

Mortuary Variability and Community Reorganization in the Early-to-Late Natufian Transition

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This paper examines community reorganization in the Late Natufian period with reference to a general ecological model that links changes in resource scarcity with social reorganization. This model explains why community reorganization should occur in times of subsistence stress, and provides a basis for generating multiple competing hypotheses to explain the nature of that transformation. One hypothesis, that Natufian communities responded to subsistence stress by centralizing land tenure, intensifying subsistence production, and redistributing subsistence goods, is not supported. An alternative hypothesis, that an unequal distribution of land within Natufian communities allowed some segments of the population to endure subsistence stress while forcing others to migrate to more marginal areas, explains more variability in the archaeological record, and withstands preliminary testing with multiple lines of archaeological evidence.

Keywords: mortuary behavior, Natufian culture, community organization

INTRODUCTION

A sedentary or semi-sedentary community faced with subsistence stress is able to sustain a population through two possible mechanisms: It can intensify extraction and production activities to increase net energetic yields, or it can artificially increase *per capita* energy returns by reducing local population density (Collier 1975:49-59; Netting 1977:76). The specific social, demographic, or technological mechanisms through which such adaptations are manifested will vary according to local conditions, such as population size, mobility, social structure, and subsistence economy (Binford 1968). Several researchers have argued that semi-sedentary Natufian communities in the late Epipalaeolithic Levant responded to subsistence stress by transforming simple kin-based social structures into internally-ranked decision-making hierarchies (Wright 1978; Henry 1985; 1989). Such reorganization of decision-making structures would have facilitated the intensification of cereal and game exploitation to offset diminishing resource availability in the wake of the Mediterranean zone contraction around 11,000 BP

(Henry 1989:206-7). Current support for this model (called the "redistribution hypothesis" below) is derived exclusively from inferences of social stratification based on a *single* Natufian burial assemblage from the site of el-Wad (see Wright 1978). As discussed below, this model fails to be upheld when tested with other lines of archaeological evidence.

The present study develops an alternative hypothesis to explain inferred organizational changes in Natufian communities around 11,000 BP. In times of extreme subsistence scarcity, certain groups within Natufian communities may have found it more profitable to fission from parent settlements to exploit new subsistence niches in more marginal ecozones. Fission, as a demographic process, would have alleviated subsistence stress in parent communities by reducing local population densities (Levy 1992:64). As a social process, community fission is precipitated by the increasing solidarity of unilineal descent groups with respect to the exclusive control of scarce resources (Forde 1938; Fortes 1953; Collier 1975:49-51). Unlike the intensification/complexity model (Wright 1978; Henry 1985; 1989), the "fission hypothesis" could not be falsified when tested preliminarily with multiple, independent lines of evidence drawn from burial assemblages, regional settlement patterns, site abandonment sequences, and subsistence technologies. The "fission hypothesis" highlights variability in the mechanisms through which different social groups within a community respond to subsistence stress, and attributes that variability to the differential distribution of resources among corporate lineages. It is argued that changes in material culture and social organization associated with the Late Natufian transition are best understood not as uniform, pan-Natufian responses to regional environmental perturbations (e.g., Henry 1989; Belfer-Cohen 1991a), but rather as diverse adaptive strategies undertaken by corporate groups faced with locally-variable natural and social environments.

NATUFIAN SUBSISTENCE AND SOCIAL ORGANIZATION

The Natufian cultural complex represents a clear departure from earlier hunter-gatherer economies of the Middle and Upper Palaeolithic Levant (Byrd 1994). Around 12,500 BP large, semi-sedentary communities appeared for the first time along the interface of grassland and upland forest zones in the southern Levant, where populations began to employ a "complex" strategy of hunting and gathering (Belfer-Cohen 1991a). This new strategy, characterized by a radiating pattern of forays from a semi-permanent central occupation site, contrasts with typical Palaeolithic strategies by which residentially mobile groups (*sensu* Binford 1980) exploited different resource zones by moving about the

landscape in a cyclical fashion (Henry 1985). Natufian communities exploited seasonal resources, such as cereals in the late spring and summer, and nuts and game in the fall, by situating their settlements on the interface of different resource zones and by making periodic forays to specialized extraction sites (Bar-Yosef and Valla 1991).

Many researchers have emphasized the importance of this shift in subsistence strategies in explaining both the origin and collapse of the Natufian culture. Belfer-Cohen (1989; 1991a), for example, has argued that a logistical exploitation strategy would have allowed large populations to aggregate at semi-permanent locations along the upland/lowland boundary, but that such a strategy, in the long term, would have caused over-exploitation of local resources, subsistence stress, and eventually system collapse by 10,500 BP. Henry (1985; 1989) has proposed a similar scenario, attributing the Natufian collapse to population growth, intensified exploitation, and exhaustion of local resources. Below, the "fission hypothesis" posits that an emphasis on logistical foraging from a semi-permanent central base may have allowed certain social institutions, such as unilineal descent, to become entrenched in Natufian communities as responses to resource scarcity. Such social mechanisms forestalled, but apparently did not prevent, the over-exploitation of local game and cereal resources.

Community organization, in the *Early* Natufian period at least, has been characterized as a simple kinship-based system, with horizontal divisions defined by descent group membership (Belfer-Cohen 1991a; Byrd 1994). Some researchers have specifically adopted a matrilineal/matrilocal model for Natufian kinship organization. Henry (1989:208-9), for example, has argued that the high frequency of third molar agenesis, an inherited recessive trait, in the Hayonim Cave skeletal population is indicative of a high degree of endogamy within this population (see Smith 1973; Smith *et al.* 1985). Cross-culturally, endogamy is highly correlated with matrilineality (Murdock 1967; Levinson and Malone 1980), suggesting, to Henry (1989:208) at least, that Natufian communities were organized into matrilineages. This inference is somewhat problematic for two reasons. First, skeletal evidence for endogamy is limited to Hayonim Cave; third molar agenesis and other recessive traits occur in lesser frequencies in skeletal populations from Ein Mallaha, Nahal Oren, el-Wad, Kebara, Shukbah, and Erq el-Ahmar (Smith *et al.* 1985; Belfer-Cohen *et al.* 1991). Second, endogamy among Natufian communities might simply have been a function of the small absolute size of these communities and the limited number of available mates. With these reservations in mind, however, it is important to note that endogamy often serves to concentrate a descent

group's control over scarce resources (Hammel 1964; Collier 1975; Mussi 1976; Levinson and Malone 1980; Levy 1992). While the evidence for matrilineality, *per se*, is sparse in the Natufian archaeological record, other lines of evidence, especially in the spatial organization of cemeteries, suggests that a unilineal descent system may have functioned to maintain the intergenerational integrity of subsistence territories, and, especially in times of resource scarcity, to limit access to those territories through a form of "social boundary defense" (*sensu* Cashdan 1983).

DIACHRONIC CHANGES IN SUBSISTENCE AND COMMUNITY ORGANIZATION

While the Natufian cultural complex spans the period 12,500-10,500 BP in the southern Levant, major environmental and organizational changes around 11,000 BP divide the Early Natufian from Late Natufian period. Warm, wet conditions that allowed for the natural expansion of cereal stands into lower elevations seem to have given way around 11,000 BP to a cooler, more arid period termed the Younger Dryas (Bar-Yosef and Valla 1991). The immediate result of this drying trend, as documented by palynological research, was the contraction of cereal stands into higher, wetter elevations, followed by the expansion of the grassland zone into territory formerly occupied by an upland forest ecosystem (Bar-Yosef *et al.* 1974; Henry and Leroi-Gourhan 1976; Leroi-Gourhan 1980). Although recent nutritional analyses demonstrate a shift in emphasis toward game resources after expansion of the grassland zone (Belfer-Cohen *et al.* 1991), faunal analyses from Hayonim Cave and Terrace, Ein Mallaha, and several Late Natufian sites indicate that gazelle populations were becoming increasingly over-exploited by the Late Natufian period (Cope 1991). It would appear, then, that by the Late Natufian period major dietary staples -- including cereal and game resources -- were becoming increasingly scarce along the upland/lowland boundary (Bar-Yosef 1981).

Major changes in regional settlement patterns also occurred around the time of the Early-to-Late Natufian transition. Partial abandonments may have occurred at many of the largest Natufian settlements, most notably at Hayonim Cave (see Bar-Yosef 1991) and Ein Mallaha (see Valla 1991), and many sites were apparently abandoned for the first time since the Middle Palaeolithic (Henry 1989:181). Simultaneously, a number of Natufian occupations appeared well outside of the Mediterranean zone in the more marginal environments of the Negev and Black deserts. Although little excavation has been conducted in such areas, investigations of several Black Desert sites indicate that settlement

was relatively permanent (Betts 1982; 1991), and that subsistence was focused predominantly on the exploitation of game resources (Olszewski 1986; Byrd 1989). Although the presence of bedrock mortars at such sites indicates some processing of plant materials (Betts 1991), the apparent diversity of faunal remains in desert sites contrasts with hunting economies typical of "core" Natufian settlements, which focused primarily on gazelle (Henry 1975; Bar-Yosef 1981). This last observation suggests that the exploitation of a new dietary niche may have been one cause of the Late Natufian expansion into desert regions.

Contemporary with major changes in environment and settlement patterns in the Late Natufian was a significant change in human burial practices. In the Early Natufian period, large aggregated cemeteries appeared for the first time, an indication of at least semi-permanent sedentism and perhaps of increasing territoriality (Bar-Yosef and Goren 1973; Wright 1978; Brandt 1988; Belfer-Cohen and Hovers 1992). Group interments, which include adults and children, are common and were frequently reopened to admit later burials (Bar-Yosef 1991). This tendency to re-use graves and cemetery areas lends itself to the interpretation that individual graves and cemetery loci contain the members of descent groups (although this inference is debatable) (Belfer-Cohen and Hovers 1992). The differential distribution of grave goods in the Early Natufian period, while evident, is not pronounced. The vast majority (90% according to Belfer-Cohen and Hovers 1992) of Early and Late Natufian burials contain no grave inclusions.

Many significant changes in mortuary behavior apparently correspond to the transition from Early to Late Natufian periods. With few exceptions, group interments disappeared and individual burials became the most common mode of interment (e.g., Garrod and Bate 1937; Wright 1978; Edwards 1991; Bar-Yosef 1991). The use of distinct cemetery areas also appears to have ceased in the Late Natufian, and burials were placed in abandoned structures for the first time at many sites (see Bar-Yosef 1991; Belfer-Cohen and Hovers 1992). In the Late Natufian, grave goods were distributed more evenly among interments, although goods occurred almost exclusively in the form of *dentalium* shell bracelets and necklaces in this period. The practice of separating the skull from the body before interment first appeared around this time, although it is presently unclear if this is evidence of ritual violence or simply a precursor of the later Neolithic practice of skull-removal (Byrd 1994). Wright (1978) has interpreted many of the apparent discontinuities in burial assemblages across the Early-to-Late transition as evidence of the rise of social stratification in Natufian societies. Since this inference is central to Henry's (1985; 1989) model of social

complexity and intensified resource exploitation in the Late Natufian, Wright's (1978) analysis of the el-Wad burial population is examined below.

THE EL-WAD BURIAL ANALYSIS

Wright's (1978) inference of social stratification in the Late Natufian period is based on the partial analysis of a burial population recovered from the site of el-Wad, which spans both Early and Late periods. The theoretical basis for this analysis is derived almost exclusively from Binford's (1971) cross-cultural study of burial practices among hunter-gatherer, pastoralist, and agriculturalist societies. Binford's goal was to define a set of general material correlates that would partition variability in burial assemblages according to the number and types of social distinctions symbolized in those assemblages. Based on ethnographic accounts, Binford found that sex differences were most often marked by the form of the objects interred with individuals, while social status was most frequently correlated with both the type and quantity of grave goods. Social affiliation, or social group membership, was almost always marked by the spatial location of the grave. Although Binford's (1971) correlates fail to account for a great deal of variability in mortuary assemblages (Carr 1995), their utility for distinguishing very broad social distinctions, such as age, sex, and social characteristics of the deceased, has been verified in *some* ethnographic and ethnohistoric contexts (see Bartel 1982; O'Shea 1984; Howell 1994; cf. LaMotta 1998). Wright (1978) applied these correlates to the el-Wad assemblage to develop the hypothesis that kin-based social distinctions broke down in the Late Natufian period and were replaced by a community-wide status hierarchy.

Two lines of evidence for the breakdown of kin-group distinctions are inferred from the el-Wad burial data. The replacement of group interments with individual burials in the Late Natufian period is supposed to indicate a de-emphasis of social distinctions symbolized by the spatial location of graves. According to Binford's (1971) cross-cultural study, location of burials can mark distinctions in cause of death, age, social status, or social group affiliation. Group and individual interments crosscut age groups at el-Wad, and no differences in cause of death were discerned (Wright 1978). Furthermore, according to Binford (1971), social status is more strongly correlated with the form and quantity of grave goods than it is with location of the grave. From these empirical generalizations, one *might* conclude, as Wright (1978) has done, that the abandonment of group interments in Late Natufian con-

texts at el-Wad reflects a general dissolution of lineage-based social distinctions.

Wright (1978) has also argued that the differential distribution of grave goods in the Late Natufian period is indicative of a transformation of simple kin-based social distinctions to distinctions based on a status hierarchy in which community members are ranked individually. Wright notes that in the Early Natufian period most graves contained some form of grave goods, if only a limestone slab (cf. Belfer-Cohen and Hovers 1992). This pattern changed in the Late Natufian burials, where most individuals were apparently interred with no grave goods. A sub-set of this Late Natufian population, however, was interred with a single type of grave inclusion: a *dentalium* shell headdress. Since this item crosscuts sex lines, and is therefore not a marker of sex distinctions (Binford 1971), it has been interpreted as a marker of individual status within the community hierarchy. Wright (1978) used the differential distribution of this supposed status-linked object to argue for a two-tiered social hierarchy in the Late Natufian, much like a simple chiefdom type of organization (see also Henry 1989:209).

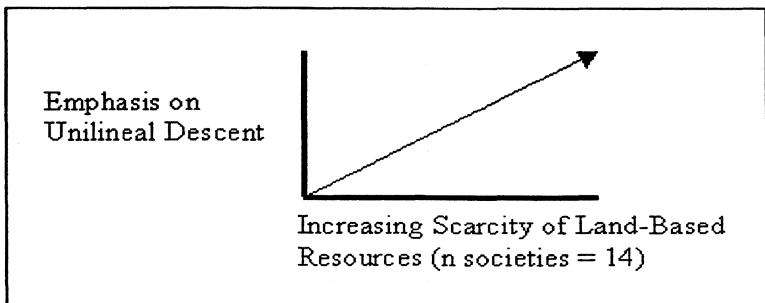
Based largely on this single line of evidence drawn from a very small data set from el-Wad (n burials = 44, 18 others were not analyzed), Wright (1978) and Henry (1985; 1989:206-210) have proposed the following model: A cooling and drying trend around 11,000 BP caused a major shift in the spatial distribution of Natufian subsistence territories, and specifically increased the elevation of the grassland/forest zone boundary. Natufian communities, which had formerly straddled this boundary in order to practice logistical exploitation of resources that were seasonally out of phase, could not move their settlements to the new phase boundary because they were tied to permanent water sources at the upland/lowland zone interface (Henry 1985). Because cereal resources became more scarce, and more difficult to obtain, subsistence stress would have occurred in the spring and summer months. To offset this stress, traditional kinship organization was replaced with a two-tiered hierarchy; the upper tier consisted of a small number of decision-makers who had the power to re-direct labor to intensify resource exploitation, create food surpluses, and direct food redistribution (Wright 1978; Cohen 1985; Henry 1989:209-10). Eventually, intensified exploitation, coupled with population expansion, outstripped the ability of the environment to replenish natural resources, and the Natufian system collapsed (Henry 1985; 1989; Belfer-Cohen 1989; 1991a). While several investigators have questioned the validity of Wright's (1978) inferences of social stratification (see Belfer-Cohen 1991b; Byrd 1994), this "redistribution" model has yet to be systematically tested against

other lines of evidence. Below, the hypotheses of Wright (1978) and Henry (1985; 1989) are discussed within the context of an ecological model that relates the relative availability of subsistence resources to the strength of unilineal descent groups and the practice of corporate land tenure. This model serves to generate test implications for the Wright-Henry "redistribution" hypothesis, and to suggest an alternate hypothesis to explain the inferred dissolution of kin-based organization in the Late Natufian period.

RESOURCE SCARCITY AND THE DEVELOPMENT OF UNILINEAL DESCENT

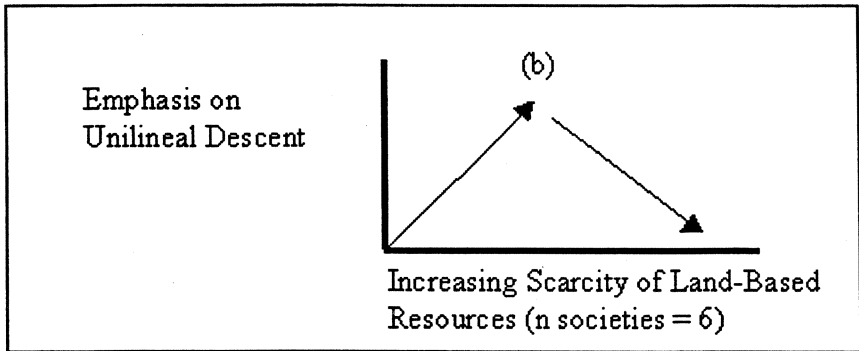
Cross-culturally, variability in the availability of productive land is correlated with significant variation in kinship structures and social organization, especially variation in inheritance systems (Collier 1975:60). A unilineal descent principle often functions to channel the inheritance of rights to resources through a single line of descent, and thereby prevents the intergeneration dispersion of inherited resources that often occurs in bilateral decent systems (Fortes 1953). A unilineal inheritance system also draws an unambiguous boundary between those who have access to resources and those for whom access is restricted, and defines that boundary based on kin-group membership traced through one sex of parent. In situations where resources are scarce, the descent principle acts as a type of "social boundary defense" (*sensu* Cashdan 1983), a mechanism that defines legitimate access and succession to land-based resources (Collier 1975:61), mitigates disputes (Bohannon and Bohannon 1953), and provides a cleavage plane along which conflict and community fission may occur (Levy 1992:54-6).

A general functional relationship has been hypothesized between the relative availability of land-based subsistence resources and the frequency with which inheritance of land occurs through a single line of descent. As one might expect, given the role of unilineal descent principles in consolidating, defining, and restricting access to resources, as land-based resources become more and more scarce, inheritance is increasingly defined through a single line of descent. Meggitt (1965:279), for example, found a strong positive relationship between an emphasis on unilineal inheritance and increasing land scarcity in a sample of fourteen New Guinea societies:



Meggitt's research documents the increasing solidarity of the descent group, acting as a corporate unit, as a function of the increasing relative value of resources held in common.

This direct positive relationship is ultimately limited, however, by the absolute scarcity of available resources. Among contemporary Maya agricultural communities, for example, Collier (1975:51) has demonstrated the following relationship between the strength of unilineal descent principles and the relative scarcity of resources.



Collier's (1975:51) model demonstrates a strong positive correlation between land-based resource scarcity and inheritance of land through a single line of descent until point (b). Up to this point, the descent principle serves to mitigate conflict over scarce resources by defining rights of access through kinship, as in Meggitt's (1965) example from New Guinea. After point (b), however, the absolute scarcity of land-based resources is so great that the relative value of land begins to decrease and the solidarity of corporate groups defined by unilineal descent breaks down (see also Adler's [1994] "Curvilinear Hypothesis," which is similar to Collier's [1975] model). From this point (b) onward, the energetic returns from landholdings are so diminished that the corporate ownership of land, which entails the distribution of returns among all members of the descent group, is no longer profitable (Collier 1975:56).

Point (b) in Collier's model represents the initiation of a disequilibrium relationship between population levels and energetic returns from land-based subsistence resources. When this point is reached, several possible mechanisms exist for restoring an equilibrium relationship between a population and its food base. One mechanism involves the transformation of a corporate landholding pattern into a system based on individual rights to land (Collier 1975:58-9). While land-based resources may be too scarce for corporate landholding to be profitable, energetic returns from that land may be sufficient to support

social units below the level of the lineage, such as the nuclear family. Of course, such a transformation would leave a large segment of the population disenfranchised. In such a situation, one would expect a substantial decrease in local population densities as disenfranchised groups relocate to resource zones with (a) less competition for resources, and/or (b) new subsistence niches (e.g., Goodenough 1956; Levy 1992:95, 120). The economic mechanism through which such a transformation would be effected is provided by the unilineal descent principle as well. An unequal distribution of land-based resources is fostered, and even accentuated, by a unilineal inheritance principle. The consolidation of resources within a single line of descent (as opposed to the gradual dispersal of resources through a bilateral system), coupled with random growth and shrinkage of specific lineages, will eventually lead to an unequal *per capita* distribution of land-based resources (Collier 1975:59). Such an uneven distribution of resources would allow certain individuals and families to support themselves independently of the lineage system in times of extreme resource scarcity, at which time the corporate basis of land control would dissolve.

An alternative mechanism for restoring an equilibrium relationship between a population and its resource base involves the transformation of a corporate landholding system to a redistributive system (Collier 1975:59; Renfrew 1979). Whereas the transformation of corporate to individual land tenure re-establishes equilibrium by reducing local population densities, and thereby inflates relative *per capita* energy returns, a redistributive system invests authority in a small number of individuals for the purpose of reorganizing and intensifying energy extraction from existing land resources. Intensification increases the net energy returns from a given resource base. In such a situation, population levels would be expected to remain stable, and perhaps even increase, assuming extraction levels could be maintained without exhausting the environment (Collier 1975:63; Netting 1977:56). As in the transformation from corporate to individual land tenure, however, the introduction of central control of land-based resources will result in the de-emphasis of unilineal descent principles with respect to inheritance (Collier 1975:61), assuming land rights are the primary inheritable commodity. The unequal distribution of resources through a unilineal descent system also provides an economic mechanism through which certain groups might usurp decision-making authority in times of resource scarcity.

The specific social and economic conditions that determine whether a community under subsistence stress will adopt a redistributive system, or alternatively, an individual land tenure pattern, is presently unclear.

Such an explanatory mechanism is not critical in the present application of this model to the Natufian problem, however. More important is the observation that structural reorganization and community fission are two distinct processes that should leave *some* unambiguous traces in the archaeological record. Such traces are examined below in the context of the archaeological record of the Early-to-Late Natufian transition.

EXPLAINING THE EARLY-TO-LATE NATUFIAN TRANSITION

Although Collier's model is based on fully-sedentary agricultural societies, as are Meggitt's (1965) examples, it is argued that the principles developed above are applicable to the semi-sedentary, hunting/gathering economy of the Natufian system for three reasons: (1) Natufian communities were dependent on subsistence resources whose relative productivity (like agriculture) was almost certainly functionally related to the size of the territory exploited (Henry 1985; Liebermann 1993); (2) Natufian communities were at least semi-sedentary, and their use of resource territories was therefore limited to a fixed range of land around the settlement (Tchernov 1991); (3) Based on spatial distinctions in cemetery areas (Wright 1978), and Smith's (1973) evidence for endogamy in the Hayonim Cave population, it is possible – although not certain – that Natufian communities practiced something similar to a unilineal system of descent (Henry 1985; 1989:208-9). This last assumption is particularly likely given the climate-driven trend around the Early-to-Late Natufian transition toward greater resource scarcity and expanded subsistence ranges which could have been more easily defended through social mechanisms than by physical boundary defense (see Peterson 1975; Dyson-Hudson and Smith 1978; Cashdan 1983). In sum, land in the Natufian system (as in the agricultural systems upon which Collier's model is based) was a finite resource, the control of which directly determined the ability of groups and individuals to extract subsistence goods from the environment.

The model proposed by Wright (1978) and Henry (1985; 1989) to explain the inferred transformation of Natufian community organization around 11,000 BP is very similar to the corporate-central redistribution transformation model discussed above. From the same general model (Collier 1975), an alternative hypothesis can be extrapolated to explain the demise of corporate descent groups in the Late Natufian period: a lineage-based land tenure system in the Early Natufian was transformed into a system of individual control in the Late Natufian, resulting in the fission of disenfranchised groups from parent settlements. Collier's model, and the other examples discussed above, can be used to generate

test implications for the Wright-Henry "redistribution hypothesis" and the alternative "fission" hypothesis.

TESTING THE WRIGHT-HENRY "REDISTRIBUTION" HYPOTHESIS

The primary evidence for the intensification/complexity model proposed by Wright (1978) and Henry (1985; 1989) is the disappearance of spatially-distinct group interments in the el-Wad cemetery, and their replacement with individual burials, signifying the breakdown of lineage distinctions in the Late Natufian period (after Binford 1971). This pattern is corroborated with similar (but more complete) data from human burials at Hayonim Cave. At Hayonim Cave, group interments established in, and re-used throughout, the Early Natufian period were abandoned around the onset of the Late Natufian period (with only one exception) and replaced by individual interments in abandoned structures (Bar-Yosef 1991). Belfer Cohen and Hovers (1992) report a similar change in mortuary ritual in Late Natufian cemeteries at Ein Mallaha and Erq el-Ahmar. The dissolution of descent group distinctions is predicted by Collier's (1975:51) model for both intensification/ redistribution *and* fission hypotheses, however, and these observations neither confirm nor falsify either hypothesis.

The other evidence presented in support of the Wright-Henry hypothesis is the differential distribution of *dentalium* shell ornaments among Late Natufian graves in the el-Wad cemetery, which is inferred to indicate a two-tiered social hierarchy. This observation would confirm the prediction generated by Collier's model that a vertical control unit (*sensu* Johnson 1973) should appear in situations where control of land-based resources is transferred to a central redistributive authority. Wright's (1978) inference of social stratification is problematic, however, given the observation that the differential distribution of grave goods in Late Natufian cemeteries is not a robust pattern in any other burial assemblage (Belfer-Cohen and Hovers 1992). At Hayonim Cave, for example, *all* known Late Natufian interments were buried with *dentalium* shell ornaments of some kind. There is simply no strong evidence for social stratification in any known Natufian burial assemblage (Byrd 1994), and the pattern observed by Wright at el-Wad may simply be the product of sampling bias.

Johnson (1978) and Peebles and Kus (1977) indicate that a size hierarchy among residential structures is frequently a marker of vertical stratification within a settlement. Although there are significant size differences among Natufian structures (ranging from 2-9 m in diameter), this variability in size is evident in both Early and Late Natufian periods, and functional explanations presently cannot be ruled out (Henry

1989:212). At Hayonim Cave, for example, there is no evidence for significant variability in structure size in either Early or Late Natufian periods. Furthermore, there is currently no strong evidence for communal architecture in Natufian settlements in general, which one might expect to find in redistributive economies (Adler 1989) (although a possible ritual structure at the Late Natufian site of Rosh Zin may represent an exception [Henry 1976]). In sum, architectural data provide no strong evidence for a social hierarchy, nor for a redistributive economy, in the Late Natufian Period.

For systems that centralize land control and intensify extraction activities, Collier's model predicts that population levels will remain stable, and possibly increase; Henry (1985; 1989:210) predicts a similar demographic trend in the wake of subsistence intensification in the Late Natufian. Site abandonment sequences and regional settlement patterns in the Natufian "core" suggest the opposite demographic trend in the Late Natufian period, however. At Hayonim Cave, for example, about half (3 out of 6) of the structures occupied at the Early-Late transition (phase III) were apparently abandoned by the Late Natufian period (phase IV); only one known structure was apparently occupied well into the later period (phase V) [it should be noted, however, that major portions of the Natufian deposits in the cave remain unexcavated]. Based on the admittedly problematic assumption that this is a representative sample of occupation structures from this site, it is possible that some portion of the Hayonim population abandoned the cave at the Early-Late transition (although local relocation of structures cannot yet be ruled out). Valla (1991) reports a similar, albeit less pronounced, pattern of abandonment at the site of Ein Mallaha. More significant, however, is the appearance of many new occupations in marginal desert zones in the Late Natufian period, which might indicate a population exodus from large Mediterranean zone sites at this time. These preliminary data suggest that population densities at large base camps may have decreased significantly in the Late Natufian period. This possibility further undermines the Wright-Henry hypothesis and, as discussed below, lends support to the fission hypothesis.

Finally, there is no overwhelming direct evidence for subsistence intensification in the Late Natufian period. Possible evidence for the intensification of hunting strategies exists at Hayonim Cave, where Henry (1989:191) has linked the increasing frequency of geometric microliths through time with the intensification of hunting activities. Cope (1991) has likewise suggested that an increasing ratio of female-to-male gazelle kills through time at several Natufian sites might be indicative of intensified hunting in which even the reproducers are

exploited for meat. Additionally, based on bone Sr/Ca analyses, Sillen (1986) and Sillen and Lee-Thorp (1991) report an increase in the proportion of meat in Late Natufian diets. While these data suggest an increased *use* of game in later Natufian diets, this may simply be a factor of the natural expansion of the grassland zone around 11,000 BP and the resulting scarcity of cereal resources. There is no direct evidence for an *intensification* of game exploitation in the Late Natufian.

Furthermore, there is presently no strong evidence for the intensification of cereal exploitation in the Late Natufian period. While groundstone mortars and other processing tools are prevalent at Natufian sites, there has been no systematic quantitative analysis of their occurrence that would suggest a significant intensification of cereal and nut extraction and processing within the Natufian cultural period (Anderson 1991; Wright 1994). Storage features, which one would expect to increase in frequency in a shift to an intensified, redistributive economy, are notoriously difficult to date, and no diachronic trends are currently evident (e.g., Valla 1991). In general, the evidence for the intensification of subsistence activities in the Late Natufian is incomplete and open to other interpretations (cf. Flannery 1969, 1972). Current data lend little support to the hypothesis that Natufian communities responded to subsistence stress by centralizing land tenure and intensifying extraction activities. The alternative hypothesis, that control of land was shifted from the descent group to individuals and small social units, which resulted in the fission of Natufian communities around 11,000 BP, is tested in a preliminary way below. Since much of the relevant data has already been discussed in detail, the evidence in support of this hypothesis is presented in summary fashion.

TESTING THE "FISSION HYPOTHESIS"

According to Collier's (1975) model, when land tenure is shifted from kin-group to individual control, a general decline in emphasis on unilineal descent principles should occur, which will result in the breakdown of distinctions between decent-based corporate groups. As discussed above, one reflection of this breakdown might be reflected in the shift from group to individual interments in the Early-to-Late Natufian transition. Again, the dissolution of descent group boundaries would be expected to occur in the centralization of land tenure as well, so this observation does not help to confirm the "fission hypothesis."

With the shift from a corporate to an individual land tenure pattern under conditions of subsistence stress, one would expect the disenfranchisement of a significant segment of the population (Collier 1975:57-8; Levy 1992:120). Such a situation has been demonstrated to

result in direct conflict and/or the migration of disenfranchised groups to other locations. At sites like Hayonim Cave and Ein Mallaha a permanent site abandonment *appears* to coincide with the Late Natufian transition (see Bar-Yosef 1991; Valla 1991). At about the same time, a significant number of settlements were established for the first time in marginal desert environments where populations began to exploit a subsistence niche different from that exploited in the Mediterranean zone (Betts 1991; Garrard 1985). It is argued here that these two archaeological patterns are the result of the same demographic phenomenon, namely the fission of Natufian "core" occupation sites and the subsequent settlement of marginal regions by populations that could no longer be supported by diminishing Mediterranean zone subsistence resources.

The fission hypothesis also predicts that vertical stratification and the intensification of subsistence exploitation should not be evident in the Late Natufian. This prediction assumes that community fission would have lowered local population densities, thereby artificially inflating, or at least stabilizing, *per capita* energy returns from local resources and relieving subsistence stress. As discussed above, there is no significant evidence from burial or architectural data to support the notion that Late Natufian social organization was stratified. Nor is there unequivocal evidence for the widespread intensification of subsistence activities, nor for the redistribution of subsistence goods, in the Late Natufian period. While arguments from negative evidence are admittedly problematic, these observations suggest that the "fission hypothesis" is the more parsimonious explanation for changes in community organization associated with the Early-to-Late Natufian transition. In sum, current data conform to the predictions of the "fission hypothesis" better than they do to the "redistribution hypothesis".

SUMMARY

This paper has examined the prevalent theory concerning community reorganization in the Late Natufian period within the context of a general ecological model that links resource scarcity with social organization through the mechanism of unilineal inheritance. This model explains why community reorganization should occur in times of subsistence stress, and provides a basis for generating multiple competing hypotheses to explain the nature of that transformation. One hypothesis, that Natufian communities responded to subsistence stress by centralizing land tenure, intensifying subsistence production, and redistributing subsistence goods, is not supportable given currently available data. An alternative hypothesis, that an unequal distribution of

land within Natufian communities allowed some segments of the population to endure subsistence stress while forcing others to migrate to more marginal areas, explains more variability in the archaeological record, and withstands preliminary testing with multiple lines of archaeological evidence. While the fission hypothesis is favored as *one* explanation for some of the changes associated with the Early-to-Late Natufian period transition, this model is not advocated as a blanket explanation for all discontinuities observed in the archaeological record of the transitional period. Some lines of evidence do perhaps suggest that some communities intensified resource extraction in the Late Natufian period (Cope 1991), and that some may have become somewhat more stratified and centralized (e.g., Rosh Zin with its possible "ritual" structure). Undoubtedly there were many experiments involving technological and social reorganization that occurred with the onset of subsistence stress around 11,000 BP, centralization and fission among them. The fission model, however, attempts to account for at least some of this variability by highlighting the different strategies that could have been employed by social groups faced with subsistence stress in Late Natufian communities. Differential access to subsistence resources among social groups, it is argued, was in part a consequence of the Natufian adoption of a semi-sedentary economy, resource diminution, and the resulting organization of communities around unilineal descent groups to consolidate and maintain control over resource territories. Future research should attempt to identify other axes of differentiation in Natufian populations, and the role played by such distinctions in the transformation of lineages, communities, and regions in the Late Natufian period.

ACKNOWLEDGEMENTS

I would like to thank one anonymous reviewer for pointing out several weaknesses in the original draft of this paper, and for suggesting several additional references. I am especially indebted to Mary Stiner, whose extensive comments and constructive criticism greatly improved the present work. As always, my critics in the Laboratory of Traditional Technology Friday afternoon "bull sessions" contributed their share of verbal abuse and helpful suggestions for the final draft. Finally, I am grateful to Anna Belfer-Cohen; with her assistance I've come to better appreciate the complexity of Natufian mortuary behavior. I absolve all of the above individuals of any responsibility for errors or opinions in the present manuscript, however, which are exclusively my own.

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