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DEMOGRAPHIC AND ARCHITECTURAL RETRODICTION: AN ETHNOARCHAEOLOGICAL CASE STUDY IN THE SOUTH AMERICAN TROPICAL LOWLANDS

Peter E. Siegel

This paper focuses on the demographic and architectural organization of a South Amerindian tropical-forest community. The household, as the most important social, economic, and behavioral unit in this society, is reflected in the strong quantitative relations between the floor areas of the various structure types and the associated number of occupants. In contrast, floor area/number of occupants relations at the nuclear-family level are quantitatively weak. Since the aboriginal household was also the most important economic and demographic social unit in the South American tropics, the present study may be used to estimate prehistoric settlement population levels using excavated data. As such, this study encourages the use of the direct-historical approach by archaeologists working in the lowlands of South America.

Se presenta la organización demográfica y arquitectónica de una comunidad del bosque tropical sudamericano. El grupo doméstico, como la unidad de mayor importancia social, económica y de comportamiento en dicha sociedad, se refleja en las fuertes relaciones cuantitativas entre las superficies de varios estilos estructurales y el número relativo de ocupantes. En contraste, las relaciones entre el área y el número de ocupantes a nivel de familia nuclear son deficientes en términos cuantitativos. Porque el grupo doméstico aborigen era además la unidad social de mayor importancia económica y demográfica en los trópicos sudamericanos, el presente estudio podría ser utilizado para estimar los niveles de las poblaciones de los caseríos prehistóricos mediante el uso de datos excavados. Como tal, este estudio alienta el enfoque histórico-directo por parte de los arqueólogos que se encuentran trabajando en las tierras bajas de Sudamérica.

Researchers have long investigated the relation between group size/organization and settlement area (Casteel 1979; Cook and Heizer 1965; Hassan 1981:63–77; LeBlanc 1971; Naroll 1962; Weissner 1974). The motivation behind these studies has been to produce a reliable population figure based upon the known area of a prehistoric site. As such, regression techniques have been applied in numerous contexts in order to predict population size from floor area. LeBlanc (1971) indicated that it is inappropriate simply to measure the relation between total surface area of a settlement and the corresponding group size to obtain useful generalizations. He concluded that "it will be necessary to collect data not only on total floor area, but on the amount of roofed area and/or walled space *put to various specified uses*" (LeBlanc 1971:211, emphasis added).

This addition to the floor area/settlement population relation is important because it brings the important notion of "context" into the discussion. As researchers have documented abundantly in recent years, it is not appropriate to treat settlement area as a uniform homogeneous space (Binford 1978b; Ferring 1984; Flannery and Winter 1976; Hitchcock 1987; Kramer 1979; Newell 1987; O'Connell 1987; Savelle 1984; Schiffer 1976; Yellen 1977). Space is partitioned and used in a multitude of different ways within the *same* settlement. It is incumbent upon the analyst to ascertain what, if any, aspects of the spatial dimensions for a given settlement relate to meaningful population segments. This task requires that the researcher become familiar with the cultural and social setting of the settlement and make a diligent effort to define realistic analytical units, which are used subsequently to measure against demographic organization.

In some contexts, floor area may be a poor predictor of group size. Hayden and Cannon (1984: 180–181, 188–189), working among the Highland Maya, found that house-floor area correlated

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poorly with household size. It is important to use the results of particular tests to delve into aspects of the cultural, social, and behavioral contexts that are responsible for the observed patterning (or lack thereof). To note simply that there is or is not a strong relation between demographic and architectural organization, for example, is not adequate. We need to investigate the source(s) of the strong or weak relations, which will likely lead into a discussion of the cultural context (Hayden and Cannon 1984; Kent and Vierich 1989).

Ethnoarchaeology is a useful technique to employ for studying floor area/demographic relations. In an ethnographic context we may determine which factors are important or constraining in the observed relations. These observations may then be used as hypotheses for testing in the archaeological context. Further, in certain settings, the ethnoarchaeologically derived inferences may be used fruitfully in a direct-historical sense. As I argue later, the present ethnoarchaeological study is most useful for assisting in the interpretation of local prehistory.

THE RESEARCH SETTING

The case study presented in this paper is based on a currently occupied village—Shefariymo—located near the headwaters of the Essequibo River in southern Guyana (Figure 1). The occupants of Shefariymo consist primarily of the Waiwai, a Cariban-speaking group, and secondarily of the Wapisiana, who are Arawakan speakers (Fock 1963:233; Mentore 1984).

In the lowlands of South America, issues revolving around community organization have come under investigation only recently. For years researchers have debated the origins, spread, and complexity of the ancient populations that inhabited the Amazon Basin (Lathrap 1970; Meggers 1971; Roosevelt 1980). Given the serious problems resulting from poor preservation and the logistical constraints on doing archaeology in the tropics, it is certainly understandable why the development of the discipline may appear to be slow in this region.

In recent years, exciting advances have been made in the development of theory and associated methods. Sociocultural complexity is an issue that links current and previous generations of archaeologists working in the South American lowlands. However, rather than focusing only on ceramic styles, ethnohistoric data, and ecological models, researchers now are taking an aggressive approach to obtaining good community organization data from the archaeological record (Roosevelt 1989, 1991; Stahl 1984, 1985; Zeidler 1984). House floors, village ground plans, disposal areas, ceremonial features, etc. become the focus of research. Only by seriously attempting to retrieve detailed information on the community organizations of the prehistoric populations will we be able to progress in our understanding of cultural complexity and change.

One aspect of the South American tropics in which researchers have an advantage over other regions is that relatively unacculturated groups still inhabit many areas. Archaeologists have studied these groups in their various ecological and social settings in order to generate expectations and hypotheses about how the archaeological record might be structured, as well as to derive general principles of human behavior (DeBoer 1989; DeBoer and Lathrap 1979; Roe and Siegel 1982; Siegel and Roe 1986; Stahl 1985; Zeidler 1984).

THE CULTURAL AND SOCIAL SETTING

As is the case all over the Amazon Basin, the cultural history of northeastern South America is characterized by shifting territories of groups in response to competition over land, women, and other resources (Butt Colson 1983–1984b:104–106; Carneiro 1961; Chagnon 1968, 1973; Lathrap 1970).

Located high in the Guiana Shield, the upper Essequibo region is bounded on the south by the Acarai Mountain range, on the north by the Pakaraima Mountains, and on the east by the Courantyne drainage network. The Acarai range is the divide between the Essequibo and Amazon rivers. Ethnographic and ethnohistoric accounts indicate that the region has been occupied primarily by Carib-speaking groups (Evans and Meggers 1960:191–270; Farabee 1924:278; Fock 1963; Roth 1924:Plate 1, 1929:IX–X; Yde 1965).

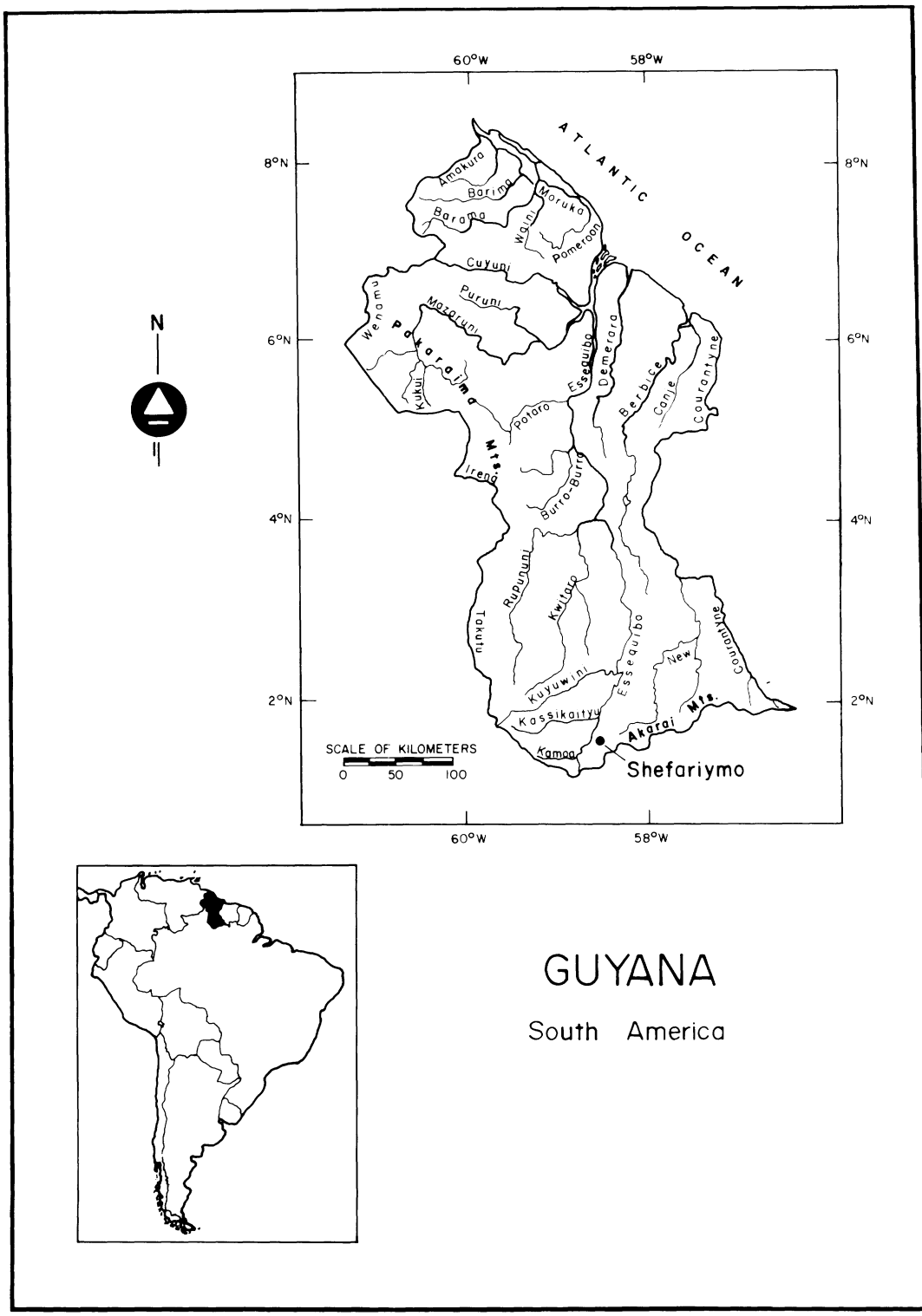

Figure 1. Map of Guyana, South America, showing the location of Shefariymo near the headwaters of the Essequibo River.

Since the nineteenth century, groups occupying the upper Essequibo region include the Waiwai, Mouyenna, Parukoto, Piskaryenna, Hishkaryenna, Katawina, Aaramayenna, Chikena, Shereo, Marakayenna, Tunayenna, Taruma, and Wapisiana (Butt Colson and Morton 1982; Evans and Meggers 1960:191–270; Farabee 1924:153; Fock 1963:5–9; Mentore 1983–1984:200; Schomburgk 1836, 1841; Yde 1965:277–282). In their survey of the upper Essequibo region, Evans and Meggers (1960: 191–270) record archaeological and ethnographic evidence for two major groups successively occupying the area: the Taruma and Waiwai. On the basis of sherd deposition rates from a number of sites and historic accounts, Evans and Meggers (1960:240) estimate that the Taruma occupied the upper Essequibo for roughly 200 years, from ca. A.D. 1720 to 1925 (but see Rivière's [1966–1967:305–306] qualification of this reconstruction). Owing to diseases the Taruma became extinct by 1925 (Roth 1929:IX). By this time, the Waiwai expanded into the upper Essequibo area from the Mapuera region in Brazil, south of the Acarai Mountains (Roth 1929). Roth (1929:IX) indicates that the Waiwai and Taruma had friendly relations, which included marriage ties.

Today, the Waiwai Indians are divided into four villages, three in Brazil south of the Acarais and one in southern Guyana, on the upper Essequibo (Mentore 1987:515). My study is based on the organization of Shefariymo, which is the village located on the Essequibo River. Since the mid-1950s, "Waiwai" villages have consisted of numerous ethnic groups, including Waiwai, Parukoto, Taruma, Mouyenna, and more recently Trio and Wapisiana. Fock (1963:9) considers this strategy of interethnic cohabitation to be "an example of the expediency of dividing tropical forest tribes into culture areas rather than by race or language." Although I believe that the "culture area" concept should only be used in a very general sense, the importance of Fock's observation lies in the phrase, "expediency of dividing tropical forest tribes." Ethnographers have well documented the fission and fusion process, which characterizes Amazonian settlement patterns (Butt Colson 1983–1984a:20–21; Carneiro 1961:52; Chagnon 1968:70–72, 1973:131–133; Gillin 1936:139; Goldman 1963:99–100; C. Hugh-Jones 1979:24, 40–43; S. Hugh-Jones 1979:19–24; Mentore 1984:4–5; Smole 1976: 87–94). As Fock demonstrates, the fission/fusion process frequently results in multiethnic villages.

Some investigators suggest that the phenomenon of multiethnic villages is the product of missionary influences disrupting the "traditional" system of ethnic identity in the tropical lowlands (e.g., Yde 1965:19–20). While I certainly acknowledge the negative impact of missionaries on Amerindian society, I do not believe that villages composed of different ethnic groups are a modern invention. Archaeologists recognize the antiquity of this process when investigating social plurality in the prehistoric context (Roosevelt 1985; Rouse 1985; Zucchi et al. 1984), thus providing a diachronic perspective for this aspect of Amerindian village organization.

Zucchi et al. (1984:170–171, 178–179), in particular, infer the coexistence of different ethnic groups within a single village at roughly A.D. 600 in the middle Orinoco. Although they acknowledge the dramatic increase in interethnic mixing "as a reaction to the depopulation of the area through the effects of the European conquest (disease and slavery) and the concentration and relocation of indigenous groups by the missionaries" (Zucchi et al. 1984:171), they cogently argue that this phenomenon has a long antiquity prior to the conquest. The important point for the present study is that multiethnic villages found in the lowlands of South America today are not a product exclusively of missionary influences and development programs, but in a larger sense reflect an adaptive strategy based on flexibility and a certain degree of opportunism (Frechione 1990; Smole 1976:52). As will be demonstrated below, the two ethnic groups presently occupying Shefariymo cannot be distinguished by their use of village space.

Degree of social distance between ethnic groups co-occupying a village may be an important factor in delineating the cleavage lines along which fissioning occurs. Indeed, in the present study a considerable amount of tension was observed between the Wapisiana (Arawakan speakers) and the Waiwai (Cariban speakers), the two major groups currently residing in Shefariymo (Siegel 1985a). In 1985, when this fieldwork was conducted, I hypothesized that the next major settlement change at Shefariymo would be an out-migration of the numerically inferior Wapisiana, resulting in two distinct villages, each of which would be more ethnically homogeneous than was Shefariymo prior to the split. I venture to predict that a visit to Shefariymo today would reveal such a situation.

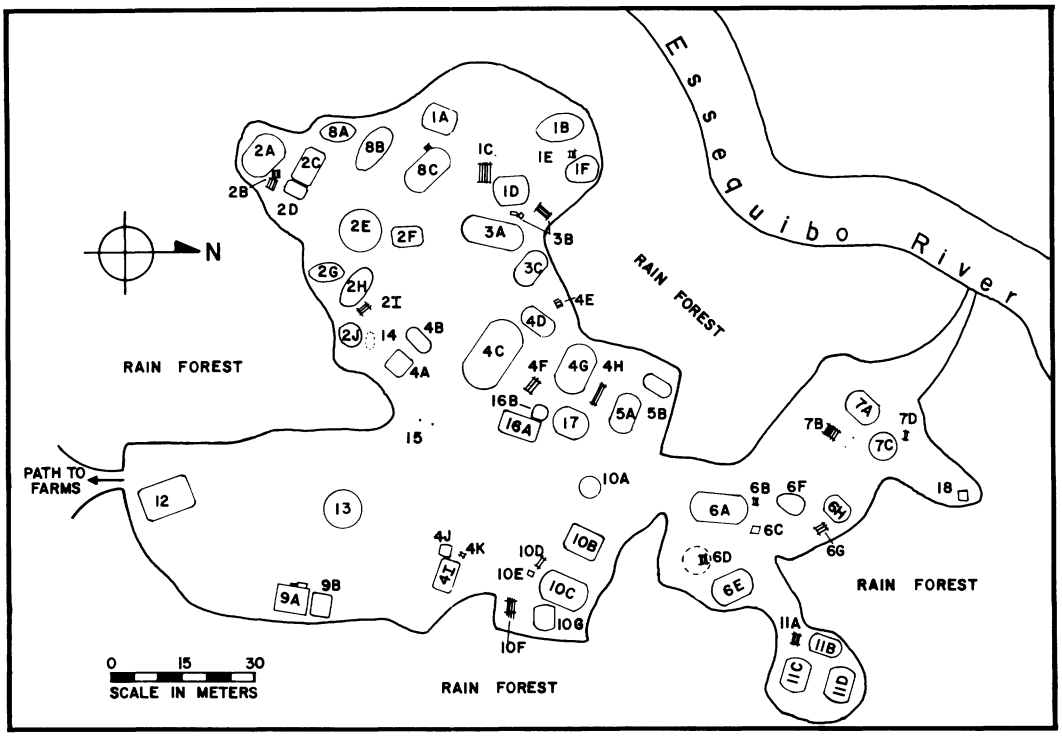

Figure 2. Map of Shefariymo as it appeared in June 1985. Every structure in the village is labeled and keyed to Table 2.

In order to place the demographic and architectural organization of Shefariymo into a useful analytical framework, it is necessary to investigate the social context of the village.

Traditionally, the Waiwai and other groups of the region occupied large communal houses, which were organized along kinship lines and subdivided into nuclear-family units (Fock 1963:196; Meggers 1971:86–88; Mentore 1984:181; Yde 1965). Labor and social relations are strongest among closely related families.

Ideally, the Waiwai conform to a matrilocal residence rule, however, in practice a variety of arrangements are followed depending on specific circumstances. In general, a newly married couple will reside with the bride's family, and the groom is subordinate to the other males in this family unit (Fock 1963:200–201; Mentore 1984:185). When the couple begin having children, they make an effort to establish their own residence, usually within close spatial proximity to the wife's family. The closely related nuclear families cooperate in a number of activities. For instance, the women work together in cassava-bread production and the men may join forces in a hunting expedition or agricultural-field clearing (Mentore 1983–1984; Yde 1965:100). Even though the separate nuclear families today frequently reside in their own houses, as will be described below, a kitchen and work shed may be shared by the related families. The nuclear family is the basic reproductive unit in this society, however, the extended family constitutes a corporate group in terms of production, and labor and social relations.

Urbina (1983–1984:185) offers a parallel example in the case of the Arekuna Pemon. As with the Waiwai, the Pemon display a two-level system of domestic organization: (1) A nuclear family residing in its own house and (2) several related nuclear families that are spatially clustered, thus forming a "domestic compound" (Urbina 1983–1984:185). Urbina refers to the group constituting a compound as a "domestic unit," in that the members work together in garden plots, and "this is the first step

in the distribution process" (Urbina 1983–1984:185). Urbina's domestic unit is what I call a "household" in the present study. (This is discussed in greater detail below.)

A third level of organization observed by Urbina (1983–1984:191) is a "quarter," which comprises a cluster of related and cooperating domestic units. He indicates that quarters characteristically emerge in large settlements.

METHODS AND ANALYSIS

The present study is a contribution to the ethnographic data base for one aspect of our archaeological retrodictions. As sites are excavated from the perspective of settlement organization and community structure, researchers increasingly attempt to reconstruct population figures using site size (e.g., Roosevelt 1980:217–233). Ethnographers rarely provide accurate quantitative information concerning settlement dimensions. Demographic data frequently are presented in the ethnographic accounts, yet if we cannot correlate on-the-ground characteristics of a village with the population figures this information may be of little use to archaeologists. It therefore becomes our task, as archaeologists, to map current villages as if they were archaeological sites. These maps, in combination with the demographic data, then may be used as a basis for estimating prehistoric population sizes from well-excavated sites (Binford 1978a; DeBoer and Kaufman 1977; Hayden and Cannon 1984; Hitchcock 1987; Kent and Vierich 1989; O'Connell 1987; Yellen 1977).

The village of Shefariymo, which is bounded by the dense tropical rain forest, is roughly ellipsoid in form (Figure 2) and is 11,565 m^2 (or 1.16 ha) in area (Siegel 1985b). In May and June of 1985, there were 134 people divided among 26 nuclear families and 11 households (Table 1). The density of interactions within a household necessarily is greater than across households. Households are spatially and familially distinct. In addition, the two ethnic groups, Waiwai and Wapisiana, are sociopolitically distinct, which is reflected clearly in the spatial organization of the village.

The spatial organization of the village is investigated along three dimensions. First, the distribution of architecture is analyzed across the village by nuclear-family group, and then by household group. Second, these two groupings (nuclear family and household) are evaluated controlling for ethnic identification, as compared to the total village as an analytical unit.

In the present study the household is defined as "the smallest [social] grouping with the maximum corporate function" (Hammel [1980:251] cited in Wilk [1983:100]), and in Shefariymo consists of several related nuclear families. In rare instances, the entire household comprises a single nuclear family. Households cooperate in food processing, child care, and resource procurement (see also Wilk and Netting 1984), and as such are social, economic, and behavioral units (Wilk and Rathje 1982:618). Households do not necessarily reside under the same roof, and in Shefariymo we find that most nuclear families have their own separate residences. These residences, however, are in close proximity to those of the other nuclear families of the same household. This is one type of residential corporate group described by Hayden and Cannon (1982:142–146), contrasted with a single corporate group residing under one roof (Hayden and Cannon 1982:141–142). The present day Waiwai/Wapisiana household residential pattern is a result of missionary influence in the early 1950s. The aboriginal pattern was the single household residing under one roof. As such, the Waiwai/Wapisiana village displays a shift in household residential patterns, yet maintains the original functional and morphological aspects of the corporate group through spatial propinquity of the nuclear-family residences making up the individual households.

Finally, the division of architecture is measured against a prestige dimension. The Waiwai, and Cariban-speaking groups in general, aspire to an overt egalitarian ethic (Mentore 1984; Morton 1983–1984:224). Prestige differentiation among men is determined by such factors as hunting (Meggers 1971:91) and leadership ability (Morton 1983–1984:226), and may be measured by membership in one of two councils: political elders or religious elders. In this third aspect of the analysis, my expectation is that there should not be a significant difference in the amount of architectural space across households as a product of perceived status or prestige distinctions. Positions of leadership are not hereditary, and it is difficult for an individual, or a family, to monopolize power or resources or both. Strong social-leveling mechanisms minimize any such tendencies (e.g., Fried 1967:63–66).

RESULTS

Architectural Distribution: Entire Village

Several interesting patterns emerge in the spatial distribution of architectural types across the village. There are essentially four functional structure types recognized by the Waiwai and Wapisiana, and these are potentially discernible in the archaeological record (Figure 2, Table 2). These are: (a) residences, or *müimó* (Figure 3); (b) multipurpose work structures, or *yawarímta* (Figure 4); (c) outdoor storage racks, or *churiapon* (Figure 5); and (d) community structures (Figure 6).

As seen in Table 3 the mean sizes of these structure types vary considerably from one another. Community buildings are the largest, followed by residences, and then multiuse work structures. The outdoor storage racks are the smallest structure type in the village. However, the standard deviations of the structure areas reflect a certain degree of overlap. Large residences overlap in size with community buildings, and smaller residences may overlap with multiuse structures. There is no overlap, however, between community buildings and multiuse structures.

A partial explanation for the overlap in size of multiuse structures and residences is derived from the functional life history, through which many structures progress. A common occurrence is for a residence to be functionally modified for use as a kitchen (kitchens are one category of multiuse structures). Later, the kitchen may become a storage shed. The functional end point for a structure life history is often when the given structure becomes a source for raw materials in the construction of new structures, thus beginning the cycle over again. This sequence generally is unidirectional. In other words, a residence may be modified for use as a kitchen, but a kitchen will not become a residence. (This same unidirectional recycling process of structures has been noted by researchers in other world areas [see Kramer (1982:147) for rural Iran]; David [1971:119] refers to a "devolutionary cycle" in connection with the Fulani structures of northern Cameroon.)

The largest structure in the village is the village leader's residence, at 125 m^2. This is bigger than the largest community building, which is the church at 82 m^2. This situation seemingly contradicts the relation observed above, whereby community buildings generally are larger than residences. However, as discussed below, the village leader's house is used also as a community building, especially when secular matters at the village level are being discussed (Mentore 1984:19).

Architectural Distribution: Nuclear Family

Other sources of variability in architectural type sizes may be related to the demographic structure of the village. I examined the number of people per nuclear family relative to the amount of space devoted to the different structure types. Next, the same relations were examined by household (or corporate) group.

In general, the quantitative relations between the sizes of the structures and the associated number of people in the nuclear family are not very strong. The weakest relation is seen with multiuse structures, generating a Pearson's r correlation coefficient of .13 and an r^2 value of .01 (Table 4). In other words, only 1 percent of the variation in multiuse structure size is explained by the number of people associated with the structures, at the nuclear-family level.

House area plotted against the number of people in a nuclear family yields a correlation coefficient of .66 (Table 4, Figure 7). Thus, 43 percent of the variation in house-floor area is explained by the nuclear-family size.

Finally, combining the floor areas of residences, multiuse structures, and outdoor storage racks and plotting these values against the associated number of people produces the strongest relation at the family level (Table 4). We now see that 51 percent of the variation in structural space is explained by the number of nuclear-family members using the facilities. This leaves a considerable amount of unexplained variation.

Architectural Distribution: Corporate Group

When we examine the amount of space devoted to the various structure types by house compound rather than by individual nuclear family a very different set of relations is observed.[1] Comparing

Table 1. Number of Village Occupants and Structure Type Areas by Nuclear Family and Household Groups in Shefariymo.

Nuclear Family Name	Number of People	House Area (m^2)	Multi-Purpose Structure Area (m^2)	Table Area (m^2)	Total Structures Area (m^2)
Household number 1					
Suse	4	47.85	37.77		85.62
Kaywe	7	31.06	40.29	2.52	
				3.37	77.24
Totals	11	78.91	78.06	5.89	162.86
Household number 2					
Mewsha	3	55.41		1.68	
				5.05	62.14
Marawanaru	3	63.80	20.98		84.78
Saraka	3				
Daniel	2	20.14			20.14
Paw	3	26.02			26.02
Charuma	5	35.26		2.52	37.78
Pitu	5	37.77	13.43		51.20
Totals	24	238.40	34.41	9.25	282.06
Household number 3					
Kenke	10	65.48	33.58	.84	
				1.68	
				4.21	105.79
Totals	10	65.48	33.58	6.73	105.79
Household number 4					
Mawasha	8	124.90	26.02	.84	
Charakura	5			7.58	159.34
Maripa	5	66.32		5.89	72.21
Yowkaru	5	22.24	23.95		46.19
Moses	5	28.54	5.87	.84	35.25
Totals	28	242.00	55.84	15.15	312.99
Household number 5					
Wacanna	4	38.61	18.47		57.08
Household number 6					
Ayiio	8	58.76	44.49	.84	
				4.21	108.30
Yenpu	2	20.98	15.95	4.29	36.93
Totals	10	79.74	60.44	9.34	149.52
Household number 7					
Upon	7	39.45	25.18	5.05	
				.84	70.52
Totals	7	39.45	25.18	5.89	70.52
Household number 8					
Victor A.	6	44.49	23.50		67.99
Wario A.	7	57.92			57.92
Totals	13	102.41	23.50		125.91
Household number 9					
Denis P.	5	40.29	20.14		60.43
Household number 10					
Wayaka	6	58.76	21.82	1.68	
				8.42	90.68

Table 1. Continued.

Nuclear Family Name	Number of People	House Area (m^2)	Multi-Purpose Structure Area (m^2)	Table Area (m^2)	Total Structures Area (m^2)
Mirici	2	40.29			40.29
Mingeri C.	8	15.95			15.95
Totals	16	115.00	21.82	10.10	146.92
Household number 11					
Henry J.	6	41.13	22.66	2.52	
			36.10		102.41
Totals	6	41.13	58.76	2.52	102.41
Village totals[a]	134	1,081.42	430.20	64.87	1,576.49

[a] These village structure area totals do not include the community buildings.

the amount of multiuse structure area to the number of individuals within the households yields an r value of .41 (Table 4). Thus, 16 percent of the variation in these structures is explained by the number of household members. Even though this a low value, it is considerably higher than the 1 percent value for the same structure type at the nuclear-family level.

Next, the amount of house area plotted against the number of household members produces a correlation coefficient of .98, or 96 percent of the variation in house size is explained by the number of individuals (Table 4, Figure 8). Finally, 92 percent of the variation in the household total structure area is explained by the associated number of people (Table 4).

Comparing these two sets of relations at the nuclear family vs. household level is revealing. We see that the house-compound residents (household) function as a corporate group in terms of food processing, child care, and a range of other domestic activities. Further, when small hunting or general resource-procurement parties depart from the village they are composed of members from the same household. Households function as economic and social units in this society. The ties connecting these units are reinforced by the spatial propinquity of the nuclear-family residences that make up the households. The household, as a corporate group, is the important adaptive unit with relatively specific spatial requirements. As such, we are able to retrodict household size based upon the aggregate house sizes of the associated families.

Architectural Distribution: Ethnic Identity

Next, the distribution of architectural space was examined, controlling for ethnic identity (Waiwai vs. Wapisiana). We see that both distributions look very similar in form, except that there is a greater amount of variation for the Waiwai household house-floor area than for the Wapisiana (Figure 8). There are only four Wapisiana and seven Waiwai households, however; thus it is difficult to generalize in terms of a pattern. Yet, given the considerable amount of overlap in the scatter plot between the two, it seems clear that the two ethnic groups are part of the same process and cannot be distinguished on the basis of floor area relative to household size.

As seen in the village map (Figure 2, Table 2) Wapisiana households are located only in peripheral areas of the settlement. Even though the village occupants profess an egalitarian ethic, the Wapisiana are considered by the Waiwai to be "second-class citizens." Politically, this is reflected by membership in leadership councils, as discussed below, and socially in the locations of Wapisiana households.

Architectural Distribution: Household Prestige

Finally, I examined the distribution of architectural space in terms of relative degrees of household prestige. There is no overt class distinction within the village, following an egalitarian ethic (Morton

Table 2. Key to Figure 2 Showing Ethnic, Household, and Family Affiliations of all Structures in Shefariymo.

Structure Number[a]	Structure Type	Family
Waiwai		
1A	multipurpose	Suse
1B	house	Suse
1C	table	Suse
1D	multipurpose	Kaywe
1E	table	Kaywe
1F	house	Kaywe
2A	house	Mewsha
2B	two tables	Mewsha
2C	house	Pitu
2D	multipurpose	Pitu
2E	house	Marawanaru
2F	house	Paw
2G	multipurpose	Marawanaru
2H	house	Charuma
2I	table	Marawanaru
2J	house	Daniel
3A	house	Kenke
3B	three tables	Kenke
3C	multipurpose	Kenke
4A	multipurpose	Yowkaru
4B	house	Yowkaru
4C	house	Mawasha
4D	multipurpose	Mawasha
4E	table	Mawasha
4F	table	Mawasha
4G	house	Maripa
4H	table	Maripa
4I	house	Moses
4J	multipurpose	Moses
4K	table	Moses
5A	house	Wacanna
5B	multipurpose	Wacanna
6A	house	Ayiio
6B	table	Ayiio
6C	parrot house	Ayiio
6D	table[b]	Ayiio
6E	multipurpose	Ayiio
6F	multipurpose	Yenpu
6G	table	Yenpu
6H	house	Yenpu
7A	house	Upon
7B	table	Upon
7C	multipurpose	Upon
7D	table	Upon
Wapisiana		
8A	multipurpose	Victor A.
8B	house	Victor A.
8C	house	Wario A.
9A	house	Denis P.
9B	multipurpose	Denis P.
10A	house	Mingeri C.
10B	house	Mirici
10C	house	Wayaka
10D	table	Wayaka
10E	parrot house	Wayaka

Table 2. Continued.

Structure Number[a]	Structure Type	Family
10F	table	Wayaka
10G	multipurpose	Wayaka
11A	table	Henry J.
11B	multipurpose	Henry J.
11C	multipurpose	Henry J.
11D	house	Henry J.
Community structures		
12	church	
13	school	
14	abandoned house[c]	
15	two posts[d]	
16A	guest house	
16B	multipurpose structure with guest house	
17	store	
18	outhouse	

[a] The arabic numbers refer to the households listed in Table 1.

[b] This table was located on the site of an abandoned house. The outline of the abandoned structure was detectable by the drainage ditch encircling the building and a few rotting house posts still in place.

[c] This abandoned structure was the previous residence of Charuma, now living in Structure 2H. When a building is abandoned, it becomes community property. Any village member may scavenge parts from the structure.

[d] These two posts are used in community events. George Mentore (personal communication 1985) witnessed the posts being used to tie live game animals, such as tree sloths, which then were ritually killed by bow and arrow. They also functioned as goal posts for soccer games played in the central village plaza.

1983–1984:224), yet there are two leadership councils. For this study, prestige is measured simply by membership in one of these two groups: political or religious councils. There was not enough field time to conduct household material-culture inventories to reliably estimate wealth distribution within the village. This will be an important project at a future date. However, membership vs. nonmembership in one of these two leadership councils should reflect status differentiation, albeit very generally.

The heads of four households belong to one of the leadership councils. (These four households are all Waiwai; no Wapisiana household heads belong to a leadership council.) These households represent 72 (or 54 percent) of the 134 village members (Table 5). The total amount of residential area occupied by these four households is 625 m^2 (or 58 percent of the total household residential space in the village). The remaining household residences in the village occupy a total of 456 m^2 (42 percent of the total village household residential space) and are occupied by 62 individuals (or 46 percent of the village population). Apparently, the amount of space partitioned among households is a function of the number of occupants per household, rather than their relative status.

These figures suggest that high-status households tend to be large. However, the standard deviation of the mean household size also is large. Further, the amount of residential, work, and storage space is proportional to the size of any given household within the community. This is seen clearly when we compare the household percentages of village occupants to village structural space (Table 6); the correspondence is nearly perfect.

It should be noted, however, that the village leader, Mawasha, has the largest structure in the community (Table 1), even larger than the church (Figure 9). In Figure 7 his residence appears as a distinct outlier in the upper right-hand corner of the distribution. We might conclude from this

Figure 3. Form of the traditional communal round house (*müimó*) constructed by the Waiwai. This particular structure (2E in Figure 2) is nearly 10 m in diameter and houses six individuals.

Figure 4. A work structure (4D in Figure 2). A variety of activities are performed in this type of structure (*yawarímta*). In the left corner of the building a round cassava bread is being cooked on a stove modified from a steel drum. To the right of the stove is an oven fabricated from earth, stone, and sticks.

observation that there is at least some correlation between status and house-floor area. This conclusion is thwarted, however, when we investigate the use to which the leader's house is put. Gatherings at the community level, such as ceremonial feasts, political discussions, and matters of village policy frequently are convened in the leader's residence. Therefore, his house in a sense may be considered another form of community structure. In taking on the role of leader, Mawasha is inflicted with the "prestige" of having the largest structure, and, at times, the entire community in his house.

Comparison to Other Tropical Forest Communities

It is instructive to compare the correlations observed in Shefariymo to those obtained from other Amazonian communities. Two sets of data, both collected by Warren DeBoer, are available for this purpose (DeBoer 1989; DeBoer and Kaufman 1977). In the *montaña* of eastern Peru, DeBoer and Kaufman (1977) measured the floor areas of 11 Shipibo–Conibo houses and correlated them to the associated numbers of individuals. The Pearson's r correlation coefficient is .853, therefore, 73 percent of the variation in Shipibo–Conibo floor area is explained by the family sizes (Figure 10). These investigators note that in present-day Shipibo–Conibo society, the nuclear family is the important economic and social unit (DeBoer and Kaufman 1977:6).

The second data set collected by DeBoer is for the Chachi Indians, who occupy the Rio Cayapas Basin of eastern Ecuador (DeBoer 1989). According to DeBoer (1989:480, personal communication 1990), the Chachi "live in single-house settlements" and they never occupied large communal residences. Analyzing 19 houses he obtained a correlation coefficient of .8011 between floor area and number of residents (DeBoer 1989:Figure 4). Comparing the results of the Waiwai, Shipibo, and Chachi regressions between nuclear-family house-floor areas and number of occupants we see that the Shipibo and Chachi are higher than for the Waiwai.

Figure 5. In the center foreground is an outdoor table or storage rack (*churiapon*). These racks are used in a variety of short-term storage or processing activities. Newly made cakes of cassava bread often are placed onto a rack for sun drying. This is structure 4F in Figure 2. In the background is a residence (structure 4G).

Figure 6. This is the church (structure 12). In addition to religious activities, village meetings are held here.

In fieldwork conducted in the largest Shipibo village, San Francisco de Yarinacocha, in 1976, I noted that related nuclear families occupy house compounds within the settlement (Siegel and Roe 1986:98–99). As in the Waiwai case, the "nuclear family residences are the fragmented remains of an ancient communal hut, or *maloca* as it is called" (Siegel and Roe 1986:99).

Warren DeBoer (personal communication 1990) suggests that the higher *r* values of the Shipibo nuclear-family relation, compared to the Waiwai context, may perhaps "relate to their longer separation from the traditional *maloca* dwelling." In other words, the Shipibo have adapted to the nuclear family as the primary social and economic unit, compared to the Waiwai, who still maintain the extended family in this regard.

San Francisco de Yarinacocha, being the largest Shipibo village, has many extended families. Out of the six households falling below the regression line in Figure 10 four are from San Francisco. There are no San Francisco households above the line. If these households were removed from the regression then the resulting *r* value would be considerably higher. These limited data suggest that in large villages the traditional extended family will be maintained longer as a functional unit than in small settlements.

Table 3. Distribution of Architectural Space by Structure Type in Shefariymo.

Structure Type	N	Sum of Structure Areas (m^2)	Mean (m^2)	Standard Deviation
Residence	24	1,081.42	45.05	22.29
Multiuse	17	430.20	25.30	9.87
Storage rack	20	64.87	3.24	2.29
Community building	4	229.17	57.29	15.04
Total	65	1,805.66	27.79	24.17

Table 4. Pearson's r Correlation Coefficients and r^2 Values Between Various Structure Types and Associated Numbers of Individuals at the Nuclear Family vs. Household Levels in Shefariymo.

Structure Type	Level	N	r	r^2	F Ratio	df	Significant at .05 Level?
Multiuse	family	16	.137	.018	0.25	1,14	no
House	family	24	.662	.439	17.18	1,22	yes
Total[a]	family	24	.714	.510	22.86	1,22	yes
Multiuse	household	12	.411	.168	2.01	1,10	no
House	household	11	.982	.965	248.76	1,9	yes
Total[a]	household	11	.962	.926	112.64	1,9	yes

Note: The correlation coefficients are considerably higher at the household level than at the nuclear family for each structure type examined.

[a] The "total" entries represent all of the structures (multiuse, house, and storage racks) belonging to a given family or household.

Final limited comparisons may be made to three other tropical-forest groups: (1) the Achuar, who are a Jivaroan-speaking group from eastern Ecuador; (2) the Arawakan Tuyuka who occupy the upper Uaupes River district in northwestern Brazil; and (3) the Yanoama who inhabit the headwaters region of the Orinoco River. Zeidler (1984) conducted an ethnoarchaeological study among the Achuar and presented useful information for one of the households in the village of Pumpuentsa. The structure, roughly 161 m^2 in area, housed 16 individuals, representing a single extended family (Zeidler 1984:319). We see that the Achuar household falls into the Shefariymo household distribution plot very well (Figure 8).

A communal house in the Uaupes region was described by Wallace, an example of which is

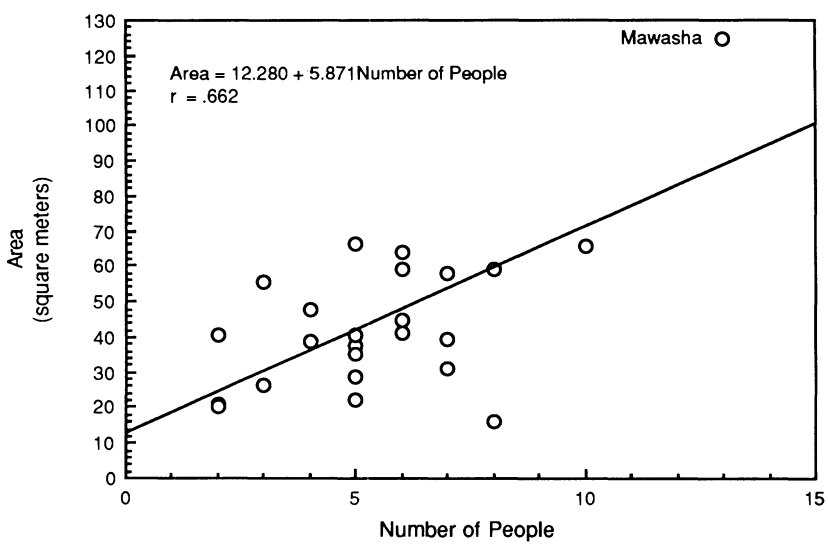

Figure 7. Scatter plot and regression of nuclear-family house areas with respect to number of people. The outlier in the upper right-hand corner is the residence of the village leader, Mawasha. As explained in the text, his house often is used for community meetings, thus accounting for the disproportionately large size of the structure compared to the rest of the distribution.

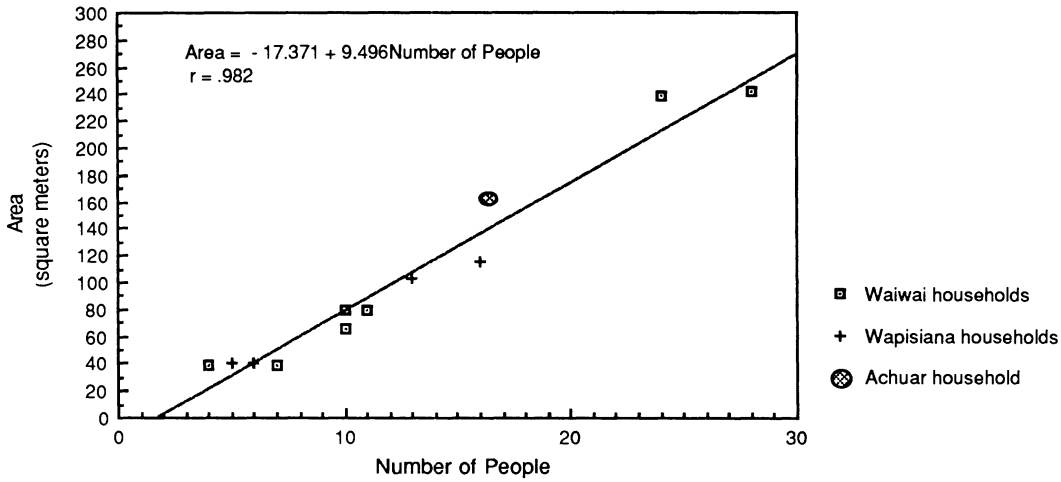

Figure 8. Regression plot of household house areas with respect to the number of people. The Waiwai and Wapisiana households are distinguished to demonstrate the overlap between the two ethnic groups with regard to this distribution. In addition, the Achuar household described by Zeidler (1984:319) is plotted showing the close fit to the Shefariymo households. The Achuar household was not used in deriving this regression equation.

pictured by Roth (1924:Plate 61A and B). The house, occupied by the Tuyuka on the upper Uaupes River, was "one hundred and fifteen feet in length, by seventy-five broad, and about thirty high. This house would hold about a dozen families, consisting of near a hundred individuals" (Wallace 1969:341). Converting the dimensions to meters this house is 801.28 m^2 in area, and using the regression displayed in Figure 8 I would estimate that roughly 86 people occupied the residence. This corresponds nicely to Wallace's figure of "near a hundred individuals."

Smole (1976:70–71) presents demographic and architectural information for several Yanoama *shabono* (communal houses). The Mayobo-teri *shabono* is 32.3 m (106 feet) in diameter (area = 819.84 m^2). Using the regression in Figure 8 I estimated 88 people to occupy the house, which compares favorably to Smole's figure of "about 80 people" (Smole 1976:71). The *shabono* occupied by the Jorocoba-teri is 30.5 m (100 feet) in diameter (area = 729.65 m^2) and contains 84 people. The regression formula estimated 79 people. Finally, the Waracacoyafiba-teri *shabono* is 18.3 m (60 feet) in diameter (area = 262.67 m^2) and is occupied by 60 people. I estimated that this *shabono* should house roughly 30 individuals. The disparity between the estimated and actual population size of this *shabono* perhaps may be an indication that the group will soon fission. Smole (1976:71) indicates that "since new *shabono* are built when fissioning or fusion of their population occurs,

Table 5. Distribution of Household House Areas by Village Elders vs. Nonvillage Elders in Shefariymo.

Household Membership	Number Households	Total Number Household Personnel	% of Total Village Population	Mean Household Personnel	Standard Deviation Household Personnel	Total House Areas (m^2)	% of Total Village House Area	Mean House Areas (m^2)	Standard Deviation (m^2)
Village elder	4	72	54	18.00	9.38	625.62	58	156.40	83.95
Nonvillage elder	7	62	46	8.85	4.52	455.80	42	65.11	30.75

Table 6. Percentage of Village Occupants per Household Compared to Percentage of Village Structural Space per Household in Shefariymo.

Household Number	Percentage of Village Occupants per Household	Percentage of Village Structural Space per Household
1	8.20	10.35
2	17.91	17.94
3	7.46	6.72
4	20.89	19.90
5	2.98	3.63
6	7.46	9.23
7	5.22	4.48
8	9.70	8.00
9	3.73	3.84
10	11.94	9.34
11	4.47	6.51

Note: For each household the percentages are very close. In other words, the larger the household the more structural space will be used by the household. The relationship is nearly perfectly linear, with a ratio of 1:1.

shabono dimensions coincide roughly with *shabono* populations." He points out further that fissioning generally "is due to accumulated tensions and factional disputes arising when internal strife and bickering reach critical proportions—a condition increasingly likely as a *teri* grows in numbers" (Smole 1976:87).

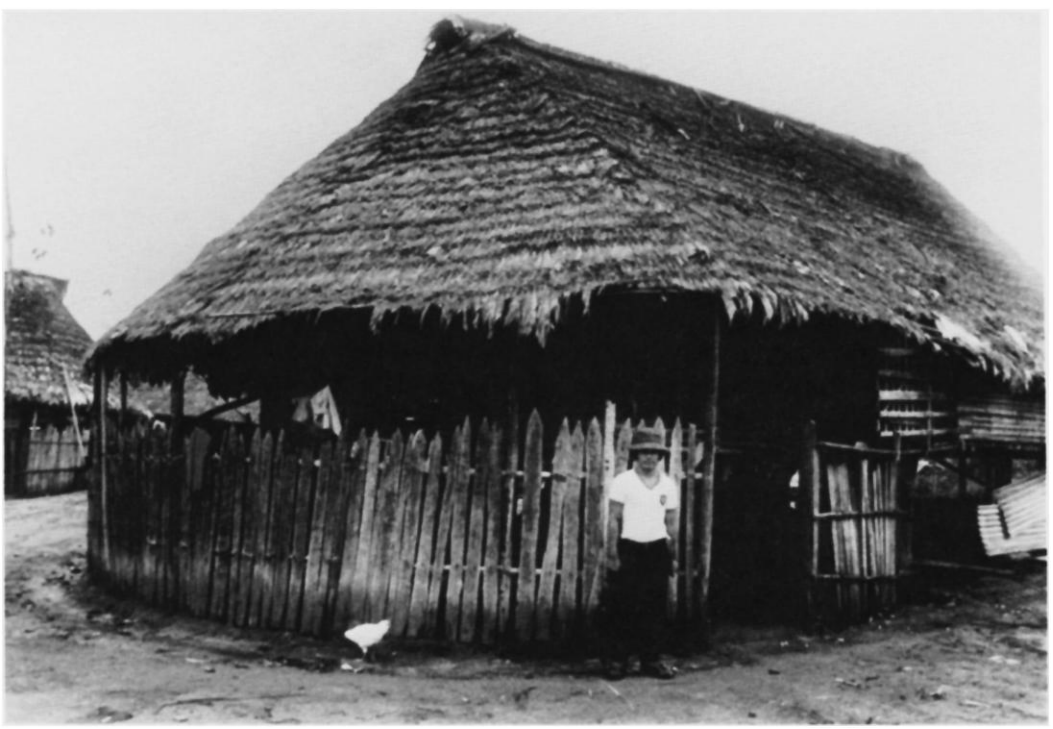

Figure 9. The village leader's house. It is the largest structure in the community and often is used for village-wide meetings.

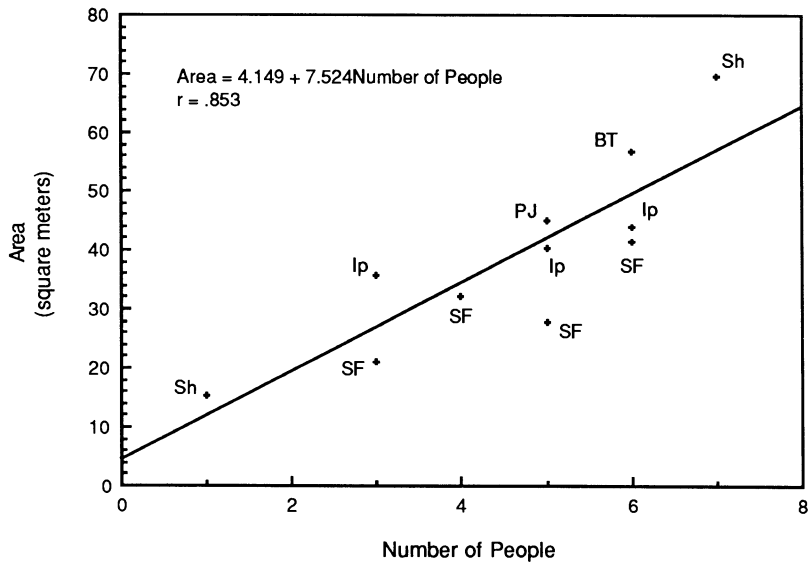

Figure 10. Scatter plot and regression of house-floor area per family with respect to number of people for the Shipibo-Conibo villages studied by DeBoer and Kaufman (1977). The families from the largest village, San Francisco de Yarinacocha, are all below the regression line. This is suggestive evidence that in the large villages the household is still the strong social and economic unit. In small villages, however, the Shipibo-Conibo have adapted to the nuclear family as the fundamental social unit as reflected in this distribution. BT: Boca Tamaya; Ip: Iparia; PJ: Puerto Junio; SF: San Francisco de Yarinacocha; SH: Shahuaya.

Figure 11. In this photograph a portion of the village plaza is being used for pottery production. This is an activity performed at the household level by related women. In the background is a house compound belonging to household number 2. From left to right these are structures 2I (storage rack), 2H (house), 2E (house), and 2F (house) in Figure 2.

DISCUSSION

Prior to missionary contact in the early 1950s, the Waiwai lived in large communal houses, known as *müimó* (Yde 1965:153), and Meggers (1971:86) noted that these structures varied "in size according to the number of occupants." Minimally, the houses would contain an elderly married couple, their unmarried sons, and their married and unmarried daughters. In small villages, the entire group may live in one communal house, the internal organization of which followed household lines.

Due to missionary intervention the Waiwai no longer live in communal houses, though the traditional household organization is still maintained spatially within the village. In other words, related nuclear families live in a cluster of houses in close proximity to one another (Wilk's [1983: 109] household cluster) (Mentore 1984:181). An individual cluster of houses and associated structures and plaza space is referred to here as a "house compound" (Figure 11). The house compound is the physical locus within the settlement for the basic social, economic, and demographic unit (or household), and where many of the household activities are conducted. Of course, there are many activities organized along household lines that are performed outside of the house compound. The majority of these activities are economically based, such as tending to agricultural plots, hunting game, and gathering firewood. The same pattern of household and house-compound organization has been noted for the Shipibo Indians in the *montaña* of eastern Peru (Roe 1980; Siegel and Roe 1986:99).

The findings in the present study support those documented by Hayden and Cannon (1984:180–181) with respect to the Highland Maya. They found that house-floor area was a poor predictor of nuclear-family size. However, "when individual nuclear families are grouped together as corporate groups, predictive values for measures such as floor area to population should become much more precise" (Brian Hayden, personal communication 1987). This is because "idiosyncratic factors affecting individuals (or individual households) are more likely to cancel each other out, yielding a more stable and therefore predictable relationship" (Hayden and Cannon 1984:18). One of the explanations offered by Hayden and Cannon for the weak relation between floor area and family size is that "due to major amounts of effort and resources required, structural modifications cannot be undertaken very frequently" (Hayden and Cannon 1984:180). I would argue that key factors involved in this context thus center around effort and resources.

When we examine the Waiwai/Wapisiana setting in terms of these variables, it is seen that effort and resources are not constraining factors in house construction. Structures are modified or completely rebuilt in response to two primary factors. In this tropical setting, vermin quickly infest various components of a building. The dry roof thatch provides an ideal habitat for cockroaches, rats, and snakes. The posts, beams, and purlins frequently are sites for termite infestations. As various elements of a structure become noticeably and annoyingly populated by undesirable creatures they are replaced with new parts. There are times, however, when it is easier simply to rebuild an entire structure rather than selectively replace bad elements. When the roof and structural members simultaneously are "crawling" with unwanted fauna then the building likely is to be destroyed by burning and replaced by a new structure.

The second condition responsible for structure modification, or new construction, is related to changes in household personnel and/or organization. If a nuclear family acquires a new member(s) (i.e., birth or adoption of a child, elderly parent(s) joining the family) then frequently there will be changes in the associated structures to accommodate the addition(s). Likewise, a newly married couple will build a new house, with the help of their related household members. These personnel changes will affect the demography/floor-area relations differently depending on which structure types are considered and whether the relation is being evaluated at the nuclear-family or household level. In a general discussion of architectural design, McGuire and Schiffer (1983:285) suggest that "when the composition or size of social units changes, their activities (and thus requirements of space) often also change. Architectural design must reflect and adapt to these variations in social units and their architectural needs." In the Waiwai example the different structure types vary in the relative degrees to which they are closely linked to associated numbers of individuals. This reflects alternative spatial requirements associated with different activity sets.

As seen earlier, the floor areas of houses are correlated more highly with associated numbers of individuals, at both the nuclear-family and household levels, than are multipurpose structures (Table 4). Multipurpose structures are used as kitchens, worksheds, social and child care centers, and storage loci. These findings suggest that there are critical spatial requirements associated with sleeping and other related activities, thus producing an allometric relation between nuclear-family as well as household size and the corresponding house-floor areas (though this relation is considerably stronger at the household rather than nuclear-family level).

Multipurpose structures, on the other hand, are relatively flexible, in a spatial and functional sense, when accommodating various numbers of individuals. In other words, it is not so important how large a kitchen is, but how much food is produced in the kitchen. In a small village, such as Shefariymo, a kitchen serving four individuals will serve eight individuals equally well. At the nuclear-family level this observation clearly is reflected by the low correlation coefficient ($r = .137$). The fact that the correlation coefficient increases ($r = .411$), when comparing multipurpose-structure floor area and numbers of individuals at the household scale, indicates, however, that the spatial requirements for the activities conducted within these types of structures do become an important consideration at this larger level of social organization.

From the above observations it may be generalized that in situations where construction effort requirements are low and available construction resources are high then floor area should be a good predictor for household size (where the household is the important economic and social unit). Alternatively, where construction effort requirements are high and available construction resources are low then floor area will likely be a poor predictor for household size, as in the Highland Maya context (Hayden and Cannon 1984). David (1971:117) made this same observation with regard to Fulani construction technology: "The less the capital outlay or labour required to construct a building or complex of buildings, the greater the fit between it and its personnel over the useful life of the building. Conversely, the more permanent a building, the less the degree of fit."

As available construction resources become scarce within the catchment area of the Waiwai village, then this becomes an important factor in determining the timing for settlement relocation. Often, the depletion of construction materials coincides with scarcities of other important resources, such as firewood, and declining fertility levels in agricultural plots. The combination of these factors will prompt relocation, thus minimizing the need to alter the existing relation between house-floor area and number of occupants.

Kent and Vierich (1989) recently investigated a number of factors affecting village spatial organization among the Basarwa and Bakgalagadi of the Kalahari in Botswana. Their study focused explicitly on the predictability of a number of variables for settlement size and structure. These variables include ethnicity, subsistence orientation, actual settlement occupational duration, and anticipated occupational duration. Kent and Vierich (1989:128) found that of all these variables, only anticipated occupational duration will affect the structure and organization of a settlement significantly, including hut size and amount of space allocated per person. Among the Basarwa and Bakgalagadi, hut size correlated very poorly with number of occupants (Kent and Vierich 1989: 120). However, when anticipated occupational duration (short, medium, long) is factored into the analysis, a number of village organizational features are accounted for.

Kent and Vierich (1989:130) conclude that *anticipated* mobility strategies and the *anticipation* of sedentism may be a major organizing principle in the structuring of human communities. I would argue that, just as in the case of the Highland Maya, the *context* of cultural settings is the important factor to consider when evaluating the predictability of alternative variables in community organization. Thus, I do not agree with Kent and Vierich that anticipated mobility strategies may be used as a general explanatory factor for all human behavior; this borders on determinism. However, their results have broad applicability to other *appropriate* settings, namely highly mobile populations.

SUMMARY AND CONCLUSIONS

As defined in this paper, structural space includes residences, multiuse work sheds, storage racks, and community buildings. This typology is based on how the villagers conceive of and use their built environment, thus it is an emic classification. There is a close correlation between household

(or corporate group) size and the amount of structural space used by a given household. Alternatively, there is relatively little correspondence between nuclear-family size and the amount of associated structural space. These two findings make sense in light of traditional, premissionary Waiwai/Wapisiana lifeways. The household is the adaptive, functioning unit in this society, and, as such, spatial requirements are dictated along household lines. Once we understand this, then the household becomes the analytical unit, which makes sense culturally.

It is important to address an issue raised earlier regarding the low correlation between floor area and nuclear-family size. It was noted by Hayden and Cannon (1984) that in addition to other factors, the low correlation seemed to be strongly related to the amount of effort and resources required in Maya house construction. In the case of the Waiwai, effort (including labor relations) and resources are not constraining factors in house construction, yet the poor correlation exists at the nuclear-family level. As noted above, when the analysis is conducted at the appropriate level of social organization, predictability increases and *sources* of variability become more understandable. Therefore, as Hayden and Cannon (1984) clearly demonstrate, it is important to ascertain the most appropriate level or scale of analysis for a given context.

Owing to missionary intervention, the traditional communal house is no longer used by the Amerindians occupying the upper Essequibo drainage. However, the disaggregated communal residence is reconstituted in the form of the house compound. Thus, strongly connected nuclear families maintain their social ties through close spatial positioning of the residences. Further, such multiuse structures as the kitchens and worksheds are shared by the nuclear families of a single household. The same is true of the storage racks. The missionaries may have destroyed the physical appearance of the traditional Amerindian village, but the household corporate structure, providing the critical economic and social relations for successful production and reproduction, is well intact.

In terms of prehistoric archaeology in the South American tropical lowlands this study provides a basis for retrodicting household size for a particular settlement type, the sedentary community. In this sense, my analysis is most useful in a direct-historical framework. Therefore, when a communal house of a group cognate to the Waiwai is excavated, the number of individuals who occupied the house may be estimated using the regression established in this study.

One may query, "How do we know when we are excavating the remains of a group cognate to the Waiwai?" I would argue that in the case of the South American tropical lowlands, prechiefdom or tribal-based societies may be considered cognate. I do not mean to suggest that all lowland groups are "ethnically Waiwai." Ethnic differences are present between lowland groups of similar sociopolitical organization. However, among these groups I would argue that there are certain generalizations that may be offered, including the organization, distribution, and use of internal village space. This was noted above in the comparison between the Waiwai/Wapisiana, Shipibo–Conibo, Chachi, Achuar, Tuyuka, and Yanoama.[2]

As Lathrap (1970) and many of his students (e.g., Brochado 1984; Oliver 1989; Stahl 1984) have demonstrated, there appears to have been a vast sharing of cultural elements by the tropical-forest societies occupying the Amazon Basin. Lathrap (1970:47) argued originally that the basis of this tropical-forest system was economic, specifically the intensification of root-crop agriculture. More recently, others have suggested that cosmology was also an important factor in defining this tropical-forest culture (Bierhorst 1988; Roe 1982; Stahl 1984). It is likely that both cosmology and economics were aspects of the tropical-forest system shared by the lowland societies. Further, it has been well documented that the peopling of the Antilles by ceramic-using Indians originated in a dispersal from the Orinoco Valley, roughly 2,500 years ago (Rouse 1986, 1989a, 1989b). Similarities in material culture (Lathrap 1970:110–112; Rouse 1964, 1986; Rouse and Cruxent 1963) and worldview (Stevens-Arroyo 1988) suggest that the early ceramic-age groups in the Caribbean may be considered, in a very general sense, an extension of the tropical-forest system from lowland South America.

Given this argument, therefore, I suggest that the results of the present study may have wide applicability for lowland tropical forest archaeology in South America and the Antilles. The challenge now is for archaeologists to recognize and excavate prehistoric houses in this regional context.[3]

Some investigators recently have argued that the importance of ethnoarchaeology is solely for the

generation of pancultural principles of human behavior, and as such the premise of ethnographic analogy is wrong (see especially Kent 1987:41–43). I would argue, of course, that individual studies should be evaluated in terms of their goals, appropriateness of methods, and conclusions generated. In some contexts, ethnographic analogy and even the direct-historical approach may be very useful (Hayden and Cannon 1984:202). The South Amerindian ethnographic context has a well-documented prehistoric counterpart. If archaeologists study on-going Amerindian lifeways with the goals of understanding processes of site formation, demographic organization, and the interrelations of critical variables structuring the archaeological record, then there will be payoffs at two levels: (a) general principles for such concerns as site formation processes and demographic organization *and* (b) specific characteristics about internal settlement organization of groups such as the Waiwai and Wapisiana, and their prehistoric counterparts. If we organize our research in a hierarchy of goals/implications (such as general to specific), then the applicability and relevance of the study (vis-à-vis general principles *and* direct analogy) is apparent.

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NOTES

[1] In grouping nuclear families into households and computing correlation coefficients between household size and floor area, one might suppose that I am falling into the trap of the "ecological fallacy." In other words, grouping nuclear families into households, or corporate groups, may result in aggregation bias when studying individual behavior (Langbein and Lichtman 1978; Robinson 1950). The important point is that grouped data "will generate aggregation bias in the estimation of standardized measures" (Langbein and Lichtman 1978:33), like correlation coefficients, when the goal is to understand the behavior of *individuals*. Langbein and Lichtman (1978:10) indicate that "aggregation bias will not bedevil a researcher who appropriately uses aggregate level information to explore the behavior of groups themselves, rather than the individuals comprising the groups." In my analysis of nuclear families and households, and their use of space, I am necessarily interested in *group* behavior, as opposed to the individual. In this regard, nuclear families, as well as households, represent ecological or grouped units.

[2] It is important to note that I am considering only the village structure of a sedentary community organized along egalitarian lines. In this context, therefore, temporary camps, hunting stations, and agricultural field houses will have very different spatial, architectural, and demographic correlates to what is presented in the present study.

A further qualifying statement must be made with regard to villages with festival houses. Such villages may serve as a ceremonial center for smaller surrounding communities within a settlement system, as in the case of the Akawaio (Butt 1970:36–42). The size of the festival house possibly reflects the number of communities or overall numbers of individuals using the structure, yet this remains to be demonstrated. The important point for the present analysis is that archaeologically a large festival house may be difficult to distinguish from a communal residence. The key discriminating factor in the archaeological record would necessarily revolve around the associated artifact assemblage. The diversity of artifact categories, and particularly the abundance of tools devoted to domestic activities, should be considerably lower in a festival house compared to a residence. Likewise, the proportion of elaborate or sumptuary items to everyday material remains should be higher in the ceremonial house than in the residence. Of course, postabandonment processes must be factored in as well. For instance, if a festival house ceases to be used in a ceremonial context, what is its subsequent fate? If it becomes a repository for general refuse, then archaeologically it might be very difficult to distinguish its original function (ceremonial structure) from a residence in terms of both structure size/shape and associated artifacts. In this case, it then becomes necessary to consider the spatial and frequency distributions and relationships between different classes of artifacts. The important point is that we must attempt to distinguish primary from secondary refuse, thus making a diligent effort to reconstruct the systemic context of the ancient settlement (Schiffer 1972, 1976).

[3] Another methodological challenge facing researchers who deal with prehistoric community organization is in distinguishing different structure types recovered archaeologically. In the ethnographic setting we have the

luxury of observing behavior in action. In the prehistoric context, it is critical to marshal several lines of evidence to substantiate our structure assignments, such as "house," "workshed," etc., and then to link these data to the social context. Associated artifacts and features are important elements to consider in this regard. (For a good example of this analytical process see Winter's [1976] study of a Formative household in the Valley of Oaxaca.)

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