Late Woodland Maples Mills Focus Populations in the Illinois Valley: Cultural Affinities and Biological Distance

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Abstract

The biological dimensions of cultural interaction are examined through biological distance analysis of skeletal series from six Late Woodland sites in the central Illinois and Mississippi valleys. Craniometric data are utilized. Series from the Gooden and Hagan sites, which have been associated ceramically with the Maples Mills focus, are compared to culturally distinguishable Late Woodland groups from the Erroke, Dickson and Ledders sites.

The Mahalanobis' generalized distance results generally support the pattern of cultural relationships hypothesized on the basis of associated archaeological assemblages. Geographical distance among the groups examined does not appear to be an important variable in explaining intergroup biological relationships.

Introduction

In 1937 Fay-Cooper Cole and Thorne Deuel distinguished a Late Woodland cultural complex in the central Illinois River valley which they termed the Maples Mills focus (2). They defined Maples Mills projectile point and ceramic types at the site of bluff-edge burial mounds on the Robert Gooden farm in Fulton County, Illinois. Two additional mortuary sites were later associated with the Maples Mills focus. Griffin, *et al.* (4) recognized Maples Mills occupations at the Hagan site in Schuyler County, Illinois, and Morse and Morse (6) tentatively associated burials at the Emmons site in Fulton County with the Maples Mills focus. Radiocarbon dates are not available from these sites; however, Griffin *et al.* (3) suggest a temporal range of approximately A.D. 700-900 for the Maples Mills complex.

Biocultural relationships of the Maples Mills people with other Late Woodland groups are not clear. The skeletal remains of these people offer a means of examining group affinities from a biological perspective. In the present investigation, biological variability is examined within and between skeletal series from the Gooden, Hagan and Emmons sites which are associated with the Maples Mills focus. In order to clarify the interactions of the Maples Mills groups with other Late Woodland groups, these three series are compared with skeletal series which have been distinguished ceramically from Maples Mills. The non-Maples Mills series used for these comparisons are from the Dickson, Erroke and Ledders sites.

The Dickson mortuary site overlooks the western floodplain of the Illinois River and the northern floodplain of the Spoon River in Fulton County, Illinois. Both Mississipian and Late Woodland components are present at the Dickson site. The series used in my analysis is from the Late Woodland component, which Harn calls the Sepo focus (5). Blakely has suggested a date of approximately A.D. 900 for initial Late Woodland use of the cemetery (1). The Sepo focus is therefore close to the Maples Mills focus in both time and space.

The Erroke series is from a bluff-edge mound overlooking the Mississippi River at Quincy, Illinois, in Adams County. It is a Late Woodland complex which is distinguishable from Maples Mills on the basis of ceramics. The archaeological assemblage associated with the Erroke burials has not been described in the literature to date.

The Ledders series is from the lower Illinois Valley region in Calhoun County, Illinois. Associated ceramics are typical of the Jersey Bluff complex, a Late Woodland variant in the lower Illinois Valley region. Radiocarbon dates from the Ledders site center around A.D. 1000.

Predicted Relationships

Four archaeologically distinct complexes are represented by the series examined: Maples Mills, Sepo, Jersey Bluff and Erroke. The Maples Mills focus is represented by three series: Gooden, Hagan and Emmons. Hypotheses of biological relationships among these groups were formulated on the basis of cultural relationships and geographical distance among sites. Approximate contemporaneity of sites is assumed on the basis of archaeological data.

If the cultural relationships suggested by ceramic analysis are valid, we should expect to see these relationships reflected in the biology of these groups. This assumes that social variables which restrict biological contact parallel differences in material culture. Thus genetic similarity is expected to correspond roughly to cultural similarity. The following hypothesis was formulated according to this model:

> It is predicted that the Gooden, Hagan and Emmons groups, which share a ceramic tradition, will show more biological similarity to one another than they show to any one of the non-Maples Mills groups, Sepo, Erroke and Ledders.

Geographical relationships among sites (Fig. 1) provide an alternative model for predicting biological distance. This model assumes that the likelihood of intermarriage decreases with increasing spatial separation, and that cultural variables are not interacting to regulate gene flow. Two additional hypotheses are based on this model:

> It is predicted that the Gooden group will be more similar in cranial morphology to the Dickson Sepo group than it is to the Hagan and Emmons groups, since the Gooden group is nearer to the Dickson site than it is to either the Hagan site or the Emmons site.

In terms of both land miles and river access, the groups on the Illinois River are located at a considerable distance from the groups on the Mississippi River (Fig. 1).

> It is predicted that the three Maples Mills series and the Sepo series, which are all from sites on the Illinois River, will be more like one another than they are to either the Erroke or Ledders groups which are from sites located on the Mississippi River.

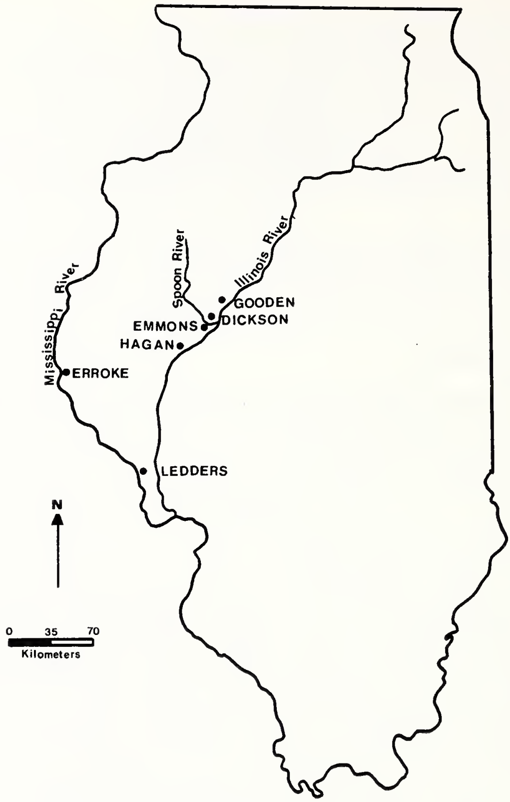

FIGURE 1. *Location of sites.*

Methods

Twelve cranial measurements and seven indices were used to estimate biological distance. Craniometric data were collected in part by Georg Neumann and in part by myself. I could not measure all of the material because much of the Gooden and Erroke series is no longer available for study. I remeasured a number of individuals previously measured by Neumann in order to standardize measurement technique.

Variables and sample sizes are indicated in Table 1. Selection of variables was to some extent dictated by the availability of data, a problem owing to the small size of the series. An 80% inclusion criterion was followed in selecting both variables and individual cases. Variables highly influenced by age and highly correlated (greater than .5) with another variable were not included. Group means were substituted for missing data. Only male crania were included since data available from female crania were limited.

Biological distance was estimated using multivariate discriminant analysis (BMDO7M "Stepwise Discriminant Analysis") and Mahalanobis' generalized distance estimates (D^2). Measurements and indices were analyzed separately. Results based on measurements were interpreted as reflecting predominantly size differences; results based on indices were interpreted as reflecting predominantly shape differences.

TABLE 1. *Male group means for cranial measurements and indices.*

Variable	Series					
	Gooden (N=14)	Hagan (N=11)	Erroke (N=7)	Emmons (N=2)	Sepo (N=12)	Ledders (N=5)
Measurements						
Glabello-opisthion length	182.07	182.73	180.14	176.50	184.50	180.80
Maximum breadth	137.29	138.18	138.86	131.00	137.92	140.00
Minimum frontal breadth	92.79	94.09	93.71	96.00	94.17	95.00
Basion-bregma height	140.00	143.09	142.00	135.50	145.75	140.40
Length of cranial base	104.93	102.82	103.86	101.00	110.50	104.40
Total facial breadth	136.29	136.64	138.00	135.50	136.08	137.60
Midfacial breadth	100.29	100.82	99.71	102.50	98.58	102.00
Upper facial height	75.07	76.91	76.29	73.50	74.42	73.40
Left orbital breadth (mf)	42.50	44.27	42.71	44.00	43.83	43.00
Left orbital height	34.36	35.18	34.29	34.50	34.92	34.20
Nasal height	53.57	55.09	54.29	54.00	55.00	53.60
Nasal breadth	25.36	26.18	24.57	24.00	25.58	26.00
Indices						
Cranial	75.53	75.61	77.10	74.20	74.81	77.44
Mean height	87.84	89.18	89.31	88.15	90.22	87.52
Transverse fronto-parietal	67.64	68.12	67.57	73.35	68.28	67.76
Upper facial	55.14	55.95	55.50	54.25	54.58	53.66
Transverse cranio-facial	99.31	98.87	99.16	103.50	99.03	98.26
Nasal	47.54	47.32	45.31	44.40	46.60	48.72
Left orbital (mf)	80.88	79.76	80.36	78.30	79.77	79.54

Results

The results of the biological distance analyses are summarized in Table 2 by Mahalanobis' distance estimates (D^2) derived separately from measurement and index data. The results based on measurement data are further illustrated by the plot of the first and second canonical variables derived in the discriminant analysis (Fig. 2). The first canonical variable, which explains approximately 64% of the total variation, is plotted along the abscissa; the second canonical variable, which explains an additional 29% of the total variation, is plotted along the ordinate. The ellipses enclose approximately 95% of the dispersion about the group means. Ellipses are drawn here for the Gooden, Hagan, Erroke and Sepo series, which were entered into the analysis as groups. Due to limited sample size the Ledders and Emmons crania were submitted to analysis as unclassified cases. As such they were omitted from the calculation of the discriminant functions but were classified into one of the four remaining groups according to the discriminant functions calculated for these four groups.

The groups plotted in Figure 2 in general show a considerable degree of shared variation. The overlap is particularly striking in the case of the Gooden and Erroke groups where the Erroke 95% dis-

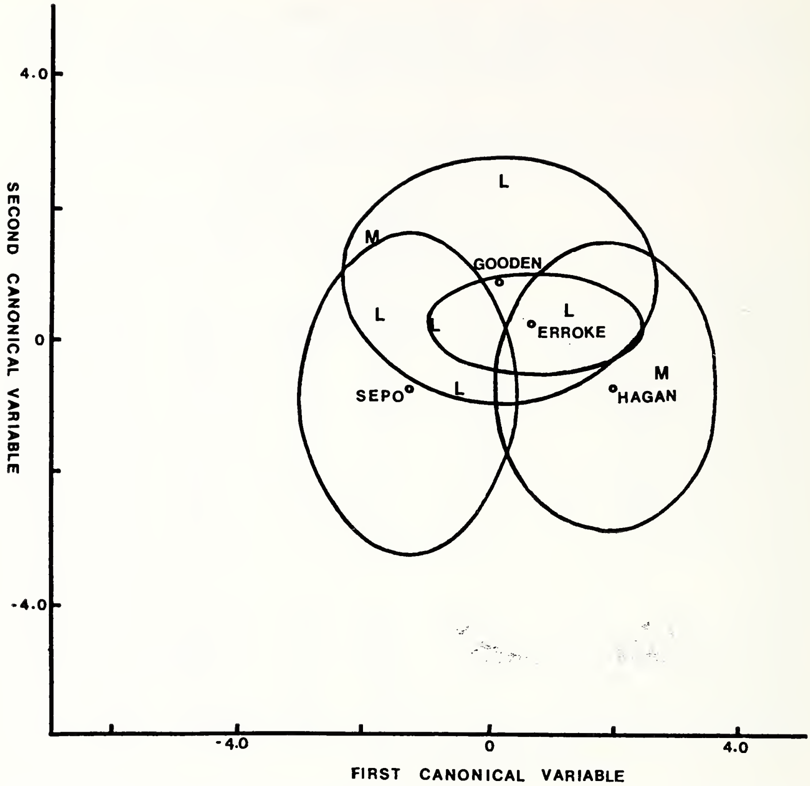

FIGURE 2. *Plot of first and second canonical variables based on cranial measurements from the Gooden, Hagen, Sepo and Erroke groups. Ellipses represent 95% dispersion limits. Unclassified Ledders crania are indicated by L, Emmons by M.*

TABLE 2. *Mahalanobis' distance estimates based on cranial measurements (below diagonal) and indices (above diagonal).*

Group	Gooden	Hagan	Erroke	Sepo
Gooden	---	.69	1.76	2.10
Hagan	6.01[1]	----	.65	1.46
Erroke	1.86	3.66	---	1.85
Sepo	4.97	10.05[2]	5.61	---

[1] Significant at the .05 level.
[2] Significant at the .01 level.

persion limits are contained well within the 95% limits of the Gooden group. The small degree of variation within the Erroke group relative to the other groups is a problem here. It seems likely that the rather small Erroke sample does not approximate the total within-group variation of the Erroke population from which it was drawn. It is quite clearly similar to the Gooden group, however. Mahalanobis' D^2 estimates of distance (Table 2) are low both in the analysis based on measurements and in the analysis based on indices.

The distinction between the Hagan and Sepo groups is marked. The Mahalanobis' estimate of distance between them when measurements are considered is statistically significant at the .01 level.

Both of the unclassified crania from the Emmons site, tentatively associated with the Maples Mills focus, are classified into groups which have been assigned to the Maples Mills focus. One of the Emmons crania is classified as Gooden, the other as Hagan.

The Gooden and Erroke groups show approximately equal degrees of overlap with Hagan and Sepo, and are clearly distinguished from them by the second discriminant function. The Gooden-Hagan Mahalanobis' D^2 estimate is statistically significant at the .05 level when measurements are compared. Examination of group means (Table 1) indicates that the Hagan crania are larger than the Gooden crania in every measurement except length of the cranial base, while indices do not differ greatly in the two groups. This suggests that size differences are more marked than shape differences between the Gooden and Hagan groups. Limited shape differences are indicated by the relatively small Mahalanobis' D^2 estimate which results from discriminant analysis of the indices (Table 2). Since size is more likely to vary with environmental factors such as nutritional level and disease stress (7), shape is probably a more stable reflection of the genome. Unfortunately, data necessary to test such an environmental difference between the Hagan and Gooden peoples are unavailable. If the size difference is in fact due to differences in the health status of the two groups, a relatively small biological distance between the two groups is suggested.

The distinction between the Hagan and Sepo groups is marked when cranial measurements are analyzed (Fig. 2); the Mahalanobis' estimate of distance between them is statistically significant at the .01 level (Table 2). The Hagan and Sepo groups are more alike in cranial indices than in cranial measurements. However, the difference in cranial morphology is not a case of one group simply being larger than the other. Shape as well as size differences are indicated.

The standardized weights of each variable included in the discriminant functions indicate that measurements of the facial skeleton, particularly the nasal and orbital areas, are the best discriminators among groups. Similarly, when indices are used as a basis for analysis the most heavily weighted indices in the discriminant functions relate facial dimensions. Since the greater part of the between-group variance in these analyses is accounted for by comparisons involving the Sepo group it can be inferred that the Sepo crania are distinct from the other groups in size and shape of the facial skeleton.

Discussion

It was predicted from the ceramic relationships that the Maples Mills groups, Gooden, Hagan and Emmons, would be more like one another biologically than they were to any one of the non-Maples Mills groups. This proposition is supported by the similarity in shape of the

Gooden and Hagan groups indicated by the relatively small D^2 estimates which result from analysis of indices. The classification of the two Emmons crania as Gooden and Hagan is also as predicted and supports the cultural affinity suggested for the Emmons site on the basis of archaeological data. The sizeable Mahalanobis' distances estimated between the Maples Mills groups and the Dickson Sepo group (Table 2) further support this hypothesis. However, the similarity in cranial morphology of the Erroke and Ledders groups to the Gooden group was not predicted. Sampling bias could account for this result; the Erroke and Ledders series are very small. Possibly the morphological similarity of the Erroke and Gooden series will be explained more satisfactorily when analysis of the cultural remains from the Erroke site is completed. With this exception, the hypothesis based on cultural relationships is supported; the groups described archaeologically as Maples Mills—Gooden, Hagan and Emmons—show considerable craniometric similarity.

Geographical relationships led to the prediction that the Gooden group would be more similar in cranial morphology to crania recovered from the nearby Dickson site than to crania from the more distant Hagan and Emmons sites. In this case geographical proximity is not reflected by biological proximity. The Gooden group is clearly more distinct craniometrically from the Sepo group than it is from the Hagan and Emmons groups. The existence of sociocultural barriers to biological exchange between the Sepo and the Maples Mills people is suggested in light of the relatively large biological distance between them despite close geographical and temporal proximity.

Spatial relationships also failed to predict biological relationships of the two Mississippi River groups—Erroke and Ledders—to the four groups from sites on the Illinois River. The Erroke and Ledders groups, while they are quite similar to one another, show considerable similarity in cranial morphology to the Gooden group. The distance of the Erroke group from the Hagan group is also small when indices are considered (Table 2). In addition, the groups on the Illinois River are less homogenous than predicted. In particular, morphological separation of the Sepo group from the other groups from Illinois River sites is contrary to expectations if geographical proximity is a significant factor in inter-group biological contact.

To summarize, the results presented here indicate that a simple geographical model does not adequately explain biosocial interaction among Late Woodland populations in this area. Cultural relationships, following largely from ceramic analysis, appear to be somewhat better predictors of biological distance. More extensive analysis of ceramic variation in the central Illinois region is needed to further our understanding of sociocultural interactions among Late Woodland populations. In addition, analysis of biological distance, demography, and epidemiology in larger skeletal series could add significantly to our appreciation of biological variability as a reflection of sociocultural relationships and human ecology among prehistoric inhabitants of the central Illinois Valley.

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