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Faunal Analysis—A Tool for Early Historic Research

Investigators working with paleolithic and neolithic collections have demonstrated the value of a careful and detailed analysis of faunal material found in the archaeological context. Studies of animal remains from such sites as Mount Carmel [1] and Jericho [2] have contributed crucial data to our understanding of life in the ancient Near East. However, recent advances in the method and theory of faunal analysis indicate that this avenue of investigation should not be limited to earlier periods.

Many questions archaeologists should ask can frequently be answered by applying these techniques. Faunal analysis is often helpful in verifying textual references to herd composition and husbandry practices. The problem of establishing the congruence of written sources with actual cultural patterns can be approached only by recourse to concrete data, of which animal bones comprise a vital portion. A knowledge of the range and distribution of the various wild and domestic species is basic to the identification and interpretation of animals portrayed in graphic or plastic arts. The ibex, for instance, is frequently said to appear in a variety of representations occurring far outside its range of antiquity.

Although the domestication of the major food animals (sheep, goats, cattle, and pigs) had been accom-

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[1] D.M.A. Bate, "The Fossil Fauna of the Wadi el-Mughara" in D.A.E. Garrod and D.M.A. Bate, The Stone Age of Mount Carmel, Vol.I, Part 2 (Oxford, 1937), pp. 136-240.

[2] Ann Grosvenor-Ellis, "Report on Equids in Tomb J-3" in K.Kenyon, Excavations at Jericho, Vol.I (London, 1952), pp. 535-536.

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plished prior to the beginning of the Protoliterate Period in Mesopotamia,[3] information is sadly lacking about the appearance of the equids, camelids, and gallinaceous birds. Apparently data on these animals and their domestication is available only from levels dated after 3000 B.C.

Of basic interest to an excavator in his reconstruction of life at a site are the uses of each species and the relative dietary importance of each species, whether hunted or husbanded.[4] These factors can be discussed only on the basis of a vaild sample of faunal material, which in turn depends on the size and character of the recovered collection of bone.

A valid collection is one which contains all of the faunal material recoverable from each archaeological level or unit about which information is desired. The bulk of the material available from any identifiable or culturally significant level in a typical early historic settlement probably would render impractical an attempt to collect all bones. In order to avoid gross over-representation of larger bones and larger animals and to insure valid statistical treatment, specific portions of each level should be selected and excavated so that the following criteria are met. First, all material from the selected areas must be recovered, using a sifting technique and, if possible, the flotation process. Second, no less than 1000 identifiable specimens should be recovered.[5] Third, it is essential that the areas selected for intensive analysis be culturally and functionally comparable. Comparing bones or any other artifact from a Level I temple to those from a Level II garbage pit is hardly useful. It should not be assumed from the above that only bones in the selected areas are to be collected, for the chance of recovering a specimen from an animal the ancients rarely encountered can only be increased by making a collection as complete as possible.

Unfortunately, there are almost no zoologists who are prepared to interest themselves in archaeological

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3D. Perkins, Jr., "Prehistoric Fauna from Shanidar, Iran," Science 144 (June 26, 1964), pp. 1565-1566; F.E. Zeuner, "The Goats of Early Jericho," PEQ 1955, pp. 70-86; D. Perkins, Jr., "Fauna of Çatal Hüyük: Evidence for Early Cattle Domestication in Anatolia," Science 164 (April 11, 1969), pp. 177-179; C.A. Reed, "Osteological Evidences for Prehistoric Domestication in Southwest Asia," Zeitschrift für Tierzuchung und Zuchungsbiologie 76, Heft 1 (1961), pp. 31-38.

4P. Daley, "Approaches to Faunal Analysis in Archaeology," American Antiquity 34 (1969), pp. 151-152.

5Oral communication from D. Perkins, Jr.

problems, and those who do[6] are frequently ill-equipped to ask the right questions. The task thus most likely becomes the excavator's. The crux of the problem can be summed up thus: Animal bones in the archaeological context are artifacts, i.e., they owe their presence in archaeological deposits to human activity, and the determination of this ancient activity is the specific province of the archaeologist. Fortunately, at most Near Eastern sites, the outlines of this activity are not particularly difficult to establish. The number of species which are important in the ancient economy is usually small, and learning the identification of their bones is no harder than mastering a pottery sequence.

Once the samples have been collected, the specimens are recorded in some convenient form according to their elements. An element is a minimum portion of a bone that makes possible the identification of the whole bone of which it is a part. If multiple elements appear in a single specimen, each element must be dealt with in terms of the entire collection. The character of the entire collection will determine the importance of each type of element recovered and indicate the appropriate assessment of it. If, in a given collection, evidence for the horse metapodial consists almost exclusively of the distal end, the occasional occurrence of a complete bone with its multiple elements would be anomalous, and a statistical adjustment would be required to determine the proper proportion of the entire collection assignable to the horse metapodial.

"Element" as defined above does not necessarily imply that species can be determined. The number of element types diagnostic for a species will vary from collection to collection depending on the species present. If preliminary study shows that the only species present are cattle and sheep, then almost any bone fragment, whether containing an element or not, will be attributable to one or the other species simply on the basis of size.[7] However, if red deer and goats occur in addition, the number of elements which can be used to catagorize the specimens

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[6]Daley, op. cit., p. 147.

[7]I.W. Cornwall, Bones for the Archaeologist (London, 1956), p. 191.

according to species drops dramatically. It is difficult to distinguish sheep from goats[8] or cattle from red deer[9] because there are fewer diagnostic elements available for these separations.

Once the initial identifications of bone and species have been made, the survival pattern of the various elements in the skeleton of each species should be determined. The frequencies of archaeologically recovered elements usually do not mirror the expected frequencies, which are based on a multiple of the elements found in an individual animal. This distortion is due to the fact that some bones are less resistant to the chemical and mechanical pressures of deposition than others and because human behavior may alter the way in which the various bones are deposited. Therefore, for each archaeological unit the "archaeological animal" must be defined. The archaeological animal is composed of that set of element types which best represents the relative frequency of all species in a particular context. This set of element types is determined by an examination of the frequencies of all elements and will be those which survive equally in all species and appear to be unaffected by cultural selection. For instance, if the astragulus (knuckle bone) is the most commonly recovered element for sheep, it might not be useful for determining the relative frequency of sheep because it was frequently used as a gaming piece by ancient cultures and thus might be over-represented.

It is very important to remember that, once the list of species present has been established and the economically important animals determined, the objective of this analysis is to develop a value for the relative proportion of each species in the collection. Few excavations can hope to unearth more than a fraction of the total debris deposited or discarded by an ancient people, and the collection, as defined above, is only a sample of that fraction. Therefore, the number values assigned to each species do not have any real meaning themselves as to an absolute amount of livestock or protein available to the ancient inhabitants. Further, these values are not a representation of the herd at any one point in time. They are indicators of the relative proportion each species contributed to a sample of the total amount of dead animals available to a group of people

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[8] B. Lawrence, "Evidences of Animal Domestication at Cayönü," Belleten, Türk Tarih Kurumu, in press.

[9] Oral communication from S. Bökönyi.

over a specific period of time. The relative proportions within the herd necessary to produce the observed proportions of slaughtered animals can only be understood with reference to the pattern in which the individual species were dispatched. Reducing a sample derived from material deposited over a period of time to a model of what is necessary at any one point in time to produce the sample recovered is tricky at best. The following style of analysis[10] produces the relative proportion of dead animals available for cultural use over a period of time. This is not an empty piece of data, for the definition of an archaeological unit depends on the consistency of human behavior over a space-time frame. Thus, the accuracy of the values determined for each species is only as good as the sample is representative of the results of human activity.

The chart (p. 44) is a simplified model of the analysis of a collection. Sheep, goats, cattle, and pigs have been selected because they are the most frequently encountered domestic food animals in the Near East. Line 1 is the number of elements (not specimens) assignable to each species, given the spectrum of animals in the collection. If there is an extreme paucity of material and if the length of occupation of the unit is long, each specimen might reasonably be said to represent an individual;[11] then these figures might be the best estimate of the proportions of animals available. This is rarely true in early historic sites, so a series of adjustments is required to correct for different patterns of use and the variations between the skeletons of the species.

Line 2 is the number of elements that constitutes the archaeological animal. This is the set of element types that are equally well represented among the species and are thus least susceptible to variations in cultural behavior. Line 3 indicates the number of actual elements present in one individual of each species implied by the archaeological animal. Certain element types have several expressions in the same animal that are not easily separated, and the number of expressions for each element type is not the same for all species. As in this example, if the

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[10] D. Perkins, Jr., and P. Daley, "A Hunter's Village in Neolithic Turkey," Scientific American 219 (Nov. 1968), pp. 97-106.

[11] Bearing in mind different butchering practices based on the size of the animal and the distance of the kill from the point of consumption--the Schlepp Effect. Perkins and Daley, op. cit., p. 104.

archaeological animal is defined by the first phalanx, the third phalanx, and the distal metapodial, the investigator must remember that these foot bones are rarely specified as to right or left, front or back, and that pigs have more bones in their feet than sheep, goats, or cattle.

A Simplified Faunal Analysis

Sheep	Goats	Cattle	Pigs
300	250	100	450
3	3	3	3
20	20	20	48
80	100	40	100
4	5	2	2.08
77 lbs.	77 lbs.	1000 lbs.	220 lbs.
308	385	2000	457.6

Line 4 is the number of elements in the collection determined by the archaeological animal. Dividing Line 3 into Line 4 gives the relative frequency, Line 5, of each species in the collection. Line 6 is an estimate of the amount of meat available from an individual of each species.[12] Multiplying this figure by the relative frequency gives the proportion of meat available from each species relative to each of the other species and thus a picture of the slaughter pattern produced by the occupants (Line 7).

The above analysis implies that the dead animals were used in the same fashion, i.e., they were eaten. If art, texts, or an examination of the age classes of the animals (age at death, not herd composition) indicate otherwise, then further interpretation is necessary. The above method is not changed, however, as it produces a picture of the harvest not dependent on the use of each species.

As work on the collection proceeds, other data should be recorded. Age classes should be gathered for the reason mentioned above. Measurements should be recorded so that the morphology of each species can be investigated. Butchering technique can be inferred from cut marks on the specimens.[13]

To sum up, faunal remains are a valuable portion of the archaeological record, one which is partic-

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[12] Ibid., p.100.

[13] J.E. Guilday, P.W. Parmalee, and D.P. Tanner, "Aboriginal Butchering Techniques at the Eschelman Site (36La12), Lancaster County, Pennsylvania," Pennsylvania Archaeologist, Bulletin of the Society for Pennsylvania Archaeology, Vol. 32, No. 2 (1962), pp. 59-83.

ularly sensitive to patterned social behavior. The scheme in which bones are deposited provides insight into a basic part of the activity of ancient man. It would be a serious mistake for the scholar to ignore faunal material or to relegate to it a second-class status. The study of ancient life cannot afford to avoid the basis upon which that life depended, and faunal analysis provides an important tool by which this basis can be understood and evaluated.