The Interpretation of Archaeological Spatial Patterning

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Chapter 3

Distribution of Refuse-Producing Activities at Hadza Residential Base Camps

Implications for Analyses of Archaeological Site Structure

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1. INTRODUCTION

Recent research on prehistoric hunter-gatherer site structure continues to be concerned primarily with the identification of discrete, activity-specific areas within sites (e.g., Carr 1984; Hietala 1984; Flannery 1986). However, an increasingly large body of ethnoarchaeological data suggests that such areas may be rare in the archaeological record, especially among middle- and low-latitude foragers (Yellen 1977; O’Connell 1987). Here we present additional data pertinent
to this topic, derived from recent fieldwork among the Hadza of northern Tanzania. Preliminary analysis indicates that although activity areas can be identified within Hadza base camps, the range of activities associated with each are broad and broadly similar from area to area. Assumptions commonly made by archaeologists about the differential distribution of activities are only weakly supported by our data.

Comparison of the Hadza data with those on other hunter-gatherers shows certain general cross-cultural similarities in site structure but also reveals significant differences in the distribution of refuse-producing activities within sites. These differences further challenge common archaeological assumptions and underline the need for a better, more comprehensive understanding of the relationship between human behavior and site structure. Recent ethnoarchaeological research suggests that site structure may reflect, among other things, variation in food procurement, sharing, and storage practices. This surprising prospect deserves attention. Further ethnoarchaeological research may be especially informative.

2. THE HADZA

The Eastern Hadza are a group of 600 to 800 people who currently occupy a 2500 km² area south and east of Lake Eyasi in northern Tanzania. Much of this region is rough and hilly and covered with mixed savannah woodland. Medium and large herbivores, notably elephant, buffalo, zebra, and several species of antelope, are locally common (Smith 1980). The climate is warm and dry; annual average rainfall is in the 300 to 600 mm range, most of it falling in the 6-month wet season from November to April (Schultz 1971).

At the time of first European contact around the beginning of this century, only the Hadza occupied this country (Woodburn 1964 and references therein). They apparently lived entirely by hunting and gathering. Since then, the Hadza have suffered gradual encroachment by pastoral and agricultural groups and have also been subjected to a series of government-sponsored settlement schemes (McDowell 1981). Most Hadza now support themselves by a combination of hunting and gathering, farming, and farm labor. The precise mix of strategies pursued varies locally. Some 200 Hadza are essentially full-time subsistence foragers. During 1985-1986, we spent 188 days over 14 months living among the latter, collecting quantitative data on time allocation, foraging returns, and other topics (Blurton Jones et al. 1989; Hawkes et al. 1989; O'Connell et al. 1988). Data reported here are derived from this fieldwork. Earlier ethnographic reports concerning the Hadza have been provided by Kohl-Larson (1958), Woodburn (e.g., 1964, 1968a, 1970, 1972), and Vincent (1985a), among others.
Table 1. Site Population, Site Area, and Nearest Neighbor Distance at Six Hadza Base Camps

<table>
<thead>
<tr>
<th>Site</th>
<th>Date</th>
<th>Family</th>
<th>Women</th>
<th>Adolescents</th>
<th>Total</th>
<th>Number of Residents</th>
<th>Area (m²)</th>
<th>Mean distance between nearest neighbors (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tsiptite B</td>
<td>12 September 85</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>8</td>
<td>36</td>
<td>1000</td>
<td>4.2+1.1</td>
</tr>
<tr>
<td>Tsiptite C</td>
<td>24 September 85</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>12</td>
<td>49</td>
<td>700</td>
<td>5.8+5.1</td>
</tr>
<tr>
<td>Mugendeda</td>
<td>24 November 85</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>13</td>
<td>46</td>
<td>1250</td>
<td>7.3+3.6</td>
</tr>
<tr>
<td>Umbea A</td>
<td>12 December 85</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>12</td>
<td>43</td>
<td>600</td>
<td>6.5+3.0</td>
</tr>
<tr>
<td>Umbea B</td>
<td>13 April 86</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>12</td>
<td>39</td>
<td>650</td>
<td>5.6+1.9</td>
</tr>
<tr>
<td>Dubunghela</td>
<td>21 May 86</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>11</td>
<td>34</td>
<td>575</td>
<td>6.0+1.9</td>
</tr>
</tbody>
</table>
The Hadza we observed pursued a seasonally variable, central-based foraging strategy (see Woodburn 1968a for additional description). During the dry season, when medium to large game animals were concentrated near water sources, adult men practiced both encounter and intercept hunting (sensu Binford 1978), the latter from blinds near water sources or along heavily used game trails. Both were typically solitary activities, although tracking wounded prey usually involved parties of men and boys. Weapons were limited to the bow and arrow (often poisoned); traps and snares were not employed, except rarely for small birds. Small game were not often taken by men, though they frequently shot at ground nesting birds. Groups of women foraged daily for roots and baobab fruit. In the wet season, when game animals were dispersed, intercept hunting was abandoned. Men continued encounter hunting, again mainly for medium to large mammals, often in the context of honey collecting trips with their wives. Parties of women also foraged separately for berries and roots. Many of these resources were consumed away from camp, but substantial quantities were also brought back for redistribution, processing, and consumption.

3. HADZA RESIDENTIAL BASE CAMPS

Six Hadza base camps at which we lived had populations of 35 to 50 individuals, and covered areas of about 550 to 1250 m² at the time they were first mapped (Table 1). (Woodburn 1972) reported camp populations of up to 100 individuals.) All were located within walking distance (usually within 15 minutes, sometimes up to 60 minutes) of a seasonally reliable source of water. All were associated with rocky outcrops that, according to the Hadza, provide potential refuge from elephants.

Base camp populations were divided into sleeping groups whose members usually shared the same shelter or sleeping area each night they were in camp. Three types of sleeping groups could be identified on the basis of age and sex composition:

1. **Nuclear families.** These consisted of a man, his wife, and their pre-adolescent children. They ranged in size from two to eight individuals, averaged about four to five, and were relatively stable in composition.

2. **Older women.** These groups consisted of older unmarried or widowed women, their unmarried adolescent daughters or granddaughters, and their preadolescent children or grandchildren. They included as many as five members, but usually numbered two to three. Senior women in such groups were often sisters or first-generation cousins. Their composition changed frequently as individuals moved between camps.

3. **Adolescents.** Theses groups included teenagers and young adults of the same sex, usually males. They included two to five members but averaged
about three. Members were sometimes (but not always) closely related; group composition changed frequently.

4. ACTIVITY AREAS

All activities in residential base camps took place in one of three kinds of areas: household, communal, and special activity areas (Figure 1). Household

**Figure 1.** Distribution of household and communal activity areas at Umbea B, 13 April 1986. See text for details.
areas were occupied and used by one of the sleeping group types mentioned (Figure 2). They were the settings for a wide range of domestic activities, including the preparation and consumption of food, and the manufacture and maintenance of tools, clothing, and other equipment. Each was marked by a circle of cleared ground 2 to 6 m in diameter. Each contained a simple shelter and one or more hearths and was flanked by one or more secondary refuse areas. Shelters varied in form depending on the season of the year. During the wet season, they were usually simple, dome-shaped huts, 2 to 3 m in diameter and about 1.6 m in height, with a woven brush frame and grass cover. Similar huts were also built in the dry season, although unroofed or partly roofed brush windbreaks of about the same size were also common then. Shelters were often positioned to one side of their respective activity areas but sometimes covered or enclosed them completely.

Household shelters usually contained hearths. These were small features, about 30 cm in diameter, located at the center of the hut floor or just inside the entrance. Outside hearths were also common and were generally positioned within 1 to 3 m of the hut entrance. Like interior hearths, they were relatively small but were often flanked by two to three large stones that served as stands for cooking vessels.

Activity areas were kept clear of refuse, mainly by frequent sweeping with

Figure 2. Household activity area at a residential base camp, April 1986. Secondary disposal areas at margins of cleared space.
leafy boughs or grass brooms. Hearths were also periodically cleared of ash. Much of the cleared material was deposited in secondary refuse areas along the edge of the activity area. There it appeared as a diffuse scatter, in dense circular or subcircular concentrations up to 2 m in diameter, or in well-defined windrows along the edge of the swept zone. Some size sorting occurred in disposal, depending on the hardness or penetrability of the ground surface in the activity area. Large items were always likely to be removed, but where sediments were soft or loose, some fraction of the smaller items were trampled into the ground rather than swept into secondary disposal areas (cf., Gifford-Gonzalez et al. 1985). Refuse was also occasionally deposited in small piles, up to 30 cm in diameter, located just to one side of the hut entrance. These “door middens” usually consisted of small items of food waste (e.g., small bone fragments or fruit pits), which accumulated during meals taken inside the hut.

Communal areas (Figure 3) were used for essentially the same range of activities as household areas but were not associated with any particular household or sleeping group. Members of different households were routinely seen in these areas, often in single-sex groups. Some areas were used by one sex to the complete or near complete exclusion of the other; others were used by members of both sexes, but not often simultaneously. Communal areas were always marked by the presence of one or more hearths and were periodically swept clear of refuse.

Figure 3. Communal area at a residential base camp, May 1986. Man at left shapes a metal arrowhead on rock anvil with a metal hammer; man at top right shapes a wooden arrow shaft; man at right sews a leather bag; others recline, watching.
Most varied in size from 4 to 6 m across. Structures of any kind were seldom found within these areas, nor did people often sleep in them at night.

*Special activity areas* (Figure 4) included bedrock grinding facilities, and defecation areas. The former were large, relatively flat-topped outcrops of granite or schist, whose surfaces were marked by small pecked and polished patches, 30 to 50 cm diameter, where baobab and other hard seeds were ground. Small handstones were frequently found in association with such features. All residential base camps had these facilities, which suggests their presence was a determinant of camp location. Defecation areas were located at the margins of camp, often forming a discontinuous ring around it.

5. DISTRIBUTION OF ACTIVITY AREAS WITHIN CAMPS

Household areas were often arrayed in a roughly circular pattern, with nearest neighbors 4 to 7 m apart (center of area to center of area; see Figure 1). In some camps, household areas were grouped in loosely defined clusters; in others, they were not. The position of individual household areas probably reflected kin relationships among household members, primary kin camped close together, less closely related individuals further apart (see also Woodburn 1972). Comprehensive analysis of this aspect of camp organization has not yet been

*Figure 4.* Woman processing baobab on a rock outcrop at a residential base camp, August 1986. Child watches, occasionally eats pulverized fruit.
undertaken. Communal areas were usually found both within and at the margins of camps. Their precise location was determined primarily by the distribution of morning sunlight and midday shade. Special activity areas were almost always peripheral to the camp.

6. DISTRIBUTION OF ACTIVITIES WITHIN CAMPS

One of the principle objectives of our fieldwork was to obtain information on time allocation among the Hadza. Toward this end, we pursued a program of systematic behavioral scan sampling, or “spot checks” of the activities of all individuals present in camp at selected intervals during the course of each day (Altman 1974; Borgerhoff Mulder and Caro 1985; Hawkes et al. 1987). Data recorded included each individual’s identity, location in camp, activity, and equipment and facilities involved, if any. More than 25,000 individual observations were recorded at seven different camps during the 14-month study period. A subset of the data has been subjected to preliminary analysis with attention to implications for site structure. We report some results of the preliminary study here.

Data analyzed were from scans performed on nine days over a 21-day period, from 26 March–16 April 1986, at a camp called Umbea B (Figure 1). The scans yielded about 1,000 individual behavioral observations. The camp retained essentially the same configuration of household and special activity areas throughout this period. It consisted of 12 household activity areas, 6 used by nuclear families, 1 by an adult man temporarily separated from his wife, 3 by older women, and 2 by adolescents. Four communal activity areas were used frequently, 2 (A and B) located at the center of the camp, 2 (C and D) at its northern and western edges.

Our particular concern here is with the distribution of refuse-producing activities within the camp. Four broad categories of activities were defined: (1) weapons maintenance, (2) clothing maintenance, (3) tool maintenance, and (4) food processing. Weapons maintenance includes all activities related to the manufacture and repair of men’s hunting gear. The most common single activity in this category was arrow making. Clothing maintenance includes the manufacture and repair of garments. Tool maintenance refers to the manufacture and repair of all implements other than weapons, mainly women’s digging sticks. Food processing includes all steps in the processing of foods for consumption. During the period under consideration, only about 16% of all food-processing activities involved meat, the rest plant foods. Food processing and the maintenance of women’s digging sticks also often took place away from camp; other refuse-producing activities did not.

Table 2 shows how often these activities were observed at the site in daylight hours during the sample period. The sample is fairly large, about 200 individual
Table 2. Refuse-Producing Activities Observed at Umbea B, 26 March–16 April 1986

<table>
<thead>
<tr>
<th>Activity</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weapons maintenance</td>
<td>129</td>
<td>0</td>
<td>129</td>
</tr>
<tr>
<td>Clothing maintenance</td>
<td>4</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Tool maintenance</td>
<td>1</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Food processing</td>
<td>2</td>
<td>42</td>
<td>44</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>136</td>
<td>62</td>
<td>198</td>
</tr>
</tbody>
</table>

observations. This should be sufficient to provide a rough indication of the relative frequency of daytime activities performed at the site as a whole and at various locations within the site. The most common activity by far was weapons maintenance, which accounted for 65% of the total number of observations. Food processing accounted for 22% of the total, clothing repair 7%, and tool maintenance 6%. Table 2 also shows the distribution of these activities by sex. The distinctions are very clear: Weapons-related activities were associated exclusively with men, all other activities (especially food processing) primarily with women.

Table 3 shows the distribution of activities by location. Two patterns are immediately apparent. First, activity areas can be distinguished by the frequency of activities of all types recorded at each. The great majority of activities, 86% of the total observed, took place in the four communal areas. The remaining 14% were distributed among the 12 household areas. Second, communal activity areas located on the periphery of the site (Areas C and D; Figure 1) differ sharply from both centrally located communal areas (Areas A and B) and household areas in the relative proportions of associated activities. Peripheral areas were exclusively associated with male activities (more than 95% of the total observed), mainly weapons maintenance. Centrally located communal areas and household areas witnessed a broader range of activities associated with both men and women. Men’s activities accounted for about 49% of the total observed in both central communal areas and about 52% of those in household areas. Weapons maintenance represented about 47% of the activities observed in central communal areas, 41% in household areas. Chi-square tests indicate that differences in the relative frequency of activities associated with household and centrally located
### Table 3: Spatial Distribution of Refuse-Producing Activities at Umbea B, 26 March–16 April 1986

<table>
<thead>
<tr>
<th>Activity</th>
<th>A</th>
<th></th>
<th>B</th>
<th></th>
<th>C</th>
<th></th>
<th>D</th>
<th></th>
<th>Household areas (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Weapons maintenance</td>
<td>18</td>
<td>46%</td>
<td>5</td>
<td>13%</td>
<td>4</td>
<td>10%</td>
<td>12</td>
<td>31%</td>
<td></td>
</tr>
<tr>
<td>Clothing maintenance</td>
<td>5</td>
<td>13%</td>
<td>4</td>
<td>10%</td>
<td>5</td>
<td>17%</td>
<td>21</td>
<td>37%</td>
<td></td>
</tr>
<tr>
<td>Tool maintenance</td>
<td>10</td>
<td>28%</td>
<td>2</td>
<td>9%</td>
<td>1</td>
<td>3%</td>
<td>0</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Food processing</td>
<td>39</td>
<td>100%</td>
<td>100</td>
<td>100%</td>
<td>59</td>
<td>100%</td>
<td>100</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>394 (100%)</td>
</tr>
</tbody>
</table>
7. DISCUSSION

These data are sufficient to support several preliminary observations. First, the structure of Hadza residential base camps is a variant of a general pattern defined on the basis of recent ethnoarchaeological work among the Alyawara, !Kung, and (less certainly) the Nunamiut (Yellen 1977; Binford 1983; O’Connell 1987). Among each of these groups, residential base camps contain household, communal, and special activity areas. Household areas witness a wide range of domestic activities and are the most common activity areas in the camp. Communal areas (called shaded areas among the Alyawara and !Kung) are settings for essentially the same range of activities. They contain some of the same facilities but are less frequently reported. Special areas see a much narrower range of activities, usually only one per area. They are generally peripheral to household areas and often peripheral to the site as a whole. They are comparatively uncommon among the Hadza, !Kung, and Alyawara but are apparently encountered quite frequently among the Nunamiut.

The spacing of these areas differs significantly from group to group. Among the Hadza and !Kung, household areas are located on average about 4 to 8 m apart, whereas among the Alyawara and other central Australian groups (Gould and Yellen 1987; Gargett and Hayden 1987, Chapter 1 this volume), the distances are in the 25 to 45 m range. For the Aché of eastern Paraguay, who also display a variant of this same pattern of residential site organization, the mean inter-household distance is no more than 3 to 3.5 m (Jones 1984). A survey by Whitelaw (1983) shows substantial variation in this aspect of site structure among ethnographically known hunter-gatherers worldwide.

Hadza camps also differ from those of the !Kung and Alyawara with respect to the quantitative distribution of daytime refuse producing activities. Data presented here show that among the Hadza, more than 85% of these activities occur in communal activity areas, less than 15% in household areas. Similar data on the Alyawara (Denham 1978; Moslak and Tucker 1987) show just the opposite: More than 90% of all activities are confined to household areas, less than 10% in communal areas. Yellen (personal communication) reports the latter pattern for the !Kung. The Aché abandon foraging camps during the day, but in the late afternoon and early morning hours, when the camps are in use, the distribution of activities is like that described for the !Kung and Alyawara, unlike that for the Hadza (Lupo 1987).

Data presented here indicate that Hadza camps display little significant variation in the relative proportions of different refuse-producing activities pur-
sued in communal and household areas. The exceptions to this generalization are peripherally located communal areas, which are dominated by men’s activities, particularly weapons maintenance. Household and centrally located communal areas all witness essentially the same range of activities in about the same proportions. Analysis of a larger sample of behavioral scan data should enable us to distinguish older women’s household areas from nuclear family and central communal areas by the absence of men’s activities. Proportions of other activities in these areas should be fairly constant. Similar or perhaps somewhat more pronounced patterns of interhousehold variation in the relative importance of male versus female activities should be present among the Alyawara, although this has not yet been demonstrated quantitatively (but see O’Connell 1987). Preliminary analysis of scan sample data from the Aché shows no evidence of such a pattern (Lupo 1987). All household activity areas witness the same range of activities in about the same proportions.

8. ARCHAEOLOGICAL IMPLICATIONS

A common objective of site structural analysis is the identification of activity areas and tool kits used in the past (Carr 1984; Hietala 1984; Flannery 1986). Recent approaches to this goal are based on some common assumptions, among them that activities will be differentially distributed within sites and that there will be a consistent quantitative relationship between the performance of particular activities and the deposition of certain categories of refuse. Note that the first of these assumptions does not necessarily require that different activities be completely segregated, only that they be performed in some areas more often than in others. If these conditions prevailed during the formation of a site, then quantitative analysis of the spatial distribution of various categories of refuse should reveal covariant sets associated with particular activities.

The Hadza data provide only limited support for the first assumption. Men and women pursue distinctive sets of refuse-producing activities, which are differentially distributed over the site as a whole. Given a consistent quantitative relationship between the performance of those activities and the deposition of certain kinds of refuse (it remains to be seen whether such a relationship actually exists; cf. Ammerman and Feldman 1974), it might be possible to distinguish men’s from women’s activities and to determine their distribution and relative frequency in different parts of the site. Such an exercise would require analysis of a large sample of activity areas, including peripheral communal or older women’s household areas. Men’s and women’s activities would not be distinguishable in an analysis of central communal and/or nuclear family household areas alone. Moreover, spatial analysis at any scale would be unable to separate the three refuse-
producing activities most often pursued by women because their relative frequency is apparently correlated in the areas in which they take place.

Comparison of the Hadza with other modern hunter-gatherers further limits the confidence we can place in assumptions commonly made about the segregation of activities. Segregation by sex and sex-related activity may be common between household areas among the Alyawara, and among the Nunamiut, both within household areas and between such areas and special activity areas. It is not common among the Ache and apparently of only limited significance among the !Kung.

These results should not be surprising; Yellen (1977) made essentially the same point 10 years ago. Nevertheless, its importance often remains unappreciated. For example, in an analysis of site structure at Guila Naquitz, Flannery (1986) and his colleagues make the initial operating assumption that men’s activities will be spatially separated from women’s. No ethnographic support pertinent to matters of site structure is cited. Patterns observed in the distribution of debris within the site are interpreted primarily in terms of the initial operating assumption. Alternate explanations grounded in the recent ethnoarchaeological literature on site structure are never considered.

Ethnoarchaeological data reviewed here underline the inappropriateness of this approach. Analyses of site structure must be based on a theoretically and empirically justified set of expectations about behavior and its archaeological reflection.

The research reported here contributes to this goal. Our description of the Hadza and comparison with other groups reveals both a general pattern and some marked differences in the use of space among hunter-gatherers. The fact that three groups compared, the Hadza, !Kung, and Alyawara, live in superficially similar environments makes the differences especially intriguing. Some of these differences have received attention and may be at least partly explained. For example, Whitelaw (1983), Gould and Yellen (1987), Gargett and Hayden (1987), and O'Connell (1987) have all speculated on the relationship between interhousehold spacing and the relative importance of food sharing and predator pressure. O'Connell (1987) and Binford (1987) have attributed certain differences in the form and relative frequency of special activity areas among foragers and collectors to the relative importance of food storage. The reasons behind other differences, especially the completely unanticipated contrast in the distribution of activities between communal and household areas between the Hadza, Alyawara, and !Kung, remain unclear. Like other aspects of site structure, they may reflect basic differences in local ecological circumstances, particularly related to food procurement and redistribution.

Though still only tentatively suggested, these relationships have great potential interest: Questions concerning food procurement, sharing, and storage have long been of general concern to students of human evolution. The research needed to explore this potential is also clearly indicated. Instead of continuing to
look for activity areas and tool kits, we must begin to ask how and why behavior is organized as it is within sites, how that organization is reflected in the distribution of refuse, and whether our knowledge of the relationship can be applied in archaeological context. These questions can only be answered where both behavior and its archaeological reflection can be observed directly, that is, in ethnoarchaeological situations.

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