Herding Strategies at Neolithic Gritille

The Use of Animal Bone Remains to Reconstruct Ancient Economic Systems

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Introduction

The Neolithic period, spanning the 9th through early 5th millennia B.C., was a time of two fundamental and far-reaching changes in the Near East: the beginnings of settled village life and the first appearance of food production — the raising of domesticated plants and animals. Much anthropological study of early plant and animal domestication in the ancient Near East has focused on the question of origins; where, when, how, and why man first made the transition from hunting and gathering to food production. Although the problem of Neolithic origins continues to be a major research topic, it is equally important and challenging to study how these Neolithic food producing systems actually functioned once they were established.

Excavated animal bone remains from the Aceramic Neolithic site of Gritille in southeastern Turkey (Fig. 2) provide one way to investigate the ways in which animal herding or stock raising might have been practiced at this early village community. This discussion will attempt to answer three questions: 1) Which domesticated animals were herded at Gritille in the 7th millennium B.C.? 2) What were the herding strategies employed? In other words, how did the Neolithic villagers of Gritille raise their animals and shape the composition of their herds in order to obtain specific types of animal products? 3) Why did the people of Gritille continue to hunt, even after they had access to domesticated animals and domesticated crops as reliable sources of food? Examination of these problems provides an example of the ways in which excavated animal bone remains are used to reconstruct...
field work uncovered a 9000-year-long history of settlement at Grítile (Ellis and Voigt 1982; Voigt 1985; Voigt and Ellis 1981). The earliest occupation level at the mound, the focus of this paper, is a 3- to 4-meter-thick deposit of well-preserved houses, open areas, and associated artifacts dating to the 7th millennium B.C. (Fig. 3). This period of early agriculture and animal domestication is often called the Aceramic Neolithic, because it antedates the introduction of pottery in this part of the Near East. This phase at Grítile is thus contemporaneous with sites such as Çayönü in eastern Turkey and Pre-Pottery Neolithic B Jericho, in the Jordan river valley (see Fig. 2).

Excavations at Aceramic Neolithic Grítile have recovered stone tools, bone implements, clay figurines, and other objects that reflect the everyday activities of this early village (see Voigt 1985). In addition, approximately 80,000 fragments of animal bone were collected from the Neolithic levels as part of the Grítile Project's research emphasis on ancient economic systems. Preliminary studies of a small portion of this material (ca. 5000 fragments) have provided valuable information about the economic organization of early Neolithic village communities, specifically in relation to the three problems noted earlier.

Identification of Animal Domestication in the Archaeological Record

Determining which domesticated animals were present at Neolithic Grítile poses a basic but difficult problem. The first step is to identify the animals from their bones, and then determine whether these were wild or domesticated forms of sheep, goat, cattle, pig, or dog. Identification of many fragments is often difficult or impossible because the animal bones recovered in excavation are frequently small fragments eroded under millennia of later buildings, burnt, cooked, trampled, or gnawed beyond recognition by dogs in the ancient settlement (Fig. 4). The species present at an archaeological site can be identified by comparing the excavated bone fragments with the skeletons of modern animals of known species. Analysis of this sort, using comparative faunal collections of Neolithic inhabitants of the site appear to have relied far more heavily on land mammals than on aquatic resources (e.g., fish or mussels).

After identifying what animals were present at Grítile, the next step consists of determining whether the potential food animals—sheep, goats, pigs, and cattle—from this site were wild or domesticated. Domestication can be thought of as a process of increasing human control over animals so that they are kept captive, bred, and exploited for their products, such as meat, dairy goods, hides, or wool. After a certain amount of time, controlled breeding, feeding, and selective culling of animals resulted in changes of size, shape, and behavior of the newly domesticated livestock. In short, the early effects of domestication can be characterized as the eventual emergence of selectively bred sheep, goats, cattle, and pigs that were smaller, more docile, and considerably less intelligent than their wild counterparts.

Three types of changes in a faunal sample provide important clues as to whether or not an animal had been domesticated:

1) Reduction in size: Early domesticated animals are often smaller than their wild ancestors (Fig. 5).

2) This domestication-related size reduction appears in some teeth and
The third form of evidence for domestication is a change in the ages of the animals killed. Falling well below the 81-109 millimeter size range for wild cattle (Hole, Flannery, and Neely 1980:307), similarly, a fragmentary cattle first phalanx (toe bone) from Gritlelle has a maximum width of 24.68 millimeters, within the expected size range for a domesticated individual (Fig. 8c, Hole, Flannery, and Neely 1980:308, fig. 127). Measurements of other phalanges suggest that wild cattle continued to be hunted in addition to the herding of domesticated cattle.

Measurements of pig teeth seem to indicate that swine at Neolithic Gritlelle were at a very early stage of domestication (if they were domesticated at all). H. Stampfli's analysis of the pig remains from Cayotin suggested a series of tooth sizes that characterize domesticated versus wild pigs (Lawrence 1980:307). By these criteria, the five measurable second and third molars from Gritlelle fall just within the expected range for domesticated pigs; however, the measurements given in another study of pig domestication in the Near East (Flannery 1983:table 3) suggest that the Gritlelle Neolithic teeth fall within the range of the smallest wild pigs in the area. This ambiguity might be explained by suggesting that the pigs at Neolithic Gritlelle were in a very early stage of domestication. Clearly, we need a much larger sample of measurable teeth from Gritlelle in order to determine whether the pigs at this site were domesticated, transitional, or wild.

2) Morphological Changes: The second clue to domestication is a change in the shape of certain body parts. For example, in one of the characteristic genetic changes associated with domestication, the shape of goat horn cores shifts from a straight "scimitar" shape to a helically twisted or "corkscrew" shape (Figs. 6, 7; Hole, Flannery, and Neely 1980:276-278).

3) Cutting Patterns: The third form of evidence for domestication is a change in the ages of the animals killed. Herds of wild sheep and goats consist of mostly adult animals, with a relatively small percentage of young lambs or kids (due to the extremely high natural mortality rate from disease, predation, and adverse weather conditions in the wild). Since hunters would in any case want to bring home as much meat as possible, it would make sense for them to kill mostly full-grown adults. For these two reasons, an archaeologist finds large numbers of adult sheep and goat remains, it is likely that these animals were hunted (see, e.g., Hesse 1982).

If the sheep and goats were domesticated, we would expect to find mostly young animals. One major reason for this is that the Neolithic herders would have been selectively killing off or culling the young male sheep and goats, so that they would not compete for grazing and fodder with the more productive and valuable females. In addition, we would expect natural deaths from disease to affect young animals more severely than adults. In short, if a village had domesticated animals, the effects of natural mortality combined with the deliberate killing off of young males would result in a situation where the bones of young animals are very common in archaeological deposits at that site.

Thus, the presence of many adult animals suggests the hunting of wild sheep and goats, while the predominance of young animals (two years old or less) suggests the herding of domesticated animals. The age at which an animal was killed can be determined by examining either the fusion of bones (Fig. 8) or the eruption and wear of teeth (Fig. 9). The ages at which different bones fuse are known from studies of modern animals. Similarly, teeth erupt at specific ages and wear down at a more or less consistent rate. As a result, by examining the mandible (jaw bone) of a sheep or goat from Neolithic Gritlelle, we can give a relatively precise determination of the age at which it was killed, and a study of the sheep and goat mandibles from Gritlelle showed that more than 60 percent were young animals in the first year of life or less, and over 30 percent were less than one year of age. This strongly suggests that most of the sheep and goats of Gritlelle were domesticated.
different survivorship curve (see Payne 1975).

By examining the bone and teeth from an archaeological site, we can determine the age at death of the animals and reconstruct a survivorship curve for that herd. By computing the archeological survivorship curve with the survivorship curves for known products, we can make an educated guess at whether the ancient villagers were raising their animals to provide curds, kebab, or kilims (woolen textiles). Figure 11 shows the reconstructed survivorship curve for Neolithic Grille. The ages of the sheep and goats fit very closely with the kind of culling or kill-off pattern we would expect if these animals were being raised mainly for their meat (Fig. 12). As yet, the analyzed sample of cattle remains from Neolithic Grille is still too small to allow for any reconstruction of the herding strategies followed.

**Hunting by Herders**

Having examined domesticated herds, we can now turn to the third question: Why did the people of Grille continue to hunt, even after they had domesticated animals and crops as reliable sources of food? In trying to answer this question, it helps to look at two very different sets of schedules: 1) the seasonal cycle of agriculture and herding, and 2) the seasonal cycle by which wild animals such as deer or mountain goats migrate from summer to winter grazing areas. Briefly, these schedules suggest that the villagers hunted in the winter and relied much more on domesticated crops and animals for the rest of the year (Fig. 13).

The production of domesticated crops and animals in the Near East follows a consistent seasonal round. In southeastern Turkey, cereals are planted in October or early November, and harvested in June or July. In the herding cycle, sheep and goats are born in the winter, usually in the period from January to March. For both the agricultural and herding cycles, winter is the time of greatest uncertainty. The villagers do not know how the crops will survive, or how long they will have to live off their stocks of stored grain. For the herds, the winter birthing season is a particularly risky period because it is a time when the newly born lambs and kids are particularly susceptible to disease and relatively harsh weather conditions. In short, winter is a time when farmers and herders are extremely reluctant to consume their stored crops or animals because they do not yet know how well the next harvest will turn out or how well their herds will survive the winter birthing season. The seasonal cycle of wild animals, however, would have provided a valuable added resource to the Neolithic villagers of Grille.

**Herding Strategies**

Given that domesticated sheep, goats, cattle, and (possibly) pigs were present at Grille, can we now look at the second question posed at the beginning of this discussion: How did the Neolithic villagers of Grille raise their animals and shape the composition of their herds in order to obtain specific types of animal products? In other words, what type of herding strategies did they employ?

Sheep and goats can yield a variety of different products, such as dairy goods, meat, or fiber (wool or goat hair). The ideal herd composition differs for each of these production goals. For this reason, depending on whether the herder wants to emphasize dairy, meat, or fiber production, he would shape the age and sex composition of his flock in a different way. Graphs that plot the number of animals born at each age are called survivorship curves. The different culling patterns for each production goal will generate distinctive survivorship curves for dairy herds, wool herds, or herds raised mainly as a source of meat (see Fig. 10).

For example, with dairy production the males would be culled at a very early age (up to 8 months old), since they have no milk-producing potential and are not used for meat. In contrast, in meat production males would be culled later in life (at about 15 to 24 months old) when they begin to reach optimum meat weight. In wool production, males would be castrated and retained in the herd, resulting in a completely different survivorship curve (see Payne 1975).
resource to the Neolithic villagers of Gritle at just the time when it could provide the greatest benefit—in winter. Animals such as red deer, fallow deer, wild goats, and wild sheep have a fairly predictable seasonal migration in which they spend summer in the uplands and winter in the lowlands (Fig. 14).

Gritle is located along the Euphrates in the largely snow-free flood plain, while the neighboring mountains and plateau are snow-covered in winter (Fig. 15). In a situation like this, deer, wild goats, and probably wild cattle, as well, would have come out of the hills into the Euphrates river valley as a prime winter grazing area. In other words, every winter these wild animals would have been coming straight towards Gritle at precisely the time when the villagers were most reluctant to consume their domesticated animals or stored crops. If this suggestion is correct, then hunting emerges as an important part of the Neolithic economy—it would have provided an easily available and fairly reliable source of food that could be used each winter until the villagers had a better idea of how well their crops and herds would survive and produce that year.

**Conclusion**

The animal bone remains from Gritle suggest that the Neolithic villagers there herded domesticated sheep, goat, cattle, and (possibly domesticated) pigs as a source of meat for the spring, summer, and autumn. In winter, however, they may well have depended much more on hunting the deer, wild cattle, and wild sheep or goats that migrated down from the highlands into the Euphrates river valley.

When we consider the Neolithic economy at Gritle as a carefully scheduled combination of cropping, herding, and hunting, the picture that emerges depicts a seasonal cycle of alternating bounty and scarcity, conservatism and willingness to consume. In this view, the Aceramic Neolithic villagers of Gritle were people who knew their environment and exploited it in a variety of ways with great ingenuity.