!Kung Spatial Organization: 

An Ecological and Historical Perspective

Richard B. Lee

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The ecological and social bases of spatial organization among hunters and gatherers are examined. After criticizing the patrilocal band model of social organization, the author documents the flexible, nonterritorial groupings of the !Kung Bushmen of Botswana and relates them to rainfall and surface water scarcity and variability. The paper goes on to consider the effects of extra-Bushman contacts on the breakdown of sociospatial organization and finds that the observed flexibility occurred in both the pre- and the postcontact periods. The final section attempts to relate the analysis to general issues. Three areas that need further work if a more valid model of hunter spatial organization is to be developed are the problems of time perspective in research, adaptation to long-term climatic variability, and critical thresholds of population density.

INTRODUCTION

This is a contribution to the study of how hunters and gatherers organize themselves in space and how this organization adapts to variations in population and resources. Using fields data from the contemporary !Kung Bushman of Botswana, I examine the nature of the association between social groups and their space, and I search for the ecological and sociological determinants of this association.

Since there has been extended controversy in anthropology on the question of sociospatial organization of hunter-gatherers, it is important at the outset to define the problem to be solved and to pinpoint possible sources of

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1 See the Appendix for a brief description of the pronunciation of the Bushman languages.

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confusion. All hunting and gathering peoples live in organized groups that move frequently through their ranges. Most modern hunter living groups are small—under 200 people—and these groups are observed to move their campsites from two to ten times per year. The existence of a group and a space necessarily implies the existence of two kinds of boundaries: social and spatial. A social boundary can be measured according to how open or closed the group is. At the open extreme, individuals move at random within a space, encountering one another for brief periods, then moving on. At the other extreme, there is a series of tightly organized groups whose members stay together throughout the year with minimal interchange with other groups. A spatial boundary can be measured along the dimension of overlap/nonoverlap. Imagine a large space containing five groups. At the “overlapping” extreme, all five groups have free access to the entire space; at the nonoverlapping extreme, the five groups divide the space into five exclusive sectors. In an intermediate condition, each of the five groups has a core area which is theirs alone, while they share the rest of the space with their neighbors. These two kinds of boundaries are illustrated in Table I (c.f. Yellen and Harpending, 1972).

The distinction between social and spatial boundaries is a necessary one. Open groups may have nonoverlapping territories but still accommodate movement of personnel across the boundaries, and it is at least theoretically possible for a closed group to share overlapping ranges with their neighbors. Much confusion has arisen from the fact that group boundaries and land boundaries have not been kept separate in analyses of hunter-gatherer organization. As we shall see, both kinds of boundaries are fluid for contemporary hunter-gatherers.

A second source of confusion has been the failure to distinguish between the behavior of groups in their space and the conceptions or folk view of the people about themselves and their land. The latter type of data, though important, is at best an imperfect reflection of the actual arrangements of persons on the ground. In this paper, my prime concern is with the behavior of

<table>
<thead>
<tr>
<th>Table I. Dimensions Along Which Social and Spatial Boundaries May Vary in Hunter-Gatherer Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social boundary</td>
</tr>
<tr>
<td>open (random movement)</td>
</tr>
<tr>
<td>Spatial boundary</td>
</tr>
<tr>
<td>overlapping (shared)</td>
</tr>
</tbody>
</table>
groups and not with their ideology, although later in the study some ideological aspects are introduced (for example, p. 142).

Having defined the dimensions along which social and spatial organization may vary, we must now consider what formations are actually observed in the ethnographies of hunter-gatherer societies. Ethnographically, there is no case known of a society in which the members move randomly in a totally overlapping space. Toward the opposite extreme, however, there is apparent evidence in a number of societies for tightly organized groups maintaining exclusive territories. Such groups have been reported from several parts of the world and have been lumped under the general rubric of the “patrilocal band model” of hunter-gatherer social organization.

In its essentials, the patrilocal band is based on three organizing principles: (1) band exogamy (everyone must marry someone from outside the group), (2) patrilocal post-marital residence (women move into other groups at marriage; men remain together and bring their wives in), and (3) band territoriality (each group controls a space, moves within it, and defends it against outsiders) (Radcliffe-Brown, 1930; Steward, 1936, 1955; Service, 1962, 1966).

The operation of these principles results in a situation not unlike the “closed group/nonoverlapping space” extreme of our model. This is not to say that no interchange occurs: women move between groups at marriage, and all of these societies are acknowledged to have formalized visiting arrangements for the purpose of carrying out rituals and trade. Nevertheless, the dominant impression one gets from accounts of patrilocal bands is one of semi-isolated, male-centered groups, encapsulated within territories.

This patrilocal territorial exogamous band or “horde,” as Radcliffe-Brown called it, has proven to be a remarkably persistent construct in the study of hunting and gathering peoples. For Radcliffe-Brown in 1930 it was “the important local group throughout Australia” (1930: 35); others have endorsed this view quite recently and have presented some ethnographic data in support of it (Stanner, 1965; Birdsell, 1970). Still others have sought to establish the patrilocal form as the basic grouping not only for Australians but for all hunter-gatherers present and past (Service, 1962, 1966; Williams, 1968).

Why do so many analysts continue to be attracted to the patrilocal band model? At least part of its appeal is that it is an elegant and parsimonious formulation. The society is seen as being structured by the interaction of a small number of jural rules: territorial ownership by males, band exogamy, and viripatrilocal postmarital residence. Similarly, the spatial arrangements are extremely neat: a mosaic of territories arranged in a honeycomb pattern, each containing its land-owning group. This apparent neatness and parsimony have proved especially useful to model-builders seeking to characterize hunter-gatherer group structure in an economic way for computer and mathematical simulation.
However, the problem is that a society based on these rules would find itself in severe adaptive difficulties. The patrilocal band makes scant provision for a number of basic features of hunter-gatherer life, such as the necessity to even out demographic variation in sex ratios and family size, the continuing necessity to adjust group size to resources, and the desirability of resolving conflict by fission.

In contrast to the recent advocates of the patrilocal model, I argue in the present paper that this form of organization is empirically rare and that its rarity can be made intelligible by a careful ecological analysis. The model of !Kung Bushmen described in the paper appears to account well for the observed facts and, moreover, can be applied to the analysis of other hunter-gatherer cases. A similar critique of the patrilocal model based on !Kung Bushman materials is presented by Yellen and Harpending (1972).

We are of course not the first to question the universality of the patrilocal band among hunter-gatherers. This was done as early as 1936 by Steward (1936, 1938, 1955), and criticisms of the patrilocal model have become more frequent in recent years (e.g., Helm, 1965; Hiatt, 1962, 1966, 1968; Leacock, 1969; Meggitt, 1962: 70-71; Woodburn, 1968; and various authors in Damas, 1969, and Lee and Devore, 1968). According to these criticisms, a relatively open, social group with overlapping shared territories seems to be the prevailing form among contemporary hunter-gatherers.

Yet the flexible group alternative to the patrilocal model is not without its difficulties. Though different, it appears at first glance to be equally unattractive. The recent observations of hunter-gatherer group structure present an apparently chaotic picture, in which a person may live wherever and with whomever he or she pleases. The situation is further complicated by the fact that all living hunter-gatherer groups have been strongly affected by contact with outside peoples. Service (1962) goes so far as to argue that the flexibility of modern hunter groupings is strictly an artifact of acculturation and breakdown.

In short, we are stuck with a complex set of messy facts collected in ambiguous field situations, and the job of the analyst is to make sense of them. Since so much of the recent controversy has focused on the Australian Aboriginal material, it may be refreshing to take a different but equally interesting case—that of the !Kung Bushman hunter-gatherers of southern Africa.

!KUNG LOCAL GROUPS AND THEIR SPACE

We will consider the Dobe Area !Kung of Botswana (including the /du/da !Kung) and the closely related Nyae Nyae !Kung across the border in Namibia (illegally occupied by South Africa). The latter people have been described in a brilliant series of ethnographies by Lorna Marshall, in the films and writings of John Marshall, and in the writings of Elizabeth Marshall Thomas. Aspects of the Dobe Area !Kung have been investigated by a number of authors. The
description to follow is drawn from the Dobe material, although the main features apply to the Nyae Nyae !Kung as well. Where specific points of disagreement exist, they are explicitly stated.

What are the major features of !Kung local groupings, land ownership, group affiliation, and boundary maintenance? The basic local grouping is a camp (Marshall's band), which is a noncorporate, bilaterally organized group of people who live in a single settlement and who move together for at least part of the year. At the core of each of these camps are two, three, or more siblings and/or cousins, both male and female, who are generally acknowledged to be the owners (K"ausi) of the waterhole. Around each waterhole is a bloc of land or n!ore. This contains food resources and other water points and is the basic subsistence area for the resident group. Lorna Marshall (1960: 344 ff) has argued that the ownership of each waterhole resides in the person of a band headman who is always male and who inherits his position patrilineally, but my own research indicates that no headmen existed among either the Dobe or the Nyae Nyae !Kung Bushmen. Instead the sibling-cousing group of K"ausi collectively held the waterhole. (Documentation on the problem of the headman will be presented elsewhere.

Specific groups have histories of association with their waterholes that vary from a few years up to several decades in duration. Rarely does this association go back as far as the grandparent generation of the oldest people living. To put it another way, a first approximation of the "half-life" of a group's tenure at a waterhole can be estimated at 30 to 50 years.

An individual may inherit his or her n!ore from his father's or mother's family; or he or she may inherit it from both parents, or from neither. There is a discernible patrilineal tendency, at least among males. A survey of 151 men over the age of 15, representing 90% of the adult male residents of the Dobe area, gave the breakdown on inheritance of n!ore shown in Table II. We see that while the majority take n!ores not in a strict patrilineal way, inheritance from father is the most frequent single alternative. Unfortunately, comparable data were not gathered for females.

Table II. Patrilineal vs. Matrilineal Inheritance of Locality as Reported by 151 !Kung Men

<table>
<thead>
<tr>
<th>Inherited n!ore from</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Father</td>
<td>60</td>
<td>39.7</td>
</tr>
<tr>
<td>Mother</td>
<td>40</td>
<td>26.5</td>
</tr>
<tr>
<td>Both father and mother</td>
<td>16</td>
<td>10.6</td>
</tr>
<tr>
<td>Neither parent</td>
<td>21</td>
<td>13.9</td>
</tr>
<tr>
<td>[Doesn't know, or no n!ore]</td>
<td>14</td>
<td>9.3</td>
</tr>
<tr>
<td>Total</td>
<td>151</td>
<td>100.0</td>
</tr>
</tbody>
</table>
The composition of groups at any one time shows little or no patrilocal emphasis. In fact, because of the frequency of bride service, there is even a slight tendency toward matrilocality (cf. Leacock, 1955). Of 114 currently married couples, 22 were living with husband's parent(s); 24 were living with wife's parent(s), while 12 were living with both husband's and wife's parents. A further 15 couples were living neolocally, while in the case of 41 couples, neither husband's nor wife's parents were alive. Those couples in which both had living parents were observed to pay frequent visits to both sides. This and other processes of intergroup visiting created a fluid situation in which the composition of groups changed from week to week with the comings and goings of people (Lee, 1972a).

Within a local group's area, subsistence resources are not exclusively reserved for the K'ausi and their families. By observing elementary good manners, anyone who has a relative in a camp may enjoy the resources of the area around the camp. Within the camp, food is shared in such a way that everyone—residents and visitors alike—receives an equitable share (cf. L. Marshall, 1960, 1961).

In moving through the annual round, the !Kung groupings satisfy their subsistence requirements with surprisingly little friction with neighboring groups. Subsistence space is bounded, but these boundaries are vague and not defended. In fact, a frequent pattern is for groups from two or more waterholes to join forces for the joint exploitation of a major resource, such as tsin beans or mongongo nuts. And during the winter dry season, it is common to find from two to six different groups camping together at a permanent waterhole.

ENVIRONMENTAL CAUSES OF FLEXIBILITY

How do we account for this flexibility of group structure? Before we conclude that it is due to the effects of recent contact and acculturation, we should consider what effect pre-existing features of the environment would have on group structure. Two permanent features of the Kalahari environment appear to be salient: first, the high variability in rainfall and, second, the sparse distribution of standing water in the northern Kalahari. Let us consider each of these features in turn.

Rainfall Variability

Average annual rainfall has little meaning in an environment in which rainfall may vary by as much as 300% from year to year. During the 1963 to 1964 rainy season, we recorded 239 mm (9.4 inches), while during 1967 to 1968, 597 mm (23.5 inches) was recorded. Given this variability, it would be more useful to discuss rainfall in terms of extremes—for example, tabulating the number of years out of every ten in which drought is experienced. Maun, 300
km by air southeast of Dobe, is the nearest weather station for which long-term rainfall records are available. Figure 1 illustrates the fluctuations in rainfall that Maun has experienced over the last half century, Table III summarizes these data. In a run of 46 years, drought occurred in 17 years (37%), and, of these, 12

![Graph of rainfall fluctuations](grafico.png)

**Fig. 1.** Variations in annual rainfall at Maun, Botswana, July 1922 to June 1968 (mean 462.3 mm based on 46 years of records).

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years of normal rainfall&lt;sup&gt;a&lt;/sup&gt;</td>
<td>29</td>
<td>63</td>
</tr>
<tr>
<td>Year of drought&lt;sup&gt;b&lt;/sup&gt;</td>
<td>17</td>
<td>37</td>
</tr>
<tr>
<td>1st degree (mild)</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>2nd degree (severe)</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>3rd degree (very severe)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>100</td>
</tr>
</tbody>
</table>

<sup>a</sup>Normal rainfall is annual rainfall more than 85% of mean.<br>
<sup>b</sup>Definitions of drought severity adopted from Wellington (1964: 40-43): 1st degree, 70 to 84% of mean rainfall; 2nd degree, 55 to 69% of mean rainfall; 3rd degree, less than 55% of mean rainfall.
years (26%) were classified as severe drought when less than 70% of average rainfall occurred. In other words, the probability of drought occurring at Maun is about 2 years in 5, and of severe drought, 1 year in 4.

The situation for Dobe would be even more acute since rainfall is lower overall (about 350 mm at Dobe vs. 462 mm for Maun) and therefore more erratic in annual fluctuation. Judging from our experiences over a 7-year period (1963 to 1969) and that of the Marshalls (1952 to 1959), drought conditions probably characterize about half the years. For reasons which are not clear, the northern Kalahari appears to experience alternating runs of good years and of bad years of varying length.

A second source of variability is the difference in rainfall from place to place in a single month or season. In a cluster of five stations within an area 200 km across, annual totals may be comparable, but the fall in a given month may vary from place to place by as much as a factor of 10. Table IV shows the rainfall for 1966-67 rainy season at five stations in the Ghanzi district 300 km south of Dobe. In the early rains of October to December, this local variation is crucial, since it is these rains which largely determine the overall size of the wild food harvest later in the season. For example, in November, Kalkfontein received only 3.5 mm while Scarborough, 50 km away, received 34.0 mm. As a result, the desert may be blooming in one area while a few hours’ walk away it will still be parched.

It is to such variable conditions that the spatial organization of the !Kung Bushmen must adapt. Theirs is a long-term solution to the problem, and it is

<table>
<thead>
<tr>
<th>Table IV. Local Variations in Rainfall Among Five Localities in the Ghanzi District, Botswana, 1966-67 Rainy Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainfall in mm at</td>
</tr>
<tr>
<td>Kalkfontein</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td><strong>1966</strong></td>
</tr>
<tr>
<td>July</td>
</tr>
<tr>
<td>August</td>
</tr>
<tr>
<td>September</td>
</tr>
<tr>
<td>October</td>
</tr>
<tr>
<td>November</td>
</tr>
<tr>
<td>December</td>
</tr>
<tr>
<td><strong>1967</strong></td>
</tr>
<tr>
<td>January</td>
</tr>
<tr>
<td>February</td>
</tr>
<tr>
<td>March</td>
</tr>
<tr>
<td>April</td>
</tr>
<tr>
<td>May</td>
</tr>
<tr>
<td>June</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
unfortunate that an ethnographer will observe only a small segment of the pattern in any given year of fieldwork.

**Water Source Scarcity**

The sparse distribution of water on the ground is the spatial correlate of the temporal variability just discussed. Because of the porosity of the sandy soils, the high rates of evaporation, and the infrequency of exposures of water-bearing rock, standing water points are few and far between. Figure 2 shows an area south of the Aha Hills and north of the Eiseb Valley. This includes the southern half of the Dobe area and parts of the Nyae Nyae and /du/da areas on the west and south, respectively. The area straddles the international border and measures about 80 by 80 km for a total area of 6400 km² (2500 square miles). This entire area contains only five permanent water points, that is, waterholes that hold water throughout the year, and of these three have been known to fail within living memory.

![Diagram of water sources in the /ai/ai/-gam area](image_url)
In fact, the area contains a hierarchy of water sources arranged in order of their duration and reliability: I, two have never given out in living memory (/ai/ai, /gam); II, three have not failed in the last five years (/wihaba, ≠o/gana, /du/da); III, five (at least) are strong summer waters which may last through the winter of good years (/dwia, n≠wama, hxore, !widum, //gum//geni); IV, about 50 are seasonal water points holding water from a few days to several months; V, about 100 are mongongo, baobab, and terminalia trees with small reservoirs in their hollow boles; VI, about 150 are sites in which the water-bearing root !xwa (Fockea monroi) is found.

In general, the farther down the hierarchy of water sources they go, the harder it is for the !Kung to satisfy their moisture requirements. Tree water (class V) is usually difficult of access and often must be soaked up in a makeshift sponge or sucked out in a reed straw. (Sip-wells are known by the !Kung Bushmen but rarely utilized.) Water root (class VI) is even more difficult to get at, since the root itself must be dug out from depths of up to 40 cm (15 inches) and contents of as many as 20 roots must be consumed per day to provide the needs of one person (cf. Lee, 1965: ch. 8). On the other hand, root and tree waters are widely distributed in close proximity to valuable food sources and therefore are often utilized despite their difficulty of access.

The !Kung ability to operate successfully in this environment therefore involves them in sorting out a complex set of variables about the current locations of food and water, the ease or difficulty of getting it, and the whereabouts and current activities of adjacent groups. And their subsistence plans must be continually revised in light of the unfolding rainfall situation through the growing season and beyond.

**PATTERNS OF !KUNG SPATIAL ORGANIZATION**

Given the ecological conditions, what land use pattern has emerged? Today (1963 to 1969), international politics and pastoral occupation have restructured the land use in non hunter-gatherer ways. The current situation and how it evolved are interesting questions in their own right and will be discussed below. In order to understand the hunting and gathering pattern, we have to do a reconstruction to get a picture of the distribution of landholding groups as they were during the 1920s, before the Bantu settlement.

In Fig. 3 are plotted the landholding groups of the /gam-/ai/ai areas of 40 years ago. The number is located on the map in the vicinity of the largest waterhole each group’s area contains. An examination of Fig. 3 makes it apparent that there were many more groups holding land than there were permanent waterholes to support them. Eleven groups regularly wintered in the area, with occasional visits from at least four other groups; yet there were only five permanent waterholes and of these only two were really reliable. Eleven is
the minimum number that operated in this area. There may have been more groups, especially in /gam. The members of these groups have moved entirely out of the area to the larger "magnets" of the Ghanzi and Gobabis white farms, or to the Tswana and Herero cattle posts around Lake Ngami. Further, this presentation does not take into account groups that have moved into the study area since 1930, such as the group from /gusa (355) who moved to /ai/ai in the 1940s, and groups from the Ghanzi farms who were moving into the /du/da area in the late 1960s (625 and 729).

Such a large number of groups could be supported only if there were widespread agreement to maintain regular and free access to permanent water. The orderly, rather evenly spaced arrangement of groups in Fig. 3 is characteristic only of the height of the rainy season when water and food are available throughout the area. But as the summer waters evaporate with the
coming of the winter, the 11 groups would converge to the pattern plotted in Fig. 4 and summarized in Table V, column 2.

Unless water was exceptionally strong, groups 2 and 4 would join group 3 at /wihaba, and later in the season most or all of the people would pay a visit to group 1 at /ai/ai. At the same time, groups 5, 6, and 7 would converge on /o//gana, while groups 8, 9, and 10 would converge on /gam. Group 11 stayed around /du/da, where it was joined by one or two groups from /o//au and dumn!a (see Table IV footnote). Later in the season, it was customary for groups at /du/da and /o//gana to pay visits to relatives at /gam.

In good years, groups had the option of wintering in any one of several places: in the home area, at a permanent waterhole, or visiting relatives at waterholes outside the area. Also, the members of the groups that were primarily associated with one of the two very reliable waterholes—group 1 at /ai/ai and group 8 at /gam—could spend most of their year enjoying the seasonal food

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Fig. 4. Patterns of convergence of landholding groups during the dry season and in drought years, 1920 to 1930.
Table V. Reconstructed Groups of the /ai/ai and /gam Areas, Circa 1920 to 1930a

<table>
<thead>
<tr>
<th>Group No.</th>
<th>Informant</th>
<th>Summer (1)</th>
<th>Winter (2)</th>
<th>Extreme dry recourse (3)</th>
<th>Current status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>396</td>
<td>n!umdi</td>
<td>/ai/ai</td>
<td>/ai/ai</td>
<td>!xum!a's group at /ai/ai</td>
</tr>
<tr>
<td>2</td>
<td>346</td>
<td>/wihaba</td>
<td>/wihaba</td>
<td>/ai/ai</td>
<td>No longer functioning; descendents at /ai/ai</td>
</tr>
<tr>
<td>3</td>
<td>414</td>
<td>/dwia</td>
<td>/wihaba</td>
<td>/ai/ai</td>
<td>/i!ay's group at /ai/ai</td>
</tr>
<tr>
<td>4</td>
<td>429</td>
<td>!ai</td>
<td>/wihaba</td>
<td>/ai/ai</td>
<td>No longer functioning; descendents at /ai/ai</td>
</tr>
<tr>
<td>5</td>
<td>335</td>
<td>ñodanaha</td>
<td>≠o//gana</td>
<td>/gam or /ai/ai</td>
<td>Still utilize n!ore part of the year; winter at /ai/ai</td>
</tr>
<tr>
<td>6</td>
<td>543</td>
<td>//gum//geni</td>
<td>≠o//gana</td>
<td>/gam or /ai/ai</td>
<td>A few families still utilize n!ore; winter at /ai/ai or /du/da</td>
</tr>
<tr>
<td>7</td>
<td>363</td>
<td>n. of ño//gana</td>
<td>≠o//gana</td>
<td>/gam or /ai/ai</td>
<td>No longer functioning; descendents at /ai/ai</td>
</tr>
<tr>
<td>8</td>
<td>336</td>
<td>Around /gam</td>
<td>/gam</td>
<td>/gam</td>
<td>No longer functioning; descendents at /ai/ai</td>
</tr>
<tr>
<td>9</td>
<td>580</td>
<td>due or ñon!a</td>
<td>/gam</td>
<td>/gam</td>
<td>A functioning group now based at /du/da</td>
</tr>
<tr>
<td>10</td>
<td>636?</td>
<td>due</td>
<td>/gam</td>
<td>/gam</td>
<td>Moved to South African Government settlement scheme at Tsum!we</td>
</tr>
<tr>
<td>11</td>
<td>684</td>
<td>/du/da</td>
<td>/du/da</td>
<td>/gam</td>
<td>A functioning group based at /du/da</td>
</tr>
</tbody>
</table>

aIn addition, there were several groups who moved into this area from the west and south during the summer and may have opted to winter at /gam and/or /ai/ai during extremely dry years such as Marshall's bands 1 and 2 from /gusa, band 15 from dum!na, and band 17 from n//o!au (L. Marshall, 1960).

resources of their neighbors. Reciprocal access to resources at all times ensured that key resources would be available at critical periods.

In moderate winter dry-season conditions, the 11 groups distributed themselves at five water points. Under very severe conditions, the groups...
underwent another phase of convergence (see Table V. column 3). Four groups fell back on /ai/ai, four others on /gam, and three others alternated between /gam and /ai/ai. Thus in the most difficult drought years there might be as many as seven groups at a single waterhole. Such a situation was observed by the Marshalls when seven groups converged on /gam in the severe drought winter of 1952 (J. Marshall, 1957: 36).

Traditionally, waterholes such as /ai/ai and /gam have played important roles as entrepots in the economic and social lives of the !Kung. Even before the Bantu built their cattle posts there, /ai/ai was a trading center where people from all points of the compass came to visit, dance, and do hxaro trading (and sometimes fight).

/Ilay 414 described the traditional role of /ai/ai as follows:

"/ai/ai has always been a meeting place for people even before the blacks came. People came from the north, from !angwa and !gose, and from the south from /gam (and from the west from /gausa), strayed here, did hxaro, drank n!lo (a choice wild fruit), ate //"xa (mongongo nuts), and then went back. They asked Kan!lo [one of the owners] for permission. They also asked noal'gain [Father of 396].

/ai/ai was favored because the water was so big. Choma [men's initiation ceremony] was danced here, but the main reason [to meet] was hxaro trade.

People came in all seasons of the year—summer, winter, and spring. But they particularly came in spring [!gaa, September-October] when the trees were in flower [before the onset of the rains]. When the summer pans dried out, they ate !xwa [the water-bearing root]. When the !xwa got thin they came into /ai/ai. This was because some of the n!lores did not have year round water.

A closely comparable land use pattern has been observed in the Nyae Nyae area as recently as 1952 to 1953 by the Marshall expedition. In a little-read but extremely informative work ("Ecology of the !Kung Bushmen of the Kalahari," Harvard senior honors thesis, 1957), John Marshall discussed how the Nyae Nyae groups would arrange themselves with reference to water first under "normal" and then under drought conditions. Of the latter, he writes:

"In very dry years, more of the bands would be concentrated around /Gautscha, Deboragu, and perhaps Khumsa. I do not know for sure whether Khumsa is a permanent waterhole. I am sure that there is a permanent waterhole northeast of /Gautscha to which bands 8, 9, and 10 would shrink if a winter of desiccation was complete. The distribution of the interior bands in such a winter season that so utterly rejects all juicy things would probably be:

Band 1, 2, 3, at /Gautscha is the highest yielding waterhole in the area, therefore able to support the 85 people of these bands.

Band 4 and 5 might hold out at Deboragu and would be joined by band 6. Deboragu is a weak water. The 29 people of bands 4, 5, and 6 would probably be able to survive, however. One man told us, speaking with affection for Deboragu, that, though it may look dry, scratch and you will find water.

Band 11 might flee to S'amangaigai and so the people would endure. (J. Marshall, 1957: 32-33)
HUNTER—GATHERER SPATIAL ORGANIZATION

The spatial organization of many hunting and gathering peoples was similar to that of the two !Kung Bushmen cases cited. For example, a division of the Eskimo year into a large-group phase and a small-group phase was first formally described by Mauss in a classic paper (1906), and documented by many observers (Boas 1888; Rasmussen, 1931; Spencer, 1959; Balikci, 1964; Dama, 1969; the last source is particularly useful). In the case of the central Eskimo, the time of maximum concentration was also in the winter, but the environmental determinant was the accessibility of good seal hunting rather than the availability of water. For other Eskimo groups, the maximal aggregation was associated with a variety of ecological strategies, as summarized by Damas (1969: 135-138).

Among the Australian Aborigines, the flexible land use pattern was for a long time obscured in anthropological studies by a confusion of the patrilineal totemic group with the on-the-ground living group. The totemic group indeed controlled real estate exclusively but only for occasional ritual purposes, and not for day-to-day living (Hiatt, 1962; Berndt, 1970). For the latter, the group that hunted, gathered, and lived together was made up of members of a number of patriclans and exhibited a genealogical composition and an annual pattern of concentration-dispersion similar to that of the Bushmen. In arnhem Land and Cape York, the significant ecological determinant appeared to be the annual flooding of the plain which caused the people to congregate in larger groups on the seacoast (Thomson, 1939: 209) or on higher interior ground (White and Peterson, 1969; Schrire, in press; see also Hiatt, 1965: 24-29). In desert Australia, the concentration-dispersion pattern has been known for many years. Particular attention has been paid to the maximal grouping in the form of the corroboree or ceremonial gathering (Spencer and Gillen, 1899: 271 ff). The ecological significance of this gathering has been pointed out by Meggitt (1962: 54-55) and Strehlow (1947: 65). Here, as among the Bushman, the environmental determinant was seasonal differences in water availability.

Examples could be multiplied: concentration-dispersion and reciprocal access to resources have been documented for subarctic Indians (Helm, 1965; Leacock, 1955, 1969), Great Basin Indians (Steward, 1938, 1955), and Pygmies (Turnbull, 1965, 1968); the case of the Northwest Coast is discussed below. However, what is central to all of these cases is a pattern of concentration and dispersion, usually seasonal, and a set of rules and practices for allowing reciprocal access to or joint exploitation of key resources.

The worldwide occurrence of this pattern of spatial organization in vastly different kinds of environments indicates the degree to which it was basic to the hunting and gathering adaptation. Several of the adaptive advantages can be spelled out. In the case of the !Kung Bushmen, we see, first, that reciprocal
access to resources allowed a much higher population density than could be supported if it were required that every n!ore contain a permanent water source (Fig. 4). Thus in the /ai/ai/-gam areas, we find 11 groups in occupation instead of two. Second, the pattern contained a mechanism for responding to local imbalance in food resources. It had the capacity to adjust to conditions of scarcity and also to conditions of exceptional abundance. Third, the pattern offered many social advantages, not the least of which was the separating out of individuals and groups in conflict, thus keeping the threat of violence to a minimum. (Leacock, 1969:14 cites a very similar set of advantages for the flexibility of Montagnais groupings.)

By contrast, the patrilocal pattern of spatial organization that encapsulates a group of males with their spouses and offspring within a territory is far less adaptive. Indeed, it would be difficult to visualize how a patrilocal territorial-organization could function in the Bushman case. I would predict that such a society could survive only to the extent to which its members could slough off their patrilocality and territoriality and approximate the flexible model outlined above. (It is curious that Birdsell, one of the foremost exponents of the ecological approach in anthropology, should have chosen to espouse a model of hunter social organization that is as ecologically unviable as is the patrilineal band.)

In view of these adaptive advantages, it hardly seems likely—as Service has argued—that this flexible land use pattern is strictly a product of acculturation brought about by the breakdown of aboriginal bands. Flexibility appears to be adaptive in both the precontact and the postcontact situation. In fact, we are now in a position to trace what actually has happened to change !Kung Bushman land use patterns over the last 80 years.

CONTACT AND SPATIAL ORGANIZATION: 1890 TO 1969

Starting in the late 1880s and early 1890s, Tswana pastoralists began coming out to the /ai/ai/-gam areas from their towns in the east for annual hunting and grazing expeditions. At the end of each rainy season, the various hunting parties, along with several groups of Bushmen, would rendezvous for some weeks of hunting, dancing, and trading. In the trade, the !Kung gave furs, hides, honey, and ostrich eggshell beadwork, while in return they received tobacco, clay pots, iron implements, and European goods. When the trading was done, the oxen were inspanned and the Tswana drove their wagons back to the east for the winter. During this period of initial contact, an annual concentration point occurred at this encampment known as koloi (ox-wagon, or ox-wagon camp in Setswana).

During the 1920s, permanent Bantu-speaking settlers began to move into the area, bringing herds of livestock and enlarging and deepening the waterholes
at /gam and /ai/ai. A nucleus of semisedentary !Kung began to develop at these two points in a process that has been observed worldwide among hunter-gatherers around what L. R. Hiatt has aptly called “the magnets” of attractiveness. Mission and Government Stations constituted the magnets in Australia, while, in the northern Kalahari, Bantu cattle posts were the magnets (Lee, 1972b).

Prior to Bantu settlement, the !Kung had spent most of the year moving around the n!ores and a few months camped at the permanent water. Since the arrival of the Bantu, a reverse pattern has evolved. Today, many !Kung remain most of the year camped at /ai/ai and spend only a few months of the year moving around the n!ores. In fact, the point of major population concentration in recent years has usually coincided with the Christmas feast offered the !Kung by their Bantu neighbors (Lee, 1969).

The effects of contact on spatial organization are shown in Fig. 5 (and Table V, last column). Acculturation has produced fragmentation and

![Image of a map showing land use patterns.](image-url)

Fig. 5. Current land use patterns of active landholding groups, 1963 to 1969.
discontinuous utilization of n!ores. Four groups have ceased to function as subsistence units, having become wholly attached to Bantu cattle posts (groups 2, 4, 7, and 8). One group, 10—along with many others from the Nyae Nyae, outside our study area—has joined the South African government settlement station in Tsum!we. Four other groups move in and out of /ai/ai on hunting and gathering trips of varying length (groups 1, 3, 5, and 6).

Even though these semisettled groups spend most of the year at /ai/ai (or Tsum!we), each tries to spend at least a month or two in the home n!ore. Unlike the Australians, the !Kung Bushmen do not maintain totemic sites within their home localities. Nevertheless, the ties to the n!ore are certainly based on sentiment as well as economic expediency; this emotional content is expressed in the following quotation from a young woman member of group 3 now living at /ai/ai:

[You see us here today but] you know we are not /ai/ai people. Our true n!ore is East at /dwia and every day at this time of year [November] we all scan the eastern horizon for any sign of cloud or rain. We say, to each other, “Has it hit the n!ore?” “Look, did that miss the n!ore?” And we think of the rich fields of berries spreading as far as the eye can see and the mongongo nuts densely littered on the ground. We think of the meat that will soon be hanging thick from every branch. No, we are not of /ai/ai; /dwia is our earth. We just came here to drink the milk.

In only two cases (groups 9 and 11), are the groups using their n!ores in anything like the traditional manner. And in the last 3 years, even these groups have been affected. South African police patrols have ordered these groups to confine their camps and activities to within a close radius of the border so that they can be easily checked up on. This has produced two rather bizarre effects on spatial and social organization: first, there is a highly unusual linear pattern of land use as the groups move up the border road from camp to camp and then down again, and, second, there are abnormally large groups of 90 to 120 people camping together at times of the year when one would expect them to be dispersed into much smaller groups. The !Kung say they are afraid to disperse for fear that the police patrols will go out after them (cf. Fig. 5).

In short, contact has produced in !Kung land use a spectrum of effects including fragmentation and sedentism in some groups and consolidation and mobility in others. The actual changes in land use can be accounted for by a combination of economic and political factors, although common to all situations is the introduction of an economic “magnet” and along with it an outside jural authority (Lee, 1972a, 1972b). The highly flexible spatial arrangements of today appear to be a continuation of flexible spatial arrangements of the precontact era. And these flexible arrangements in turn are shown to be adaptations to the perennial problems of the arid environment: recurrent drought and scarcity of surface water.
CONCLUSION

It remains now to deal briefly with several methodological issues. First, I want to specify the operations of the method used in this paper so that it can be applied to other ethnographic cases. In the analysis of a given case, we consider, first, how the environment varies spatially in terms of the uneven distribution of resources and, second, how the abundance and distributions of these resources vary through time. The resources that vary may be water supply, game populations, salmon runs, vegetable foods, or other factors. Each case will have its own constellation of factors. Then, invoking Elton's concept of Minimal or Economic Density (Elton, 1927), we delineate the minimum area that a group of people has to maintain access to in order to ensure its survival in the medium and long run. For example, a hunter-gatherer group may be able to satisfy susistence requirements within 100 km$^2$ for 4 years out of 5 but it will still go out of the business unless it has access to a much larger area during the fifth year. And in order to ride out environmental fluctation over the course of 50, 100, or 200 years, the area to which the group must maintain access must be even larger, probably on the order of 10 times the area it covers in a single good year. Maintaining access to such a large area is really a question of maintaining cordial working relations with one's neighbors occupying the space. So the environmental problem has a social solution.

However, little of this long-term perspective is visible to an observer. When an observer arrives on the scene and finds a hunting and gathering population in a state of constant motion, he may be initially puzzled by this mobility, since the people appear to be moving even more frequently than necessary to exploit what appear to be rather stable resources. Faced with such a set of facts, the observer is liable to attribute this mobility—as Service does—to breakdown of aboriginal bands through contact (Service, 1962: 108), or he may conclude with Turnbull that the mobility is socially determined and has nothing to do with environmental factors (Turnbull, 1965: 177-178).

Both these interpretations suffer from the short time perspective enforced by the limitations of anthropological fieldwork. An ethnographer in his stint in the field observes one or at best two repeats of the annual round, and on this basis tries to generalize about Pygmy life or Eskimo life. But we have seen that there is no such thing as a typical year for a hunter-gatherer population. Their adaptation is a long-term one, and the observer can catch only a very short segment of the whole in a year.

When we see hunters moving widely about their range, in the apparent absence of ecological necessity, we are watching intergroup, economic relations that take years and generations to unfold. Keeping up distant social ties against a possible future need and visiting neighbors who owe favors from previous years are only two of the factors that set hunter groups in motion. The ostensible
purposes are social, but the underlying rationale is adaptive. This may also help to explain why hunter-gatherers trade beads in exchange for beads with their neighbors. The trade item in the perspective is a facilitating device for maintaining relations that may be ecologically crucial over the long run. Similarly, when an investigator reports an environment which is without significant regional or temporal variation (Turnbull, 1965, 1968), we may suspect that he has not looked into the matter carefully enough or long enough.

Population density is also a key variable. An adequate analysis of environmental variability must also plot the minimal subsistence areas for varying levels of population density. A resource area that looks quite undifferentiated for five persons per 100 km² (13/100 square miles) may be highly differentiated when the population grows to 25 persons per 100 km² (65/100 square miles). For example, a population in the process of moving into a new area and occupying it at low densities would be initially immune to fluctuations in key resources, and its members thus might manage their affairs without elaborate arrangements for reciprocal access. But their population would grow after several generations to the level where environmental fluctuation would threaten their survival. Long before this point is reached, however, one would expect that the necessary mechanisms of reciprocal access would have evolved. At this point, other forces tending to limit population density become operative, and these serve to prevent the population from threatening the overall level of resources (Lee, 1972b).

Finally, it might be argued that the method presented here is applicable only in the most marginal environments with maximum unpredictability of resources. Again I invoke population density. Since all environments vary, for all environments there will be a certain threshold of population density at which point the resource base will become unpredictable. It is extremely interesting that concentration-dispersion land use and rules for reciprocal access to resources are found even in the “richest” environments among the most affluent of the world’s recent hunter-gatherers. The Indians of the Northwest Coast (Drucker, 1955) annually dispersed from their large winter villages into smaller summer settlements located nearer to prime fishing sites. And it was on the Northwest Coast that the pioneer research in the problem of environmental variation in relation to spatial organization was carried out by Wayne Suttles. Suttles (1960, 1962, 1968) has shown that even the rich environment of coastal British Columbia was subject to severe local and annual variation in salmon runs. Without the annual dispersion and the reciprocal access to resources offered by intervillage feasts and potlatches, many villages of coastal Indians would have gone out of business (see also Vayda, 1961; Piddocke, 1965).

If the method and the argument presented in this paper have merit, then it may be appropriate for us to discard models of prehistoric populations that encapsulate each group of males within a territory and to consider instead a
more dynamic model in which interlocking aggregations of persons undergo continual reshuffling of groups in response to short- and long-term environmental fluctuations and to changes in population density.

**APPENDIX**

The Bushman languages are characterized by clicks, sounds produced with an ingressive airstream when the tongue is drawn sharply away from various points of articulation on the roof of the mouth. The four clicks, along with examples and some English equivalents, follow:

/ Dental click as in /ai/ai, /du/da (in spoken English, this sound denotes a mild reproach, written tsk, tsk)
≠ Alveolar click as ≠o//gana, ≠on!a.
! Alveopalatal click as in !Kung, /ilay.
// Lateral click as in ≠o//gana, //gum//geni (in spoken English, this sound is used in some dialects to urge on a horse).

Bushman words may be pronounced by simply dropping the click in cases where a consonant follows the click or by substituting t or k where the click is followed by a vowel or w. For example, for /ilay read tikay, for gam read gam.

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