



An Ethnoarchaeological Study of Mobility, Architectural Investment, and Food Sharing among Madagascar's Mikea

ABSTRACT Ethnoarchaeology is a field of study that aims to provide the information needed to draw reliable behavioral inferences from archaeological data. In this study, data from four settlement types (permanent villages, forest hamlets, seasonal hamlets, and foraging camps) of a forager–farmer population in southwestern Madagascar are examined from an archaeological perspective. Doing so shows that house size, house post diameter variability, outdoor workspace, trash disposal, and feature diversity jointly sort out settlements of different lengths of occupation. However, the relationship between mobility and material culture is not simply a product of the length of stay; it is also affected by differences in the social environments of settlements of different occupational lengths. Using the behavioral ecology of food sharing, we show that certain architectural changes that ensure privacy are expected to occur as settlements become larger and more permanent. These observations from Madagascar should be applicable to other areas. [Keywords: Madagascar, ethnoarchaeology, mobility, behavioral ecology, sharing]

THE TRANSITION FROM NOMADISM to sedentism is often associated with dramatic changes in human society, notably a shift from egalitarian to nonegalitarian political organization. Archaeological studies of the transition show that it is not always quick, irreversible, or pervasive. Instead, the transition can produce a mosaic of lifeways. Sometimes sedentary villagers lived cheek-by-jowl with nomadic groups; sometimes people moved back and forth seasonally, or on a longer time scale, between nomadic and sedentary settlement options; sometimes the same people kept both permanent and one or more temporary residences (Ames 1991; Eder 1984; Kelly 1992; Kent 1992; Madsen and Simms 1998; Schlanger 1991). Thus, wherever people made the transition from nomadism to sedentism, archaeologists could recover remains produced by a range of settlement options implemented concurrently or sequentially. How can archaeologists sort these out?

Ethnoarchaeology seeks to discover consistent relationships between human behavior and material remains in an ethnographic context to help construct inferential arguments for archaeologists. In her study of Kalahari forager settlements, Susan Kent (1991, 1992, 1993; Kent and

Vierich 1989) argued that certain archaeologically recoverable variables sort out occupations of different lengths of stay. She made the logical assumption that people construct houses and organize activities spatially depending on how long they anticipate remaining in a settlement. Our research confirms this expectation and shows that a few archaeologically recoverable variables do track settlement permanence. We also argue for the effect of social changes, particularly those relating to privacy and sharing. Although archaeologists can expect the relationships between material remains and human behavior that we discuss to hold true beyond Madagascar, the specific relationships may depend on the nature of sharing behavior.

In this article, we discuss ethnoarchaeological research in southwest Madagascar among a population that practices a mix of horticulture, pastoralism, foraging, wage labor, and craft production (Dina and Hoerner 1976; Fanony 1986; Kelly et al. 1999; Molet 1958, 1966; Stiles 1991; Tucker 2001). Households practice a mixed economy through mobility. Most maintain several houses at a time, one in each of the microenvironments they exploit. As the household allocates its labor to different activities, it moves members

among its different houses, from villages to hamlets to foraging camps.

We first introduce southwest Madagascar and the types of settlements encountered there, and then present data on differences in the settlements in terms of house size, feature diversity, trash disposal, and labor investment in house construction. In part, the differences reflect mundane differences in the relative importance of various activities at settlements of different intended occupational lengths. However, as settlements become larger, the nature of social relationships also changes, especially those concerning sharing and privacy. Furthermore, some architectural differences reflect these changing relationships and only indirectly track a change in occupational length.

THE STUDY AREA

Madagascar's dry southwest is environmentally heterogeneous (see Figure 1). Within a 35-kilometer east-west transect,¹ one traverses mangrove swamps, coastal mudflats, dunes, dry lakebeds, thorn forest, dense deciduous forest, anthropogenic clearings, savanna, and savanna woodland (Seddon et al. 2000). Rainfall is seasonal—85–95 percent falls within the months of December through March—and unpredictable, with annual precipitation varying from 200 to 1,700 millimeters (Tucker 2001). The people who live in this region exploit the environmental heterogeneity to counter the climatic unpredictability. They practice a diversified economy with different activities occurring in each microenvironment. On the coast they collect marine products and tend small gardens; in the forest they forage for tubers, honey, and small game, grow maize in slash-and-burn fields, and raise livestock; in the savanna they cultivate manioc and sweet potatoes, herd cattle, and participate in village markets. Settlement types associated with these different subsistence options vary in terms of their lengths of stay. From longest to shortest stay, we classify these as villages, forest hamlets, seasonal hamlets, and foraging camps.

We call the people described in this article "Mikea," although identity formation in this part of Madagascar is complex (see Astuti 1995a, 1995b; Poyer and Kelly 2000; Tucker 2003; Yount et al. 2001). Three identity terms are commonly used: Mikea, Masikoro, and Vezo. Identity is neither tribal nor ethnic but, instead, is based on purported economic specialization: Mikea are forest-dwelling foragers, Masikoro are savanna-dwelling agropastoralists, and Vezo are coastal fisherpeople. Despite reputed specializations, most households combine foraging, fishing, farming, and herding activities. The identities may symbolize historical relations to the precolonial Andrevola kingdom: Masikoro were subjects of the cattle-wealthy elites, whereas Vezo and Mikea evaded domination through reliance on the sea and forest, respectively. Oral histories indicate that Mikea are descended from Masikoro and Vezo who fled into the forest during the past 400 years to avoid tribute demands and slavery, and later, to escape French colonialism with its forced

relocation, head taxes, and mandatory labor projects (Poyer and Kelly 2000; Tucker 2003; Yount et al. 2001). Today, people flexibly alter their identity with social circumstances, justified by different sets of rules that are sometimes contradictory. All speak the same dialect of Malagasy, move freely among coast, forest, and savanna, may own houses in each zone, and are historically, genealogically, socially, and commercially interrelated. Anyone who exploits the forest for part of their subsistence is considered "Mikea" (but may call themselves "Masikoro-Mikea" or "Vezo-Mikea"). Therefore, we use the term *Mikea* in its most general sense.

The "ethnographic present" in this article is 1993–96.

Villages

Permanent villages with several hundred to a thousand or more inhabitants border the Mikea Forest on the western coast, the eastern savanna, and within the lakebeds of the Namonte Basin (see Figure 1).

The coastal strip consists of dunes, mudflats, mangrove swamps, and shallow bays. Inhabitants of coastal villages exploit the sea, catching fish and octopi and gathering shellfish, crabs, and sea cucumbers, which are often sold to mobile retailers for eventual marketing in the savanna. They also grow manioc and maize in small gardens and herd cattle, goats, and swine. Savanna villagers cultivate manioc, sweet potatoes, and maize in rainfed fields and herd cattle, goats, and swine. These villages are connected to National Road 9 (mostly unpaved), which supports markets in these villages by linking them to each other and to the cities of Morombe and Toliara.

Within the northwestern portion of the forest is the Namonte Basin, a region of lakebeds, channels, and dunes. The lakebeds are flat, grassy pans and channels that flood during some years; a few contain standing water year-round. Villages here consist of 20–300 reed houses. Inhabitants herd cattle and goats, grow manioc and sweet potatoes, and forage for fresh water fish, birds, and honey.

Two house types predominate in villages: (1) rectangular wattle-and-daub and (2) reed thatch. Wattle-and-daub houses are made from posts set upright about 70–75 centimeters deep (the distance from an adult male's hand to his armpit), with smaller poles woven between them. On the coast, daub is made from a white clay mixed with crushed, burnt seashells, chinked with small limestone rocks; these houses are called *trañiosokay*. In the savanna, daub is made from red sandy clay mixed with water (straw and dung are not used); these houses are called *trañiofotake*. A two-meter diameter pit dug to about two meters in depth is sufficient to provide the mud plaster for a small (six-m²) house. With proper maintenance, wattle-and-daub houses last for 20–40 years (see Figure 2a). The floors of the houses are normally compacted earth, which are covered in mats woven from the fronds of a palm (*Hyphaena shatan*). There is normally only one door, usually with a manufactured lock, and one or two shuttered windows, fashioned from planks. Furniture includes beds, tables, chairs, and storage boxes. Houses

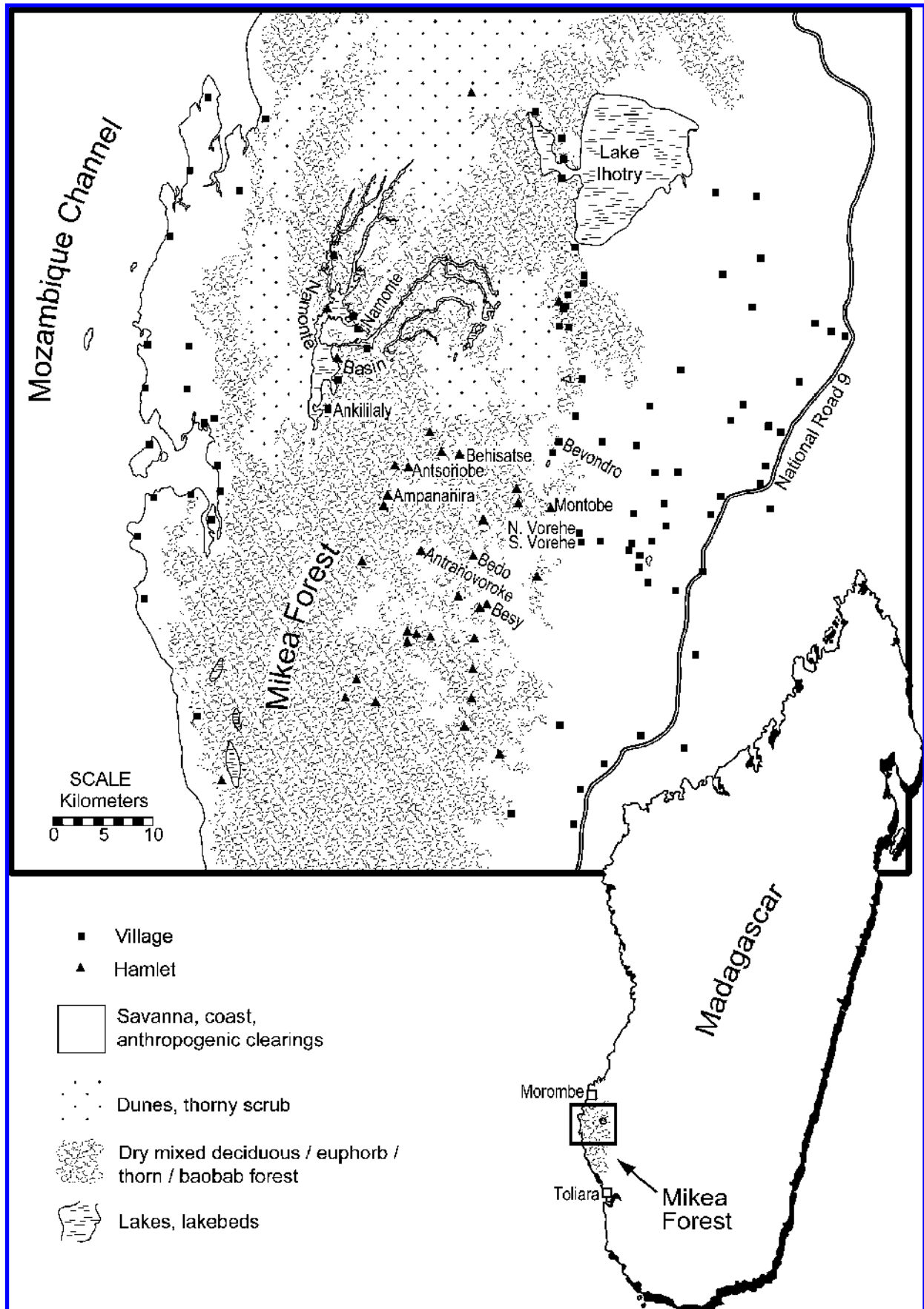


FIGURE 1. Map of the northern Mikea Forest with all villages and hamlets shown. Forest extent by James Yount based on 1994 Landsat TM and 1999 SPOT imagery.



FIGURE 2. Architecture in villages and hamlets: (a) mud house, or trañofotake, in Vorehe; (b) reed thatch house, or trañovondro, in Ankillilaly; (c) grass-thatch house, or trañoakata, in Besy; (d) bark-thatch house, or trañoholits'hazo, in Bedo; (e) forest hamlet Montobe; and (f) freshly swept "trash ring" in Behisatse. Note the kitley platforms in front of the houses in (c), (d), and (e).

are filled, often packed, with material goods and food stores. Very few belongings are left outside village houses.

Critical to the lifespan of the wattle-and-daub house is the roof, which is thatched with reeds or grass. A strip of baobab bark, plastic, or metal is sometimes laid along the roof's peak to make it waterproof. The roof extends for a meter or so around the four edges of the house, forming a veranda that protects the walls from the weather and promotes their longevity. This veranda provides shade for out-

door work and social activities, and a platform on which to dry manioc. A thick, well-made roof can last up to five years.

Labor requirements for gathering construction material and for building wattle-and-daub houses may exceed two months. Gathering materials may be the biggest cost in terms of time or money (some individuals specialize in collecting these materials for sale).

The other common house type in villages—and the only other type found in Namonte Basin villages—is reed

thatch houses, or *trañovondro* (see Figure 2b). These are similar to wattle-and-daub houses, with poles set in the ground (no wall trench is excavated for either wattle-and-daub or thatch houses), but with bundles of reeds tied to the latticework. Trañovondro tend to be smaller than wattle-and-daub houses and, consequently, are built with thinner posts. They also tend not to have verandas; if present, it is only on one side, usually over the door. These houses take two–four weeks to build. After three years the reeds, if not the poles, are replaced. Like wattle-and-daub houses, reed houses sometimes have palm floor mats; are often furnished with beds, tables, chairs, and storage boxes; and are packed with personal belongings.

Forest Settlements

Between the coast and the savanna is the Mikea Forest or *Añalamikea*, a 20–40-kilometer wide swath of dry forest. The Mikea Forest is a mosaic of dense, dry, deciduous forest choked with vines, with patches of thorn forest, groves of baobab trees, slash-and-burn (*hatsake*) maize fields, and anthropogenic clearings. In some places, grasses colonize these clearings, creating savanna. In other places, the dry forest is slowly regenerating.

Slash-and-burn maize fields are cut in July and August, burned in October, and planted in late November or December. The maize is harvested in March and April; some is eaten, some dried and stored, some kept as seed, and some sold to traders.

The forest is a source for wild foods. People forage for wild tubers, especially *ovy* (*Dioscorea acuminata*), *babo* (*D. bemandry*), and *tavolo* (*Tacca pinnatifida*); wild cucurbits; honey; and small game animals, particularly three species of tenrecs (*Tenrec ecaudatus*, *Echinops telfairi*, *Setifer setosus*), feral cats (*Felix sylvestris*), tortoises (*Pyxis arachnoides*), and occasionally lemurs (*Microcebus murinus*, *Chierogaleus medius*, and *Lepilemur ruficaudatus*). There are no large game animals in the Mikea Forest, except for the rare wild boar (*Potamocorus larvatus*).

The forest is also used as pasture for cattle and goats, and more rarely for swine. Although living in the forest, Mikea may also do wage labor such as guarding cattle or cutting for hatsake fields village men.

Within the forest, we identified three settlement types: (1) forest hamlets, (2) seasonal hamlets, and (3) foraging camps.

Forest hamlets usually consist of 3–20 square to rectangular houses located near hatsake fields. Some households live most of the year in these settlements, although they may have a village house, whereas others move in seasonally to tend their hatsake or to pasture livestock in the surrounding forest. Most forest hamlets are occupied by kin. Foraging, especially for wild tubers, is a daily activity in these settlements.

Informants claimed that forest hamlets were occupied for three to five years, although we know of some hamlets occupied for as few as two years or as many as ten. The

houses in forest hamlets are small, with about five square meters of floor space and eaves one to two meters in height. They are made with a set of upright posts, although fewer in number than in village houses, set into the ground about 45 centimeters deep. Pliable sticks are woven through them to form the lattice that holds the wall thatch. The houses (see Figures 2c–2e) are thatched with reeds (*trañovondro*), bark (*trañoholits'hazo*), or grass (*trañoakata*). More rarely, walls are made from upright logs or planks.

There are costs and benefits to different types of thatch. Reeds are the most solid, but they do not grow in the forest and must be transported from elsewhere or purchased. Grass thatch requires little maintenance but attracts roaches. Tree bark is easy to acquire but requires considerable maintenance: It tends to crumble and fall out of the lattice, and so it is usually replaced once or twice each year. As houses age, people patch holes in walls and roof with different materials, including thatch, old woven mats, and plastic bags. Broad slabs of baobab bark, 30–40 centimeters wide, and two to three centimeters thick, are a preferred roofing material because they are waterproof. Grass roofs may have a strip of baobab bark along the peak to keep out rainwater. Baobab bark is rarely used for walls because goats will eat it.

It takes one–two weeks to gather the material and construct a forest house. They also require annual maintenance. After a few years, the house is often destroyed and a new one built in its place, with some of the poles, lattice, and baobab bark slabs being reused. When hamlets are moved to a new location, which may only be a kilometer or two away, existing structures are sometimes dismantled and the materials reused in the new location.

Another common structure in hamlets is the *kitrely*, a platform two meters or more above the ground. Kitrely platforms serve two primary functions: storage on top, especially for maize and tools; and shade below, for work and social activities. Kitrely are often erected just outside the front doors of homes (see Figures 2c–2e). They are composed of four to six large posts (sometimes more if they are especially large), set into the ground about 75 centimeters deep.

In nearly all cases, these houses have an exterior hearth located about two meters in front of the doorway beneath the kitrely platform. There is no stone in the forest; hearths are nothing more than low heaps of ash and cinders. Inside the house, normally to the left as one enters, is another hearth used for heat at night and some cooking. The adjacent portion of the front wall slopes outward at the bottom, so that the smoke rises and finds its way through cracks in the wall and roof.

The doorways of these houses almost always face north, and settlements are normally a linear north–south scatter of houses. In addition, the rear (south) wall of the house is sometimes built more solidly than the others, with reeds or planks. During the dry season, a cold wind blows from the south at night, and the better-constructed south wall protects against it. The north-facing doorway (which may or may not have a working door) prevents the wind from

blowing hot sparks that might ignite the house. (In villages, doorways face a variety of directions. During the very hot, wet season, there is an evening west or north wind that, if doors and windows are left open, helps to cool the house; no indoor fire is burning at this time of the year.)

Forest hamlets may also contain a variety of other types of houses, made of grass or bark. We have seen lean-tos, three-sided boxes, A-frames (small, pup tent-like structures), and Quonset hut-shaped structures (see Figure 3). Such structures are used when people first move into a hamlet until they have built their more permanent house, after which time they may become children's houses, because, by the age of ten years or so, children sleep outside their parents' house.

Other structures include maize threshing bins, animal pens, and troughs—hollowed-out logs—placed beneath the eaves of houses to catch rainfall for drinking water during the wet season. If fenced enclosures are present, these are usually ceremonial enclosures (see below), but they are also sometimes animal pens.

Seasonal hamlets are forest hamlets that are less permanently occupied. The occupants spend most of the year in other places, mostly in villages, but live in these hamlets

while tending their hatsake or pasturing livestock. Seasonal hamlets have fewer houses, and the houses are sometimes expedient lean-tos, three-sided boxes, A-frames, or Quonset huts. The houses have interior and exterior hearths, but fewer kitrely platforms. The houses themselves may have the same floor space as those in forest hamlets but tend to be shorter. The houses may be used for more than one season but are not thought of as a main residence. These houses can be built in a few days, and they last about one season.

Many forest hamlets began life as seasonal hamlets. Several settlements that were seasonal hamlets in 1993–94 were forest hamlets in 1997–99. A settlement was classed as a “seasonal hamlet” depending on whether anyone was living there when it was visited in the dry season and on informant testimony.

When foraging effort is intensified—as often occurs in June through August, particularly in years when the maize harvest is inadequate—households relocate their families closer to the wild food patches and occupy foraging camps. Most Mikea households practice nomadic foraging (*mihe-motse*) for at least a few weeks in some years. In the dry season, there is virtually no rainfall and no surface water in

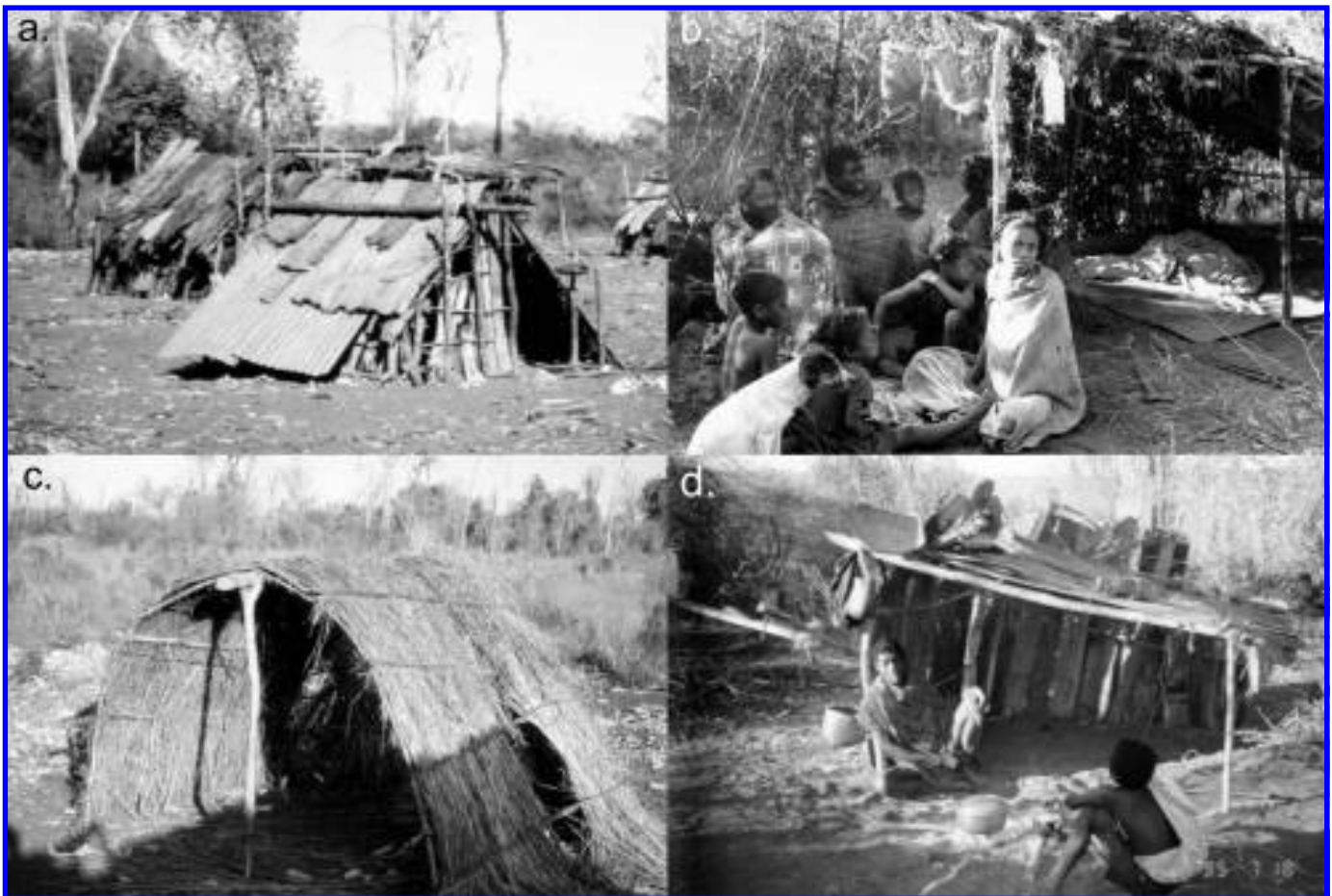


FIGURE 3. Expedient shelters found in hamlets and camps: (a) A-frame, (b) lean-to, (c) Quonset hut (photo courtesy of James Yount), and (d) three-sided box.

the forest outside the Namonte Basin, except for a few enhanced wells. Most water comes from the tuber *babo*. Adults sometimes leave their children in others' care in hamlets or villages to increase their mobility and decrease drinking water needs. Often an individual household or pair of households occupies a foraging camp.

Foraging camps are often not far from hamlets and people may go back and forth between the two. If the camps contain any structures at all, they are simple lean-tos or box-like shade structures (see Figure 3). These structures can be built in a day and last two–four weeks. But, more often, foraging camps have no structures; widely spaced hearths are simply nestled among the tangled brush. Mats are laid around the hearth, and the few possessions brought along are hung on trees. Where modest structures are built in foraging camps, they are built where people station themselves in the open and need protection from wind and sun (rain being rare in the dry season).

What little trash produced in foraging camps that is not eaten by dogs is tossed only one to two meters from the hearth, normally in the bushes. The hearths are also periodically emptied of their ashes, which are tossed into the nearby vegetation.

WHAT MATERIAL REMAINS CHARACTERIZE SETTLEMENTS?

Mikea implement a variety of settlement options that differ in terms of perceived permanence of each option. How could an archaeologist sort out these settlements of differing lengths of stay?

First, we must consider the differential availability of raw materials. The villages' wattle-and-daub houses are possible because the clay suitable for such houses is present along the eastern edge of the forest, but not within the forest itself or in the Namonte Basin. Likewise, houses that use burnt shell as mortar are easier to build on the coast.

However, differences in the number or size of poles used in construction are not affected by the availability of wood. For the settlements in this study, all people had access to trees, either in the immediate vicinity of their settlement or near their hatsake fields.

A number of ethnoarchaeological studies point to several variables that track differences in mobility (e.g., Diehl 1992; Kent 1991, 1992, 1993; Kent and Vierich 1989; see also Kelly 1992). These include house size, feature diversity (or richness, the number of different kinds of features), distance to areas of trash disposal, and investment in house construction. We consider each of these variables below.

House Size

People intending to remain in one place for a longer period might be expected to invest in larger houses. Kent found that intended length of stay was a better predictor of house size than number of household residents (1992; Kent and Vierich 1989). We do not have comparable data on household size, but in our sample, mean house size is largest in the permanent villages. This is primarily because of the typically large size of wattle-and-daub houses; village thatch structures are only slightly larger than houses in the forest and seasonal hamlets (Table 1), and there is no significant difference in house size between forest hamlets and seasonal hamlets. We cannot make adequate comparisons between populations in part because the seasonal hamlets are not occupied in the dry season, the time of year when we gathered much of our data.

Kent (1992:640) suggests that house size increases in more permanent villages because people in such communities have more belongings. Although we have no systematic measure, our impression is that people in the villages did indeed have more belongings. There are also greater wealth differences within villages, so that some households have more belongings to hide. Forest settlements tend to be inhabited by households with similar

TABLE 1. House and Post Data from Settlements.

Settlement	Mean House Size (m ²)	Main Posts (n)	Second. Posts (n)	Main Post CV	Second. Post CV	Mean Main Post Dia. (cm)/SD	Mean Second. Post Dia. (cm)/SD	Mean Second. Posts per Wall (n)	Mean Second. Post Distance (cm)
Villages									
Vorehe Wattle and Daub	24	12	58	.06	.14	8.4/.5	6.7/.9		
Vorehe Thatch	8.3	42	145	.20	.25	7.1/1.4	4.6/1.2	5.6	41
Ankililaly	5.7	19	68	.13	.15	9.6/1.2	6.7/1.0	8	57
Bevondro	6	23	86	.16	.16	7.4/1.2	6.5/1.0	5	56
Forest Hamlets									
Montobe	5.2	13	32	.18	.16	6.4/1.2	4.9/.8	4.5	60
Bedo	4.9	30	48	.16	.16	4.3/.7	4.9/.8	3.5	65
Behisatse	5.5	22	69	.16	.20	6.6/1.1	4.6/.9	4.4	54
Seasonal Hamlets									
Besy	5.7	17	52	.15	.17	4.5/.7	5.7/.9	3.5	72
Antsoñobe	4.9	29	40	.25	.25	3.8/1.0	4.9/1.2		51
Antrañovoro	5.2	10	22	.29	.27	5.4/1.6	4.3/1.2	3	
Ampanañira	4.9	29	53	.24	.21	6.7/1.6	3.9/.8		

Note: CV = coefficient of variation; dia. = diameter.

livestock assets and foraging, farming, and cash incomes. As we note below, the need for a larger house may be not only a product of “more stuff” to store but also of an increased need to store those possessions out of sight.

Feature Diversity

Based on a list of 31 features, we tabulated the number of features and the number of different kinds of features found in 29 settlements; some of these are the same settlements in different years. The list included 11 different kinds of habitations ranging from lean-tos to tin-roofed cement houses (very rare), kitley platforms, animal corrals, cook houses, latrines, public troughs, drying racks and miscellaneous posts, churches, schools, stores, wells, maize threshers, “guest houses,” clinics, bellows, wash houses, outside hearths, and storage bins. Villagers also construct fenced enclosures around gardens and houses to restrict access of people and livestock. Individuals who practice spirit possession (*tromba*) have enclosures made of upright logs set close together behind or around their house. In such an enclosure, there is a shrine in which an individual’s possessing spirit is said to live when not inhabiting his or her host. These are common in forest hamlets, but there is usually only one per hamlet.

As we might expect, feature diversity increases as the total number of features increases ($r = .85$; $df = 27$; $p < .001$). But the distribution of settlements along this continuum is instructive (see Figure 4): Villages have greater feature diversity than the other types of settlements; forest hamlets and seasonal hamlets have about the same diversity; and foraging camps have the least. This is not surprising, and other studies show that feature diversity mirrors a settlement’s longevity (see Kelly 1992). We see this for the forest hamlets of Bedo and Behisatse (a pseudonym, used

to protect the identities of our key informants). Bedo was established between the dry seasons of 1993 and 1994. In 1994, it had a feature diversity of .13; this increased to .16 in 1995. By 1996, additional facilities had been added to the hamlet, including a larger fenced enclosure, and feature diversity rose to .26. The same pattern holds at Behisatse. This hamlet contained two linked patrilineal household clusters, one of which was established when the hamlet was first visited in 1993; members of the other lineage had just arrived. The highest-ranking man in this cluster at the time was living with his wife in a small A-frame structure that by 1994 had been replaced by a more substantial bark house. Feature diversity registered as .16 in both 1993 and 1994. By 1996, more houses had been added to both clusters, and feature diversity had increased to .26. And by 2000, the inhabitants of Behisatse had upgraded their homes from *trañoholits’hazo* to the more time-consuming *trañovondro*, an indication that the settlement was becoming more permanent.

The types of features that differentiate villages from forest and seasonal hamlets are worth noting. These include schools, churches, stores, clinics, and “guest houses” (houses set aside for visitors; this was only seen in south Vorehe, where a Lutheran mission hosts foreign guests). These features result from and permit increased interaction with the Malagasy government, medical and religious missions, and tourists. There is a greater diversity of house types in villages, including a few rare houses made of milled lumber or cement block, or houses topped by tin roofs. These houses reflect the wealth some individuals are able to muster by tapping into broader social, economic, and political networks. The increased diversity of features is not directly a product of the increased length of stay but, instead, reflects the role that a larger, more permanent settlement plays in the wider political, economic, and social world.

In this respect, it is interesting to note that north Vorehe has a lower feature diversity than south Vorehe. North Vorehe is also known as Vorehe’s “Mikea Quarter.” The people who live here have closer ties to the forest (e.g., this is where a dwarf lives who was portrayed many years ago in a traveling carnival as an original Mikea, a “man of the forest”). There is a clear physical separation between north and south Vorehe, and a social separation as well. In 1995, for example, a celebration in north Vorehe was attended by few people from south Vorehe, and a Lutheran clinic in south Vorehe did not acknowledge the existence of a state clinic in north Vorehe only 500 meters away. North Vorehe’s lower feature diversity suggests that inhabitants of this part of the village may see themselves as somewhat more temporary inhabitants, less committed to a permanent life in the village than those who live in south Vorehe. This is also reflected in house construction. Grass-thatch houses, the typical form in the neighboring forest habitations, constitute 34 percent of north Vorehe’s houses, whereas 42 percent were wattle-and-daub; only two percent of south Vorehe’s houses were grass-thatch, whereas 66 percent were wattle-and-daub.

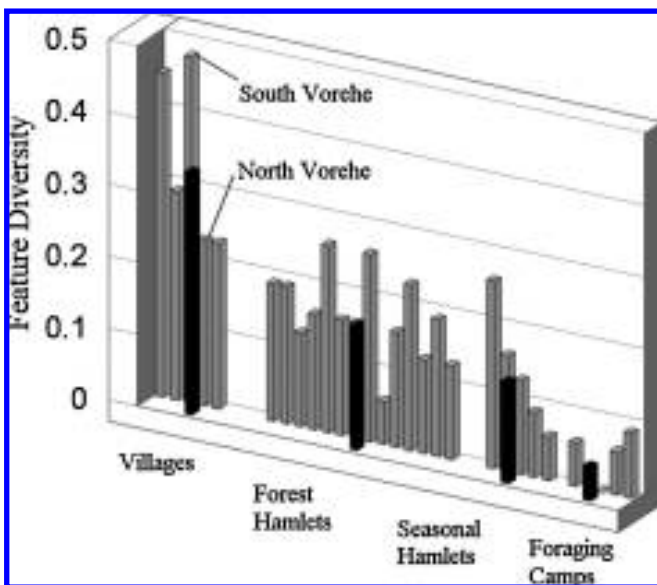


FIGURE 4. Histogram showing feature diversity with means for the villages, forest hamlets, and seasonal hamlets.

It is also important that there is only about one kitrely per three houses in villages (and many of these are not associated with a house but are shades for market stands), about one for every two houses in seasonal hamlets, and nearly one per house in forest hamlets. Because kitrely are used in forest hamlets as places to store dried maize and tools, this means that everyone is able to see others' maize crops, and everyone can borrow another family's tools, such as axes, blowguns, spears, and digging sticks.

Trash

A third factor is the distance to trash from outside hearths. As in other ethnoarchaeological studies (e.g., Hitchcock 1987), we see an increase in the distance between the place where trash was created and where it is deposited as the length of stay increases. Trash is tossed only a meter or two from hearths in foraging camps, and some two to three meters away from the outside hearth in seasonal hamlets.

Trash in forest hamlets tends to be deposited in an arc some three to nine meters away from the outside hearth. Sweeping debris out of the living space around houses and into the "trash ring" (see Figure 2f) is a weekly housekeeping chore. Trash piles contain large amounts of debris from maize husks and other debris that is periodically burnt (although clean corncobs are kept for use as toilet paper). Vegetation seems to play a role in the distance to the trash. At recently established settlements there are many bushes near the houses. Trash is deposited in these bushes (or is blown and caught there) because no one walks through them. As settlements are occupied longer, vegetation disappears as it is trampled, eaten by goats, or pulled up by children to use for brooms or in games. As a result, trash disposal moves further away from the house. But even where there is no vegetation, trash is deposited some eight–nine meters from the house's doorway, often in an arc in front of it. Houses are placed far enough apart that the eight–nine-meter arc does not fall within a neighbor's space.

In villages with a red clay substrate, exterior household areas are swept clean almost daily, and the trash is either dumped at the village's edge, which can be 40 or more meters away, or it is thrown into the pits that were originally excavated to obtain clay for house construction. In villages with a sandy substrate (and that consequently lack the clay pits), trash is still removed to the village edge, although smaller items probably disappear in the sand.

Investment in House Construction

A final factor concerns measures of investment in housing. Cross-cultural studies show that more permanent houses have walls built of durable material and roofs fashioned from materials different from those used for the walls (Binford 1990; Diehl 1992). This is the case here: Wattle-and-daub houses have walls of post and mud and roofs of thatch. Walls and roofs in forest and seasonal hamlets are often made of the same material; although, as noted

above, the more permanent forest hamlets may have south walls fashioned of more tightly woven grass or reeds.

With regard to the archaeological manifestation of houses, little would remain: interior hearths, a slightly depressed floor in sandy areas, a slightly raised, packed clay floor in village houses, and post molds. We focus on the post molds, a common feature in archaeological sites. We collected data on post diameter by measuring posts with a caliper at ground level, only measuring those on which we could obtain accurate measurements. In addition, we counted the number of posts along the long sides of the houses and measured the distances between them. We do not have a truly random sample, as our schedule did not permit us to take measurements at all settlements, and we were not given permission to measure all houses.

Informants stated that if they intended to remain in a house for a long time, they were more selective in their choice of wood for posts. This selectivity is reflected partly by choosing posts of a more standardized diameter for particular tasks. In villages, we often saw poles of approximately the same diameter bundled together, with each bundle destined to be used as primary supports, secondary supports, roof beams, and so forth. But informants were clear that in building more temporary structures they would use whatever poles could be easily had in the forest or scavenged from abandoned dwellings. Post selectivity, therefore, could be reflected in the amount of variation, as measured by the coefficient of variation (CV) in house post diameters.

Houses have six main supports, at the four corners and the two posts holding up the central roof beam. They also have a number of secondary support posts along the four walls. Surprisingly, mean house size (by settlement) is not significantly correlated with mean main post diameter ($r = .43$, $df = 9$, $p > .10$), although it is correlated with mean secondary post diameter ($r = .64$, $df = 9$, $p < .05$). However, the sample of house sizes is skewed to smaller houses; as noted above, the large houses are wattle-and-daub, and they are considerably larger than others in the sample. Without the wattle-and-daub house sample, the correlation between mean secondary post diameter and house size is not significant ($r = .2$, $df = 8$, $p > .1$). Although large houses require large diameter posts, small houses can use both small and large diameter posts. The mean diameters of main and secondary posts by settlement are correlated ($r = .87$, $df = 9$, $p < .001$), as are their CVs ($r = .85$, $df = 9$, $p < .001$). We have different sample sizes of the different post types (e.g., wattle-and-daub house posts could only be measured on houses under construction), but this is not important because CV is not correlated with sample size (for main posts, $r = .21$, $df = 9$, $p > .10$; for secondary posts, $r = .07$, $df = 9$, $p > .10$).

There is a significant difference in CV among main posts in villages, forest hamlets, and seasonal hamlets (Table 2; $D'AD = 8.53$, $df = 2$, $p < .025$; Feltz and Miller 1996), with the highest CV in the seasonal hamlet sample, as expected. There is also a significant difference among the CVs of secondary posts ($D'AD = 14.67$, $df = 2$,

TABLE 2. Summary of Main and Secondary Support Post Size by Settlement Type.

Settlement Type	Mean	SD	N	CV
Main Support Posts				
Forest Hamlets	6.7	1.2	69	.18
Seasonal Hamlets	6.1	1.5	85	.25
Villages	7.9	1.6	97	.20
Villages without Vorehe Thatch Houses	8.4	1.5	54	.17
Secondary Support Posts				
Forest Hamlets	4.5	.89	171	.20
Seasonal Hamlets	4.1	.94	167	.23
Villages	5.4	1.4	359	.26
Villages without Vorehe Thatch Houses	6.1	1.2	212	.20

Note: CV = coefficient of variation.

$p < .001$) but, contrary to expectations, the greatest CV is found in the village sample. The village sample contains both wattle-and-daub and north Vorehe's thatch houses. If we remove the thatch houses from the village secondary post sample, the seasonal hamlets have the highest CV, but there is no significant difference among the samples ($D'AD = 4.25$, $df = 2$, $p < .25$). Hence, the prediction that less selectivity in building materials would be reflected in greater CVs in the hamlets than in the villages holds true only for the main support posts.

The lowest CV in the seasonal hamlet sample is found in Besy. We classified Besy as a seasonal hamlet because no one was present in the dry seasons when we visited it. But some people from Vorehe have tried to establish new villages; Montobe, for example, was established in 1994 but had failed by 1996. Informant testimony suggested that Besy might also be an "upstart" village. This might be reflected in Besy's trash, which was swept in an arc some eight–nine meters from houses (see Figure 2c); additionally, more houses were of reeds than of bark. If we reclassify Besy as a forest hamlet (and leave the Vorehe thatch houses out of the village sample), there is still a significant difference in the main posts' CVs ($D'AD = 14.631$, $df = 2$, $p < .005$), but also a significant difference in the secondary posts' CVs ($D'AD = 8.92$, $df = 2$, $p < .025$). For each sample, the highest CV is the seasonal hamlet sample (for the main posts, $r = .26$, as opposed to .18 and .17 for the forest hamlet and village samples, respectively; for the secondary posts, $r = .24$, as opposed to .19 and .20, respectively). With this reclassification of Besy, the CV of both main and secondary supports sorts out seasonal hamlets from forest hamlets and villages.

In telling us something about the length of intended stays, these data may also reveal something of the social relationships that may be crucial to determining the length of stay. The lowest post CV is found in Vorehe's wattle-and-daub houses (Table 2). This is intriguing because the highest CV in the village sample is in Vorehe's thatch houses. What accounts for this difference? One explanation is that different house builders obtained their raw materials in different locations; therefore, they did not have the same range of

building materials from which to choose. There are only sparse clumps of trees in the immediate environs of Vorehe; clearing for cultivation has left the village surrounded by anthropogenic savanna. We cannot evaluate this possible source of the variation, but we suspect it is unimportant, because all villagers must go equally far afield to find construction materials, and because builders of wattle-and-daub houses were able to find consistently sized poles.

Another possibility is that although large heavy houses have a minimum support post size, the effort to cut down a tree increases exponentially relative to its diameter. Thus, men may cut trees that minimally will do the job; hence, they may tend to fell (large) trees that are of nearly the same diameter. However, although this may explain why wattle-and-daub posts are of consistent diameters, it does not explain why thatch-house posts are not.

A third explanation draws on the fact that the grass and reed houses measured were in north Vorehe, which, as we mentioned above, is spatially and socially distinct from the rest of the village. It is possible that the people of north Vorehe think of their neighborhood as being more like a forest hamlet. The more common grass-thatch houses (see above) are potentially mobile: the roof and walls can be untied from one another, the posts excavated, and the house moved as four separate walls and a roof. Once, an entire cluster of houses was packed up and moved because of sickness and death among their inhabitants (the land was said to be *tany mafana*, lit. "hot land," signifying "unhealthy land"). So, perhaps the high CV in the posts is caused by the use of more scavenged posts and the use of less-than-optimal materials from the depauperate nearby forests. This may reflect people's unwillingness to commit themselves to Vorehe. This interpretation is also consistent with the lower feature diversity noted above.

Investment in housing is also indicated by measures of "overbuilding," such as the number of secondary posts per wall. By excluding the large wattle-and-daub houses, we effectively hold house size and, hence, wall length constant in these roughly rectangular houses. The data are too few for statistical analysis, but Table 1 shows that the distance between secondary posts becomes smaller from seasonal hamlets to forest hamlets to villages. The average number of posts in village (non-wattle-and-daub) houses is 6.2; in forest hamlets, 4.1; and in seasonal hamlets, 3.25. As we might expect, because house size is roughly constant, the number of posts declines, and, by necessity, the distance between them increases as settlements become more ephemeral. It is also in villages that posts are more likely to have had their bark removed before being placed in the ground (the bark tends to break away as it dries and may loosen the bindings between posts), corner posts are more likely to have secondary supports placed right next to them, and main supports may be adzed to a square cross-section (see Figure 2b).

Some ambivalence in a settlement's intended permanence is partly a function of the fact that virtually every adult male who has a house in a forest or seasonal hamlet

also owns a house in a village. People may claim that their village houses are their permanent homes and that those in hamlets are temporary. Yet these same people may spend more time in their “temporary” hamlet houses than in the “permanent” village houses. The eldest male at Behisatse, for example, spent more time in his *trañoholits’hazo* house in this forest hamlet than in his *trañovondro* equipped with table and chairs in Namonte. Partly, the house in Namonte is maintained to have a place to stay during ceremonies. And partly, it is because the village of Namonte is the *tanindraza*, the place of origin of his lineage, and a man must maintain a residence in such a place to demonstrate his lineage membership. For any given archaeological case, it must be considered that different house types could be constructed and used by the same individuals, and these houses may reflect not only mobility but also social functions. A house maintained for social reasons, but occupied infrequently, may be more elaborate and substantial than a “temporary” house maintained for economic reasons and used for much of the year.

THE ROLE OF SHARING

In sum, we can characterize different settlement types in terms of house size, post diameter variation, feature diversity, and distance to trash from outside hearths (Table 3). In general, these differences meet Kent’s expectations, in which greater anticipated lengths of stay lead to greater investment in house construction, greater feature diversity, and longer distances from hearth to trash. Given that time and energy are limited commodities, one would not invest in a labor-intensive house or in meticulous trash disposal when such behavior has less utility than competing activities, such as foraging, cutting more maize fields, performing wage labor, and so forth.

Material remains do track settlement permanence, but material remains may be related to the social environments of the different settlement types rather than to mobility per se. Settlement permanence covaries with settlement size; smaller settlements tend to be occupied by close kin, whereas residents of large settlements have less genealogical relatedness. Foraging camps sometimes consist of one or a few related nuclear families. Hamlets usually comprise two or more clusters of patrilineally related households (an

elder man and his sons) that are related through a female or marital link. These clusters live in spatially separated areas (a pattern also present in some foraging camps). Villages are composed of many household clusters packed together, and people interact with non-kin and strangers on an almost daily basis. The social functions of houses and other architecture is related to the extent to which people feel comfortable sharing their belongings and their lives with their neighbors.

Food sharing is generally thought to be ubiquitous among foragers, but analysis of observed meals at the forest hamlet of Behisatse suggests that Mikea rarely transfer most food beyond the household (Tucker 2004). Reluctance to share food at Behisatse is explained from the perspective of “tolerated theft” (Blurton Jones 1984, 1987). Because food usually delivers diminishing marginal utility, a resource “holder” is likely to devalue some portion of food if he or she holds a large enough quantity of it. A “receiver” without food (thus with as-of-yet undiminished marginal utility) values an additional portion greater than does the holder; therefore, he or she is more willing to seek the one unit than the holder is willing to defend it. “Generous” food sharing is thus a preemptive strategy taken by the resource holder to avoid a costly conflict.

At Behisatse, uncooked maize, manioc, wild tubers, and cucurbits are not shared because everyone has similar access to these foods. It may be easier to dig a wild tuber oneself (in a few minutes) than to dun one from a neighbor. The only food that is widely shared is meat from slaughtered livestock. Like meat from large game animals, which is the most commonly shared food in many foraging populations (see review in Kelly 1995), slaughtered livestock fits “tolerated theft” conditions for sharing. Animals are slaughtered by only one household at a time. The resulting amount of meat is large enough that the holder’s marginal utility diminishes, so that he does not mind giving excess portions to needy neighbors. There is also a good probability of reciprocity, for livestock are usually slaughtered for ceremonies that all households must eventually hold.

Small game and honey offer the greatest potential for resource conflicts. These are acquired asynchronously, so that some households have them when others do not, providing a strong incentive to dun one’s neighbors. However, there is little incentive to share them because individual

TABLE 3. Summary of Settlement Characteristics.

Site Type	House Size	Fenced Compounds	Post Variability	Secondary Posts	Kitrely Platforms	Distance to Trash (m)	Feature Diversity
Villages	Various, but can be large	Present	Low	Many, closely spaced	Rare	10–40 +	High
Forest Hamlets	Small	Rare (normally ceremonial)	Low-medium	Fewer, further apart	Present to common	4–9	Medium
Seasonal Hamlets	Small	Absent	High	Fewer, further apart	Rare/absent	3–4	Medium-low
Foraging Camps	Lean-tos or “boxes,” if present at all	Absent	N.A.	N.A.	Rare/absent	1–2	Low

prey animals are too small for resource holders to experience diminishing marginal utility. The largest usual prey item is the feral cat, averaging two kilograms; hardly enough meat to feed a family. More common prey are *tambotrike*, tenrecs (*Echinops telfairi*) that weigh less than 100 grams. These are collected in the dry season when they estivate ("summer-hibernate") in tree hollows and are stored alive in a state of torpor in containers. Baskets of torpid tenrecs and buckets of honey weighing seven or eight kilograms are medium-sized food packages. But the holder's utility for them remains constant because they can be preserved and because they have high market value, so each marginal unit can be exchanged for equal cash value, which can be used to purchase hard goods. Those without these foods actively scrounge by theft and demand-sharing (Peterson 1993), whereas holders defend their foods by hiding them within their houses. Although tubers and maize are frequently cooked outside houses, meat is almost always cooked inside. As other ethnographic investigations have found, among Mikea it seems to be true that if you cannot see it then you should not ask for it (Cribb 1991; Hitchcock 1987; Layne 1987; Wilson 1988). We observed somewhat greater generosity when it came to sharing tools. At Behisatse people picked up their neighbor's spades, buckets, and axes with little negotiation, although they only used them briefly before returning them to their owner. It was our sense, however, that such sharing was limited to individuals within a patrilineal cluster, rather than between clusters.

The degree to which people are willing to be generous with their food and tools influences the spacing and size of their houses, and the degree to which they store their belongings inside or outside their homes. Forest hamlets usually consist of a north-south scatter of houses broken into multiple linked patrilineal clusters, as noted above. Genealogical data and settlement maps show that kinship is reflected in house spacing: the closer the genealogical link, the closer the houses (as Whitelaw [1991] found in a cross-cultural study; see also Gargett and Hayden 1991).

The linear north-south orientation of most hamlets may function to reduce visibility and enable resource hiding. Kalahari and Ituri Forest foragers both share food, especially meat, widely. Their camps are often built as rings of houses with doorways facing inward, toward public space (Fisher and Strickland 1989, 1991; Tanaka 1980). It is difficult to hide food in such a settlement, for the workspaces of all houses are equally visible to everyone. By contrast, in a Mikea forest hamlet one can only see into someone's house if one stands to the north of it (and then only if its door is open). It may be significant that the elder's house is almost always the most northerly one, providing him with a preferential view of his neighbors' (his sons') belongings and activities. Likewise, hearths in foraging camps are often widely spaced (>10 m) in thick brush, and it is usually impossible to see from one to another. Sometimes one must crouch and negotiate "tunnels" in the brush to move between hearths. This is true even where more open savanna space is only meters away. Informants said that the main reason for shunning the open space is that the brush provides a windbreak

against the cool night wind and shade against the noon sun. But several experiences in these camps made clear that another reason for the seclusion was to prevent one's neighbors from seeing whether one had gathered any game during the day.

House size and the absence of kitrely platforms appear to be a function of the degree to which households store their products indoors, where they cannot be targeted by demand-sharers. As we noted, kitrely are common in forest hamlets but rare in villages, where people store most of their belongings inside their houses. This may reflect the fact that households in the same hamlet are likely to experience the same maize payoff: They can store their maize outdoors, in public view, because they know their neighbors are unlikely to dun them. Furthermore, it is easier to erect a kitrely than to build a storehouse. (It may also be significant that most households have a kitrely or two in the forest, so that some of their harvested maize remains hidden, although physically unprotected.) The kitrely platforms also provide shady workspaces that household clusters use collectively. Beneath their kitrely, they conduct maize threshing and meal preparation tasks in full view of others and can leave tools out for others (relatives) to use. Theft is uncommon.

But village households have unequal access to agricultural foodstuffs because their fields, which are in scattered locations, perform differently; this inequity sets the stage for demand-sharing. Piles of maize left outdoors are difficult to defend from thieves as well as demand-sharers. It is difficult to say no to a request, and where population is large, there is a greater chance that someone asking to borrow a tool or insisting on food sharing will be someone with whom one does not have a close kin tie. Without that close kin tie, and without the frequent face-to-face interaction of small residential groups, it is harder to ensure reciprocity. There are more likely to be free riders (a few individuals in Vorehe, Ankililaly, and Namonte are notorious for this). By moving things inside houses or inside fenced enclosures, one prevents theft and also removes them from the realm of demand-sharing.

Other village facilities increase privacy and security. In 1993, the village of Vorehe had a weekly market that attracted people from other villages and hamlets. Initially, this market was small, and we noted no fenced house compounds in 1993. By 1995, however, the market was quite large, and some houses, notably those of people living near the market (who were also politically important in the village), had fences around their house compounds. Their owners said that they built these enclosures because there were "too many strangers" in town on market days.

In sum, houses are built as places to stay dry (or somewhat dry) in the wet season, and they are places to keep out the cold night wind and dew in the dry season. Equally important, however, is the function of houses as private space, a place to conduct activities and store belongings that people do not want to share. In small settlements where people are closely related and anonymity is difficult, there is more reciprocity and less theft, and houses are smaller and closer

together, with more external storage. In large settlements frequented by distant kin and non-kin, reciprocity is less likely and theft more likely; houses are built larger to create more controlled private space, to protect possessions and foodstuffs from theft and demand-sharing. Archaeological data on structures and site layout may reflect the degree to which kin coreside, items are shared, and space is privatized. The archaeological transition to sedentism most likely entails an increase in the privatization of space (Wilson 1988) that is related to sharing and that affects site structure as much as mobility.

CONCLUSION

Combined with other research on mobility, the case described in this article helps provide archaeology with ways to interpret patterns in house form and site structure. Increasing distance to areas of trash disposal, the use of more uniform building materials and evidence of “overbuilding,” more function-specific materials (e.g., the use of different materials for the roof and the walls), larger houses, use of a variety of house types, and a greater variety of more function-specific features all point to lower levels of residential mobility.

Archaeologists have long used ethnographic data on architecture as a way to infer various aspects of prehistoric behavior. But we must be cautious in applying any ethnoarchaeological lesson to an archaeological case. We cannot be satisfied simply to seek correlations between material culture, such as attributes of houses, and behavior, such as mobility. We must consider those correlations within a theoretical framework (O’Connell 1995). In this case, we have considered existing research on sharing behavior. We find that changes in material culture that go hand-in-hand with changes in mobility more directly reflect changes in social relations that accompany a reduction in mobility and increasing village population density. Variables affecting those social relations—and independent of mobility—therefore will impact how mobility is reflected in the archaeological record. Because sharing is largely a function of the nature of food—for example, its package size and nutritional quality—an archaeologist must consider the nature of sharing and its impact on architecture when reconstructing changes in mobility from archaeological data.

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NOTES

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1. International Standard equivalents are: 1.609 kilometers = 1 mile; 0.092 square meters = 1 square foot; 0.305 meters = 1 foot (international); 2.54 centimeters = 1 inch; 28.350 grams = 1 ounce; and 0.454 kilograms = 1 pound.

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