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John R. F. Bower
Iowa State University

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Culture, Environment and Technology: Preliminary Results of an Archaeological Study in Kenya

JOHN R. F. BOWER

Department of Sociology and Anthropology, Iowa State University, Ames, Iowa 50011

During 1975-6, extensive data were collected on late prehistoric cultures in the Central Rift Valley, Kenya, and adjoining regions. A stratified archaeological survey was conducted in an area of about 22,000 km² centering on the Naivasha and Nakuru lake basins. The area was divided into 20 units (strata) defined by elevation and precipitation, and approximately 5% of each unit was targeted for survey. Although the study was aimed primarily at later stone age cultures, no stage of prehistory was excluded from the survey, and the data also reflect earlier stone age and iron age cultures. Just over 100 sites were located, and test excavations were conducted in 9 of them. A preliminary analysis of the survey materials and excavated data provides interesting insights on settlement behavior, technology, and culture history.
INDEX DESCRIPTORS: Kenya Rift Valley, prehistory, cultural ecology, archaeological survey.

From August, 1975, to September, 1976, I co-directed an archaeological expedition in Kenya organized by Dr. Charles M. Nelson of the University of Massachusetts, Boston. The project was one of the more ambitious recent archaeological undertakings in East Africa; it included 4 professional staff (2 archaeologists and 2 geologists), 9 students from the University of Massachusetts, about 10 students from universities in Kenya, numerous volunteer students from Canada, England and the United States, as many as 50 laborers and 4 vehicles. Its primary objective was to attempt to determine the nature of long-term interactions among cultures and environments in the Central Rift Valley of Kenya (Naivasha and Nakuru lake basins) and neighboring regions during approximately the past 10,000 years.

The temporal/spatial universe of inquiry was especially well suited to the issues at hand. The area investigated is an extremely complex ecological mosaic, with topographic relief in excess of 8000 ft (about 2430 m) and precipitation ranging from less than 600 mm to more than 1600 mm. Moreover, it has experienced marked environmental fluctuations during the past 10,000 years; in particular, the lakes in the Nakuru and Naivasha basins retreated from former high stands up to 200 m above present levels to essentially their modern levels between about 10,000 and 4,000 years ago. The retreat of the lakes was probably related to an environmental change of even wider geographic significance — a shift to a markedly drier climatic regime that affected much of tropical Africa. In addition to such environmental change, major cultural transformations occurred in the universe of inquiry; the most important of these was a change in subsistence practices from hunting and gathering wild foods to producing domestic foods (raising livestock and perhaps also domesticated plants).

The project included a number of discrete, but related, research enterprises and resulted in the collection of a wealth of data, much of which is still undergoing analysis. A tentative description of our results to date is forthcoming (Bower *et al*, n.d.); here, I would like to report briefly on some patterns which have very recently begun to emerge from the data produced by the two enterprises for which I had primary responsibility: 1) a stratified archaeological survey and 2) a program of test excavations.

STRATIFIED ARCHAEOLOGICAL SURVEY

The survey encompassed an area of about 22,100 km² and included two basins of internal drainage (lakes Naivasha and Nakuru) and part of another (Lake Bogoria) on the floor of the Gregory Rift, the escarpments on each side of the Rift and adjoining regions of high elevation — the Nyandarua (or Aberdare) Mountains on the east and the flanks of the Mau Escarpment on the west (Fig. 1). Some idea of the scale of the survey can be obtained from the fact that the area involved is greater than the combined areas of Connecticut, Delaware and Rhode Island.

As I indicated earlier, the region is one of impressive environmental diversity; often, lateral changes in environmental variables are very abrupt. Since variability in precipitation and elevation could be mapped at a useful scale, I used a combination of contours and isohyets to define 20 strata (or ecozones; Fig. 1 and Table 1). I then targeted approximately 5% of each stratum for foot survey by plotting a scatter of quadrilateral areas (Reconnaissance Areas) more or less randomly throughout its geographic distribution. Forty-three such areas were outlined, but only 31 were ultimately surveyed. Nevertheless, the average sampling intensity for the ecozones (Table 1, Column 6), ignoring the (extremely anomalous) value for ecozone 3a, was 5.35%.

A detailed description of survey procedures would be out of place here. Suffice it to note that members of the survey parties walked linear transects at intervals ranging from about 10 to 100 m, but were usually spaced 20 to 40 m apart. All types of terrain were covered and, when caves, rockshelters, rock cairns, or other promising features were evident at no great distance from a transect (within 1 km of the line of advance), detachments were sent to examine them.

One hundred and two sites were located and designated; they included everything from very early stone age to iron age cultures, but the vast majority (probably more than 75%) of the sites represented recent (10,000-2,000 years ago) stone age cultures, and many of these (perhaps half) reflected pastoral economies. In addition to designated sites, we recorded 119 find spots (Collection Loci) — places where cultural debris was present, but in such limited quantity that we could no confidently infer prehistoric occupation. Some of the Collection Loci undoubtedly represent casual abandonment of material away from an occupation area; however, it is entirely likely that some represent very poorly exposed habitation sites.

Analysis of the survey data has not progressed sufficiently to permit detailed and/or conclusive observations, but a few tentative generalizations can be drawn.

1. There seem to be marked differences in geographic preference among stone age and iron age cultures. The stone age sites are heavily concentrated in ecozones 3c, 3d and 3e, while iron age sites are more or less evenly distributed among all of the ecozones. The difference suggests that iron-using technology may have facilitated (or even required) greater geographic "plasticity" than was true of stone-using technologies.

2. Marked differences in maximum dimensions of sites were observed, those representing pastoral economies (whether stone age or iron age) having much larger average values than those representing stone age, hunting-gathering cultures. The data on maximum dimension are as follows:

1. Stone age hunter-gatherer sites
   $\overline{X}$ = 118 m, range = 30-300 m (N=32)
2. Stone age pastoral sites
   $\overline{X}$ = 156 m, range = 30-650 m (N=40)
3. Iron age pastoral sites
   $\overline{X}$ = 162 m, range = 40-500 m (N=10)

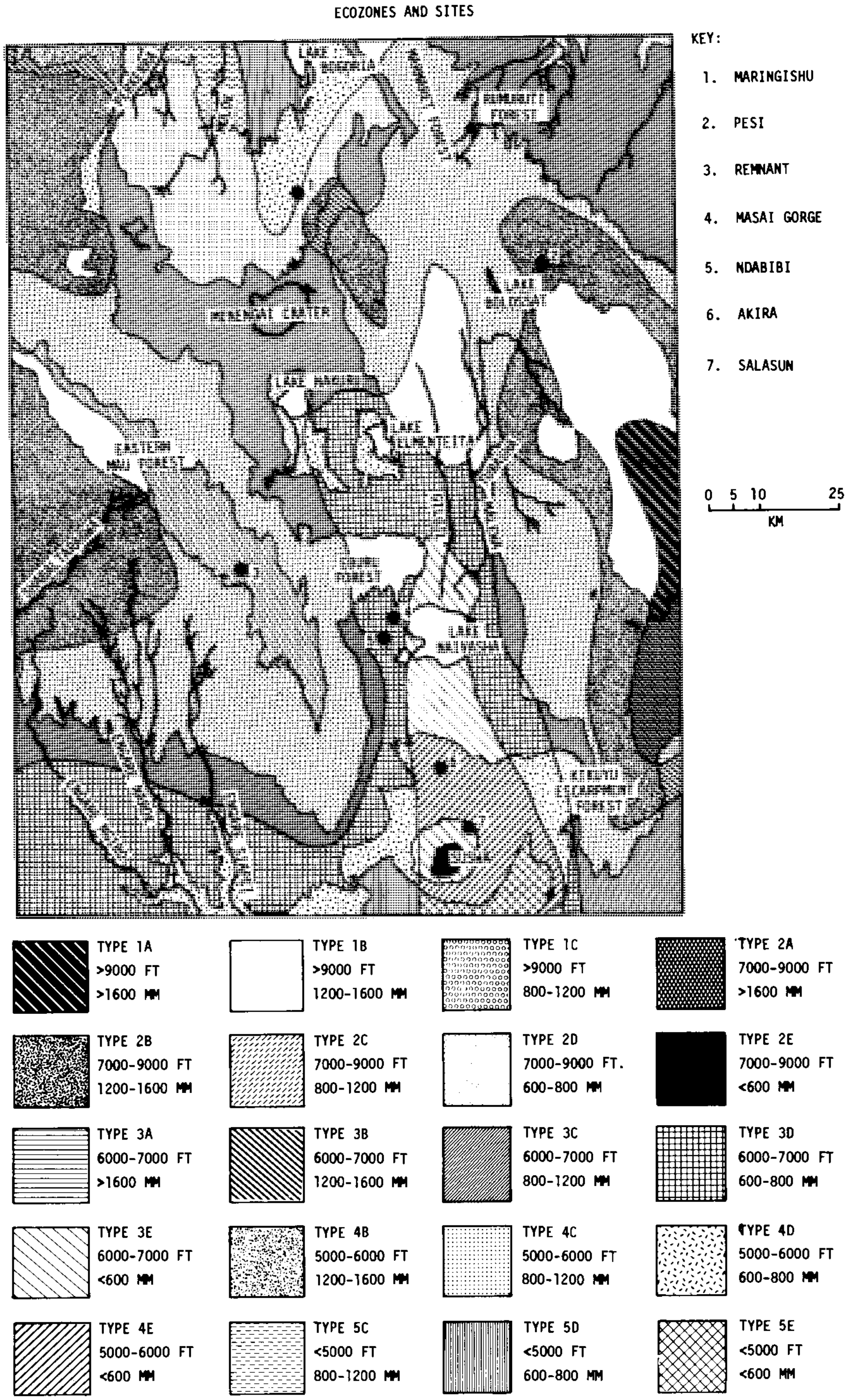

Figure 1. Ecozones and sites

It is evident that, not only are the mean values higher for the last two categories of sites, but they also are nearly equal to one another.

Moreover, the high end of the range in categories 2 and 3 above is substantially higher in each case than it is in category 1. Assuming a reasonably close correlation between population and settlement size, it seems that local residential groups ("villages") were larger on the average in pastoral societies than in those which depended on hunting and gathering.

3. A preliminary analysis of (incomplete) data on stone tool types suggests that, by and large, sites found in the survey are dominated by scrapers. However, microliths (or backed pieces) predominate at a few sites, and examples of each were tested — for instance, the Akira site, representing scraper dominated surface occurrences, and the Salasun site, representing microlith dominated assemblages (Table 2). The interpretation of the surface collections, which document a considerable amount of apparent variability, will depend on comparison with excavated assemblages now being analyzed; further comment on this point follows.

Table 1. *Ecozones: definition and distribution.*

Ecozone (1)	Elev (ft)* (2)	Precip (mm/annum) (3)	Area (km²) (4)	% of Research Area (5)	% Sampled (6)
1a	>9000	>1600	26	<1	—
1b	>9000	12-1600	1078	5	3
1c	>9000	8-1200	665	3	5
2a	7-9000	>1600	250	1	8
2b	7-9000	12-1600	3267	15	2
2c	7-9000	8-1200	5243	24	3
2d	7-9000	6-800	685	3	2
2e	7-9000	<600	35	<1	—
3a	6-7000	>1600	14	<1	71
3b	6-7000	12-1600	151	1	10
3c	6-7000	8-1200	3820	17	4
3d	6-7000	6-800	2525	11	5
3e	6-7000	<600	480	2	3
4b	5-6000	12-1600	139	1	11
4c	5-6000	8-1200	1202	5	3
4d	5-6000	6-800	1057	5	4
4e	5-6000	<600	496	2	5
5c	<5000	8-1200	234	1	6
5d	<5000	6-800	307	1	7
5e	<5000	<600	152	1	10

*Contours on the 1:250,000 series maps used were usually drawn at a 1000 ft interval. In the 8-9000 ft range, spacing was often too close to allow a useful distinction.

Table 2. *Sites tested.*

Site Name (1)	Ecozone (2)	% Microliths* (3)	% Scrapers* (4)	% Others* (5)	*N (6)
Maringishu	4d	18	36	46	11
Pesi	2b	50	50	—	2
Remnant	1c	22	11	67	9
Masai Gorge	3e	48	40	12	25
Ndabibi	3d	9	70	21	44
Akira	4e	—	53	46	15
Salasun	3e	46	39	15	57

*Surface material, shaped tools

TEST EXCAVATIONS

About 9% of the sites discovered during the stratified survey were selected for test excavation. Of these, two proved essentially uninformative and will not be discussed; the remaining seven are listed in Table 2. The sites in the sample for test excavation were selected with the intention of maximizing ecological and cultural variability. Thus, they include five open sites and two rockshelters; they are widely scattered in the research area and they sample 6 of its 20 ecozones. Moreover, the sites approach both extremes (high and low) and mid-range values for elevation and precipitation and they include a wide range of typological variability in surface representation of stone tools (see Table 2; this criterion proved illusory for reasons that will soon become apparent) and pottery styles.

As in the case of the data from the stratified survey, the analysis of material from test excavations is far from being complete. Nevertheless, a few useful observations can be made.

1. All of the sites contain decorated pottery, but there are few points of similarity among the various wares. Some of the differences are related to the distinction between stone age and iron age cultures; indeed, at three of the sites (Akira, Masai Gorge and Salasun) stone age wares were overlain by iron age pottery. However, the pottery of the stone age pastoral people is extremely varied, including several wares (Maringishu Ware and Remnant Ware) which were not known prior to our excavations. I do not know what kinds of soical distinctions — tribes, clans, lineages or others — are reflected in the mosaic of pottery wares, but they clearly represent a social configuration *different* from that of the iron age pastoral people, for the pottery of the latter is notably homogeneous in our research area.

2. While the chronological focus of the stone age pastoral cultures apparently lies between 3000 and 1500 years ago (with the earliest iron-using pastoralists appearing at about the near end of that range), there are some indications of a much earlier initial appearance of pastoral cultures: two pottery sherds dated at 7255 ± 225 years ago (GX4422/A) were found at the Salasun site. The sherds broadly resemble in decorative motif and technique a ware (called Nderit; see Bower et al., n.d.) of the stone-age pastoral cultures that is well represented between 3000 and 2000 years ago. If this identity for the Salasun sherds proves correct, it indicates continuity in ceramic style over about five millenia — a remarkable example of cultural persistence.

3. There is an interesting correlation between the ratio of pottery to stone tools, on the one hand, and elevation and precipitation on the other. The highest values for pottery/stone tools, ranging from .27 to .36, are found at the two highest and wettest sites: Pesi and Remnant. The threshold value in elevation seems to be about 7000 ft; below this level, the ratio of pottery to tools does not exceed .10. This correlation seems to be quite independent of attributes of the pottery, such as thickness or firing temperature, which might bias the result by affecting the rate of pottery fragmentation. I do not know how to interpret the correlation anthropologically; however, I should point out that the 7000 ft elevation has been observed by Isaac (1972) to be an important focus for settlement in both extinct stone age and extant iron age hunting-gathering cultures.

4. We uncovered at least one striking example of intrasite, lateral variability in stone tools. In the initial phase of test excavations at the Remnant Site, two 2 x 2 m pits were dug 14 m apart. Had the tool assemblages from the two pits not come from a single occupation horizon with relatively homogeneous pottery, one would have been tempted to call them discrete industries. In subsequent excavations, it was demonstrated that the transition, which involved both typological composition and metrical properties of the artifacts, is abrupt. While the differences probably represent rather clearcut activity segmentation within the site, we have not yet been able to discern correlations between lateral variability in stone tools and any other cultural remains (such as food debris, pottery, etc.). However, several postmolds were exposed at the Remnant site, and I am inclined to think that the activity segmentation is somehow related to the presence of a house. One area of compacted soil, which seemed a likely candidate for an entranceway to a house, was remarkably free of cultural debris (swept clean?).

5. Initial indications from our excavated materials suggest that surface debris often fails to reflect accurately the nature of the subsurface occurrence sampled. For example, Remnant Ware, a new variety of pottery from the Remnant site (Bower et al., n.d.), was not recognized as a discrete ceramic tradition until an excavated sample of pottery was at hand. Unless erosion is extensive and the surface sample large, the

relative frequencies of formal tool types in surface collections are often radically different from excavated samples out of the same sites. At many sites, where exposure is primarily via holes dug by aardvarks or other burrowing animals, occurrences in the upper 60 cm are frequently unrepresented in the surface collections. For example, we were totally unaware of the (stratigraphically high) iron age horizons at the Akira and Salasun sites until we excavated them. All in all, it seems that conclusions drawn from surface collections should be both guarded and general.

In closing, I would like to point out that, while we seem to have raised more questions than we have answered, we have managed to identify some reasonably strong relationships among the variables that interest us. This demonstrates the usefulness of our large scale, *extensive* approach to gathering archaeological data. What we lack, in most cases, are convincing behavioral interpretations of our ''disembodied'' data. In order to produce such interpretations, it will be necessary to invest in some *intensive* data collection — major excavation of sites that offer prospects of revealing detailed aspects of human behavior.

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