

Towards the Estimation of Prehistoric Populations

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Introduction

In the course of studying archeological data in a small river basin on the Chattahoochee River in Alabama and Georgia, it seemed desirable to the present writer to achieve some way of representing, in an objective fashion, the relative use of the Oliver Basin by the several different prehistoric cultural groups through time (3). The following device was created to facilitate this, and is presented herein with additional discussion and evaluation of its value as a tool of population estimation.

Prior efforts in this area have been of two types: 1) gross figures for entire "cultural periods" and 2) population estimates for individual sites. The former have all been subjective impressionistic guesses somehow based upon total number of sites per period with consideration of site size and intensity. Willey provides an example of such in his work on the Florida Gulf coast (4). Estimates of the latter type, for individual sites, have generally tended to be more objective and more frequent. Hooton made an estimate of the population at Madisonville through the number of skeletons found (1). And also many Anasazi sites in the American Southwest have population estimates based upon the total number of dwelling units at any one site. The present paper however, refers to the former category and attempts to provide a more objective method of estimating population per "cultural period" through time.

Method

In essence, the method utilized by the present author is based upon the assumption that the frequency of artifacts per cultural period should in some fashion reflect intensity of use of an area, and that intensity of use can be inferred to mean population.

It was assumed that the total universe (the Oliver Basin in this case) was well sampled in both space and time, i.e., all major cultures were represented, and over 50 sites with 129 components were located in this very small river basin. It would seem likely that the number of components of each cultural period properly weighted would reflect the use by the occupants during each period. By a process of double weighting as follows, an estimate was achieved.

- 1) Component Use Intensity: Each component (a temporally limited, culturally consistent occupation at any one site) within a "cultural period" (usually a focus or aspect level cultural unit) was given a numerical value, one through three, depending upon amount of cultural material that occurred at the component. If, for instance, just traces of a particular pottery type were found, then a value of "one" was given, but if considerable pottery and/or other artifacts occurred, then a value of "three". A policy followed however, was that in the earlier ceramic contexts fewer sherds would be given greater value than in later contexts, since it is a good assumption that there was

an absolute increase in the use of pottery within the later periods. This was demonstrated for a nearby area by the present writer (2).

- 2) Temporal Weighting: A chronology was erected for the entire pre-historic occupation of the Oliver Basin, and then broken down into 250 year time units (1 time unit equals 250 years), and the time units per cultural period calculated, i.e., the duration of each cultural period; these were then rounded to the nearest whole time unit.
- 3) All the weighted components are added together for each individual period, and then divided by the appropriate number of time units. The resultant number is designated the Use Intensity Index. The weighting of components reflects the intensity of use at the individual sites, while the temporal weighting reduces cultural periods to a par, so that longer periods are not overly represented simply due to the longer time interval in which they occupied the area. In formula this amounts to:

$$\frac{\sum C_w}{t} = UI$$

where

\sum = summation

C_w = Weighted components of one "cultural period"

t = time units (1 = 250 years)

UI = Use Intensity Index for one "cultural period"

Plotting the resultant Use Intensity Indices for all the cultural periods represented within the Oliver Basin in proper time sequence provides the accompanying Curve of Occupational Intensity (Fig. 1). Here

Use Intensity Index

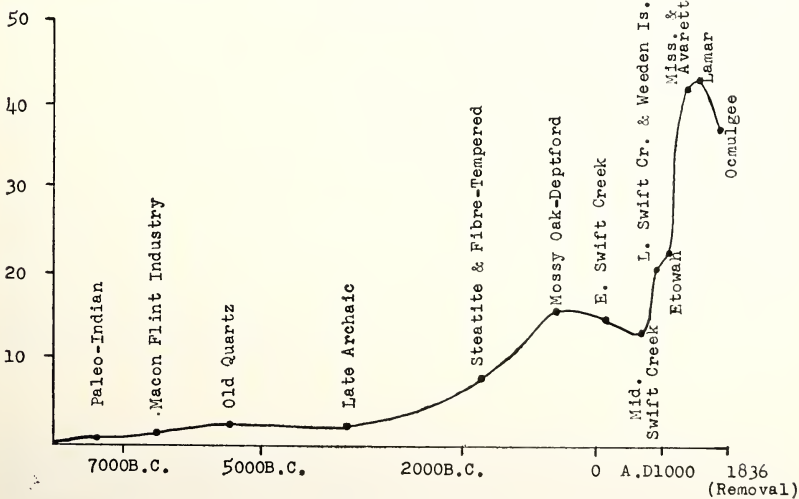


Figure 1. Curve of Occupational Intensity, Oliver Basin (Ga.-Ala.)

the Index is shown on the y axis for each period in its proper time sequence, and the time unit allotment is retained for the x axis. In cases of temporal overlapping of cultural periods, the indices for these overlapped periods are combined for plotting purposes. Groups so combined did appear to occupy the same time intervals. It is this curve (Fig. 1) that the writer would imply is a model of the population pattern of the Oliver Basin.

Critique of Method

Firstly, there may be some doubt that this actually reflects population. It certainly reflects the "intensity" of use by the several cultural groups, but whether this may be considered to mean population as well is a moot point. The writer suspects that such an inference can be made, though local situation should be considered. In the present case, the Oliver Basin, the area occurs within the fall line of the Chattahoochee River, a unique environment which resulted in most sites being small campsites. In this case occupation would have been non-continuous and intermittent; but nevertheless the relative size of communities using the Basin is implied, and hence population through time.

The area of study utilized in this method ideally should be a natural area of sufficient diversity as to be able to support all types of economies utilized by the prehistoric inhabitants, or barring this, recognition of the fact that the area of concern would not be conducive to certain economic bases, and hence the cultures adhering to such an economy would not be well represented. In the present instance, the Oliver Basin included very few hilltop areas and it is entirely possible that certain groups (especially early hunting groups) would have preferred hilltop locations.

But the matter of area may be one of the more important assets of this tool: in any given natural area, what particular prehistoric groups were utilizing the area, and therefore what economic inferences can then be made. In the Oliver Basin, the falls area was undoubtedly a good locale for fishing, and therefore we may assume that any group using the basin to any extent was probably attracted by this feature. So then, the selection of area hinges upon the investigator's interest, either in the overall picture or from an ecological point of view. In the present case little choice was available since it was a matter of salvage archeology, but nevertheless, a fascinating ecological situation was present.

The graphic representation of this method could be debated, but the writer finds the present method preferable. A curve is superior to a bar graph, since there is probably more continuity present in the area than not, and the plotting of a point at the midpoint of the "cultural period" is more in keeping with cultural dynamics: a particular cultural unit does not spring from nothingness full-blown, but is much more likely to develop gradually and subside gradually, barring outside interference, i.e., an approximation of the normal curve; hence the curve form is more amenable to the present purpose.

A far more telling weakness lies in the fact that this is still a subjective mode of estimating population in several respects. While it contains a certain aura of objectivity, in actuality, the weighting processes are still much too subjective. In the present case, it is not possible to

segregate all artifactual material into mutually exclusive "cultural periods," particularly for plain-surfaced pottery types and flint artifacts. Also, excavated sites and surface collections were combined, and in this area it is frequent that excavations reveal the presence or greater frequency of components not suspected from surface indications. A separate plotting of excavated sites only presents a slightly different curve, but for the sake of greater sample size the total plotting (surface and excavation) was retained. In short, the artifact weighting could be greatly skewed through these mechanisms.

Likewise, the chronology utilized by the writer would probably be debated by other workers in the area to greater or lesser extents, so that a possibility for error exists in this weighting process as well.

In brief, the writer is not satisfied with the present component weighting, and would much prefer a more objective method. Unfortunately, in the present example nothing more objective is possible, since all artifacts cannot be separated into mutually exclusive cultural units. But if such were the case, it should be possible to use an absolute weighting mechanism. Possibly by using a standard unit (several ten foot square levels or surface collections only) and computing artifacts per unit, a completely objective tool for weighting could be achieved. But a prerequisite is that all artifacts be assignable to one or another cultural group, with no appreciable residual category, such as was present in the Oliver Basin and prohibited the use of more objective weighting.

In addition though, some manner of graduated correction factor should be utilized to compensate for the fewer potsherds per person in the earlier ceramic periods. At least in the Southeast it is apparent that while population is increasing only gradually, use of pottery increases more sharply.

In so far as the weakness of the temporal weighting is concerned the writer is optimistic that more Carbon-14 dates will make archeologists more and more sure of their chronologies, and so this will not be an insurmountable objection.

Finally, with a method such as this, some manner of independent verification of the results is needed. By taking some restricted, well studied natural area of the American Southwest, preferably within the Anasazi region, an independent check on the present method could be accomplished. In this area, at least throughout most of the ceramic periods, stone dwelling units were constructed, and by tabulating dwelling units per period within the area and plotting these on an appropriate time scale, and here dendrochronology provides absolute dating, and then running independently the presently suggested method upon the same area, an adequate check on reliability could be achieved. If the present method is accurate, then parallel curves would be prescribed for the area by the two different methods.

Evaluation

The presented method for estimating prehistoric population, while incorporating many advantages over the few previous attempts, still contains much subjectivity. Suggested changes in the method, and independent cross-checking would minimize lack of confidence in the method.

However, the example utilized is not conducive to such modifications and checking.

The writer feels that the method has, despite present flaws, much to offer the field of archeology. In the example presented, not only is population reflected, but the economic bases of these populations. A least there appears to be a remarkable congruence between the dominant economic pattern and the population it was able to support: in essence, three curves are present within the one curve for the Oliver Basin (Fig. 1). A) A long low curve which corresponds with the early Hunting tradition of the area; B) a moderately peaked curve in the middle, which portrays the increased efficiency that a gathering economy allowed in this area; and finally C) a high peaked curve suggestive of the horticultural capture of this region, and the much greater efficiency of this economy. Incidentally, this demonstrates the fallaciousness of the Malthusian doctrine, that while population increases geometrically, production increases numerically; to the contrary, the Oliver Basin Curve of Intensity demonstrates that population is contingent upon economic increase, and that in this instance at least, production was increasing at an almost geometric rate.

Furthermore, the writer would expect that given any absolute population figure at any point upon the curve, then by extrapolation, the population for the entire continuum could be readily gotten. An absolute population figure could be had either from historical sources, or again from computations at individual sites such as mentioned in the introduction of this paper.

In sum then, a graphic tool with multiple uses could be added to the archeologist's kit of analysis, if the presently described method of population estimation is further refined.

Literature Cited

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