Statistical Perspectives on Woodland Cultures in Central Alabama

by

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This project began with the 1970 excavation of Durant Bend. The site was first shown to Nance by Dave Chase, and is located in Dallas County, on a pronounced bend of the Alabama River. It is not far from the city of Selma. Problems encountered years ago in studying the Woodland prehistoric pottery from Durant Bend eventually led to the writing of this paper. Most of the potsherds recovered from the Middle and Late Woodland periods were either plain or check stamped. The problem was that a few of the plain and a few of the check stamped sherds appeared to be intergrades, sherds that could easily have been placed in either a Middle or Late Woodland grouping. In other words, the change from one form to the other did not appear to be abrupt, a finding that certainly would make sense if the earlier culture had gradually changed into the later.

Motivated by the problem, Nance decided to classify the potsherds, not just once, according to type designation, but three additional ways as well, based on the presence and absence of attributes. Together, the three attributes would encompass more of the variability visible in the potsherds than could be captured through type designations alone. We concentrated on the common forms, plain and check stamped sand tempered sherds only, to have large enough samples for statistical analysis. The classification we decided upon involved three contrasting pairs of attributes: (1) check stamped vs. plain, (2) dark paste vs. light, and (3) thick vs. thin. The goal also was to have more objectively based groupings. Thickness was controlled using calipers with a cut-off of 7 mm (for thick,T>/= 7 mm), and paste color by checking against a Munsell Color Chart on a fresh break surface. Light sherds were those with a value of 5 or greater as measured on page 5YR of the Chart. It is important to stress that we made typological assignments for the potsherds we excavated at Durant Bend along with these attribute assessments.

When we summarized the attribute data for these check stamped and plain sand-tempered sherds, the outcome was not very revealing. One exception was.that through the deposits of a large mound we had excavated, check stamped sherd percentages were found to regularly increased with the depth of excavated samples (Nance 1976: 58, Table 5).

It wasn't until we returned to the field in 1975 and, with the assistance of Marvin Jeter, excavated at ten smaller sites in the vicinity of Durant Bend and then, many years later, in 2017 and with the application of modern statistics to the problem, that we were able to piece together a reasonable narrative from these data.

Excavations of 1975

The first step was to carry out an extensive archeological survey in the vicinity of Durant Bend. Jeter had joined the program as a post-graduate student in Anthropology and under Nance's direction, spent two summers in 1971 and 1972 in the search for and the recording of sites, working in a transect a Township wide and extending ca. 57 miles north and south of the Alabama River (Jeter 1973).

Our excavations in 1975 were limited to test excavations at ten of the sites located by Jeter, five dug under Jeter's supervision and reported by him (Jeter 1978) with the remaining five dug under the direction of Nance and reported by him (1978). When Nance studied pottery from these five sites in the 1970's, he consistently applied both the standard typological classification as well as the same attribute approach employed earlier in the Durant Bend study, recording design, (plain vs. check stamped), thickness, and paste color, as described above. One trend revealed in the tables of Nance's 1978 report is that all five sites, showed a statistically significant shift in check stamped, compared with plain sherds, as check stamping became increasingly less abundant through time (i.e., decreased proportionately from lower to upper levels) (Nance 1978: Tables 3, 9, 18. 30, and 39). This was consistent with his earlier findings from Durant Bend (see above).

In a 2017 review of his early work, Nance determined that his 1978 Report on these excavations, in effect, had never been finished. He had generated some tables and summarized his work, but had not worked with a statistician to pull the individual site data together, that is, to generate a useful narrative regarding the local prehistory. This was an approach he was to begin using a few years later (see Nance and Hurst 1981). In 2017, Nance contacted de Leeuw, a statistician with whom he had worked earlier (e.g. Nance and de Leeuw 2005; Nance et al. 2013), and de Leeuw agreed to generate a Correspondence Analysis (CA) with data from all six sites (the five sites tested during 1975 , plus Durant Bend). The remainder of this article will describe our findings from this most recent research.

Covering only check stamped and plain sand tempered sherds, the data sent to de Leeuw are included in Table1. In this two-way table, sample labels are listed in the left-hand column and variable labels across the top. From this, one can discern sherd frequencies by variable and sample. Each sherd is represented three times in the dataset, according to whether it is thin or thick, dark or light in paste color, and plain or check stamped. Each sample label includes a site and level designation. For this study, sherd data from different test pits are grouped together by level. This increased sample sizes and cut down on random fluctuations in the data. "Ds" and "Au" are abbreviations for county names, Dallas and Autaugua. The next two or three digits are the number of the site as recorded within the county, and the last digit is the level, with "1" being the level uppermost. The deepest levels are followed by a "+" sign to indicate that small collections from the deepest levels were lumped together to maintain adequate sample sizes. Samples from Durant Bend are labeled differently, DB, standing for Durant Bend, UCC for Upper Clay Cap and LCC for Lower Clay Cap. Superimposed clay caps were found covering the mound surface at three different levels in the mound. The uppermost clay clap had been destroyed through plowing and stratigraphic excavation was impossible. The Upper Clay cap was dug stratigraphically and the artifacts found within were regarded as the latest component of the mound's sequence. Beneath that, a sand layer had been piled up by the prehistoric inhabitants, but artifacts from this were not regarded as part of the sequence, due to the possible mixing-in of artifacts from early village areas surrounding the mound. The Lower Clay Cap was dug stratigraphically and artifacts found imbedded in the clay were collected as the second-latest component of the mound sequence. Beneath the Lower Clay Cap was an undisturbed midden. These deposits were dug in arbitrary 6" levels, and are included in this study as BCC1, BCC2, to BCC5+.meaning below clay caps, level 1, etc. The excavation of Durant Bend and the analysis of pottery from the site are described in Nance (1976). Finally, there are labels for site areas Ds73N and Ds773S. Here, one site was tested with several pits at each of two widely spaced localities, and the labels stand for Ds73 North and Ds73 South. Site Ds73 North was dug stratigraphically instead of by arbitrrary level; the labels include AM for Above Midden, UM, for Upper Midden, LM for Lower Midden, and BM for Below Midden.

Correspondence Analysis

Correspondence analysis (CA) is an exploratory statistical technique that allows the archaeologist to discover trends in data, in this case data having to do with potsherd distributions. Here we had potsherd characteristics (variables) with data listed in columns having to do with surface decoration, sherd thickness, and sherd paste color. Sample locations were included as labels in the left-hand column. This table (Table 1) shows how the sherds had once been distributed among six different sites, and in levels within sites. Levels, of course, are important as a measure of time. The CA statistic is based on multiple chi-square tests, and what statisticians refer to as chi-square distance. Ceramic forms with close similaries in distribution are probably contemporary. Forms with dissimilar distributions are probably from different periods of time within the local sequence. The results of a CA are manifested as loci on a two-dimensional grid and their accompanying defining values (distances from the X and Y axes). Included are one locus for each sherd sample plus one for each variable. The actual grid or chart is a best fit compilation of the chi-square distances between every sample and variable and all other variables and samples. So, if two sample loci are located close together on a CA grid, one would anticipate similar variable proportions. If a variable locus is close to a sample locus on the chart, one would expect a high proportion of sherds to manifest that variable, etc.

Variable Distributions

We can begin study of the CA in question by looking at partial depictions of the single chart, beginning with that for variables only (Fig. 1). The six variables are check stamped vs. plain, thick vs. thin, and dark and light paste color. As can be seen, Check Stamped and Plain have contrasting positions near different ends of the Y axis. As mentioned above, check stamping gradually decreases stratigraphically through the the sequences of all sites, suggesting that time might be represented by position of samples and variables along the Y axis.

The variables describing sherd thickness, Thin and Thick, are both close to the X axis. This might suggest that sherd thickness did not change through time at these sites. However, we can't rule out an alternative idea, that sherd thickness might have been the best indicator of temporal position at these sites, so that the X, not the Y axis represented time in this CA study or that this was true of both axes.wwwww Both Thin and Thick are widely separated, being at opposite ends of the X axis, and this separation of the two loci does suggest that there was a significant difference in the distribution of these two variables at the sites studied. The Light and Dark Paste Color variables are closer together, and looking at variable loci in Figure 1, we can see more of an alignment with the Y than the X axis.

Time and the Y Axis

Each sample has a Y value and comes from a particular site and level. If we study the position of samples on the CA chart, as displayed in Table 2, we see that for each site but two, the samples are vertically aligned in order of increasing depth, as indicated by level number. Next, we generated a Pearson's R correlation, comparing Y axis (vertical) values to ratios of check stamped to plain sherds, sample by sample. The result is a very high negative correlation coefficient (Pearson's R = -.9345; P=.0000; Fig. 2). This means that the vertical positions of sample loci correlate closely with ratios of check stamped to plain sherds in each sample, with what could be early samples having higher proportions of check stamped potsherds. These proportions gradually decrease through the sequences of most sites and generally through what could be a master sequence for all sites considered together (Fig. 2). As indicated above, this is consistent with our earlier findings from these same sites, as mentioned above. That is, check stamped relative to plain sherds do decrease through all individual site sequences

Time and the X Axis

One has to keep in mind that what we are dealing with here is seriated samples with only partial stratigraphic confirmation provided by these sites. We say partial, because while we know that samples for most sites are in vertical order by level number on the CA graph, when the data are viewed intra-site, we don't know if this order extends in an inter-site perspective. In other words, the question remains, are the data in chronological order on a site-by-site basis? An answer to this question can be found in the 1975 unpublished report on the five site test excavations and within the Durant Bend study (Nance, 1975, 1978). The report reads as follows: "This report describes test excavations at six sites, two Late Woodland (Ds 73 and Ds 79), three Middle Woodland (Au1123, Ds97 and Ds 98) and one Archaic (Lo 120)." The Durant Bend study adds additionally: "all checked stamped sherds from the Mound at Durant Bend, all plain, sand-tempered sherds, except those from the U.C.C . . . . are attributed to the Deptford ceramic complex" (Nance 1976, citing Caldwell and Waring 1939 and others). Finally, "U.C.C. pottery shows obvious affiliations to Weeden Island ceramics . . comparative data, admittedly sparse, . . .at least suggest that the U.C.C. dates to the Weeden Island I—Coles Creek-Troyville period"(Nance 1976, 62)

In the study of CA's, archaeologists can find data loci (output) arranged in a curve, most typically horseshoe-shaped or associated, i.e., roughly aligned, with one or both of the axes. As related above, we found variable loci for Checked Stamped and Plain sherds at the positive and negative ends of the X axis respectively (Fig. 1). This led us to examine Thin:Thick ratios and to ascertain if these ratios correlated with X axis scores. In fact, Thin : Thick sample ratios aligned closely with sample CA scores for the X axis (Pearson's R = .8630; P = .0000; see Fig. 3). Samples with high proportions of thin sherds have positive, high value scores on the X axis, and those with high proportions of thick sherds have negative, low-value scores on the same axis. However, the same is not true when we compare Y axis scores to Thin:Thick ratios (see Table 2).

We are left, then, with several possibilities, as we attempt to discover if either or both of these axes and their data represent a six-site ceramic sequence. Beginning with the Y axis, a sequence here would be seemingly based on Check Stamped:Plain sherd proportions. We anticipated a list of samples beginning at one end or the other (for seriations, both ends of the scale were equally likely starting points) with all Middle Woodland (i.e., Deptford) samples followed by all Late Woodland) samples. The ages for these sites (i.e., Middle or Late Woodland) were determined by typological assessments for all potsherds in the study. In fact (Table 2), we found a highly mixed list with no association between Y axis score and age assignment (i.e., Middle Woodland vs. Late Woodland)

So, we finally turn to consider the X axis and the possibility of a sequence based on Thin and Thick potsherds. Here we do find a good match (Table 3), at least when the data are examined on a site by site basis (inter-site perspective) with only one sample slightly out of order. This is the UCC, always a problematic component, excavated not from a tightly controlled square, but from an expansive section of clay flooring exposed in a trench that transected a large mound. Excavators had tried to separate those sherds imbedded in the clay "Pavement" from sand deposits in the trench that seemed more likely mixed. And, recovered potsherds were difficult to assign to any known archaeological component (see above).

To compare our findings for the two axes: For the Y axis, chronology, to some extent based on Check Stamped to Plain sherd proportions, provides some sequential data, but only from an intra-site perspective. The X axis seems to work better but only from an inter-site perspective, here apparently based on thin to thick sherd proportions. The sequence is grounded by a single radiocarbon date for a pit feature at the site of Ds73S (Nance 1978: 23-25). A charcoal sample provided the Late Woodland date of 790 +/- 155 A.D. (UGA 1314, recalibrated to 850 A.D. Ralph et al. 1974).

Sample Clustering by Site

One of the interesting features of this particular CA, is that samples tend to cluster together by site. We anticipated that Check Stamped : Plain ratios would correlate somehow on the CA with level depth, .i.e., time, (based on results of the Nance's 1978 report), but the clustering of samples by site was not expected. As we inspected distributions by variable, we found that samples from each site tend to have X axis scores that are similar, and hence tend to cluster together in the same area of the CA graph. Loci are determined, of couse, by both X and Y values, and for four of six sites, samples are not only clustered by site, but ordred vertically according to Y axis score, i.e. arrayed by increasing sample level number. With a single exception, level samples are bracketed vertically by high and low Y axis values for a given site. For example, for site Au113 (Fig. 4), this includes a most recent value (for level 1) of 0.1395 and a low value (for level 3+) for the earliest level of .-0.2421. There are horizontal brackets as well. For Au113, these would be an X axis value of .4694 for level 1 and .3094 for level 2. (Level 3+ has an intermediate X axis value of .4323).

Figure 5 shows the seven sample loci for Durant Bend. This site has a Y axis range of -0.4063 (early) to 0.341, while X axis values range from 0.52 to 0.341. Y axis values fall in order from the uppermost UCC positioned near the top of the CA graph to the locus of sample DBBCC5+ near the bottom. Figure 6 is for site localities Ds73N and

DS73S. Ds73N was excavated stratigraphically, like the Durant Bend mound collection, and Y axis values were found to be in regular order similarly. Ds73S was dug in arbitrary 6 –inch levels, and for this locality, sample loci were not in order for Y axis values. One can see that the order here is mixed, but the samples are still close together on the CA chart. In Figure 5, for sites Au113 andDs79, Au113 samples are in order in terms of Y axis values as indicated, but by contrast, loci for site DS79 appear out of order like those of Ds73S. Site DS97 (Fig. 7) is shown with sample loci in order for Y axis values. Ds98 had a single excavated sample, Ds98pz, with "pz" standing for plow zone, as we had run out of time at the end of the season, and only excavated and processed one sample from the site.

In summary, the study of all these sample loci (Figs. 4 to 7) indicates that four out of six sites (or site localities) were assigned Y axis values in the CA in order by increasing level or stratum, including both sites that had been excavated stratigraphically. The last point is important, because the presence of physical layering in these sites suggests relatively little depositional mixing.

Sherd Frequency

There is another aspect to this narrative, and it has to do with varying sample sizes and sherd thicknesses. Sherd frequency correlates negatively with sample scores on the X axis, which means that as scores increase on the X axis, sample sizes decrease. To put it another way, earlier samples tend to have fewer sherds than later ones. This correlation is statistically significant (Pearson $R = -.6183$; $P=0.0006$; Fig. 8). Sherd thickness is related, as can been seen when sample Thin:Thick ratios are compared to sample sherd frequencies (Pearsons

R = -0.4143; P = =0.0317; Fig. 9). This indicates that in samples where sherd frequencies are high, sherds tend to be thick. Actually, the five samples with quite high sherd frequencies are all from the same site, from the upper levels of site areas Ds73N and Ds73S, (see Table 4), and these same samples all have high proportions of thick sherds.

Paste Color

Another trend which may be significant is that paste color ratios tend to line up along the X axis. In Figure 10, Dark:Light ratios change from more dark to more light sherds along the X axis, which suggests a change through time. The difference is statistically significant (R=0.4841; P=0.0105).

Conclusions

The correlation of light paste color with lower X axis values along with thick sherds and high sample frequencies could reflect important economic developments at these sites during the Late Woodland with the increasing importance of horticulture. More specifically, this could indicate increasing sedentation, or a greater population, or the same-sized populations making more, thicker-walled, or technologically improved pots (if light paste colors resulted from better firing). Jeter (1978: Plate 9) reported two possibly cob-impressed sherds from the nearby Woodland sites of Au118 and Ds89.

Looking back on the archaeology of all these sites, we see sites that had suffered greatly from the effects of plowing, both Durant Bend and all other sites as well. Only the mound at Durant Bend contained some deposits that had not been impacted in this way, the midden beneath the Lower Clay Cap. Of the smaller sites tested during 1975, only one site had a remnant midden beneath a deep plowzone, this being the northern portion of site Ds 73, or, Ds73N. At Ds73S, we encountered a single pit feature, a feature which contained enough charcoal for a radiocarbon date, as reported above.

In spite of the negative impacts of plowing we find that consistent results were obtained from our efforts at the six sites. Samples clustered in the CA graph by site. Also, top to bottom, most were arrayed on this graph by increasing excavation level. Most sherd samples, then, had unique, identifying characteristics which were recognized during the process of statistical analysis, as the computer put most in order by site and level (Figs. 4 – 7).

This study employed two techniques little-used in Southeastern archaeology, one archaeological: attribute analysis of ceramics, and the other statistical: Correspondence Analysis (c.f., Smith and Neiman 2007) and these allowed us to develop a simple narrative, pulling together the findings from Durant Bend, excavated in 1970 and those from five smaller, nearby sites dug during the summer of 1975.. Typological analysis of all this pottery was essential to the outcome. Middle and Late Woodland components were identified typologically, and without this information, we would have had no way to evaluate trends in the attribute data. In fact, we found two different ceramic sequences, one effective at the intra-site level, based on Check-Stamped : Plain ratios and a second, or, inter-site sequence, useful at the site-by-site level. The latter seems to be based mainly on proportions of thin to thick potsherds, although it is difficult to understand the effect of the three different variables in the makeup of the CA. The X-axis sequence, viewed only on a site-to-site basis, has the earliest component (1) comprised of the lowest five samples from the mound (DBBCC1 to DBBCC5), followed by the LCC and the UCC samples, along with all samples from Au113, Ds97, Ds98 (2). These are followed by the three Late Woodland components, samples fromDs79 (3), Ds73S (4) and Ds73S(5). Altogether, then, we can ascertain a 5-component sequence, two Middle Woodland (1-2) and three late Woodland (3-5).

Beyond this, our research indicates potentially that the study of sherd frequency coupled with sherd thickness and even paste color can contribute to our understanding of economic and ecological developments in Southeastern archaeology.

	CS	Plain		Dark	Light		T<7mm	T>=7mm	
Ds73S1	118	555	673	425	248	673	157	516	673
Ds73S2	171	302	473	304	169	473	126	347	473
Ds73S3	83	156	239	163	76	239	67	172	239
Ds73S4	36	51	87	59	28	87	24	63	87
Ds73S5+	25	50	75	46	29	75	19	56	75
Ds73NAM	203	964	1167	656	511	1167	183	984	1167
Ds73NUM	196	389	585	342	243	585	100	485	585
Ds73NLM	164	199	363	229	134	363	64	299	363
Ds73NBM	74	85	159	102	57	159	27	132	159
Ds791	11	292	303	170	133	303	125	178	303
Ds792	17	247	264	163	101	264	116	148	264
Ds793	24	163	187	100	87	187	62	125	187
Ds794+	3	39	42	25	17	42	18	24	42
Au1131	7	34	41	30	11	41	30	11	41
Au1132	14	40	54	38	16	54	32	22	54
Au1133+	15	18	33	25	8	33	22	11	33
Ds98PZ	20	219	239	166	73	239	183	56	239
DBUCC	11	110	121	36	85	121	85	36	121
DBLCC	9	45	54	32	22	54	47	7	54
DBBCC1	13	20	33	19	14	33	29	4	33
DBBCC2	28	34	62	45	17	62	49	13	62
DBBCC3	90	79	169	132	37	169	147	22	169
DBBCC4	83	67	150	106	44	150	111	39	150
DBBCC5+	66	45	111	81	30	111	81	30	111
DS971	1	75	76	60	16	76	49	27	76
DS972	7	67	74	47	27	74	51	23	74
DS973+	9	45	54	43	11	54	38	16	54

Table 1: Selma Sherd Frequencies by Site, Level, and Attribute

	Lev_Samp	Y_Score	Dk_Lt	Thn_Thk	CS_Pln	Freq	Age
1	LEV/SAMP	SCORE	Dark/Light	Thn/Thk	CS/Pln	Freq	Age
2	DBUCC	0.341	0.42	2.36	0.1	121	LW
3	Ds971	0.3156	3.75	1.81	0.01	76	MW
4	DS791	0.3047	0.78	0.7	0.04	303	LW
5	DS98PZ	0.2656	2.27	3.27	0.09	239	MW
6	DS792	0.2592	1.61	0.78	0.07	264	LW
7	Ds972	0.2541	1.74	2.28	0.1	74	MW
8	DS794+	0.2538	1.47	0.75	0.07	42	LW
9	DBLCC	0.1989	1.45	6.71	0.2	54	MW
10	DS793	0.1801	1.15	0.5	0.15	187	LW
11	Au1131	0.1395	2.73	2.73	0.21	41	MW
12	Ds973+	0.1252	2.51	2.38	0.2	33	MW
13	Ds73NAM	0.0883	1.28	0.19	0.21	1167	LW
14	Au1132	0.011	2.38	1.45	0.35	54	MW
15	DS73S1	-0.0816	1.71	0.3	0.21	673	LW
16	DBBCC!	-0.0886	1.36	7.25	0.65	33	MW
17	DS73S5+	-0.1146	1.59	0.34	0.67	75	LW
18	Ds73NUM	-0.1225	1.41	0.21	0.5	585	LW
19	DS73S3	-0.1447	2.14	0.39	0.53	239	LW
20	DS73S2	-0.1559	1.8	0.36	0.57	473	LW
21	DBBCC2	-0.212	2.65	3.77	0.82	62	MW
22	DS73S4	-0.2302	2.11	0.38	0.71	87	LW
23	AU1133+	-0.2421	3.13	2	0.83	33	MW
24	DS73MLM	-0.283	1.71	0.21	0.82	363	LW
25	DS73NBM	-0.3041	1.79	0.2	0.87	159	LW
26	DBBCC3	-0.3173	3.57	6.68	1.2	169	MW
27	DBBCC4	-0.3462	2.41	2.85	1.24	150	MW
28	DBBCC5+	-0.4063	2.7	2.7	1.47	111	MW
29	Y AXIS						

Table 2

	Lev_Samp	X_Score	Dk_Lt	Thn_Thk	CS_Pln	Freq	Age
1	DBBCC3	0.6888	3.57	6.68	1.2	169	MW
2	DBBCC1	0.6442	1.36	7.25	0.65	33	MW
3	DBLCC	0.6086	1.45	6.71	0.2	54	MW
4	DBBCC2	0.5736	2.65	3.77	0.2	62	MW
5	DBBCC4	0.5228	2.41	2.85	0.82	150	MW
6	DBBCC5+	0.52	2.7	2.7	1.47	111	MW
7	AU1131	0.4694	2.73	2.73	0.21	41	MW
8	DS973+	0.4474	3.91	2.38	0.2	54	MW
9	AU1133+	0.4323	3.13	2	0.83	33	MW
10	DS972	0.3913	1.74	2.28	0.1	74	MW
11	DS971	0.3565	3.75	1.81	0.01	76	MW
12	DBUCC	0.3444	0.42	2.36	0.1	121	LW
13	AU1132	0.3094	2.38	1.45	0.35	54	MW
14	DS98PZ	0.2656	2.27	3.37	0.09	239	MW
15	DS792	0.0863	1.61	0.78	0.07	264	LW
16	DS794+	0.0701	1.47	0.75	0.07	42	LW
17	DS791	0.0403	0.78	0.7	0.04	303	LW
18	DS793	-0.0496	1.15	0.5	0.15	187	LW
19	DS73S4	-0.0536	2.11	0.38	0.71	87	LW
20	DS73S3	-0.056	2.14	0.39	0.53	239	LW
21	DS73S2	-0.0781	1.8	0.36	0.57	473	LW
22	DS73S5+	-0.1026	1.59	0.34	0.67	75	LW
23	DS73S1	-0.143	1.71	0.3	0.21	673	LW
24	DS73NLM	-0.1763	1.71	0.21	0.82	363	LW
25	DS73NBM	-0.1804	1.79	0.2	0.87	159	LW
26	DS73NUM	-0.206	1.41	0.21	0.5	585	LW
27	DS73NAM	-0.2472	1.29	0.19	0.21	1167	LW
28	X AXIS						

Table 3

Table 4: Sample Frequencies and Variable Ratios

	CS	Plain	sum	Ck:Pln	Dark	Light	Drk:Lgt	sum	T<7mm	T>=7mm	Thn:Thk	sum
Ds73S1	118	555	673	0.21	425	248	1.71	673	157	516	0.3	673
Ds73S2	171	302	473	0.57	304	169	1.8	473	126	347	0.36	473
Ds73S3	83	156	239	0.53	163	76	2.14	239	67	172	0.39	239
Ds73S4	36	51	87	0.71	59	28	2.11	87	24	63	0.38	87
Ds73S5+	25	50	75	0.67	46	29	1.59	75	19	56	0.34	75
sum	433	1114	1547	0.39	997	550	1.81	1547	393	1154	0.34	1547
Ds73NAM	203	964	1167	0.21	656	511	1.28	1167	183	984	0.19	1167
Ds73NUM	196	389	585	0.5	342	243	1.41	585	100	485	0.21	585
Ds73NLM	164	199	363	0.82	229	134	1.71	363	64	299	0.21	363
Ds73NBM	74	85	159	0.87	102	57	1.79	159	27	132	0.2	159
sum	637	1637	2274	0.39	1329	945	1.41	2274	374	1900	0.2	2274
Ds791	11	292	303	0.04	170	133	0.78	303	125	178	0.7	303
Ds792	17	247	264	0.07	163	101	1.61	264	116	148	0.78	264
Ds793	24	163	187	0.15	100	87	1.15	187	62	125	0.5	187
Ds794+	3	39	42	0.07	25	17	1.47	42	18	24	0.75	42
sum	55	741	796	0.07	458	338	1.36	796	321	475	0.68	796
Au1131	7	34	41	0.21	30	11	2.73	41	30	11	2.73	41
Au1132	14	40	54	0.35	38	16	2.38	54	32	22	1.45	54
Au1133+	15	18	33	0.83	25	8	3.13	33	22	11	2	33
sum	36	92	128	0.39	93	35	2.66	128	84	44	1.91	128
Ds98PZ	20	219	239	0.09	166	73	2.27	239	183	56	3.27	239
DBUCC	11	110	121	0.1	36	85	0.42	121	85	36	2.36	121
DBLCC	9	45	54	0.2	32	22	1.45	54	47	7	6.71	54
DBBCC1	13	20	33	0.65	19	14	1.36	33	29	4	7.25	33
DBBCC2	28	34	62	0.82	45	17	2.65	62	49	13	3.77	62
DBBCC3	90	79	169	1.2	132	37	3.57	169	147	22	6.68	169

Table 4 (cont.)

DBBCC4	83	67	150	1.24	106	44	2.41	150	111	39	2.85	150
DBBCC5+	66	45	111	1.47	81	30	2.7	111	81	30	2.7	111
sum	300	400	700		451	249	1.81	700	549	151	3.64	700
DS971	1	75	76	0.01	60	16	3.75	76	49	27	1.81	76
DS972	7	67	74	0.1	47	27	1.74	74	51	23	2.28	74
DS973+	9	45	54	0.2	43	11	3.91	54	38	16	2.38	54
	17	187	204	0.06	150	54	2.78	204	138	66	2.09	204

Scatter Plots

Dataset C:\Users\Roger\Documents\Selma Variable Loci Graphic.NCSS

Scatter Plot Section

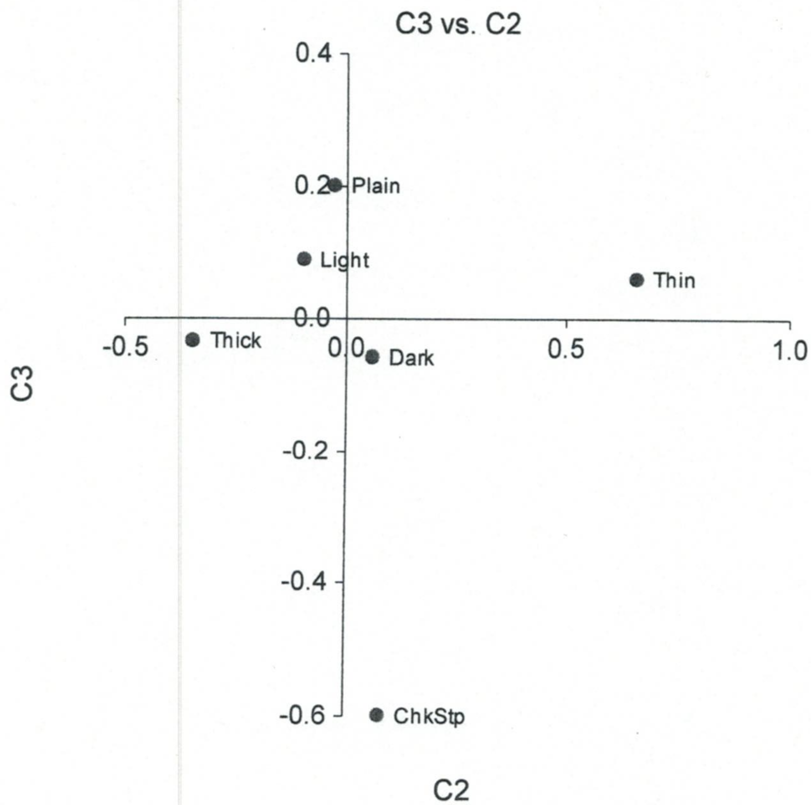

Figure 1: Correspondence analysis; Variable Plot

Correlation Report

Dataset C:\Users\Roger\Documents\Y axisdata Selma Sherds.NCSS
Y Axis Variable: Y_Score; X Axis Variable: CS_Pln

Scatter Plot Section

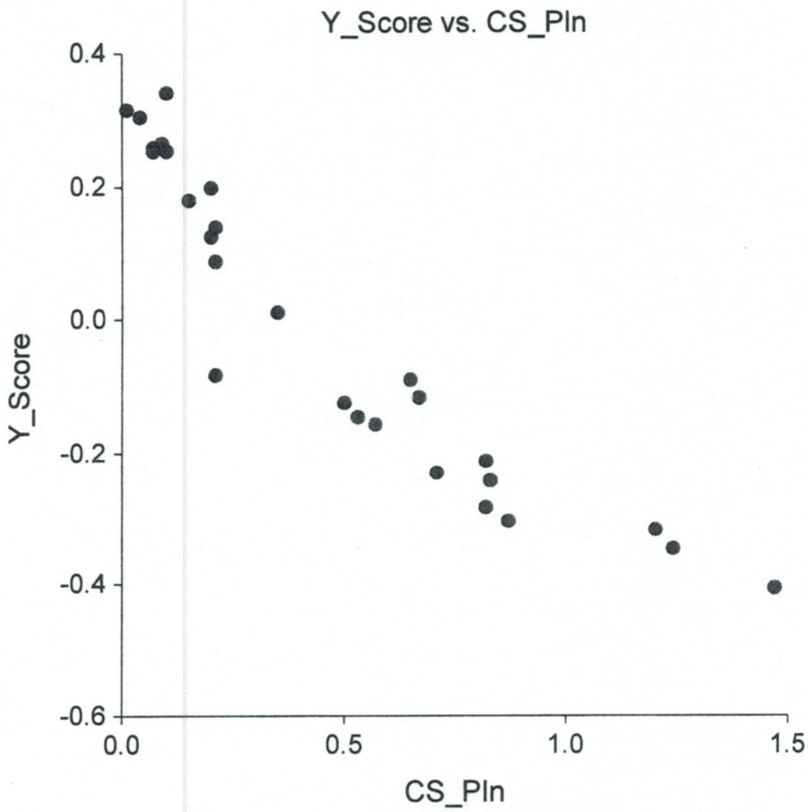

Figure 2

Correlation Report

Dataset E:\current data\Xaxis scores selma sherds.NCSS
Y Axis Variable: X_Score; X Axis Variable: Thn_Thk

Scatter Plot Section

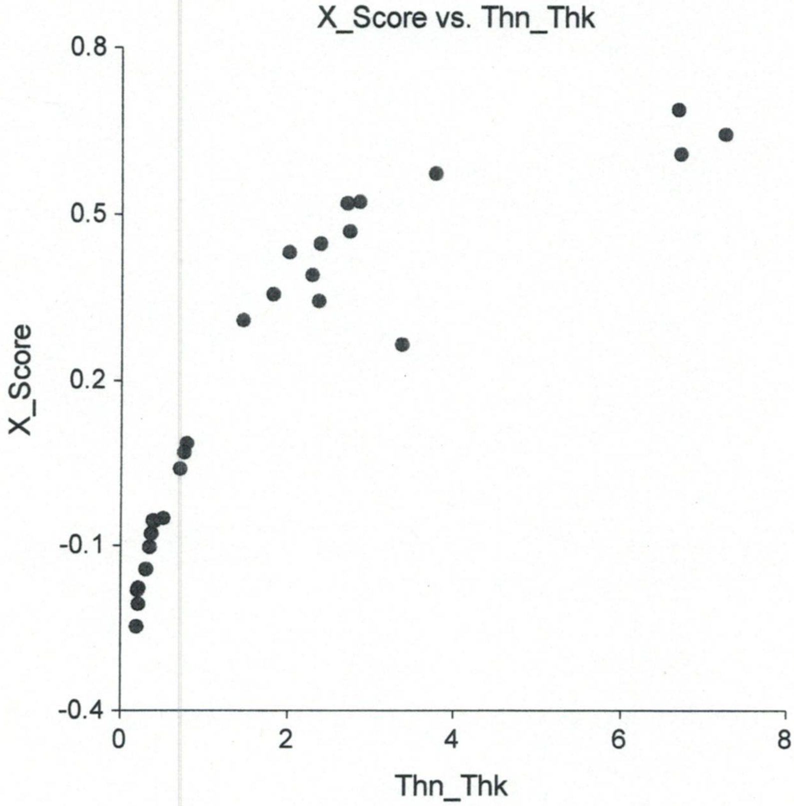

Figure 3

Scatter Plots

Dataset C:\Users\Roger\Documents\Selma Sherds Au113 Ds79.NCSS

Scatter Plot Section

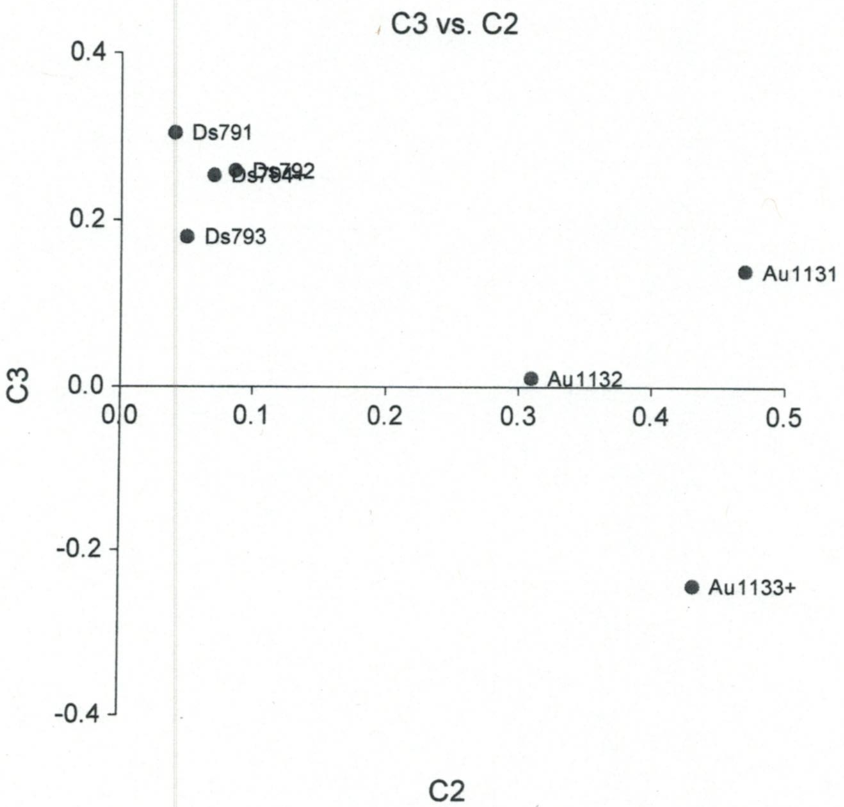

Figure 4: Sample Loci For Sites Au113 and Ds79

~~Thickness x Time~~

~~Ds793 + Au113~~

Scatter Plots

Dataset C:\...\Documents\Durant Bend Selma Pottery Graphics.NCSS

Scatter Plot Section

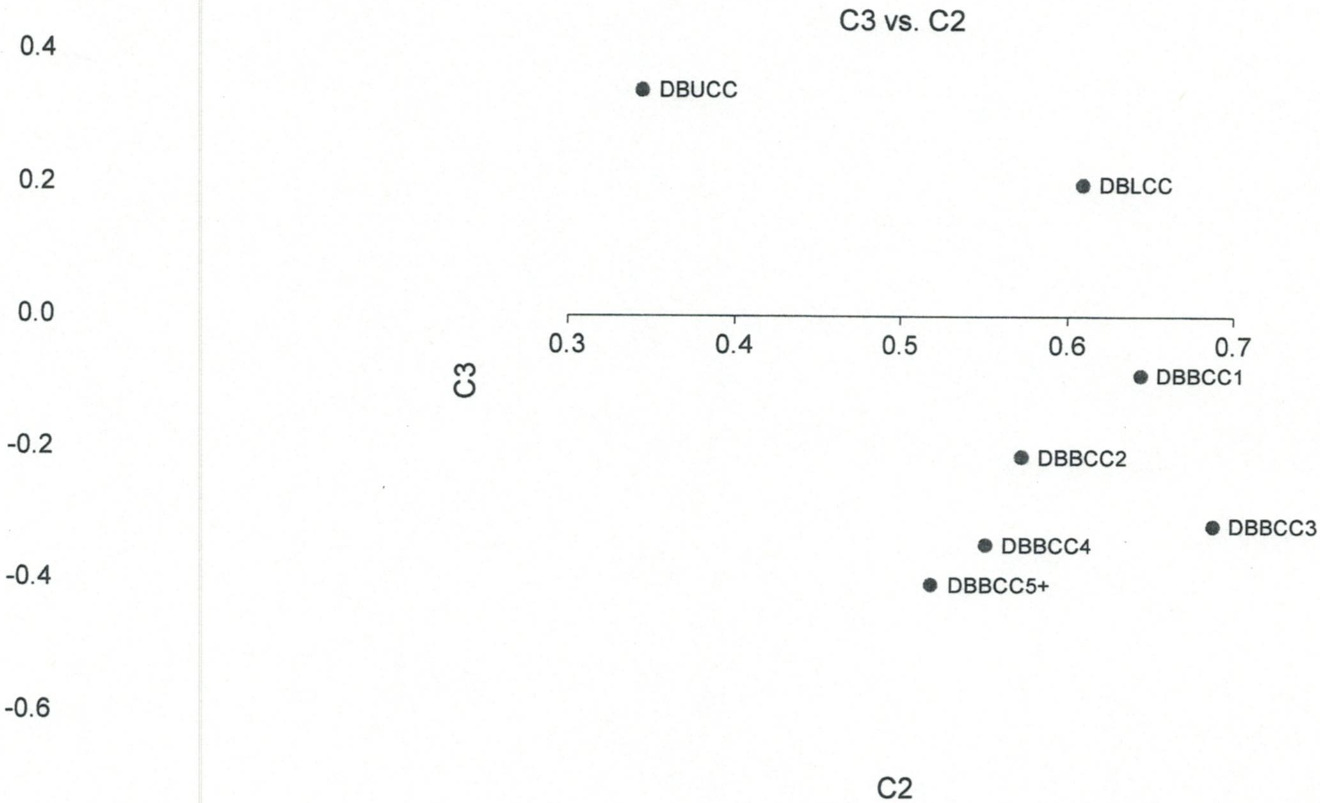

Figure 5: Sample Loci For the Durant Bend Site

Scatter Plots

Dataset C:\Users\Roger\Documents\selma sherds data Ds73N Ds73S.NCSS

Scatter Plot Section

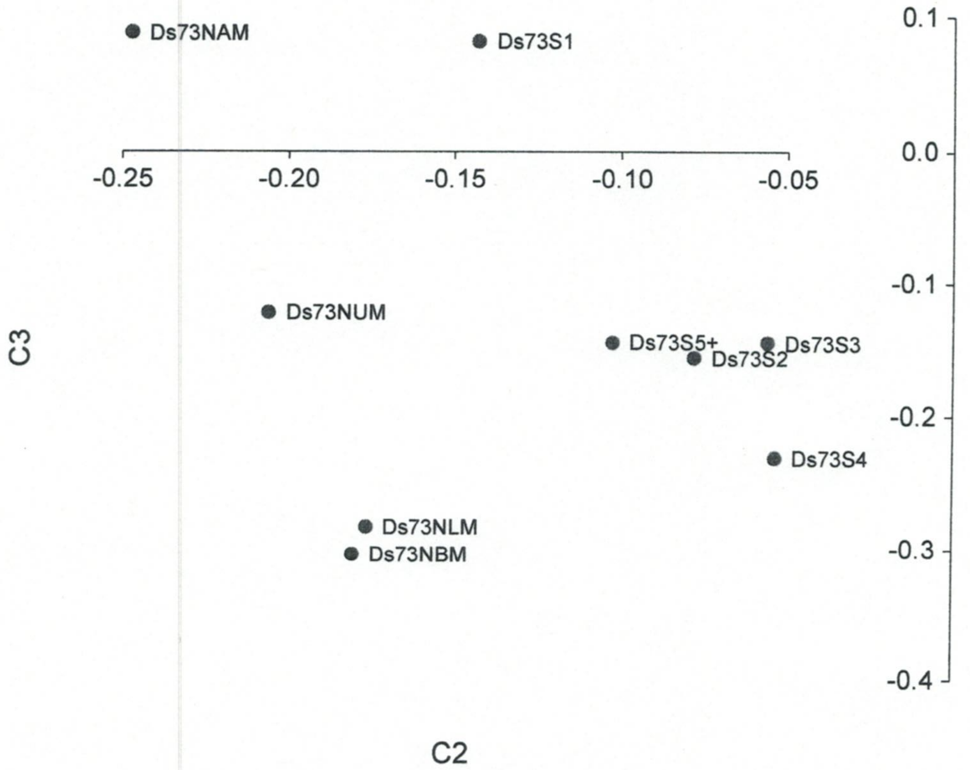

Figure 6: Sample Loci For Site Areas Ds73N and DS73S

Scatter Plots

Dataset C:\Users\Roger\Documents\Ds97 Ds98 Selma Sherds Plot.NCSS

Scatter Plot Section

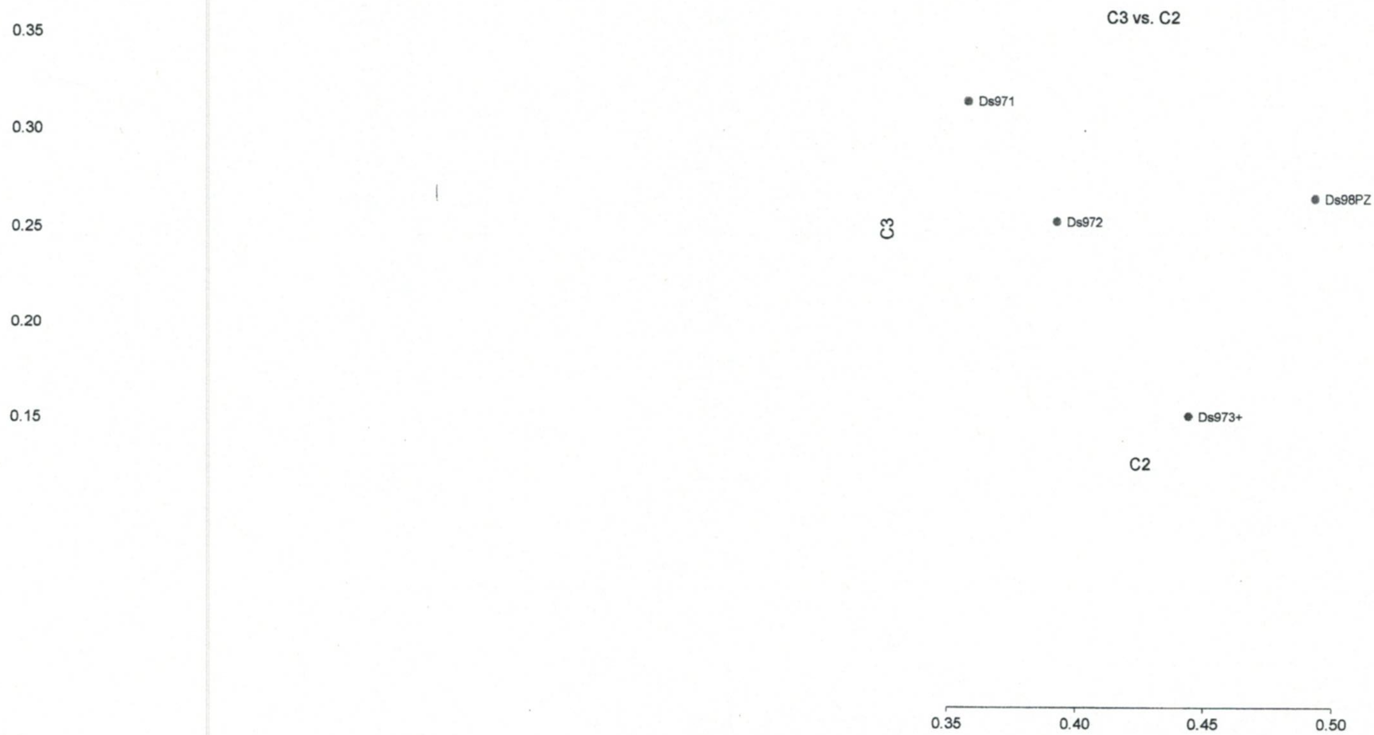

Figure 7: Sample Loci For Sites Ds 97 and Ds 98

Correlation Report

Dataset E:\current data\Xaxis scores selma sherds.NCSS
Y Axis Variable: X_Score; X Axis Variable: Freq

Scatter Plot Section

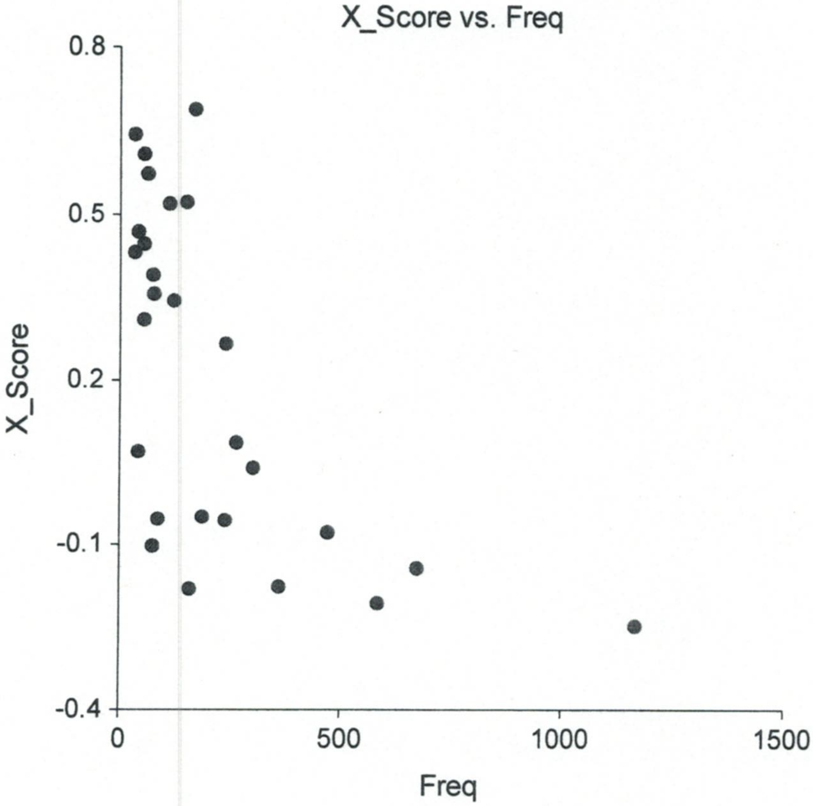

Figure 8

Correlation Report

Dataset E:\current data\Xaxis scores selma sherds.NCSS
Y Axis Variable: Thn_Thk; X Axis Variable: Freq

Scatter Plot Section

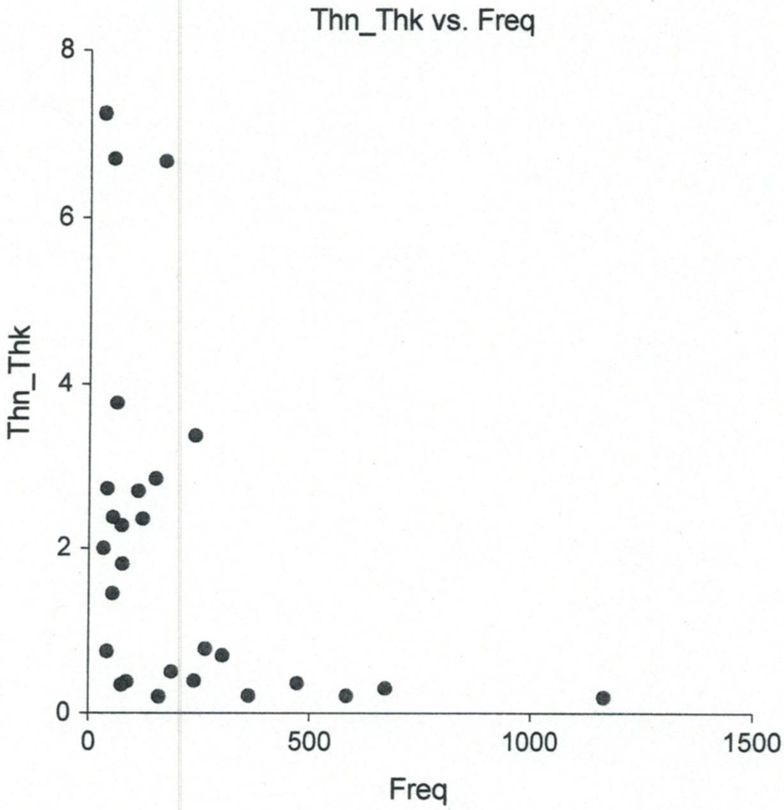

Figure 9

Correlation Report

Dataset E:\current data\Xaxis scores selma sherds.NCSS
Y Axis Variable: X_Score; X Axis Variable: Dk_Lt

Scatter Plot Section

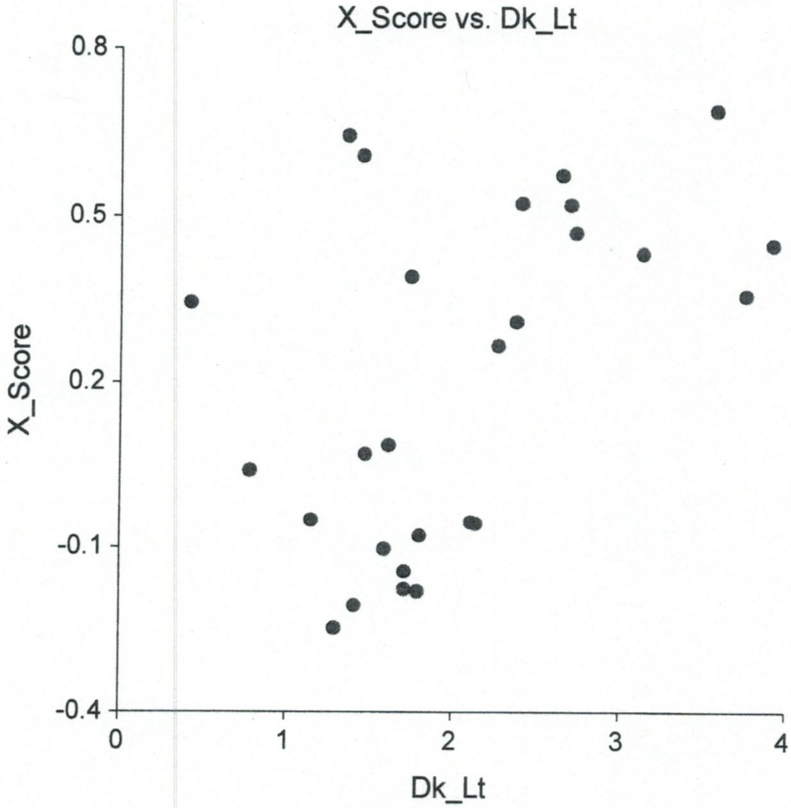

Figure 10