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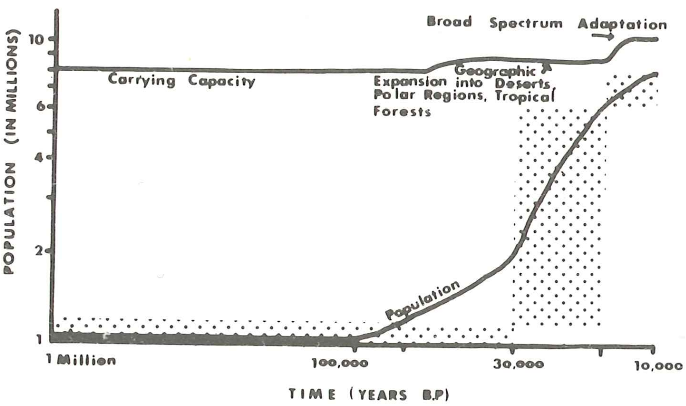
Demographic Issues in Pleistocene Prehistory: A Perspective from Wadi al-Ḥammeh

This paper explores some consequences of attempting to reconstruct human population levels in the Pleistocene, using only those direct archaeological variables available for the great majority of cases: Namely estimates of site numbers, site sizes and considerations of flaked stone tool densities and patterning. Much of the data cited here is drawn from the Jordanian prehistoric record, with inter-regional and diachronic comparisons made in order to illustrate some of the paradoxes that emerge in attempting the difficult task of demographic reconstruction.

A common model for world population trends envisages a slow, steady population growth through the earlier Pleistocene, then a sharp inflexion near the end of the Pleistocene leading to a runaway increase in the Holocene (FIG. 1). However this scenario, based on a gradualist interpretation of population growth before the last major interglacial, is not the only conceivable one. Dennell (1983) for example, has conjectured several steps at which relatively quick increases occurred in Pleistocene Europe.



1. Hassan's model for world population growth. (After Hassan 1981: 207).

The study of Pleistocene demography highlights the frustrations to progress in a field where the available units of measure remain equivocal, or worse, are liable to suspicions of irrelevance.

Lithic Density as an Index of Population

Several trials have been made using artefact densities to estimate populations that occupied archaeological sites, and lithics have usually been chosen for the Palaeolithic cases. This in itself seems a curious idea, in so far as it assumes that the abundance of artefacts or rubbish discarded on a site is always directly correlated with population size, where it is not obvious that this relation is generally true.

Direct observations are salutary in reminding us how few people and how little time may suffice for large quantities of material to be amassed. Binford cites an example of skeletal debris where:

> "...a family had killed about fifty caribou by driving them into a nearby lake. All the processing of meat for drying took place during a period of only twelve days or so, yet the amount of debris deposited at the site was *absolutely staggering*" (1983: 138; italics in original).

The remedy is not just to lower our population estimates by an order or two of magnitude because we have hitherto been overly impressed by the scale of human refuse generation, but to re-examine the assumption that amounts of refuse and population co-vary in a constant manner.

Doubts arise on several fronts when some of the applications using lithic evidence are confronted. Even if the ratio of people to artefacts remained static for communities using sites, successively older sites might be expected to have suffered more deflation, with higher selective removal of small fragments. In such cases high levels of deflation would partially duplicate the effect considered to be caused by lowered occupational intensity.

In Wadi al-Ḥammeh, the deflationary effect was evident in the Upper Palaeolithic site Wadi Hammeh 32, which yielded a mean lithic density of 500/m^3 (Edwards and Colledge 1985). Another, earlier Upper Palaeolithic site Wadi Hammeh 34 had a much higher lithic density of

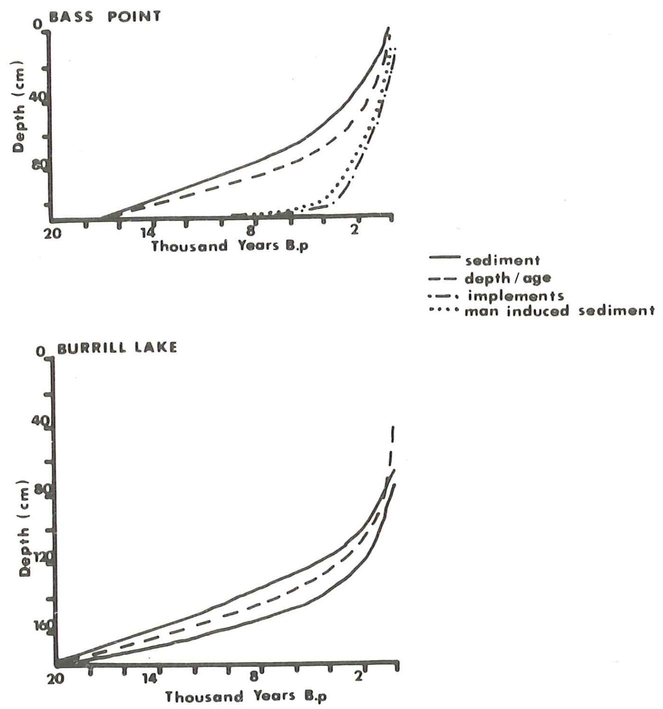
13,829/m^3 because it was embedded quickly in a silty clay matrix under low hydrological energies.

A different line of objection stems from considerations of lithic reduction techniques. During bladelet core reduction (a mode common from the Upper Palaeolithic onwards), the reduction sequence may produce more fragments, which are in turn retouched into microliths, than say, the striking of flakes or points of a Middle Palaeolithic Levallois core.

Some instructive examples may be cited from Australian prehistory. There are several sites at which the date of introduction of the so-called 'Australian small-tool tradition', which included forms that would be termed microliths in Old World prehistory, succeeding the previous 'core-tool and scraper tradition' have been closely documented (White and O'Connell 1982: 105-123).

At the Bass Point and Burrill Lake sites in New South Wales, sediments and artefacts accumulated slowly until *c.* 4000 years ago (FIG. 2). After this time, when the small-tool tradition appears, both increase rapidly (Lampert and Hughes 1974: 232-233). The excavators believed that the acceleration was best explained by increased population. Yet when summarizing their work at these two sites, together with a third one (the Curracurrang I rockshelter), they move closer to another model:

> "At each of the three sites, an increase in stone working coincided with the arrival of the new small stone technology. Because this technology itself could have necessitated more prolific stone working, more intensive occupation of the sites by people is not a necessary corollary. However the increase in man-induced sedimentation at two of the sites when stone working becomes more prolific supports the view that they were used more frequently."
> (Lampert and Hughes 1974: 233).



2. Age-depth curves for two New South Wales archaeological sites. (After Lampert and Hughes 1974: 232).

The concurrent increase in sedimentation and stone fragments does not in itself favour either hypothesis. It may be that the increased efficiency of the small-tool tradition indirectly enabled population growth in the region surrounding the site, but another more parsimonious explanation is that a core reduction sequence producing a greater volume of fragments itself contributes directly to increased sedimentation, even when population is held equal. A larger mass of stone fragments may act as an aggregate around which inwashed or in-blown sediment can consolidate.

Evidence supporting this view comes from the Lindner site, Nauwalibia 1, in Arnhem Land (Jones and Johnson 1985: 165-227). Midway through a long sequence of deposits, which in the lower levels yielded large-tool assemblages, a bifacial stone point technology was introduced some time after 5700 years ago (Jones and Johnson 1985: 203-206). Overall there is an increase in the weights and numbers of small ($< 1cm^2$) flakes in the upper layers. The age-depth curve for this site shows a concomitant increase in sedimentation rate after 5000 years ago. Again, the change in flaking techniques, not increased population, will suffice as explanation for the more prolific stone fragments which in turn generated a larger volume of sediment through consolidation of aeolian material.

For lithic densities to be meaningful for demographic purposes, the reduction sequences compared ought to produce similar magnitudes of debris.

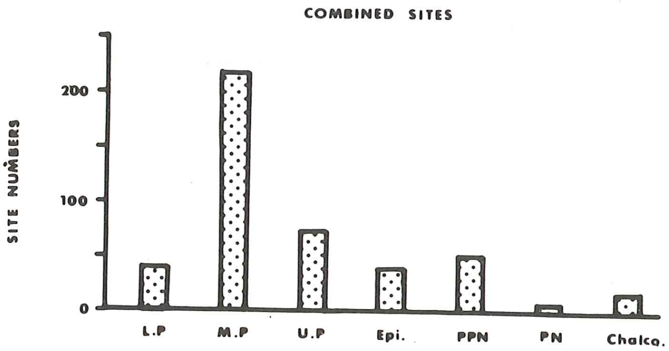
At Koobi Fora, Isaac and his colleagues (1981: 118-119) described outcrop strips containing many small sites, about twenty square metres in area, marked by stone tool clusters. These are similar in size to the Wadi al-Ḥammeh Kebaran sites of *c.* 25m^2 (Edwards 1987: 53, 97). In the Plio-Pleistocene Koobi Fora sites, lithic densities averaged in the tens per cubic metre, as opposed to thousands per cubic metre in the Wadi al-Ḥammeh Kebaran. Clearly this does not mean there were hundreds more humans clustered around the Kebaran sites than hominids around the Koobi Fora sites. For example, it is likely that Levantine Upper and Epi-palaeolithic assemblages—Ahmarian, Kebaran, Mushabian, Ramonian, Hmaran, Qalkan, Geometric Kebaran and Natufian traditions possess similar orders of lithic density. Nevertheless, fragment quantities are also dependent on site type and individual knapper's production, and any proposed equivalence between lithic density and population fails because lithic densities do not uniformly co-vary in the required way with other indicators of site size and complexity.

Archaeological Site Numbers and Population

A reasonable way of proceeding to construct global population graphs upon hard archaeological evidence would seem to be to compile numbers of archaeological sites diachronically from closely surveyed regions. The purpose of this section is not to attempt this daunting task, but to investigate the nature of one of the regional site registers on which such an attempt might be based.

Site numbers from Lower Palaeolithic to Late Neolithic were tallied from four intensively surveyed regions of Jordan: Wadi Ziqlab, Wadi al-Ḥasa, al-Azraq, and Ras an-Naqab. Those sites that were counted under more general appellations like 'Palaeolithic', because of a lack of diagnostic artefacts, were discounted. This in itself presents an insoluble methodological problem. At al-Azraq, for example, over thirty per cent of sites could be tentatively assigned to a one period, or not at all. These unknowns skew site frequencies because they do not derive uniformly from all periods, but are derived from periods such as the Lower Palaeolithic and Upper Palaeolithic which are poorly represented by local, dated sequences.

When site numbers from the separate regions are compiled, it is obvious that no gradual, consistent increase over time occurs (FIG. 3). Instead there are oscillations of



3. Combined archaeological site numbers from four surveyed regions in Jordan: al-Azraq, Ras an-Naqab, Wadi al-Ḥasa and Wadi Ziqlab. (Compiled from Garrard and Stanley-Price 1977; Henry 1982; MacDonald *et al.* 1983; Banning and Fawcett 1983).
Key to figure: L.P. = Lower Palaeolithic; M.P. = Middle Palaeolithic; U.P. = Upper Palaeolithic; Epi = Epipalaeolithic; PPN = Pre-Pottery Neolithic; PN = Pottery Neolithic; Chalco. = Chalcolithic.

high and low site numbers. Apart from al-Azraq, Middle Palaeolithic sites exceed any other period in number. Compensating for the unequal time spans restores the Holocene predominance, however the middle Palaeolithic remains the most frequent of the Pleistocene group.

Do we then conclude that Pleistocene populations reached a crescendo among archaic humans or neanderthals? Alternatively, population levels in discrete semi-arid micro-regions through much of the Pleistocene may have been largely conditioned by climatic oscillations. Egress from micro-regions during arid periods was likely, and this factor may to some extent explain the prevalence of Mousterian remains, because palaeoclimate in the southern Levant during much of the Middle Palaeolithic period was moister than at present (Goldberg 1981: 63).

The survey areas were not closed with respect to population movements. What follows from increase and decrease in site numbers is not necessarily overall increase and decrease in population, though it may well reflect episodic utilization of a particular territory. This concept is plain to anyone who walks over many of the arid parts of east Jordan, practically deserted today, which are nevertheless covered with Palaeolithic flints.

Archaeological Site Size as a Unit of Demographic Measure

A no less fundamental issue is to address the degree to which archaeological sites are intercomparable. Even for pre-agraraian sites it has long been recognized that different sizes and types of sites exist, and hierarchical classifications have been developed in an attempt to assign functions, such as 'base camp' and 'hunting stand' (Bar-Yosef 1970: 184).

An important reason why area estimations of the largest or larger sites may be a more reliable demographic measure than site number *per se* is that increasing population is not always associated with greater numbers of sites. The phenomenon of implosion, where population expansion in a large, nucleated settlement corresponds to decline and extinction in numbers of its satellite villages and hamlets characterizes the present growth of many of the Third World's urban cores, such as Mexico City, Lima and Cairo (Vining 1985). Archaeological evidence suggests the same effect occurred in southern Iraq during a phase of intensified urbanization in the Warka and Proto-Literate periods (Adams and Nissen 1972: 37-38), and for Teotihuacan during the fifth century AD (Millon 1967: 46).

In the Natufian period, sites like Wadi Hammeh 27 and 'Ain Mallaḥa represent the initial stages of *tell* formation, in which site features and dwellings were reconstructed through several successive phases. Once this form of residential system had developed, settlement was linked to spatial constraints imposed by the durable structures, the open spaces demarcated between their boundaries, and the variable functions which these spaces might have served. When such a site is habitually reoccupied, these structural boundaries somewhat control a group's specific point of residence upon its return to a general locale. This practice may tend to restrict the lateral spread of archaeological remains just as it spatially concentrates them and renders them more conspicuous. Therefore a similar implosion effect may hold for site nucleation from the Natufian period. How does one additively compare three small Kebaran camp sites, twenty-five square metres in area, with a Natufian settlement a hectare in size? These considerations suggest that better indices for population levels should be sought than the use of total site numbers.

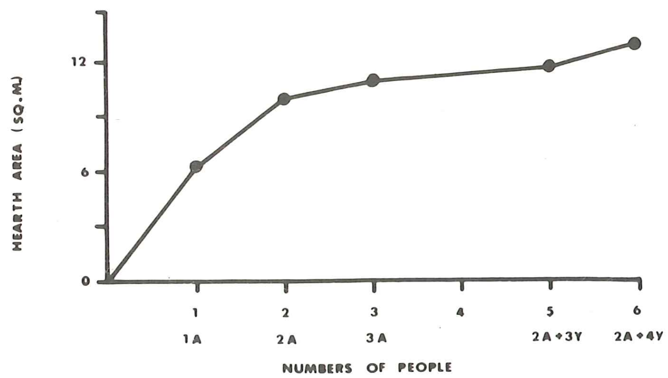
Site Area as an Index of Population

Any settlement system, ethnographic or archaeological, includes large numbers of small sites (Fletcher 1986). Taking into account all of the small, low visibility and activity specific loci generated within an archaeological period, then *every* period has a full measure of small sites and these are of little value in monitoring population changes.

From the settlement size thresholds known from Holocene sites, which have exhibited marked and staged increases, we may take it that at a gross level, sizes of the large sites are positively correlated with population.

At issue is the mathematical nature of this relationship. Although we may observe when settlement size has increased, a straight forward correlation to community size cannot be presumed. Ethnographic observations of the relationship between population and floor area sometimes arrive at a simple arithmetic relationship (Naroll 1962). But the consequence of using a static mean population density ratio, such as 'one person per ten square metres', necessitates that 'x' people occupy '10x' square metres, or that population density is assumed to remain constant with rising population.

What this does not account for is the variable way that people pack into settlement spaces (Fletcher 1981). For small hunter-gatherer sites, this is neatly illustrated by Yellen's study of !Kung camps in southern Africa (1977: 115-116). He monitored the increase in occupation area when successively greater numbers of people occupied the space around hearths (FIG. 4). Yellen's data showed that



4. Relationship between occupation area and population in a !Kung camp. (Compiled from Yellen 1977: 115).
A = Adult; Y = Young.

population and settlement space are positively correlated, but in a complex rather than a simple arithmetic fashion. An important corollary of Yellen's data is that few people can very easily attain the values of site size, and complexity that larger groups of people also generate.

Conclusions

The aim of this paper has been to show that simple correlations between numbers or sizes of archaeological sites and population cannot be substantiated. For Pleistocene sites, it is essential to first relate these archaeological data to the relative area of their contemporaneous exposures in the present landscape.

Small populations can easily saturate the values for site size and complexity that larger ones also attain. Diachronically in the Levantine archaeological record, the crossing of such threshold levels may begin in the Late Epipalaeolithic period. In measuring population trends through time, the larger site size intervals for any period appear the most relevant criteria for estimating critical population changes.

While archaeological data may not lend themselves to the calculation of precise demographic estimates, they may better indicate the relative rates of human utilization of territories through time, and indicate gross measures of human population change through the timing of expansion into or abandonment of regions.

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