones were in very poor shape (NISP=30), but it is likely that they represent cattle. Pigs are completely absent.

Some of the equid bones appear to be food debris and may be from onager. These bones differed from donkey bones that were found in articulation. Payne (1988) notes that this may indicate a difference in animal use. Goats seem
to have been relatively scarce (31 sheep to 2 goats). Most missing elements can be accounted for by destruction or non-recovery, with the possible exception of metapodials. It is possible that the feet were left with the skin and the skin may have left the site.

The fusion data on the ovicaprids confirms tooth eruption and wear data. Relatively few young animals were killed: only 16-18% animals were killed before two years of age; 35% of the animals died between 3 and 5 years; and 40% between 6 and 10 years of age. A discrepancy with the fusion data may indicate that castrates were present. One group of epiphyses (proximal humerus, distal radius, proximal and distal femur, proximal tibia) shows a higher proportion of unfused elements compared to the tooth wear data. The tooth wear data suggest that 21-23 percent of the animals were killed by 3 years, while the fusion data suggest 39-44 percent. This can be explained if the bones are from wethers or castrated animals, because these bones fuse later in castrates. Payne notes that this could indicate that sheep were kept for wool. Goats, on the other hand, may have been slaughtered earlier. Four of the five identified goat bones were from young animals, apparently consistent with the use of goats for meat or milk.

Payne (1988) notes that the bulk of the bones were recovered without screening, probably accounting for the paucity of small animal bones and the complete absence of fish and bird bones. Screening was conducted using 1 centimeter mesh on selected samples. This revealed that smaller species were
underrepresented, and Payne notes that figures for smaller species cannot be regarded as reliable.

**Hassek Hoyuk** (Boessneck and von den Driesch 1981)

A total of 3393 bones and bone fragments were recovered from Hassek Hoyuk, 3282 of which could be identified. Non-mammalian faunal remains include six bird bones, two unidentified fish bones, and 19 freshwater mussel shell fragments. Five of the six bird bones represent cranes (*Grus grus*). The other is unidentified. Wild fauna include two red deer specimens (*Cervus elephas*), one martin (*Martes foina*) and five hare specimens (*Lepus capensis*). The most plentiful domestic animal is the pig, with 2020 specimens. There are 485 sheep/goat bones, 84 sheep bones, and 164 goat bones. Cattle are represented by 495 specimens. Six specimens of domestic dogs were recovered.

The percentage of identified specimens seems very high, indicating that the sample may be biased. Goats and pigs were apparently more important in the diet than were sheep and cattle.

**Hayaz Hoyuk** (Buitenhuis 1985)

A total of 870 bones and bone fragments were identified from Hayaz Hoyuk. This represents 71.8% of the total number of bones recovered. Non-mammalian specimens include 13 freshwater mussel shell fragments and one bird
bone, belonging to a duck or goose. Wild faunal remains consist of two wild boar specimens, one possible wild goat bone fragment, a total of 11 deer or gazelle specimens and 2 hare specimens. Eight equid bones were found and are probably onager. The domestic fauna are dominated by sheep/goat (NISP=280). In addition to these, 26 specimens could be identified as sheep and 22 as goat. 49 pig bones were identified, as were 24 cattle bones. Two canid bones were also recovered.

There was a high degree of fragmentation among the sheep and goat bones. There seems to have been a trend towards smaller sheep and goats through time. Age estimates (by Buitenhuis) from complete or nearly complete jaws and single molars were used to establish mortality curves, indicating that no single age group was preferred. Cattle fall within the size range of domestic animals, and the sample of jaws was too small to provide any information on mortality. The pigs were probably domestic, and there seems to have been a slight preference for killing 2 to 3 year old animals.

There appears to be an extraordinarily large proportion of identifiable bones, which is usually closer to 30% or 40% for other sites of this period. This, in addition to the absence of fish bones and the scarcity of bird and small mammal bones, may indicate a biased sample. The sample is also quite small.
<table>
<thead>
<tr>
<th>NISP</th>
<th>total</th>
<th>BOS</th>
<th>OCG</th>
<th>SUS</th>
<th>CANIS</th>
<th>EQUUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oueili 0-3</td>
<td>206</td>
<td>68</td>
<td>25</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(154 mammal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oueili 4</td>
<td>1486</td>
<td>294</td>
<td>28</td>
<td>187</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(508 mammal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ras al Amiya</td>
<td>102</td>
<td>46</td>
<td>40</td>
<td>0</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(98 mammal)</td>
<td></td>
<td></td>
<td></td>
<td>(4 wild)</td>
<td></td>
</tr>
<tr>
<td>Uruk</td>
<td>83</td>
<td>30</td>
<td>44</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>LC Hacinebi</td>
<td>106</td>
<td>177</td>
<td>110</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Uruk Hacinebi</td>
<td>19</td>
<td>96</td>
<td>32</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Hassek Hoyuk</td>
<td>3262</td>
<td>495</td>
<td>733</td>
<td>2020</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Hayaz Hoyuk</td>
<td>379</td>
<td>24</td>
<td>280</td>
<td>49</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Tepe Sabz</td>
<td>651</td>
<td>26</td>
<td>521</td>
<td>3 (?)</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2 wild)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ubaid Faruk.</td>
<td>386</td>
<td>10</td>
<td>335</td>
<td>0</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>Uruk Faruk.</td>
<td>544</td>
<td>12</td>
<td>437</td>
<td>0</td>
<td>10</td>
<td>78</td>
</tr>
<tr>
<td>Tell Rubeid.</td>
<td>800</td>
<td>30</td>
<td>661</td>
<td>0</td>
<td></td>
<td>78</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(36 ass)</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. NISP of domestic animal bones from the sites examined arranged by geographic area.
<table>
<thead>
<tr>
<th>O/C/G</th>
<th>total</th>
<th>O/C</th>
<th>Ovis</th>
<th>Capra</th>
<th>Gazella</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oueili Ubaid 0-3</td>
<td></td>
<td>26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oueili Ubaid 4</td>
<td></td>
<td>28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ras al Amiya</td>
<td>40</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uruk</td>
<td>44</td>
<td>28</td>
<td>12</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>L.C. Hacinebi</td>
<td>191</td>
<td>177</td>
<td>11</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Uruk Hacinebi</td>
<td>106</td>
<td>96</td>
<td>8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Hassek Hoyuk</td>
<td>733</td>
<td>485</td>
<td>84</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>Hayaz Hoyuk</td>
<td>280</td>
<td>26</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tepe Sabz</td>
<td>521</td>
<td>164</td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Ubaid Faruk.</td>
<td>335</td>
<td>309</td>
<td>6</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Uruk Faruk.</td>
<td>437</td>
<td>398</td>
<td>13</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Tell Rubeidheh</td>
<td>661</td>
<td>550</td>
<td></td>
<td>93</td>
<td>O/C/G 18</td>
</tr>
</tbody>
</table>

Table 5. NISP of *Ovis/Capra/Gazella* from the sites examined arranged by geographic area.
<table>
<thead>
<tr>
<th></th>
<th>Wild</th>
<th>Domestic</th>
<th>Non-Mammal</th>
<th>Unk</th>
<th>Canid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oueili 0-3</td>
<td>7</td>
<td>147</td>
<td>51</td>
<td>477</td>
<td></td>
</tr>
<tr>
<td>Oueili 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ras al Amiya</td>
<td>9</td>
<td>84</td>
<td>4</td>
<td>92</td>
<td>5</td>
</tr>
<tr>
<td>Uruk</td>
<td>4</td>
<td>79</td>
<td>4</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>L.C. Hacinebi</td>
<td>15</td>
<td>393</td>
<td>1</td>
<td>343</td>
<td></td>
</tr>
<tr>
<td>Uruk Hacinebi</td>
<td>2</td>
<td>147</td>
<td>0</td>
<td>313</td>
<td></td>
</tr>
<tr>
<td>Hassek Hoyuk</td>
<td>7</td>
<td>3248</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hayaz Hoyuk</td>
<td>379</td>
<td>353</td>
<td>14</td>
<td>870</td>
<td></td>
</tr>
<tr>
<td>Tepe Sabz</td>
<td>67</td>
<td>192</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ubaid Faruk.</td>
<td>88</td>
<td>439</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Uruk Faruk.</td>
<td>31</td>
<td>331</td>
<td>38</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Tell Rubeidheh</td>
<td>60</td>
<td>709</td>
<td>3</td>
<td>(no birds or fish)</td>
<td></td>
</tr>
</tbody>
</table>
Even in sites beyond southern Mesopotamia southern influences are seen in both the Ubaid and Uruk periods (see Table 3). In the Ubaid period, it is marked by "Ubaid Tradition" pottery, or by characteristic southern artifacts, such as clay sickles or bent clay nails. Southern influence in the Uruk period is marked by Uruk Red or Grey ware, characteristic Uruk pottery forms (bevelled-rim bowls, conical cups, etc.), or other diagnostic Uruk artifacts.

There are many characteristic Uruk artifacts but they can be divided into a number of categories. Accounting, or bookkeeping, accoutrements include tokens, bullae, seals and their impressions, and tablets. However, some of these are multifunctional artifact classes and should be considered separately. Tokens and bullae appear considerably earlier than tablets. (Tokens are found as early as the eighth millennium B.C. and tablets do not occur until the Uruk period.) Seals and their impressions are not used solely for accounting purposes. Clay wall cones are used to decorate monumental buildings in Uruk sites, and should indicate the presence of temples or palaces decorated in a southern style. Eye idols (a.k.a. Hut symbols) are votive statuettes associated with temples. Their presence is taken to indicate widely shared ideology or religion.

Among the Ubaid or pre-Uruk sites examined here, only Hacinebi shows little southern influence (see Table 3). A clay sickle was found, though it would
seem to be superfluous in an area rich in flint. The faunal assemblage at Hacinebi in the pre-contact phase is only unusual in the sense that it is more balanced in terms of species than any other site, whether Ubaid or Uruk in date (see Figure 3). This could be referred to as a generalized pattern and may indicate less "government" influence or control over food production. With Uruk contact the percentage of sheep/goats increases quite dramatically (see Figure 4).

By definition, Uruk sites have Uruk pottery. Pottery and architecture are the primary defining factors of an Uruk site. The sites selected for this study were chosen because they were Uruk sites. Because of this, the mere presence of Uruk pottery can not be used to compare these sites with one another. However, a quantification of Uruk influence, based on the quantity of Uruk pottery and the presence of other Uruk artifacts, can be used as a basis of comparison. I have chosen to look at the percentages of Uruk pottery and the amount of bevelled-rim bowls, where this information is available, and the presence or absence of five classes of artifacts (eye idols, wall cones, seals and their impressions, tokens and bullae, and tablets) as shown in Table 7.

Hayaz Hoyuk stands out as the "least Uruk" Uruk period site, with only one bevelled-rim bowl (see Table 7). The faunal assemblage, however, does not stand out as unusual. It is, in fact, very similar to the faunal assemblage of Hacinebi in the contact period (see Figure 4). One might expect that less Uruk material would mean less of a "state" influence, which might affect the faunal
assemblage. However, this does not seem to be the case. Of course, the absence of Uruk influence does not necessarily mean a lack of complexity, as a local administration could be exercising its authority.

The faunal assemblage from Hassek Hoyuk looks very different from the other Uruk period sites, as the majority of the domestic animals are suids (see Figure 4). However, ceramics and other artifacts from Hassek Hoyuk mark it as a firmly Uruk site, lacking only the category of tablets (see Table 7). Due to the difficulties in keeping large numbers of pigs, one would expect to see smaller numbers of pigs with more centralization. This is not the case here.

Tell Rubeidheh is "less Uruk" relative to categories of artifacts, though Uruk pottery is fairly common at the site (see Table 7). The percentages of domestic animals at this site, however, do not seem unusual in comparison to Tepe Farukhabad, the other Uruk period site in the geographic region (see Figure 4), nor are there notable amounts of wild fauna (see Figure 5). Perhaps the paucity of characteristic Uruk artifacts is a function of the areas excavated, as the ceramics indicate an Uruk presence.

Site size does not explain variation in other data. The site sizes cluster between about two and five hectares, with the notable exception of Uruk at over 100 hectares. No groups can be separated out and looking at each site individually yields what seems to be a random pattern.
Earlier Ubaid sites seem to have nothing in common with one another, except their age. The two earliest sites are Tell el Oueili and Tepe Sabz (see Figure 2), which have very different faunal assemblages. Tepe Sabz lacks pigs, while they are abundant at Tell el Oueili (see Figure 3).

Hassek Hoyuk is an earlier Uruk site (see Figure 2) and has a very different faunal assemblage than the other Uruk sites examined here (see Figure 4). The two latest Uruk sites, Tell Rubeidheh and Hacinebi, are both characterized by a predominance of ovicaprids like all the Uruk sites, with the exception of Hassek Hoyuk. However, Tell Rubeidheh lacks pigs, which make up over 20% of the Hacinebi domestic fauna.

Wild faunal remains are present in all sites. In none of the sites considered here do wild fauna make up more than 17% of the mammalian faunal sample (see Figures 5 and 6). Those sites with over 8% wild faunal remains are Ras al Amiya and the three eastern sites, Tepe Farukhabad (Ubaid and Uruk), Tepe Sabz and Tell Rubeidheh. Ras al Amiya is represented by a very small sample, only 102 identified bones, so sample size may introduce a bias. Tell Rubeidheh is located in an area that is not particularly good for agriculture as the soil is rocky. Tepe Farukhabad may have been moister in the past, but irrigation may have been necessary. Representations of bows and arrows were found at Tepe Sabz. The southern sites are located on fertile agricultural land, and the northwestern sites are located in areas where rainfall agriculture is possible and
the land is good. It is possible that agriculture was more risky at these eastern sites and hunting was more important in the economy. Zeder (1994) notes that in marginal areas, economies tend to rely more heavily on wild resources as a means of risk management.

Among the domestic animals in the eastern sites, ovicaprids are much more numerous than any other species (see Figure 7). In all eastern sites considered here, they make up more than 94% of the faunal sample. In sites in other areas, ovicaprids do not make up more than 80% of the sample, and often considerably less than that. Of the eastern sites, only Tepe Sabz has any domestic pigs in the sample, and they only make up 0.6%. There are three domestic pig bones and they come from one individual. It is entirely possible that this pig is an anomalous wild individual. The other sites lack pigs, wild or domestic. Tepe Sabz also has the highest proportion of cattle, at 5.2%. It is possible that these sites were simply not within the geographical range suitable for pigs. These sites are in fairly arid environments. There seems to have been a strong commitment to herding ovicaprids and pig keeping is not compatible with a transhumant or semi-nomadic life style. Cattle may have been introduced domesticates, as there are no intermediate forms at Tepe Sabz (Hole, Flannery and Neely 1969:302). Pigs appear to have been introduced as domesticates in later periods at Tepe Farukhabad (Redding 1981:255). The predominance of ovicaprids could indicate that hunting in eastern sites was an opportunity to add variety to the diet.
If there is a southern pattern, it appears to be an abundance of cattle, and this holds regardless of time period (see Figure 8). Cattle make up more than 40% of the domestic faunal assemblages in all the southern sites. Tell el Oueili has the highest percentage of cattle in the Ubaid 4 phase, 57.8%. Flannery and Cornwall (1969:438) state in a footnote that there are also high frequencies of cattle in the Ubaid levels of Eridu. Ras al Amiya is the only southern site that lacks pig remains, although it should be recalled that Ras al Amiya has a very small sample size (102 identified bones) and the recovery techniques used there leave much to be desired. At Uruk, pigs are less common and oviscaprids are more common, making up the majority of domestic animals. Uruk also has very little reported animal bone and domestic pigs are represented by one bone (four wild pig bones were recovered as well). Roughly one third of the domestic faunal assemblage at Tell el Oueili is made up of pig remains, while oviscaprids are relatively few (17% in 0-3 and 5.5% in 4). Huot (1989:27) offers a swampy environment as an explanation of the abundance of pig remains at Tell el Oueili, and the non-mammalian fauna would seem to support this.

The northwestern sites examined here contain pig bones (see Figure 9). The only site with an appreciable amount of pig remains that lies outside the northwestern area is Tell el Oueili. Hayaz Hoyuk has the smallest percentage of pig bones in the northwest at 13.9%. In both pre-contact and contact periods, the
Hacinebi fauna is comprised of more than 20% pig bones. Hassek Hoyuk has the highest percentage of suid remains, over 60%.

There do not seem to be any overarching patterns in mortality profiles. Adult cattle at Tell el Oueili are interesting. This would be congruent with a herding strategy for draft animals. Another interesting situation is at Tell Rubeidheh, were the possible presence of wethers (castrated sheep) could indicate herd management for wool, a very important resource in later periods (Crawford 1973).

Sheep/goat ratios can be indicative cultural patterns, although the available information is very limited. There are two archaeological cases where goats outnumber sheep. At Farukhabad in the Uruk period, goats outnumber sheep, 16 to 13. The difference is greater at Hassek Hoyuk where goats outnumber sheep, 164 to 84. The only similarity between these sites is that they are both Uruk period sites. Elsewhere, the ratios of sheep to goats are often even, or very close to even, as they are at Farukhabad (Ubaid and Uruk), Hacinebi, Uruk and Hayaz Hoyuk. Martin’s (1987) work should be remembered here. There may well be a difference between the mortality profiles and the living herd. Such a mortality profile can, however, elucidate the utilization of different species.
Domestic Animals in Ubaid Period Sites

Figure 3
Domestic Animals in Uruk Period Sites

Figure 4
Wild and Domestic Animals in Uruk Sites

Figure 5
Wild and Domestic Animals in Ubaid Period Sites

Figure 6
Figure 7

Domestic Animals in Eastern Sites

- SUS
- OCG
- BOS
Domestic Animals in Southern Sites

Figure 8
Domestic Animals in Northern Sites

Figure 9
<table>
<thead>
<tr>
<th>Site</th>
<th>Uruk ware</th>
<th>Bevelled rim bowls</th>
<th>Seals &amp; Impres</th>
<th>Wall Cones</th>
<th>Tokens Bullae</th>
<th>Tablets</th>
<th>Eye idols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uruk</td>
<td>all Uruk</td>
<td>Present</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Tell Rubeidheh</td>
<td>Red &amp; Grey &lt; 10%</td>
<td>40%</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Farukhabad - Uruk</td>
<td>Grey ware</td>
<td>33%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hacinebi - Contact</td>
<td>Middle Uruk</td>
<td>Present</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Hassek Hoyuk</td>
<td>Uruk - 50%</td>
<td>Present</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Hayaz Hoyuk</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Table 7. "Urukness" of Uruk sites measured by frequencies of Uruk pottery, bevelled-rim bowls, seals and their impressions, wall cones, tokens and bullae, and tablets.
7. CONCLUSIONS

Some generalizations can be made about animal utilization at these sites, despite some obvious limits of the data set. The eastern sites considered here tend to have more wild fauna than the other sites, though wild fauna never predominate. Ovicaprids make up the majority of animal bones in eastern sites and domestic pigs are nearly completely absent. The southern sites have more cattle bones than other sites, whereas pigs seem to have been more important at northwestern sites. Patterns by geographic area appear to exist and are actually clearer than any other patterning. This should not be too surprising, as the environment would have a strong influence over the animals available and the ease of keeping particular species.

If Ras al Amiya is disregarded, the information available suggests that pigs become less important through time and ovicaprids become more so. This pattern may indicate that ovicaprids are more desirable in a more centralized economy. If they are to be produced in quantity, sheep and goats present the advantage of being easily herded for fairly long distances with relatively low water requirements. Cattle require more water and better forage. While ovicaprids would not require a great deal of direct management by a government, they can be contracted out to herders and this seems to have been the pattern in the Archaic period at Uruk, based on textual evidence (Green 1980). Cattle may have required a greater degree of management from a centralized institution.
(Zeder 1991:28-29). They cannot travel as far and often need supplemental forage. Cattle may not have been as important for meat as for other purposes, such as dairy and labor or draft. Indeed, the mortality profile of cattle at Tell el Oueili indicates that the majority of the animals killed were adults, which could indicate management of the herd for draft purposes (Huot 1989:27).

Sheep and goats are easily herded, thus moving them from one location to another is not too expensive or troublesome. This may have been a very important advantage to the reliance on ovicaprids. If animals were being produced outside the site and brought in, sheep and goats would be the most readily mobile domesticates available. Even if ovicaprids were produced and consumed within the site, their mobility would have been a great advantage in pasturing.

Because pigs are not easily kept in large numbers and are not easily herded, raising pigs at the level of an institution would not necessarily be profitable, while raising them as a household enterprise could be very beneficial (Zeder 1991:31). Evidence from Palestine indicates that pigs play a more important economic and dietary role in times of weaker political integration and relaxation of central control (Zeder 1990). In later periods, textual references to pigs are rare in Mesopotamia, but pig bones are found (Zeder 1991:31). This would seem to offer support for pigs as a "garden crop".
There are some sites with large quantities of pig bones. Tell el Oueili has already been mentioned. Hacinebi Tepe has a fairly high proportion of pigs in both periods (L.C. - 28%, Uruk - 21.7%). Pig bones are the second most numerous category at Hayaz Hoyuk, making up 13.9% of the domestic assemblage. Hassek Hoyuk stands out as unusual. Pig remains make up 62.2% of the domestic faunal remains, while ovicaprids make up 22.6% of the assemblage and cattle, 15.2%.

Behm-Blancke (1981), and Boessneck and von den Driesch (1981) offer no explanation for the abundance of pig bones at Hassek Hoyuk. It is the most northerly site examined here, but that hardly seems a sufficient explanation. Hassek Hoyuk seems to have been a fully functioning Uruk trading colony, exhibiting ceramic, architectural, glyptic and administrative Uruk artifacts. The possibility that it was less under central control than other sites seems counter-intuitive. Perhaps we are looking at a trading colony truly along the lines of karum Kanesh (Larsen 1987), where traders lived separately from the local population. Unfortunately, the spatial control necessary to examine this through faunal remains is lacking. Hassek Hoyuk does not fit the pattern we expect, nor the pattern we see.

It is interesting to note that the proportion of pig remains decreases over time at Hacinebi Tepe, while the frequency of ovicaprids increases. If Zeder's (1990) ideas and the evidence from the Levant hold true, this would indicate that
there was stronger central control in the Uruk period. If this were the case, Algaze’s (1993) ideas regarding the Uruk expansion would seem to hold true.

With the notable exception of Tepe Sabz, the domestic faunal assemblages of Ubaid sites have lower proportions of ovis caprids than do Uruk sites. The assemblages at Tell el Oueili, Ras al Amiya, L.C. Hacinebi Tepe and Ubaid Tepe Farukhabad all consist of less than 50% ovis caprids. With the notable exception of Hassek Hoyuk, all the Uruk period sites have faunal assemblages represented by at least 50% ovis caprid remains. At Hacinebi in the contact phase, there is a decrease in cattle and pigs and an increase in ovis caprids. While this is far from conclusive, it may indicate the strong influence of Uruk peoples on the local indigenous population. It is tempting and intuitively appealing to argue that increased dependence on ovis caprids and herding is the result of the Uruk Expansion.

However, the situations at the northwestern sites of Hassek Hoyuk and Hayaz Hoyuk may be indicative of the Uruk influence in that area. If an Uruk pattern does exist and it involves an increased reliance on sheep and goats, it is absent at Hassek Hoyuk, while the ceramics and artifacts indicate a strong Uruk presence. This could indicate that while there was an Uruk presence, it did not affect foodways. Perhaps there were no people actually from the south at the site. Perhaps the southern influence came from local people representing Uruk interests.
At Hayaz Hoyuk, the faunal remains exhibit the Uruk period pattern, but there is a paucity of Uruk ceramics and artifacts. Perhaps a reliance on ovicaprids is a general pattern of centralized organization of food production, rather than a pattern of the Uruk system in particular. If this were the case, one could argue that, though an Uruk administration was absent, a local government was controlling food production.

The patterns at both Hassek Hoyuk and Hayaz Hoyuk would appear to illustrate a less powerful Uruk influence, in contrast to the pattern at Hacinebi in the contact phase. This is counter to the ideas put forth in Algaze’s 1993 book. The Uruk influence seems to be less pervasive than he has postulated. This study also suggests that there may have been local administrative entities in the northwest which exerted the same kind of control that the Uruk state is hypothesized to have exerted. More information on the local Southeastern Anatolian sites could shed light on the situation there in the Uruk period. It would be necessary to look at some sites in the northwest that were not affected by the Uruk Expansion to see if there is an increased reliance on ovicaprids at "non-state" sites. While far from conclusive, this study suggests some directions for future work.
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