AN ORDINATION APPROACH TO ASSESSING LATE PERIOD PHASES IN THE CENTRAL MISSISSIPPI VALLEY

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The analytical validity of late period phases in the Central Mississippi Valley has been questioned by several researchers. Using large ceramic assemblages from 39 sites, this issue is addressed here using nonmetric multidimensional scaling, a nonhierarchical data réduction method. The results provide little support for the validity of existing culture-historical units.

Diversity is properly addressed in quantitative terms rather than by intuitive assessment (Dunnell 1989:142).

During the last decade or so, several researchers have critiqued the late period (Late Mississippi and Protohistoric) phases formulated for the Central Mississippi Valley (Fox 1992, 1998; Lewis 1990; Lipo 2001; Mainfort 1991, 1995, 1999, 2003; O'Brien 1994, 1995). Most of these phases are widely used by researchers in the area (e.g., McNutt 1996; Morse and Morse 1983). Here I further explore variation between late period ceramic assemblages that serve as the basis for phase definitions within the region. I accomplish this using a multivariate data reduction method rarely used by archaeologists, namely, ordination, which does not impose structure on data sets and has the potential to raise new questions about relations between and among the objects (in this case, sites, as represented by sherd collections) under scrutiny prior to attempts to group them. In offering a different perspective on certain late period phases, I view my efforts as moving beyond Phillips's (1970) work, particularly the largely intuitive method he used to formulate phases.

Archaeological Background

Phillips's (1970) influential synthesis is the baseline for phase definitions throughout the study area (see also Griffin 1952; Phillips et al. 1951; Williams 1954) and points south. Phillips assigned most of the late period sites considered here to the Nodena, Parkin, Kent, and Walls phases, which are among the most well known phases in the Lower Mississippi Valley (House 1991; Mainfort 2001a; D. Morse 1989, 1990; P. Morse 1981, 1990; see also O'Brien 1995). Phillips (1970), however, included virtually none of the western Tennessee sites considered here in his phase formulations. Smith (1990) has proposed several late period phases for the area that encompass the majority of the relevant sites used in this study and suggested new and/or modified phase definitions for portions of eastern Arkansas and northwestern Mississippi.

The Nodena phase, which includes a group of sites located primarily within the Mississippi River counties of northeastern Arkansas (Figure 1), is characterized by "low frequencies of Barton Incised and Parkin Punctated, which makes for a very different pattern from either the Parkin or Walls phases" (Phillips 1970:935). Among the key sites assigned to the phase are Carson Lake, Bell, Notgrass, Upper and Middle Nodena, Shawnee Village, Bradley, and Golightly. More extensive work by D. Morse (1989, 1990) has identified over 60 sites assigned to the Nodena phase. Only ceramic assemblages from Upper Nodena, Notgrass, and Carson Lake were sufficiently large to be used in the study (Table 1).

A number of late period sites along the St. Francis River drainage in northeastern Arkansas are assigned to the Parkin phase, which is characterized by very high frequencies of coarse shell-tempered Mississippi Plain (75–90 percent), relatively large amounts of Parkin Punctated and Barton Incised, and a moderate representation of Old Town Red. Among the larger sites assigned to the phase are Parkin, Williamson, Barton Ranch, Rose Mound, Neeley's Ferry, Turnbow, and Castile Landing, all of which have yielded ceramic assemblages large enough for use in this study (Figure 1 and Table 1).

A group of late period sites located primarily within the lower St. Francis basin of eastern Arkansas represent the Kent phase; Phillips (1970) also includes two sites (Commerce and Hollywood) in northwest Mississippi. More recently, House (1991) has advocated limiting use of the Kent phase to sites of the lower St. Francis. Phillips (1970:938) states that Kent phase ceramic assemblages are distinguished by "notably higher frequencies of the *Kent* variety of Barton Incised, Old Town Red, and painted types . . . than either Parkin or Walls. There is a great deal more Bell Plain than in Parkin but nowhere near so much as in Walls." The percentages of Mississippi Plain and Bell Plain are roughly equal. Kent phase sites with sufficiently large ceramic collections are Cramor, Nickel, Kent, Clay Hill, Starkley, Davis, Soudan, Hollywood, and Commerce (Table 1). The latter two are included in Smith's (1990)

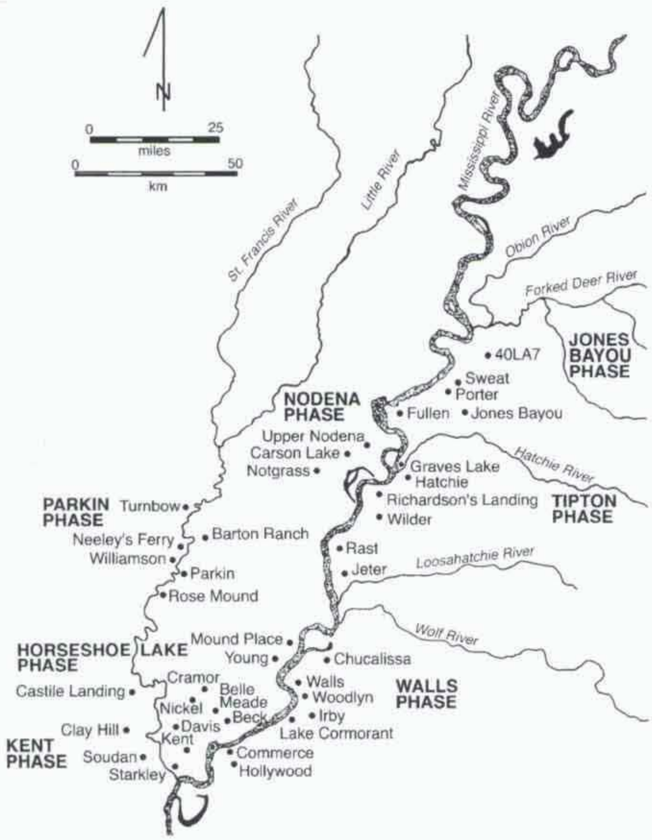

Figure 1. Late period sites used in this analysis.

Commerce phase, but here I follow Phillips's phase assignments. Smith (1990), like House (1991), is more restrictive in his use of the Kent phase concept and assigned two of Phillips's Kent phase sites, Belle Meade and Beck, to his Horseshoe Lake phase, along with Mound Place (assigned to the Walls phase by Phillips) and Young; all four sites are included here.

According to Phillips (1970:936), the Walls phase was "perhaps the most satisfactory phase dealt with in this entire study." The key Walls phase sites—Irby, Lake Cormorant, Walls, and Woodlyn—are located in extreme northwestern Mississippi. Chucalissa, in southwestern Tennessee, often is referred to as a "secondary center" of the phase, and Smith (1990) identified Jeter as the northernmost representative. Regarding Walls phase ceramic assemblages, Phillips (1970:936) was impressed with the outstanding "plurality of Bell over Mississippi Plain" and the frequent occurrence of decorated types. Ceramic collections from all of the aforementioned Walls phase sites were used in this study (Figure 1 and Table 1).

Western Tennessee was virtually ignored in Phillips's (1970) tome, as few sites had been recorded at the time he was writing, and late period sites in this area were first discussed by Smith (1990). Included in Smith's Tipton phase/district are Rast, Wilder, Richardson's Landing, and Hatchie; according to Smith, ceramic assemblages from these sites are distinguished by very low frequencies of decorated types. As in earlier studies (e.g., Mainfort 1999), I also include Graves Lake (Mainfort and Moore 1998), which falls within the geographic limits of Smith's Tipton district. To the north, Smith formulated the Jones Bayou phase/district, also said to be characterized by small quantities of decorated wares (Smith 1990), though several sites actually have relatively high frequencies of Old Town Red. Porter, Jones Bayou, Sweat, and several other sites are assigned to this phase, and I have included Fullen, which falls within the geographic limits of the Jones Bayou district (Figure 1 and Table 1).

Some Data Considerations

Given that a substantial amount of the data used here was transcribed from the original Lower Mississippi Valley Survey sherd counts, I used the ceramic typology of Phillips et al. (1951) rather than more recent type-variety designations, as did Phillips in preparing the cumulative frequency graphs he used to distinguish archaeological phases in the study area (1970:930–939). The following ceramic types are used in this analysis: Parkin Punctated, Barton Incised, Kent Incised, Ranch Incised, Old Town Red, Nodena Red and White, Rhodes Incised, Walls Engraved, Vernon Paul Applique, and Fortune Noded. All were defined originally by Phillips et al. (1951) and continue to be used by virtually all researchers in the study area (e.g., Lipo 2001; McNutt 1996; Morse and Morse 1983). Frequencies of all these types were instrumental in the formulation of existing late period phase definitions (Phillips 1970; Smith 1990).

Although shell-tempered plainwares figure prominently in Phillips's (1970) late period phase definitions (see also Lumb and McNutt 1988; Smith 1990), using them seems ill-advised. Mississippi Plain (characterized by coarse shell temper) and Bell Plain (characterized by fine shell temper) intergrade, and distinguishing between the "types" is based on a researcher's subjective judgments about the relative coarseness or fineness of crushed shell particles in the paste. Petrographic analyses of these paste types have not been conducted. It is no wonder that attempts by several competent researchers to sort the same collection can lead to significant discrepancies in plainware type counts (see Lumb and McNutt 1988 and Phillips 1970:58–61, 130–135 for relevant commentary). This problem is all the more acute because undecorated sherds constitute the overwhelming majority—usually at least 80 percent—of late period ceramic assemblages (see Table 1). Further, the difference between coarse and fine shell-tempered wares is one of technology and function, so the two major late period plainware types in the study area are not comparable to the contemporary

Table 1. Ceramic Sherd Counts from Sites Used in Analysis.

Site	Phase	Mississippi Plain	Bell Plain	Parkin Punctated	Barton Incised	Kent Incised	Ranch Incised	Old Town Red	Nodena Red and White	Rhodes Incised	Walls Engraved	Vernon Paul Applique	Fortune Noded	Total
Porter	Jones Bayou	1,047	515	64	5	1	1	83	1	0	4	1	7	1,780
40LA7	Jones Bayou	686	133	20	4	0	0	25	0	0	0	0	0	898
Hatchie	Tipton	373	388	32	6	4	4	9	0	0	0	1	1	814
Richardson's Lg.	Tipton	492	514	8	2	0	1	23	1	1	3	0	0	1,067
Wilder	Tipton	520	650	34	5	4	6	22	3	2	3	0	0	1,266
Jones Bayou	Jones Bayou	1,423	1,140	87	2	1	2	99	6	0	2	2	0	2,828
Fullen	Jones Bayou	504	477	33	5	0	0	70	2	0	2	0	0	1,107
Jeter	Walls	363	448	35	2	4	1	10	2	1	4	0	1	874
Rast	Tipton	617	927	61	2	0	2	12	2	3	6	0	2	1,639
Lake Cormorant	Walls	361	781	83	16	8	18	37	2	3	17	0	0	1,382
Upper Nodena	Nodena	1,299	1,675	5	3	2	3	25	3	1	3	1	0	3,034
Notgrass	Nodena	2,580	552	10	6	4	2	9	3	0	3	0	3	3,172
Sweat	Jones Bayou	481	425	33	1	0	2	24	0	0	0	0	0	973
Irby	Walls	439	2,134	162	2	21	37	21	1	18	50	0	0	3,000
Castile Lg.	Parkin	1,567	68	268	36	8	3	70	0	4	0	1	3	2,037
Hollywood	Kent	671	589	61	67	6	2	34	21	2	8	0	0	1,513
Commerce	Kent	655	314	35	51	14	0	12	8	1	2	0	0	1,108
Rose Mound	Parkin	1,123	35	154	62	1	1	22	0	0	0	1	1	1,410
Cramor	Kent	814	56	91	27	9	1	7	0	0	0	0	3	1,016
Neeley's Ferry	Parkin	5,992	2	760	463	4	9	14	3	0	0	0	5	7,275
Turnbow	Parkin	2,913	10	20	87	0	1	12	0	0	0	0	7	3,061
Williamson	Parkin	4,237	12	425	212	0	0	12	0	0	0	1	17	4,923
Barton Ranch	Parkin	4,056	8	395	207	0	4	6	0	0	0	0	16	4,712
Parkin	Parkin	11,203	135	1,298	579	48	43	118	5	44	2	9	34	13,671
Woodlyn	Walls	275	922	109	12	4	13	11	0	5	10	0	1	1,433
Beck	Horseshoe Lake	486	693	231	122	44	6	80	19	8	9	1	0	1,747
Nickel	Kent	592	81	114	37	4	4	20	2	2	0	1	2	886
Carson Lake	Walls	2,753	577	39	51	4	9	22	13	0	0	0	0	3,524
Mound Place	Horseshoe Lake	1,593	2,546	146	64	1	0	21	0	6	9	7	1	4,425
Young	Horseshoe Lake	850	804	208	90	0	23	12	0	0	8	0	1	2,020
Starkley	Kent	922	135	77	83	14	1	89	1	1	3	0	1	1,355
Walls	Walls	993	3,215	300	71	30	21	22	2	14	21	0	5	4,862
Chucalissa	Walls	3,190	2,748	870	78	26	49	21	11	12	48	0	22	7,129
Graves Lake	Tipton	1,514	995	51	19	11	30	46	4	3	1	3	1	2,751
Kent	Kent	796	648	149	116	24	3	116	11	2	7	0	1	1,920
Clay Hill	Kent	1,638	92	190	124	1	0	166	0	2	4	0	0	2,293
Soudan	Kent	1,059	28	123	34	2	0	55	0	0	2	0	1	1,311
Davis	Kent	536	137	87	28	2	0	57	4	0	0	0	0	861
Belle Meade	Horseshoe Lake	2,957	1,478	761	508	82	36	108	8	17	25	2	6	6,087

Note: Row totals include miscellaneous shell-tempered sherds not used.

decorated (stylistic) types (see Feathers 1989; O'Brien 1994, 1995). It is noteworthy that Phillips et al. (1951:109) recognized that relative frequencies of the type Neeley's Ferry Plain (now Mississippi Plain) were useful only in the most general sense for examining "very broad chronological and areal relationships."

Data Set

Current late period phase definitions for the study area (and many other parts of the Southeast) are based primarily on the contrasting relative frequencies of various sherd types in assemblages that usually, but not exclusively, represent "grab samples" from the surface. Whether or not such data provide an adequate basis for creating analytically defensible phases or other groupings is a legitimate question, but well beyond the scope of this paper. Nonetheless, surface collections can provide valuable data sets that permit measurement of temporal and spatial variation (e.g., Lipo 2001; Lipo et al. 1997).

Like most archaeological analyses performed at a regional scale (e.g., Phillips 1970:246), sample size was a major concern in selecting collections for inclusion in this study. In that the data set considered here is the same as that used in an earlier study (Mainfort 1999), those seeking additional information about sites and collections are referred to that work. Two key points warrant reemphasizing, however. First, one implication of Phillips's (1970) phases is that ceramic richness and diversity vary between regions. Second, "many minority types regularly occur in frequencies of less than one percent" (Phillips 1970:4), so infrequently occurring types may not be present in small samples or may be severely underrepresented. Jones et al. (1983) have demonstrated, however, that, based on an unidentified sample of 38 ceramic assemblages from the lower Yazoo basin, there is a fairly strong correlation between sample size and number of ceramic types present. The relevance of this finding to the present study area, especially in light of ambiguity about the actual sample, is not entirely clear. For example, some small ceramic collections from late period sites in the study area exhibit both considerable richness and diversity (see O'Brien 1994).

The ceramic assemblages used here range in size from 814 (Hatchie) to 13,671 (Parkin) sherds; the latter assemblage is nearly twice as large as any other. All 10 decorated types are present in only two assemblages: Parkin and Belle Meade (n = 6,087). On the other hand, assemblages with nine decorated types range in size from 874 (Nickel) to 7,129 (Chucalissa) sherds. In the second largest assemblage in this study (Neeley's Ferry; n = 7,275), seven of the 10 decorated types occur. Thus, there is not a strong relationship between sample size and diversity among the assemblages considered.

Lipo (2001) presents extensive and insightful discussion regarding the importance of large samples when comparing assemblages between sites. I excluded from analysis all sites from which less than 800 sherds were available, and most of the sites included have ceramic assemblages in excess of 1,000 sherds (Table 1). As an example of how this admittedly arbitrary sample size requirement caused some well-known sites to be deleted from consideration, only three sites that Phillips (1970) assigned to the Nodena phase are included: Upper Nodena, Notgrass, and Carson Lake (Table 1). These represent only one-third of the Nodena phase sites that "provided samples of sufficient size for safe identification" (Phillips 1970:935) and less than one-twentieth of the Nodena phase sites reported by D. Morse (1989, 1990). Any criticisms of sample size or representativeness of the collections analyzed (see, for example, Phillips 1970:936) here apply even more strongly to the efforts of previous researchers.

Some sites included in this analysis also have earlier, middle period Mississippian components, which could skew the ceramic samples. This problem also was faced by earlier researchers, and like these individuals, I choose to work with the available data (see Phillips 1970:932–933). It is regrettable to point out that, due to the appalling loss of archaeological sites in the study area to agricultural practices, in some instances the original Lower Mississippi Valley Survey collections (Phillips et al. 1951) represent virtually the only material that will ever be obtained from some major archeological sites.

Ceramic sherd counts from each site were converted into percentage occurrences. Following Phillips (1970), who noted that the relative frequencies of undecorated to decorated sherds may be of importance in isolating culture-historical units, the percentages reflect frequencies of decorated types within the entire ceramic assemblage for each site, not frequencies relative to the total number of decorated sherds, as proposed by Fox (1992, 1998) and others.[1] In this instance, I believe that Fox may be masking potentially important variation, namely, temporal and spatial variation in the relative frequencies of plain versus decorated wares.

Method

Ordination is a collective term for multivariate techniques that arrange objects (in this case, archaeological sites) along axes based on attributes (in this case, ceramic type frequencies). Ordination primarily endeavors to represent sample and object (e.g., sites) relationships as faithfully as possible in a low-dimensional space. Hence, ordination methods are data reduction techniques in that they seek to represent variability in a minimum number of dimensions. Well-known ordination methods include multidimensional scaling as well as principal components analysis and various forms of correspondence analysis, which differ considerably from multidimensional scaling.

Nonmetric multidimensional scaling (often labeled NMDS) basically takes a matrix of proximities as input and yields a configuration of points—a spatial representation of the proximities—as output. A key difference between NMDS and clustering methods is that scaling provides a spatial representation for the proximities, while clustering provides a treelike representation. Like all statistical methods that provide a representation or description of the data, an NMDS representation may be more or less accurate.

More technically, NMDS maximizes rank-order correlation between distance measures and distance in ordination space. Points are moved to minimize "stress," a measure of the mismatch between the two kinds of distance. Guttman's coefficient of alienation, which has proven superior to the stress formula originally proposed by Kruskal (1964), is used here. The method operates on dissimilarity (distance) matrices, which is why no statistical distribution assumptions are necessary. The dissimilarity of each sample (site) to each other sample is based on the characteristics (types and type frequencies) that occur in them. Thus, two samples that share no ceramic types have a very high dissimilarity, while two samples that share the same types in similar abundances will have a low dissimilarity. The distance (dissimilarity) measure computed for this analysis is Euclidean distance, which is commonly used in many multivariate analyses (Jain and Dubes 1988:15). Scaling and calculation of Euclidean distances were performed using SYSTAT (Wilkinson 1989).

Nonmetric multidimensional scaling is a powerful method of data reduction that seeks to reduce variability to a minimum number of dimensions and to visually display the results. The user must pre-specify the number of dimensions to be produced by a scaling, or examine a plot of "stress" as a function of number of axes, and select the number of dimensions after the fact. The resulting configuration will change as the number of axes change. NMDS has seen greatest use in the social sciences, though very little by archaeologists. Archaeological applications have been primarily for seriation (Cowgill 1972; Doran and Hodson 1975:213–217; Fox 1998; O'Brien 1994; Steponaitis 1983). The classic references are Shepard (1962) and Kruskal (1964); more recent overviews include those of Borg and Groenen (1997) and Legendre and Legendre (1998).

There are several important points to consider regarding visual plots produced by ordination methods in general. First, the direction of the axes (e.g., left vs. right; up vs. down) is arbitrary and should not affect the interpretation. Second, the numeric scale on the axis is not very useful for the interpretation. The relative position of points within the configuration, however, is meaningful.

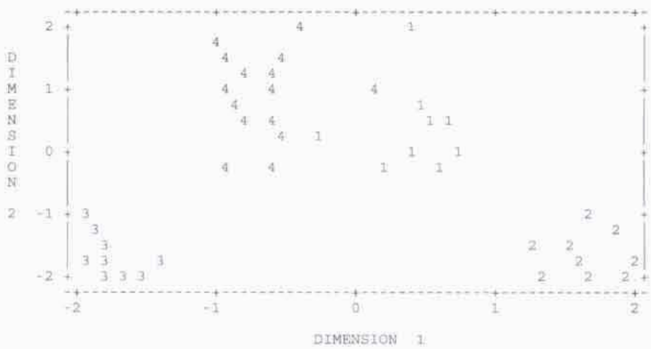

Figure 2. Two-dimensional configuration of four groups using clustered artificial data following Neyman and Scott (1972). Adapted from Jain and Dubes (1988:32).

Figure 2 illustrates a two-dimensional configuration of four groups using clustered artificial data following Neyman and Scott (1972). Cluster centers were randomly generated, and objects spread around the cluster center according to a normal distribution whose mean is the cluster center. This example is an idealized configuration; archaeological data should not be expected to behave in so orderly a fashion.

Analysis and Results

In Figure 3, individual sites are represented only by phase designations rather than by specific identifiers, as the integrity of phases, not the group membership of individual sites, is of concern here. The illustrated configuration has a low alienation coefficient (0.08578), which indicates a very close fit to the original data. Scaling in more than two dimensions is, therefore, unwarranted. Figure 3 provides little evidence for the integrity of the traditional late period phases in the study area and little support for their existence as currently formulated. No clear grouping is evident, although in a general sense most sites assigned to most phases are located in the general vicinity of each other in ordination space. Since Phillips (1970:930–932) considered the Parkin, Nodena, Walls, and Kent phases to be perhaps his most robust formulations, I focus on these in discussing the results of this analysis.

Sites assigned to the Parkin phase exhibit considerable diversity, primarily along dimension 1, which by reference to Table 1 can be interpreted as representing relative frequencies of Barton Incised (left) and Parkin Punctated (right). The Parkin phase outlier to the right represents the Turnbow site, the primary occupation at which may be somewhat earlier than the assumed age of most other sites used in this analysis (Mainfort and Demb 2001; Phillips 1970:933). Turnbow also was identified as an outlier in my earlier analysis (Mainfort

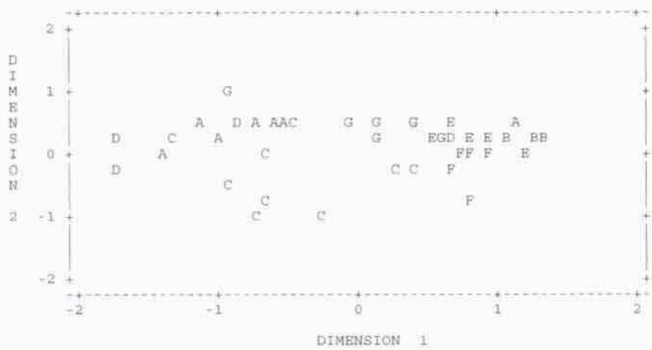

Figure 3. Two-dimensional configuration of late period ceramic assemblages, excluding plainwares. A = Parkin phase, B = Nodena phase, C = Kent phase, D = Horseshoe Lake phase, E = Tipton phase, F = Jones Bayou phase, G = Walls phase.

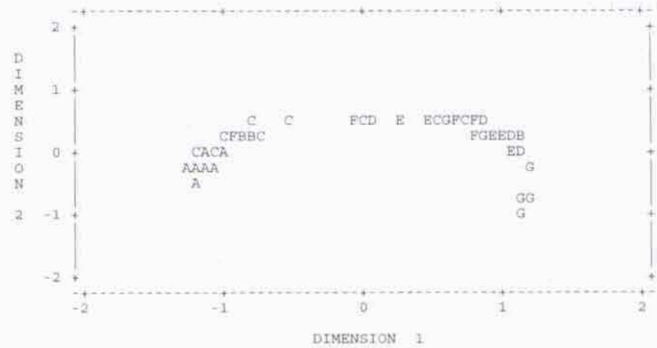

Figure 4. Two-dimensional configuration of late period ceramic assemblages, including plainwares. A = Parkin phase, B = Nodena phase, C = Kent phase, D = Horseshoe Lake phase, E = Tipton phase, F = Jones Bayou phase, G = Walls phase.

1999). Like the Nodena phase assemblages to which it appears to be closely related, the Turnbow ceramic assemblage is characterized by a very low frequency of Parkin Punctated, a type common at other Parkin phase sites (Phillips 1970:932). This may lend some support to the comment by Morse and Morse (1983:278) that Barton Incised may have appeared before the late period, but Parkin Punctated probably did not. With the exception of Turnbow, the traditional Parkin phase sites are plotted in fairly close proximity to each other within a relatively confined area but are by no means isolated from sites assigned to other phases.

Figure 3 suggests close relationships between the three Nodena phase sites used in this analysis. Nonetheless, in keeping with an earlier study (Mainfort 1999), this analysis provides no basis for viewing the Nodena phase as a definable group or a class (i.e., there are no necessary and sufficient criteria for membership or exclusion from membership) of sites, as several non-Nodena phase sites exhibit similarities to sites assigned to the phase.

Of all the phases encompassed by this analysis, Phillips's (1970) Kent phase fares perhaps the worst. This is due primarily to the inclusion of Hollywood and Commerce, which Phillips (1970:938) assigned to the Kent phase with little conviction, partly to "preserve the individuality of [the] Walls [phase]." The two sites appear as outliers from the other Kent phase sites in Figure 3, evidently based largely on lower frequencies of Parkin Punctated and Barton Incised than other sites assigned to the phase (Table 1). This complements the findings of my earlier analysis (Mainfort 1999) and supports Smith's (1990) decision to exclude these sites from the Kent phase.

The Walls phase exhibits moderate integrity, even with Smith's (1990) addition of Jeter. As I have demonstrated previously using other methods (Mainfort 1995, 1999), the ceramic assemblage from Chucalissa has a markedly higher frequency of decorated sherds than assemblages from other sites assigned to the Walls phase. If ceramic type frequencies are considered criteria for phase membership, Chucalissa cannot be assigned to the Walls phase (see also Mainfort 1999).

Smith's (1990) Tipton and Jones Bayou phases fare no worse, and perhaps even a bit better, than several constructs proposed by Phillips. Nonetheless, based on frequencies of decorated ceramics and their proximity to many other sites, they cannot be justified analytically. Finally, sites assigned to Smith's Horseshoe Lake phase, which has much to commend it on geographic grounds, exhibit marked variation (Figure 3).

Although I have discussed the reasons for not including both plainwares and decorated types in the kind of analysis performed here (see also Fox 1992 and O'Brien 1994), it could be argued that failure to include plainwares, which were integral to the original phase formulations, renders this critique suspect, if not somewhat unfair. Figure 4, therefore, illustrates a configuration of the same sites, but including plain sherds as well as decorated sherds. The horizontal axis represents relative frequencies of Mississippi Plain (to the left) and Bell Plain. Variation in the frequencies of decorated types is, as expected, largely masked due to the overwhelming abundance of plainwares in the collections. In a general sense, two groups of sites are evident. Those to the left are sites west of the Mississippi River (and primarily along the St. Francis River), while those to the right are on the east side. Nonetheless, Figure 4 provides little, if any, more support for existing phases than does Figure 3. Especially notable in this regard is the grouping of two Nodena phase sites (Carson Lake and Notgrass) with sites of the Kent and Parkin phases, and sites assigned to the Kent phase exhibit considerable variation, as in Figure 3.

Concluding Remarks

As repeatedly noted above, the analysis presented here largely complements earlier research using the same data set (Mainfort 1999). While critical of some phase constructs in that study, I also noted that some statistically derived groups of sites generally corresponded to existing phases. The findings presented here suggest that while my interpretation of the earlier results might be considered overly optimistic, the situation seems somewhat less grim than O'Brien's (1995:35) assessment of ceramic assemblage variation among late period sites in the study area.

My intent here is not simply to expose shortcomings in existing culture-historical units in the Central Mississippi Valley. These have been amply demonstrated elsewhere (e.g., Fox 1998; Lipo 2001; Mainfort 1999, 2001b, 2003) and, indeed, were acknowledged by Phillips (1970) more than three decades ago. Rather, I simply wish to suggest that we need to be more mindful of our systematics, and not just on the regional level.

It is disturbing that, since the publication of Phillips's (1970) work, attempts to group archaeological sites into culture-historical units (phases) have not been accompanied by either theoretical or methodological advances. Phillips (1970:932) himself noted that his attempts to use cumulative frequency graphs of ceramic types to demonstrate the validity of phases failed in most instances. Yet the same underlying assumptions and intuitive methods, including the "reliance on quantitative to the neglect of qualitative criteria," continue to be used (e.g., Smith 1990; Toth 1988). This situation does not appear to be unique to the Lower Mississippi valley (see, for example, various papers in Anderson and Mainfort 2002). Moreover, though researchers are asking more expansive questions about the archaeological record, without good underlying systematics, many such efforts are unlikely to produce accurate statements about past cultural behavior (see Pauketat 2001).

Nonmetric multidimensional scaling is a powerful statistical tool for discovering structure in archaeological and many other kinds of data sets. In contrast to many statistical methods, no assumptions about statistical distributions are necessary. My use of the method is not meant to imply that I consider NMDS to be the "best" technique for examining structure in archaeological data sets similar to the one discussed here. Unlike cluster analysis in its many forms, however, ordination methods such as scaling do not impose structure on data beyond reducing variability to a specified number of dimensions (see Baxter 1994:146; Jain and Dubes 1988:75). The resulting configuration of points is model of the proximity matrix (i.e., mathematical distances between sites or other objects) that can be observed and interpreted.

Although this study does not address the theoretical underpinnings of archaeological classification at any scale, it calls attention to problems with some long-lived and well-accepted culture-historical units. It also presents an accessible multivariate statistical method that has much to recommend it as a tool for exploratory data analysis and limited hypothesis testing in archaeology. No single method or technique is likely to be sufficient for recovering structure from archaeological data sets, but ordination methods such as nonmetric multidimensional scaling, coupled with judicious use of simple univariate and bivariate displays, offer considerable potential that is as yet largely unexploited by archaeologists. Finally, it is important to bear in mind that neither ordination nor other statistical pattern recognition techniques can be applied fruitfully to data without human intervention. This involves care in the selection of variables or measurements, similarity measure, and grouping technique. Importantly, the patterns (e.g., clusters and spatial configurations) that are produced require interpretation.

Notes

Acknowledgments. Ceramic counts from many of the sites used here were transcribed from copies of the Lower Mississippi Valley Survey (Peabody Museum, Harvard University) records on file at the Department of Anthropology, University of Memphis. Shawn Chapman assisted with the analysis of collections housed at the C. H. Nash Museum–Chucalissa. Most of the western Tennessee data are derived from collections obtained and curated by the Tennessee Division of Archaeology. Ken Kvamme, Charles McNutt, Michael O'Brien, Claudine Payne, and Frank Schambach provided useful commentary on earlier versions of this paper.

Collections. Most of the sherd counts from eastern Arkansas and northwestern Mississippi were taken from the original analysis sheets compiled by Phillips et al. (1951), and for some sites, these are the only available data. Additional data for the Kent phase area were obtained from House's (1991) dissertation. For western Tennessee, most counts are based on analysis of collections curated by the Tennessee Division of Archaeology. Reanalysis of collections at the C. H. Nash Museum–Chucalissa (see Smith 1990) supplied data for Beck, Belle Meade, Walls, and several other sites. Sherd counts for Chucalissa were taken from Lumb and McNutt (1988), while those for Parkin include material discussed by Davis (1966) and (Klinger 1977).

[1] O'Brien (1994:364) comments on what he considers to be a major disparity between the relative frequencies of plain and decorated wares in the Lower Mississippi Survey collection from Parkin and those obtained in the 1960s by the University of Arkansas. He neglects to note, however, that the percentage of Mississippi Plain (approx. 23 percent) used in Phillips's (1970:931) cumulative frequency graph for Parkin represents *only* rim sherds. In the LMS collection from Parkin (n = 6,849), 81 percent of the sherds are plain and 19 percent are decorated. The relative percentages are virtually identical in the 1966 University of Arkansas collection (n = 2,053). The 1965 University of Arkansas collection (n = 4,727) differs from both, with 89 percent plainware and 11 percent decorated. The total LMS collection from Parkin (and other sites) is reflected in the totals and percentages used here. Lipo (2001:179) notes that modern ceramic assemblages can be statistically indistinguishable from the earlier LMS collections. Comparisons between the LMS collections and samples obtained more recently from Grant, Davis, Kent, Woodlyn, Mound Place, and

Irby indicates that this certainly is true with respect with the ratio of plainware to decorated sherds.

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