

Food sharing past and present: archaeological evidence for economic and social interactions

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Abstract

Food sharing has been proposed as a fundamental basis for the evolution of human behaviour, and a universal characteristic of modern hunters and gatherers. Various theoretical models contrast immediate vs delayed consumption, or sharing vs storage, with the inference that these may be seen as mutually exclusive phenomena. A survey of cross-cultural evidence for sharing in the ethnographic literature indicates quite a range of variation in actual practice of food sharing among modern hunters and gatherers. While competing theories attribute this behaviour to ideological or ecological bases, most ideological models are very difficult to test in the archaeological record. The difficulty lies first in establishing that food sharing took place, as opposed to mere assertion that it did, and second in demonstrating linkages between perceived patterns in the archaeological record and explanatory models said to account for the practice. Faunal remains from a late Upper Palaeolithic archaeological site are used to examine food sharing. The spatial patterning of the distribution of portions of individual reindeer carcasses from level IV-20 of Pincevent indicates aspects of food sharing in stages of multi-tiered distribution. These results are compared with those from other methods for investigating food sharing in prehistory. Indices based on minimum numbers of individuals from the individual household locations at Pincevent are shown to underrepresent severely the food sharing interactions that are indicated by carcass refitting. Carcass refitting is suggested as an appropriate and feasible method for investigating food sharing on other archaeological sites.

1 Introduction: hunter/gatherer food sharing

Food sharing has been an essential aspect of modern hunter/gatherer studies for a long while now, and has carried considerable interest for studies of prehistoric hunter/gatherers. In 1966, with the resurgence of hunter/gatherer studies at the Man the Hunter conference in Chicago, researchers tried to formulate a general picture of hunters that could be used for a reconstruction of life in the past. A consensus was achieved that food sharing was an essential element of the “Nomadic Style,” in which “the economic system is based on several core features including a home base or camp, a division

of labour—with males hunting and females gathering—and, *most important, a pattern of sharing out the collected food resources*” (Lee & DeVore 1968:11, emphasis added). Thus, food sharing was characterised as a universal and most important aspect of hunter/gatherer behaviour.

Not only has it been seen as a universal characteristic of modern hunters and gatherers, food sharing has been proposed as a *sine qua non* for the evolution of human behaviour. A fundamental issue in Palaeolithic archaeology concerns the origins of food sharing by early humans. Arguments about food sharing concern our earliest ancestors, and the very process of hominisation (Leakey

1971). Owen Lovejoy (1981) proposed that bipedalism had evolved in order to free the hands of males for carrying food back to a base camp to solidify pair-bonding with females. Glynn Isaac (1978a,b), drawing on ethnographic generalisations of hunter/gatherers, generated an argument that the co-occurrence of stone tools and animal bones in archaeological sites implies the presence of a home base, division of labour, transport of food resources and food sharing. The purported ancestral importance of food sharing for all hominids further strengthened the idea that this practice was not only universal but also probably innate for humans. The origins or universality of food sharing are beyond the scope of this paper. What will be discussed are the nature of food sharing, potential variation in the practice of food sharing, and the possibilities for investigating food sharing in the archaeological record.

2 Bases of food sharing

The theoretical underpinnings for the perceived universality of food sharing are quite varied. Models generally fall into two camps, attributing this behaviour to either ecological or ideological bases. These have been examined in various ethnographic settings.

2.1 Ecological models for food sharing

The ecological models focus on quantitative aspects of food resources, and attribute sharing to scarcity, abundance or both. The case for scarcity is obvious. For example, Kishigami noted that the Inuit of Akulivik practice food sharing “especially during periods of reduced food availability” (2000:176). As for abundance, in many climates, spoilage precludes long-term storage of any accumulated surplus of many types of food. The occasional, serendipitous acquisition of a surplus of any food resource, such as a larger animal, may be the occasion for feasting, sharing with one’s family and friends, potentially building social prestige or obligation.

Risk reduction by reciprocal obligation is

another potential reason for food sharing. If acquisition were based on opportunistic encounters with prey, then non-synchronous inputs of food would offer advantages for those who share. They could count on receiving a share on days that they did not acquire food themselves (Hawkes 1993:345). Others have argued that if risk reduction entails the expectation of sharing today, and receiving a share tomorrow, it is not always empirically supported. Hovelsrud-Broda (2000:194) notes that shares also go to people not involved in food acquisition.

The structure of resource availability in the environment may condition either the necessity for sharing or structural aspects of food sharing practices among various groups of hunter/gatherers. Tropical forests are characterised by relatively ubiquitous distributions of small body-size prey. Among highly mobile forest hunter-gatherers, food resources are generally dispersed and unpredictable in location or encounter. One cannot count on acquiring large quantities, and when a windfall arrives it is likely to spoil quickly. Sharing, therefore, allows one to exploit short-term luck efficiently, reducing the costs of acquisition for those invited sharers. Cooperative hunting may necessitate the size or organisation of work force to acquire large animals, especially in grassland environments, where large herbivores represent the majority of available food. These require cooperative labour, if not for the actual killing or acquisition, then for the transport of the meat.

Ingold (1980) models the intensity of food sharing behaviour along an axis from famine to plenty (figure 1). When resources are plentiful, it is easy to be generous, to share often with many others in the group. But as resources become scarcer, sharing declines. As long as everybody has something, people are more frugal, taking care of themselves or their own families first. As resources decline further, sharing increases again, perhaps quantitatively reduced but distributed more evenly, making sure that everyone has at least something. Further declines, however, reach a theoretical threshold where there may not be

enough for everyone to have something, indicated by the question mark in the graph, where resources are so scarce that sharing collapses and people hoard precious resources for their own consumption. Under this theoretical perspective, we should not expect any normative, universal pattern of food sharing, whether among hunter/gatherers or any other societies.

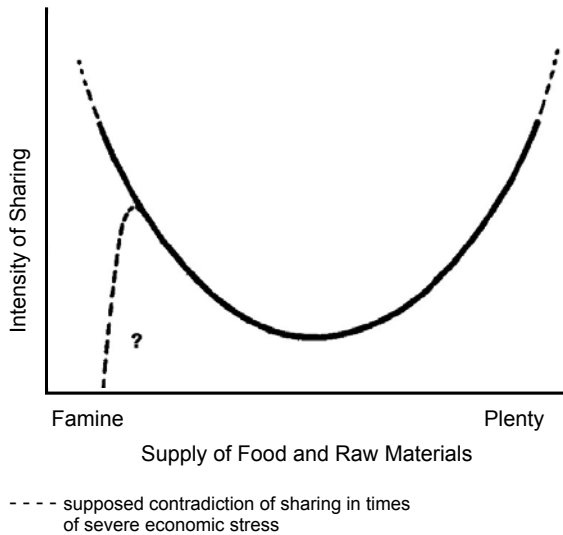


Figure 1 Theoretical relationship of food sharing and food availability. (after Ingold 1980:147).

2.2 Ideological models for food sharing

Ideological models do not look to economics or ecology to explain practices of food sharing among human groups. Rather, they look to ideas or values of social cohesiveness to justify the existence of such practices. These are essentially the integrating mechanisms of interlocking obligations that Mauss (1954) called the “system of total prestations,” unifying a given society on the basis of obligatory giving and receiving. Service identified sharing as “an expectation of the moral order, ...a keynote of the value system” (1966:16). Bird-David (1992) suggested that this might originate from perspectives on the environment as a giving or nurturing mother who shares with her children, thus establishing an ethical norm to be emulated by members of society. Some suggest that food sharing is a function of an ideological ethic within a given society (Gould &

Watson 1982), in which the strength of the sharing ethic varies among societies.

Food sharing may have broader functions, particularly in the modern world. Some see food sharing as a means of maintaining social identity within a larger sociopolitical world, sharing services and skills as well as distributing large packages of meat, protecting internal integration, “resisting hegemonic pressures of assimilation from surrounding hierarchical societies” (Fortier 2000:139). East of Hudson Bay, traditional seal hunting required and maintained cooperation and sharing among the Nunavik, making “possible the reproduction of socioeconomic relationships in the contemporary context” (Kishigami 2000:171).

In a recent volume of papers initiated at the Eighth Conference on Hunting and Gathering Societies (CHAGS 8), Wenzel et al (2000) noted a modern perspective on subsistence as social economy, emphasising a shift in perspective from resource extraction as exemplified by Steward (1955:40-41) to “an analytical focus toward how the means and methods by which resource allocation and appropriation are organised” (Wenzel et al 2000:1). This might be seen as a contrast between the focus on subsistence said to characterise processual archaeology and that on social agency said to characterise a number of post-processual perspectives on archaeology.

Clearly, whether we subscribe to ecological or ideological models for food sharing, “we should not expect to find one explanation for sharing” (Kelly 1995:180). Food sharing may act to increase diet breadth, reduce risks of food shortages, or enhance social relationships within any group. All of these can be adaptively selective, increasing the probability of group and individual survival, and thus the maintenance of a cultural identity. The poles of ideology and ecology are not actually so distant from one another. As Leslie White (1959) pointed out, the ideological, social and subsistence realms of any society are integrated. We cannot understand any one of them by neglecting the others. There are, however, problems for archaeologists in this perspective. Most ideological models, and some ecological models, are very

difficult to test in the archaeological record. The difficulty lies first in establishing that food sharing took place, as opposed to mere assertion that it did, and second in demonstrating linkages between perceived patterns in the archaeological record and explanatory models said to account for the practice.

3 Variation in food sharing patterns

Survey of the ethnographic literature indicates quite a range of variation in actual practice of food sharing among modern hunters and gatherers. A reading of the ethnographic literature makes it clear that food sharing is neither universal nor uniform. Societies are organised in different ways to provision their members with sustenance. Some models contrast immediate vs delayed consumption (eg, Testart 1982, 1988), or sharing vs storage, with the inference that these may be seen as mutually exclusive phenomena. There are also variable

conditions that operate within societies to change how food is shared. Carcasses may be divided according to different sets of rules, such as nominative portions (figure 2) attributed to recipients according to their role in the hunt (eg, Bahuchet 1984:364) or partitioned according to kinship rules (Altman 1987:135) or simply by coresidence (eg, Jarvenpa & Brumbach 1983:178, 181-182). In other cases, it is not freshly procured carcasses that are partitioned and shared, but rather accumulated stores that are privately owned and occasionally shared in instances of need (Binford 1991:101).

Among modern hunter/gatherers, the primary social and economic relationships are defined by kinship. The closest family ties are exhibited in the daily provisioning and consumption of food in the immediate family, be it a nuclear or extended unit. There are, however, other social and economic relationships important in subsistence organisation, which are most often expressed in terms of food

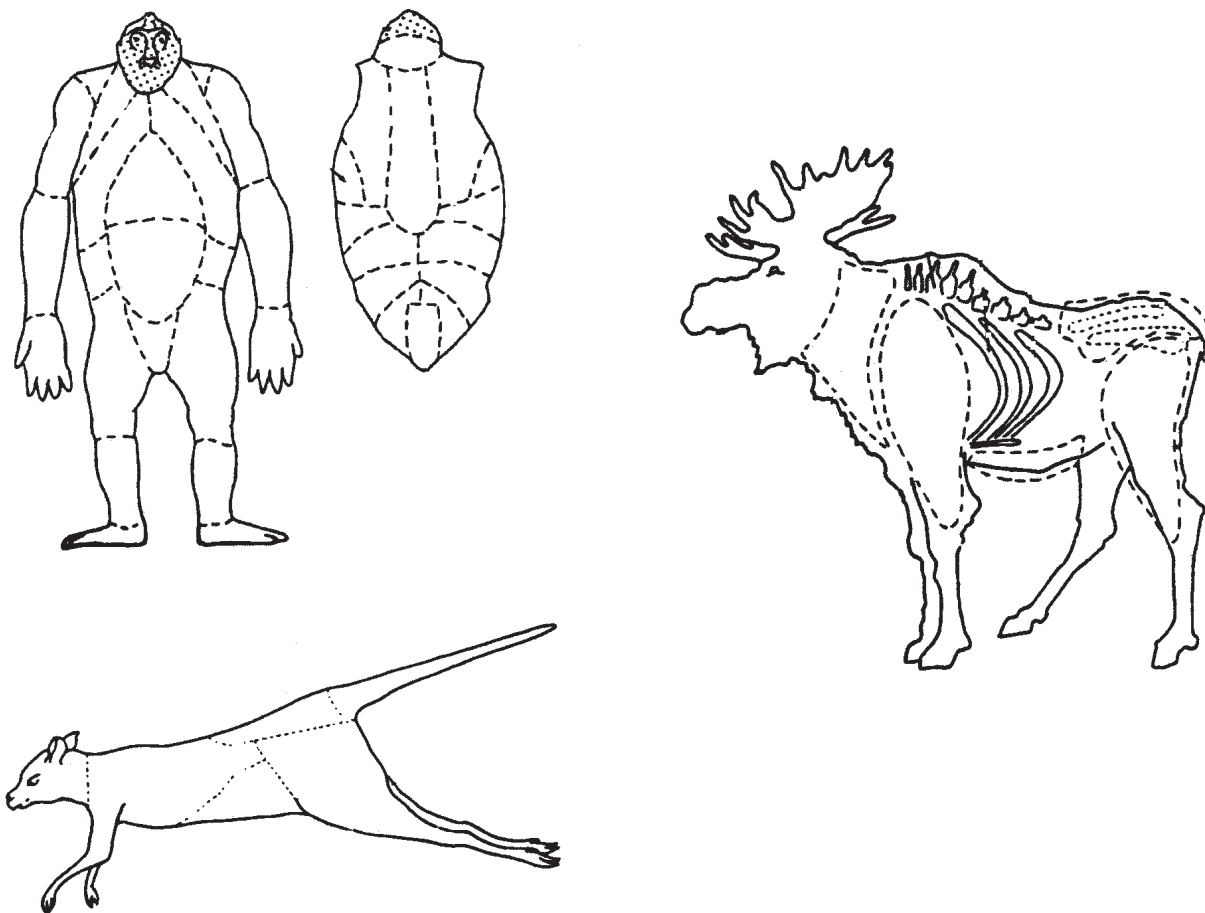


Figure 2 Examples of nominative carcass partitioning schemes (after Bahuchet 1984, Altman 1987, Jarvenpa and Brumbach 1983).

sharing. For instance, cooperative hunting of seals during the winter by the Netsilik Eskimo involves a set of hunting partners who have reciprocal obligations of sharing prey when only one or a few hunters have been successful (Balikci 1970). Among the Ache in the South American tropical forest, meat brought into the camp is shared with everyone (Kaplan & Hill 1985). Among the Nunamiut Eskimo, who subsist largely on stored caribou meat during the winter, sharing of stored meat is very limited since all hunters have virtually equal access to migrating caribou. Fresh meat, usually Dall sheep (*Ovis dalli*), brought into the camp during the winter is much more widely shared, distributed along the lines of the kinship network (Binford 1978b).

4 Stages of food sharing

Clearly, food sharing is a multi-stage phenomenon or process. In almost every ethnographic account, varied rules and contingencies operated at stages of acquisition, transport, redistribution and consumption (Bahuchet 1984, 1990; Yellen 1977a; Bodenhorn 2000:30-44; Wenzel 2000:63-67; Kitanishi 2000:154-155; Kishigami 2000:176-180; Hovelsrud-Broda 2000:198-202). For example,

Yellen (1977a) reported the distribution of a kudu carcass at one of the !Kung short-term campsites (figure 3). The carcass was divided among three hunters and transported back to camp. There, each hunter gave some to his parents or in-laws, largely passing upwards to an elder generation. Those recipients gave to siblings or in-laws, generationally lateral. Finally, some was passed back down between generations from an uncle's household to a cousin in the last household in the camp, so everyone was eventually supplied. What is important about the pattern is perhaps not so much that everyone received a share of the meat, but that the pathways for this distribution were socially structured. With larger populations in the camps or with smaller meat packages, the distribution may not have been so complete, and would have only gone through the earlier distribution levels. Yellen (1977a:304) noted that "there is significant variation in the treatment of animals according to their size."

Of interest to archaeologists is how those different stages of food sharing might be distributed or displayed across the landscape, with different stages occurring at different places. Primary distribution may occur at the kill site, as a carcass

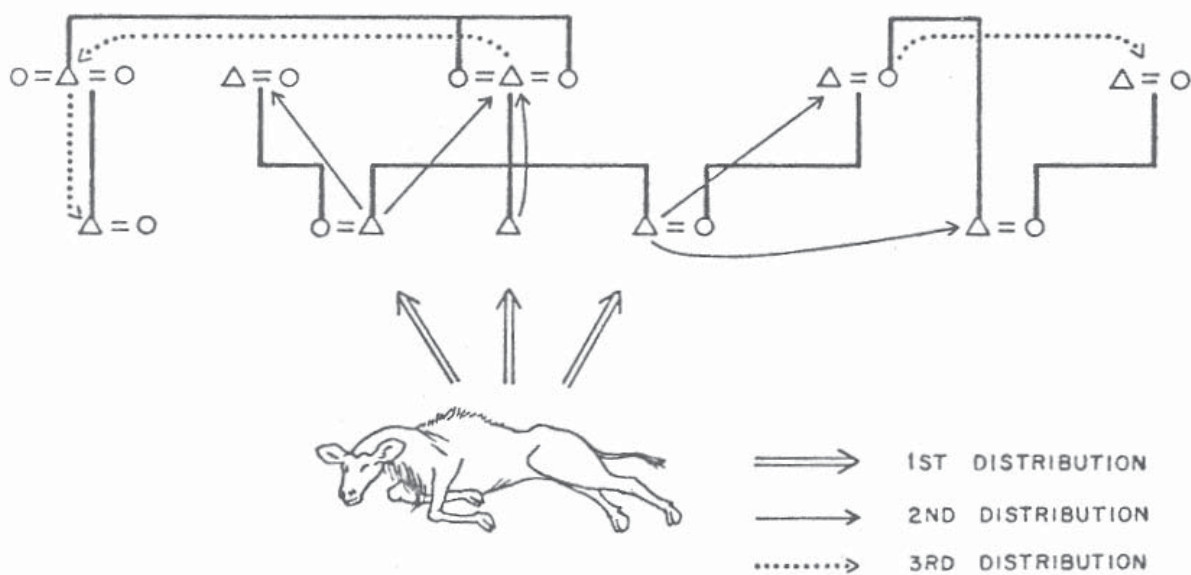


Figure 3 Multistage sharing among !Kung (after Yellen 1977a:287).

is partitioned for transport or divided according to various rights as suggested above. Secondary sharing might include redistribution to kinfolk after food has been returned to the campsite or consumption location. This may be continued as multiple steps as food is distributed through the kinship network, including various kinds of non-kin partnerships. Tertiary sharing may occur at the level of invitations to dinner. For example, for stages of food sharing among Aka and Baka observed by Kitanishi (2000:154), first distribution among hunters was regulated by strict rules; second stage distribution in camp was less formally regulated; third stage sharing took place at cooking and consumption. While food tended to be shared throughout small camps, it became more variable in large camps. Analysis of group sharing in larger camps shows that food was shared with those sharing close kinship and located in spatial proximity (Kitanishi 2000:160), just as Gargett and Hayden (1991) suggested. If we look at how food distribution patterns are displayed differently across the landscape, this might help identify the roles of different sites in subsistence or social systems. In multi-stage sharing, bones may not make it all the way to the end of the sequence, moving from carcass portions, to cuts of meat, to invited dinner guests (and perhaps to 'doggie bags'?). Thus, our ability to see the entire sequence may be limited, with only the first or second segments preserved in the archaeological record.

5 Searching for food sharing in the archaeological record

There have been a number of researchers who have made inferences about food sharing in the archaeological record, based on direct observations of archaeological remains. Certain of these have been theoretically informed by models of human evolution, while others have been more empirically oriented.

Isaac (1978a, 1978b) proposed that spatial association of stone tools and animal bones indicates transport of artefacts and meat to activity foci, which constitutes a "sufficiently sound...

inference that meat from numerous, initially dispersed carcasses was brought back as an active process of *food-sharing*" (Isaac 1978b:319, emphasis in original). Isaac offered no warranting argument that his interpretation of artefact association had necessarily been the result of his postulated human behaviour.

Bunn and Kroll (1984) argued for evidence of sharing in the archaeological record by means of observations on anatomical element frequencies and cut marks. They asserted (without ethnoarchaeological support) that multiple bone units of the same carcass were carried to the FLK "Zinjanthropus" archaeological site and that the amount of meat and marrow represented by those units was more than a single hominid could consume. Their conclusions are that systematic butchery and substantial quantities of meat and marrow imply sharing on a significant scale. The link between acquisition of a quantity of meat and marrow and resultant sharing behaviour is, unfortunately, not provided, but assumed.

Both of these cases have been justly criticised on taphonomic bases, as carnivores and scavengers other than hominids were the agents for accumulation of the majority of animal bones.

Parmalee and Klippel (1983) looked at the distribution of white tailed deer (*Odocoileus virginianus*) at the Rhoads site in Illinois. They suspected that "if there was any consistency in the deposition of a particular element or set of elements in any given feature (pit)...(this) might suggest a specific division of parts of the deer carcass among individuals or families" (1983:286). Their results were not clear-cut, as pits contained multiple elements from various portions of carcasses. If the distribution of deer carcasses was a result of sharing practices, the patterning was not as simple as their expectations. The real value of their research is in suggesting that spatial distribution of carcasses in the archaeological record might be indicative of economic interaction within a campsite.

Since none of these examples could firmly ground their interpretations in arguments of necessity concerning the facts of the

archaeological record and their inferences or interpretations drawn from them, they risk epistemological ambiguity.

Our problem is the articulation of these theoretical constructs with the data available in the archaeological record. This calls for the development of methodologies utilising the contents and the configuration of archaeological remains that can be demonstrated to represent particular kinds of behaviours. The problem is the need for a firm foundation for the interpretive inference, with an emphasis on material remains that are 1) unambiguously the result of sharing behaviours, and 2) available in archaeological deposits.

5.1 Ethnoarchaeological approaches to food sharing

Perhaps for the most reasonable solution to this problem we must turn from the purely ethnographic and archaeological records to the ethnoarchaeological record (Yellen 1977b; Gould 1978, 1980; Kramer 1979). It is only in such control cases that we can associate actual human behaviours with their material remains. This type of research is self-consciously searching for the needed inferential linkages that would allow us to identify and differentiate between various patterns of food sharing.

Gould and Watson (1982) looked to butchering patterns for a clue to food sharing. They noted that on more than 70 observed occasions, the Ngatjatjara of western Australia always divided carcasses into the same initial nine pieces. “The strict adherence to a fixed pattern of initial division of meat was explained ... with reference to social relations based upon kin-based sharing of food and access to resources” (1982:367). The rigidity of butchering practices, in contrast to the situational variation reported by Binford (1978b) for the Nunamiut, was seen as evidence that food sharing and its archaeological consequences “must be referred to the ideational domain to achieve a satisfactory explanation of all the behavior that was observed” (Gould & Watson 1982:368).

In reply, Binford stated that “there is no

necessary relationship between the strength of the sharing ethic and the lack of variability in butchering pattern” (1984:240). The Nunamiut do indeed practice sharing, but their butchering practices are much more variable according to such circumstances as means of transport or anticipated length of storage (Gubser 1965:81). There is not a nominative system of identifying carcass portions with a distribution network as noted with the Aka (Bahuchet 1984). “No particular cut of meat or part of an animal is associated with or customarily reserved for any particular relative” (Gubser 1965:82). Sharing takes place at the time of consumption or, in particular, in distribution of local game hunted individually in the summer (Binford 1984:238). Therefore, observation of a rigid butchering pattern is insufficient as the recognition criterion for food sharing.

5.2 Site structure

General site structure offers several clues as to how we can look at the archaeological record as it relates to food sharing. Examining the organisation of ethnographically recorded hunter/gatherer campsites, Polly Wiessner suggested that site structure is responsive to the risk reduction strategies employed by site occupants. Aside from the more obvious features like storage facilities, “societies which practice noncommunal storage would be expected to have a more ‘closed’ site plan...(including) widely spaced household units or closed-in eating and storage areas....Among those who pool risk and share what is brought into camp daily,...an ‘open’ site plan...makes it possible for members of each household to see what others have brought in and gauge their requests accordingly” (1982:173).

Other ethnoarchaeological research has striven to associate material patterning with behavioural dynamics. Rob Gargett and Brian Hayden stated that “through the analysis of site structure (the distribution on the landscape of habitations, activity areas, refuse areas, and other features), it is possible to make inferences about past social interaction, thus enabling archaeology to make a

significant contribution to the study of prehistoric cultural adaptations and dynamics” (1991:11).

Following suggestions by Whitelaw (1983:55) that interhousehold spacing in !Kung sites was a good indicator of social distance between occupants, and observations by O’Connell (1987:86) that nearest neighbours in Alywara camps most often had primary genealogical links, Gargett and Hayden investigated the relationship between kin distance and physical distance in a Pintupi camp in the Australian Western Desert. This relationship is made more explicit for food sharing, in that “although it may not be possible to determine the precise kinship system of prehistoric societies, the results of this and other studies should make it possible to determine the importance of sharing in communities on the basis of settlement patterns. It is this more basic behavioural adaptation that should be accessible through the archaeological record” (Gargett & Hayden 1991:28).

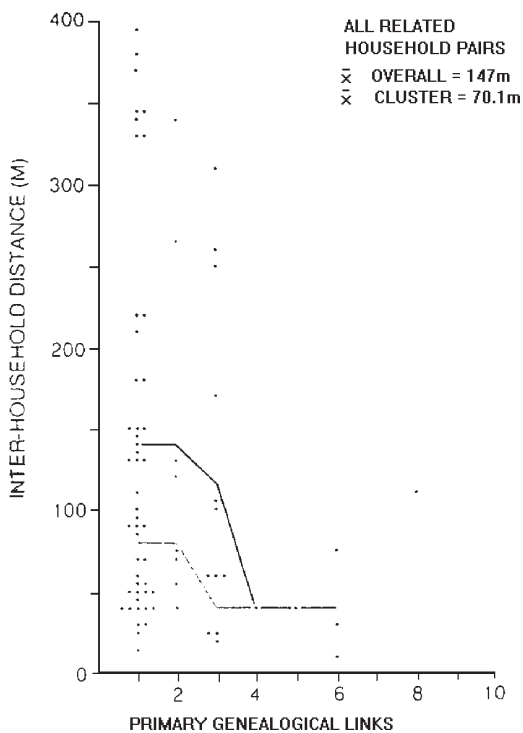


Figure 4 Relationship between interhousehold distance and genealogical distance (after Gargett and Hayden 1991:17).

Their analysis consisted of comparison of distances between household structures at the main Pintupi camp at Papunya with genealogical relationships, recorded with the help of a native interpreter. To avoid the problem of the likelihood of some kind of kinship relation between practically all members of an aboriginal camp, their analysis focused on primary genealogical links, those between parents and their children and between siblings. Their results of the relationship between kin distance and spatial distance are shown in figure 4. They concluded that most of the relationships expected to result in close spacing do manifest predictable spatial configurations (1991:15).

Although they did not directly monitor food sharing behaviour and its relation to spatial arrangement, they noted that “sharing occurs predominantly along primary kinship lines among the Pintupi, and it is precisely along these lines that residence location choices are most often made” (Gargett & Hayden 1991:28). The implications for evidence of food sharing in the archaeological record are less direct than Gargett and Hayden might have wished. Their analysis is based on untested assumptions about the role of food sharing in determining campsite organisation. Although I suspect that they are right in their assumptions - that degree of closeness indicates degree of economic interaction and this has something to do with relatively more open subsets of relatively more closed site organisation, in the sense of Wiessner’s arguments discussed above - all they have demonstrated is that closeness of kinship links is spatially reflected in camp layout. Further inferences about quantity or degree of food sharing are not addressed. When linked with independent means of demonstrating food sharing, indications of kinship structure from the spatial organisation of archaeological sites may have greater interpretive utility for explaining economic and subsistence organisation at the camp level. In contrast, Binford (1991:128) argued from his analysis of Nunamiut camp sites that structure was determined by the organisation of the workforce and consumers, rather than by kinship. Acquisition partnerships are more important in spring and

summer camps, when resources are dispersed and require numerous, small cooperative hunting teams; distances between households are greater, averaging around 70 metres. Consumption of stored resources from fall migration hunting is more important in fall and winter camps; interdependent households are spaced more closely, averaging less than 30 metres. I agree with Gamble (1999:80) that social relations of production, whether based on kinship or on partnership, can be preserved in spatial patterning. Examination of different aspects (content and configuration) of the archaeological assemblage, such as butchering data and spatial patterning, as discussed below, may provide an aperture for approaching archaeological data.

5.3 Butchering patterns

Another way of examining the archaeological record for subsistence and social organisation is to look at butchering patterns, that is, the partitioning of carcasses into units of sharing, distribution and consumption. Binford (1984) examined data collected in two ethnoarchaeological control cases (Yellen 1977b; Binford 1978b). He noted that for sheep carcasses shared among the Nunamiut that “anatomical parts common at the residence of one family are generally low or absent on the locations of other consumer units within the same site” (1984:246). Among the !Kung at Camp 10,

anatomical parts from two gemsbok are similarly differentially distributed among the separate residential units within the community (1984:250). These are compared in figure 5.

The most explicit way of examining the archaeological record for evidence of sharing patterns is to look at the spatial distribution of faunal remains of different species. Very explicit information is provided by Yellen's (1977a, 1977b) ethnoarchaeological work among the !Kung San. He stated that:

Polly Wiessner has demonstrated that the spatial distribution of faunal remains reveals something of the nature of the sharing and distribution process. Figure 6 shows the distribution of gemsbok remains at Camp number 10; gemsbok, like all large animals, are shared among all members of a camp, and this is clearly reflected in the dispersal of gemsbok bones near all of the huts. For comparison, figure 7 presents the distribution of porcupine remains from Camp 11. These two camps were occupied sequentially, and their membership was identical. A porcupine belongs to the man who kills it and generally porcupine meat is not shared—a fact reflected in the concentration of porcupine remains in front of a single hut (Yellen 1977a:305).

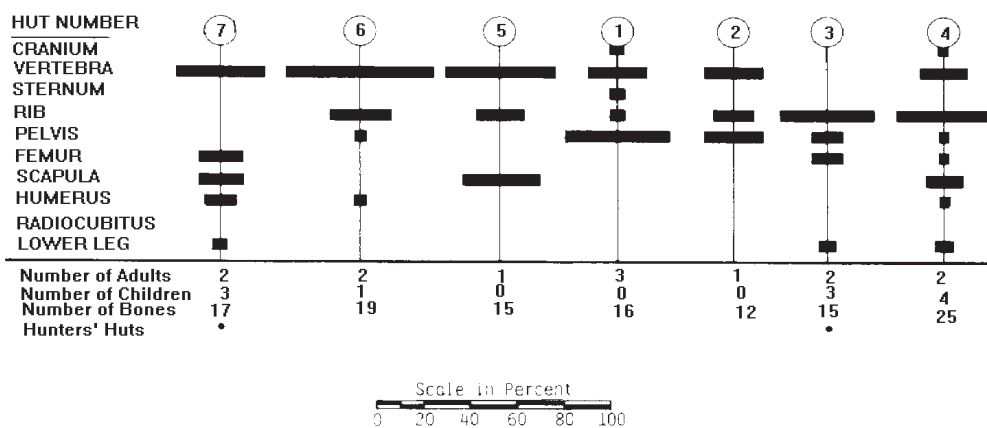


Figure 5 Distribution of gemsbok fragments at Yellen's (1977a) Camp 10 (after Binford 1984:252)

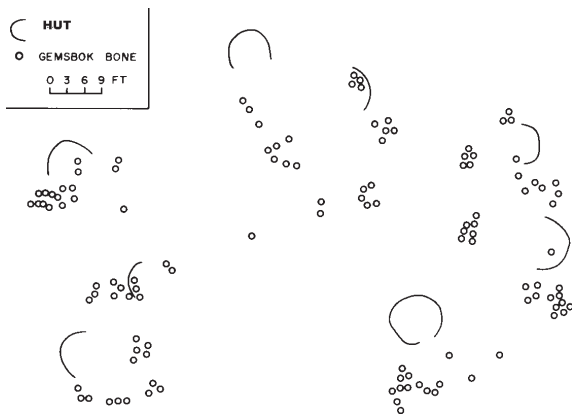


Figure 6 Gemsbok remains at Camp 10 (from Yellen 1977a:307)

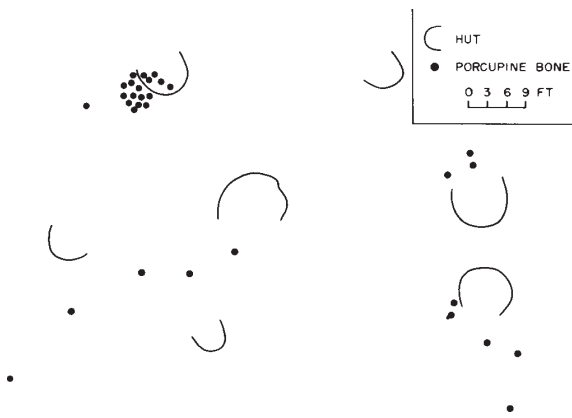


Figure 7 Porcupine remains at Camp 11 (from Yellen 1977a:307)

Here we can see a very significant difference in archaeological patterns resulting from different sharing and consumption behaviours. This visible difference in spatial patterning can serve as one of the best guides for investigating the Palaeolithic archaeological material. Methodologically, the case presents clear arguments of necessity for the spatial patterning contrasting shared with unshared food, patterns that can be discerned in the archaeological record.

Jean Hudson (1990) offered another explicitly ethnoarchaeological study of potential archaeological analysis to identify meat sharing among prehistoric hunter-gatherers. Her field work among the Aka included observations of food sharing activity by living humans in Aka campsites, and archaeological collection of remains from those

camps after they had been abandoned. Whole carcasses were usually brought into camp. Initial butchering divided the carcass according to participation in the hunt. "The second level involved social and economic an/or *perceived needs* (1990:3, emphasis added). Preparation and consumption constituted the third level, with cooperative cooking and communal consumption from a common pot being common in a residential camp. Hudson observed the spatial distribution of bone debris from three short-term occupation camps according to a number of aspects, including bone refits (Enloe & David 1989, 1992), clustering of bones at household locations, counts of specimens and species at each household, and MNI ratios per household. The specimen counts and clustering, like those of Wiessman, do not always offer sufficient resolution for identifying the patterns of interaction among households.

The MNI ratios constituted a means for tackling a particularly thorny problem when bone refits do not allow identification and assignment of components to individual carcasses. When the site or assemblage MNI of a given species is equal to one, this provides the least ambiguous evidence of meat sharing when using counts per species. Multiple carcasses of the same species can in general result from two situations. Each household may acquire and consume their own carcasses, as in most cases of Nunamiut caribou consumption (Binford 1978b), or carcasses may be sequentially introduced to the camp and distributed to multiple households. Distinguishing between these patterns may be accomplished by comparing site MNI with household MNI. Hudson (1990:8). developed an index she called the redistribution value to measure this relationship:

$$\text{redistribution value} = \frac{\sum (\text{household MNI})}{\text{site MNI}}$$

If there is no sharing of that species, the redistribution value would equal one, that is, the total number of carcasses present at households would equal the total number of carcasses at the site. If, however, carcasses acquired by members

of each household were equally distributed among all other households, the redistribution value would be far greater than one. The total of minimum numbers of carcasses for each household would greatly exceed the total as calculated for the site as a whole.

Since fragmentation and post-depositional processes greatly affect MNI counts, particularly when calculated independently for several spatial locations (Grayson 1984), this redistribution value index may be perhaps most appropriate for well-preserved and fully excavated discrete occupations. It may present a useful technique for investigating food sharing at archaeological sites where assemblages are too fragmented or poorly preserved for individual carcass identification or where the number of potential individuals in the assemblage is too great for confident verification of individual carcass identification. Although there are some promising techniques, it is clear that a more explicit means of recognising the practice of food sharing from archaeological remains is needed.

6 The archaeological case: Pincevent

Ethnoarchaeology (Yellen 1977a; Binford 1984) has demonstrated that the distribution of carcasses or of portions of carcasses can give us a warranted inference about food sharing practices of prehistoric campsites. It has established a method for using archaeological data for interpreting human social behaviour. An example can now be given of the application of ethnoarchaeological lessons to the specifics of a purely archaeological case. Faunal remains from a late Upper Palaeolithic archaeological site are used to examine food sharing. Pincevent is a very well documented site with sufficient preservation of spatial structure to investigate the relationships among contemporaneous domestic units on intact occupation surfaces (Leroi-Gourhan & Brézillon 1972). The faunal assemblage is dominated by reindeer, a species suitable for sharing under certain conditions of acquisition. The spatial patterning of portions of individual reindeer carcasses indicate

aspects of food sharing in stages of multi-tiered distribution and consumption at a residential site.

6.1 Methods for recognising food sharing

Binford's (1984:252) analysis of gemsbok skeletal elements at Yellen's (1977a) Camp 10 (figure 5) and Yellen's (1977a:305) report of Wiessner's observations on gemsbok vs porcupine spatial distributions lend a spatial dimension to species or element differentiation on hunter/gatherer sites, and suggest that food sharing did or did not take place in these cases. But the level of resolution of the spatial dimension does not extend to individual acts of social or economic interaction. In order to gain a finer perspective on the structure of such interactions, another method was sought to move from generalised patterns of presence or absence to more specific individual acts. The distribution of portions of an individual prey carcass could yield more specific information about patterns of food sharing.

Osteometrics and anatomical morphology were used to identify the portions of individual animal carcasses. Examples illustrated here are from Pincevent (Enloe & David 1989, 1992; Enloe 1991). Certain skeletal elements were demonstrated to be useful in identifying portions of reindeer carcasses that belong to various individual animals. For example, refits of adjacent articulating elements (figure 8) were used to identify elements with excavated proveniences separated by substantial distances, which were derived from a particular individual carcass.

The spatial patterning of those carcass portions indicates how different portions of reindeer carcasses circulated in food exchanges and distributions across the campsite (Enloe 1992, 1994b; Enloe et al 1994). Figure 9 shows the distribution of upper forelimb elements, humerus and radiocubitus. A right forelimb represented by refitting humerus and radiocubitus fragments is located adjacent to hearth V105 on the left, while its left side pair represented by refitting radiocubitus elements is located in association with hearth T112. This suggests sharing of a single individual between



Figure 8 Articulating distal humerus and proximal radiocubitus

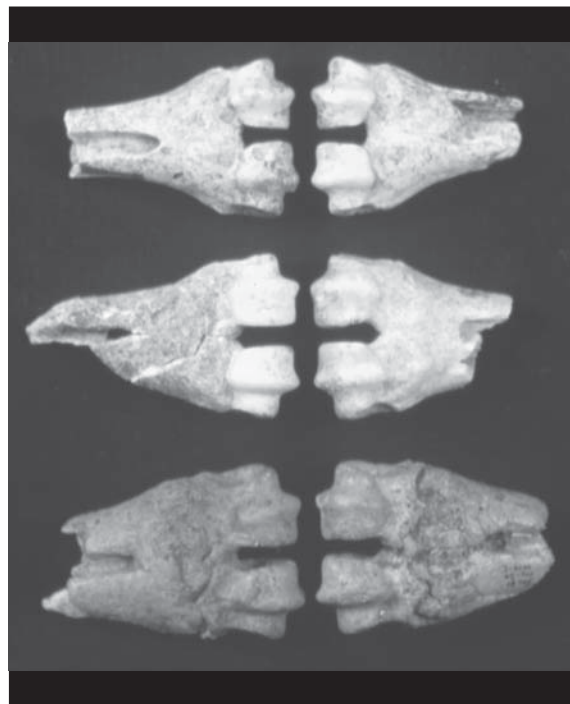


Figure 10 Matching pairs of distal metatarsals

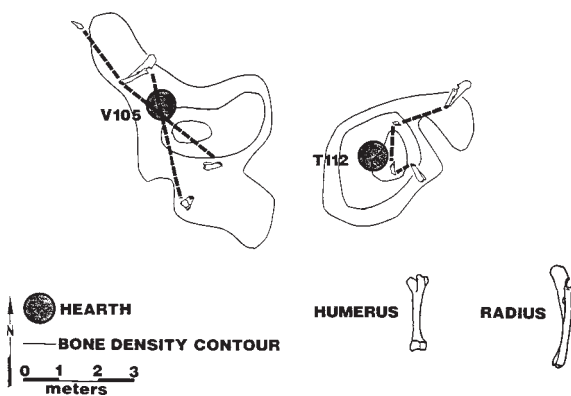


Figure 9 Refitted forelimb elements of a single individual reindeer

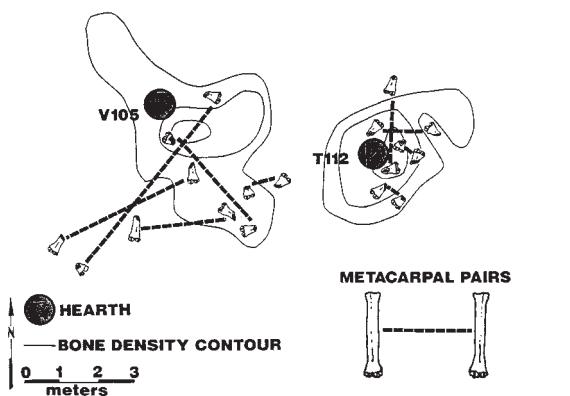


Figure 11 Matched bilateral pairs of distal metacarpals

two domestic hearths.

Bilateral pairs, such as the distal metatarsals illustrated in figure 10, could be matched to identify portions of discernibly different individual reindeer carcasses. Clear differences in distal breadth, diaphysis diameter and epiphyseal fusion can be seen to distinguish between individuals.

Another example of the spatial configuration of refits can be seen in figure 11, in this case, the distribution of matched bilateral pairs of distal

metacarpals from a number of individual reindeer carcasses. Pairs from five individuals were found adjacent to hearth V105 on the left and pairs from four other individuals were found adjacent to hearth T112 on the right. In this case, note that of the matched bilateral pairs from each individual are both associated with only one hearth, a point that will be reexamined later. Once the method of examining the distributions of various elements and individuals has been established, we can move on to a larger

scale examination of the site.

6.2 Carcass distribution at Pincevent

At Pincevent, level IV-20 corresponds to a single occupation surface, well demonstrated by sedimentary micromorphology, and confirmed by refits of lithic debris and fire-cracked rock. In figure 12, we can see the concentrations of artefactual debris associated with hearths E74, M89, V105, T112, L115 and O123. Each of these exhibits a redundant pattern of spatial structure around the major hearth that strongly suggests each is the locus of a domestic household (Leroi-Gourhan & Brézillon 1972). Elements from numerous reindeer carcasses were differentially distributed among six

domestic households. Significant numbers of carcass portions were partitioned between households, indicating that substantial food sharing indeed took place during the occupation of this site. Figure 12 demonstrates the distribution of refits among upper forelimb portions of several individuals. The lines indicate linkages between the locations of refitting fragments, articulations or bilateral pairs deriving from individual reindeer carcasses represented by the humerus and radiocubitus, as discussed above. It can be seen that upper limb elements that carry substantial quantities of meat were most often shared between domestic units. Not only does substantial interaction between hearths E74, M89, V105, T112, L115 and O123 demonstrate contemporaneity among these

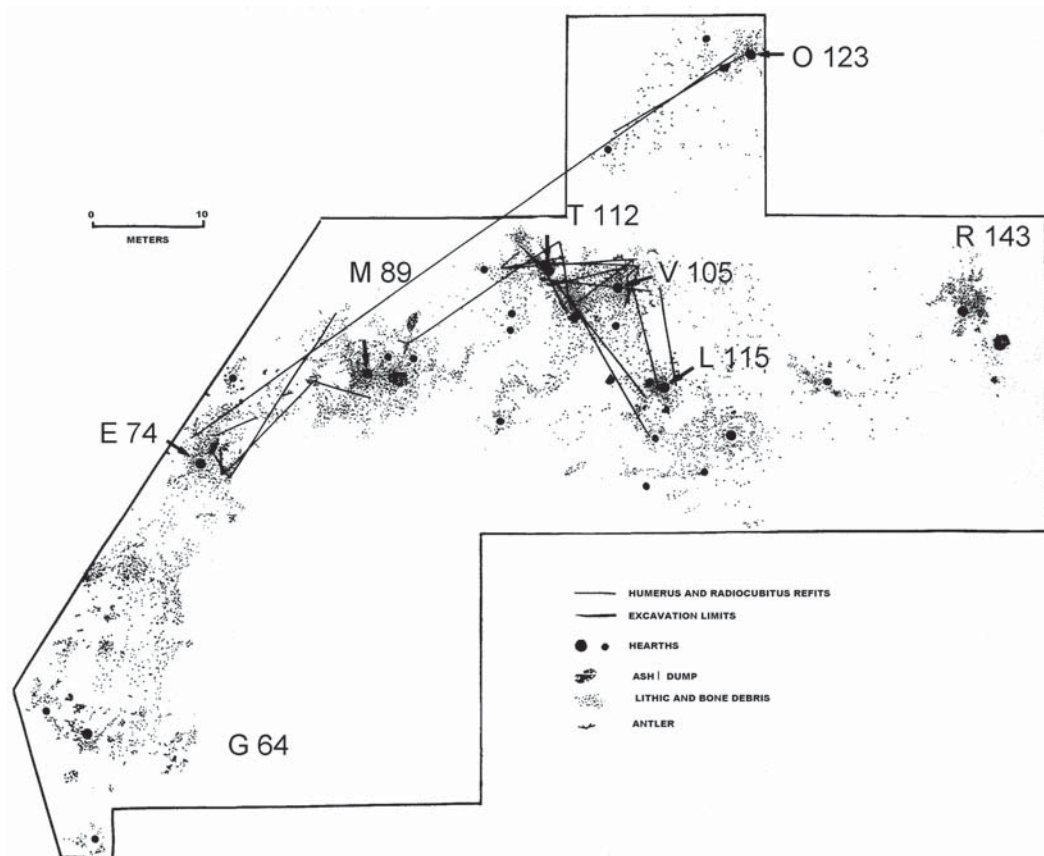


Figure 12 Spatial distribution of humerus and radiocubitus refits between hearths in level IV-20 of Pincevent

households, but the differing levels of intensity of that interaction can be seen to correlate with their spatial distance.

While some long-distance links exist, links are far more numerous between hearths that are close to one another. Figure 13 depicts the relationship between distance and intensity of sharing evidence between these hearths. The degree of sharing or economic interaction appears to be closely correlated with spatial distance between the domestic units, which suggests that food sharing was perhaps determined by or reflective of kinship distance between inhabitants of the camp. While we cannot be sure what the nature of the linkages might be, this is exactly the kind of spatial, economic and possibly kinship relationship postulated by Gargett and Hayden (1991) or Gamble (1999).

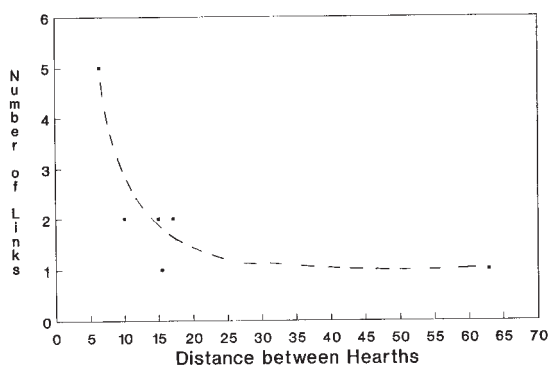


Figure 13 Relationship between degree of interaction indicated by frequency of refitting linkages of upper forelimb elements and distance between domestic hearths, level IV-20 of Pincevent

Returning to a previously mentioned point, we can see that various carcass portions circulated differentially as well. The meat-rich food packages represented by the upper forelimb elements of the humerus and radius were widely circulated. This was not true with all carcass portions. Figure 14 shows the distribution of lower forelimbs, the pairing of distal metacarpals. As previously noted, it can be seen that the pairs belonging to any given individual carcass are almost exclusively associated with a single household. These elements have little or no meat on them. They are

primarily valuable for their marrow content. Such elements, as well as heads and metatarsals, are frequently reported in the ethnographic literature as the hunter's portion. We can see that these elements were present almost exclusively at the !Kung hunters' households at Camp 10 in Binford's element representation analysis presented in Figure 5. They are rich in fats, with twice the calories per gram of lean meat, and are thus a very desirable food source. At Pincevent IV-20, they were rarely distributed between households. This may give some insight into the locations of the more successful hunters' households, those that are also most frequently implicated in the sharing of the meaty upper limb elements.

These marrow-rich elements are concentrated at hearths M89, V105 and T112, perhaps hunters' households. They are also those that participated most intensively in sharing of other meat-rich elements. The anomalous hearth is E74 to the southwest of the other hearths. This had already been identified by the excavators at Pincevent as being of a curiously different nature than the other domestic hearths. The general spatial structure was similar, but the artefactual content was poorer in content, not only in quantity, but also in quality. Certain types of tools, particularly the backed blades associated with weaponry, as well as significant amounts of flaking debris for all kinds of tool manufacture, were very poorly represented. These raised doubts as to whether this should not be interpreted as being a hunter's household. When we examine the distribution of faunal materials, we see two things. Not only are the metacarpals generally missing, but in the circulation of meat-rich upper limb elements, the portion at hearth E74 is most often the lower, leaner portion, the radius from a meatier humerus located at one of the presumed hunters' households. This household is participating in the asymmetrical circulation of meat, perhaps at the third distribution suggested by Yellen (1977a), food that is shared with non-producers, such as widows or grandparents, via the intermediaries of producers' kin or partners.

The distribution of the meaty forelimb portions of reindeer carcasses among several domestic

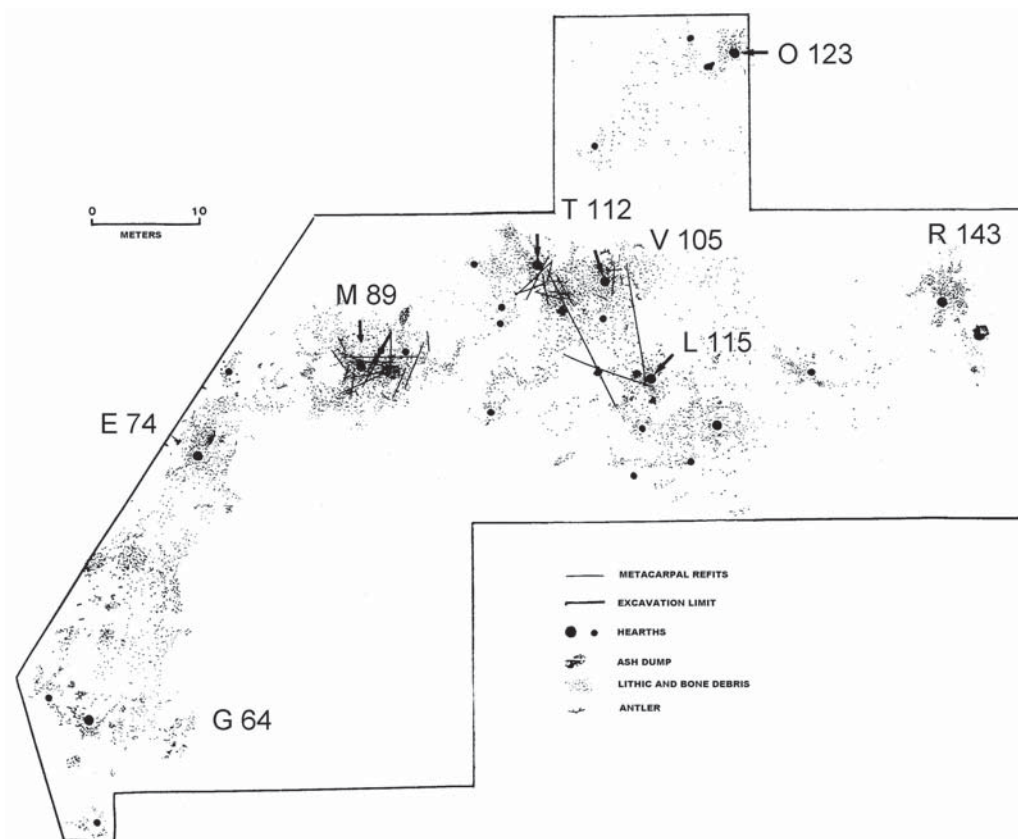


Figure 14 Distribution of matching bilateral pairs of distal metacarpals, Pincevent IV-20

hearths at the residential site of Pincevent clearly shows that food sharing was taking place at the point of consumption (Enloe & David 1989). Portions of a single carcass have been discovered at hearths separated by up to 63 metres (Enloe 1992). The hearths are dispersed over a large campsite area, of which over 4000 m² of contemporaneous space have been exposed in excavation. Individual animals were partitioned between domestic hearths, frequently in asymmetrical distributions, with apparent donor and recipient hearths, and with differential sharing according to the value of food utility of various portions of the reindeer carcasses (Enloe 1991). Multiple tiers of distribution stages are probably represented at this residential consumption site, indicating rather complex social and economic interactions were taking place at this site.

7 Methodological comparisons

Pincevent may represent a special case, with extraordinary preservation of fauna and clear definition of domestic households as structurally redundant modules of artefact content and distribution. This will not be the case for many other hunter/gatherer archaeological sites. Since I have suggested that other analyses might be useful for examining the question of food sharing at less well-preserved or well-excavated sites, I conducted a comparison between my refitting results and those obtained by using Hudson's (1990) redistribution value on the household units from level IV-20 at Pincevent. If the redistribution value were a good indicator of the presence of food sharing, it should confirm the refitting at this well-controlled case. This statistic was calculated from the reindeer

Element	Site	G64	E74	M89	V105	T112	L115	O123	R143
NISP	4506	149	207	797	1357	1102	98	459	35
MNI	52	3	6	22	19	14	3	7	2
Cranium	11	1	2	10	1	1	1	3	2
Maxilla	11	1	2	10	1	1	0	3	1
Mandible	52	1	6	13	19	14	2	3	0
Hyoid	1	0	0	0	0	0	0	1	0
Atlas vertebra	7	0	0	0	1	2	1	0	0
Axis vertebra	8	1	0	0	1	2	1	0	0
Cervical vertebra	2	1	0	0	1	0	0	0	0
Thoracic vertebra	3	0	1	0	1	1	1	1	0
Lumbar vertebra	3	0	0	1	2	1	0	1	0
Sacrum	5	0	0	0	1	1	0	0	0
Caudal vertebra	1	0	0	0	0	0	0	0	1
Sternum	1	0	0	0	1	1	0	0	0
Scapula	26	2	1	5	6	12	0	3	0
Humerus	25	1	2	9	7	12	1	7	1
Radiocubitus	41	0	4	7	14	10	2	4	1
Carpals	9	1	0	2	3	1	1	0	0
Metacarpals	50	3	3	22	15	12	2	4	0
Pelvis	16	1	1	4	7	8	0	2	1
Femur	36	2	1	6	8	9	2	4	0
Patella	8	0	0	0	4	4	1	0	0
Tibia	35	3	2	6	1	11	3	5	0
Lateral malleolus	21	3	1	3	7	9	1	3	0
Tarsals	12	1	0	2	3	3	1	1	0
Astragalus	26	2	1	2	12	11	1	2	0
Calcaneus	20	3	0	3	7	9	1	6	0
Metatarsal	28	2	2	6	11	9	2	5	0
Phalanx 1	26	1	1	3	5	5	1	2	1
Phalanx 2	19	1	1	3	5	3	1	2	0
Phalanx 3	11	1	0	1	4	3	0	1	0
Residual metapod	0	0	1	0	0	0	0	0	0
Residual phalanx	2	0	0	0	4	5	1	0	0
Sesamoid	5	0	0	0	2	2	1	1	0

Table 1 Minimum Numbers of Individuals (MNI) of *Rangifer tarandus* associated with domestic household units on level IV-20 at Pincevent, France. Bold type indicates count of element yielding highest minimum number of individuals for the archaeological unit.

skeletal elements enumerated according to counts of unique and distinguishable landmarks on each element. Minimum Numbers of Individuals (MNI) were calculated for each of the eight archaeological clusters, as well as for the entire occupation as a whole (table 1).

The calculated redistribution value for all eight artefactual concentrations on the occupation is 1.46. But how are we to evaluate that number? If no carcasses were being shared, it should equal 1.00. If all carcasses were equally shared, the redistribution value would approach the number of participating households, in this case 8.00. Obviously, the calculated value for Pincevent is much lower than 8.00. Does this suggest that food sharing was negligible at this occupation? Differential deposition and preservation are obvious at the eight units on the Pincevent living floor. It is likely that the clusters of artefacts do not all correspond to household units, or that all units were occupied for the same length of time. Units G64 and R143 have poor preservation and low frequencies of bones; they are not implicated in food sharing activity by any carcass refits. L115 also exhibits low frequency and little refitting interaction. These three units were eliminated and the redistribution was recalculated. The resulting value dropped to 1.31. When only the three highest frequency units (M89, V105 and T112) were considered, those with the most intense sharing interaction shown by the refits, the redistribution value dropped to 1.06, a value we would expect with virtually no food sharing between these domestic units. Clearly this index depends greatly upon the total proportion of the prehistoric site excavated and may be misleading

about the degree of social and economic interaction. It is unfortunate that it does not appear to satisfactorily indicate food sharing as reliably as the refitting of carcass elements.

8 Conclusions

The conclusion of this paper must be both pessimistic and optimistic. Such methods as the redistribution index, while suggested as a potential way to deal with sites with more ambiguous spatial structure, do not appear to be adequate to our needs. If household modules are not evident in the spatial structure, then the household MNIs cannot be calculated to compare with site MNIs. Where faunal preservation is too poor for individual carcass recognition, the redistribution index seems to be misleading in the quest for recognising food sharing on archaeological sites.

On the optimistic side, the Pincevent case should not be considered unique. Refitting can be applied to many other archaeological cases, and is becoming current practice in many Palaeolithic sites in Europe and Africa. I am applying it to Verberie, another Magdalenian site in the Paris Basin, with interesting differences in the patterning of the results (Audouze & Enloe 1997; Enloe 1994a, 1994b; Enloe & Audouze 1997). It has also been productively applied for a closer examination of directionality of sharing at the ethnoarchaeologically documented site of Palangana (Waguespack 2001). Continued applications on faunal remains from appropriate archaeological sites should increase our observations on social and economic interactions among prehistoric hunter/gatherers.

Food sharing past and present: archaeological evidence for economic and social interactions

James G Enloe

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