Cluster analysis of Bloodmoor Hill ICPS data

All the ICPS data held by the author from sites in eastern England south of the Humber (i.e. Lincolnshire, Cambridgeshire, Norfolk, Suffolk, Essex, Greater London, Surrey and Kent) was examined using Factor Analysis. Imported pottery was excluded from analysis as was any group where factor analysis clearly showed a difference between the Bloodmoor Hill ceramics. The remaining groups all included at least one sample which was not distinguishable using the principal calculated factors from the Bloodmoor Hill ceramics.

This reduced dataset included 289 samples, including the 63 from Bloodmoor Hill, coming from all 8 counties (Table 1).

Table 1

cname	Cambridgeshire	Essex	Greater London	Kent	Lincolnshire	Norfolk	Suffolk	Surrey	Grand Total
ASSHQ					5				5
BIOTITE							8		8
BONB/MEL	1								1
BONBT	1								1
CALCT							11		11
CALCT+CHAFF							3		3
CALCT+GROG							1		1
CHAF				2					2
CHAFF							7		7
CHAFF+MICA							1		1
CHARN					2				2
CHEL	1								1
CHFI?				1					1
CHFQ/CHFST				1					1
CHFST				1					1
CHSF				4					4
CHSF/CHAF				1					1
CHSF/ESANFO				1					1
CHSFL				1					1
CLAY	3								3
CLMEL	7								7
CMEL	8								8
ECHAF				6					6
ECHAFG				2					2
ECHAFM				1					1

ELY	22							22
EMSH?		1						1
EMX				1				1
EMX-G				1				1
ERRA				1				1
ESAXLOC							1	1
ESGS				3				3
FABRIC 27					3			3
FCLAY						5		5
GROG						2		2
GSS				3				3
hygrobia			1					1
KIA CHERT			2					2
KIA GROG1		1						1
KIA SANDY			7					7
Kimmeridge Clay	3							3
LCOAR SHEL		3						3
LIM				1				1
LIMES				1				1
LMEL	8							8
LOND		3						3
M/LMEL	1							1
MEL	25							25
MEL OR GRIM	1							1
MELT	4							4
MICA						3		3
MLS IMPORT			1					1
MSAXX-BR		3						3
MSAXX-GIA		1						1
MSAXX-GS		2						2
MSAXX-IS		7						7
MSAXX-LCLST		1						1
MSAXX-OOL		5						5
MSAXX-SSO		1						1
MSAXX-TFC		3						3
MSAXX-TFF		7						7
MSSHEL		1						1
NKMS			4					4
OX?	1							1

									Grand Total
SESH		5	1							6
SESH?		1								1
SESHL			1							1
SESHS			1							1
SHEL	1									1
SHELS			1							1
SHERL			2							2
SST					10					10
SST 1							10			10
SST 2							6			6
SST 2a							2			2
SST 4							3			3
SST 5?							1			1
SSTCL					6					6
SSTMG			1		6					7
SSW			5	1						6
SSW?				1						1
Grand Total	87	6	71	18	40	3	63	1		289

The dataset was then analysed using cluster analysis (excluding those elements which are most affected by post-burial alteration: Fe_2O_3, CaO, MnO, P_2O_3, Ba and Sr). The data fell into three clearly separable clusters containing 71, 196 and 22 samples respectively.

Cluster 1 contained 5 Bloodmoor Hill samples, the calcareous, silty samples recognised as a chemical group from the analysis of the ICPS data from the site on its own. The majority of these samples were from fabrics with calcareous inclusions, mainly shell but including oolitic limestone, calcareous sandstone, and/or quartz silt.

Bi-plots of the main factors for this cluster show that the Bloodmoor Hill samples are distinct from the remainder and therefore form a discrete group within the material sampled to date. This result is confirmed by a cluster analysis of the Cluster 1 samples, in which four of the five Bloodmoor Hill samples form Cluster 1.2 with no examples from other sites.

Cluster 2 contained 55 Bloodmoor Hill samples, from the main chemical group on the site. The comparative material was mainly from Cambridgeshire and mainly fabrics with a mixed Jurassic/Cretaceous calcareous gravel temper produced at Ely. The samples from Lincolnshire, Greater London, Kent and Surrey were mainly Anglo-Saxon coarsewares with mixed calcareous sand/gravel tempers.

Factor analysis of the samples in this cluster splits the samples into two main groups, one consisting mainly of Ely wares and the other the Bloodmoor Hill samples with isolated examples from the Thames valley.

Cluster 3 contained 3 Bloodmoor Hill samples, all with chaff temper. However, their other petrological characteristics are different and they do not form a coherent petrological group. The 19 comparative samples mainly come from sites in Lincolnshire and are in fact mainly drawn from a single site, at Dunholme.

Factor analysis of this cluster shows that it is possible to separate the Bloodmoor Hill samples from those from the Thames valley and Dunholme, leaving just three comparative samples, two from Lincolnshire and one from Cambridgeshire.

Thus, the chemical data alone can distinguish Bloodmoor Hill samples from most of the other pottery groups analysed by the author. However, the lack of East Anglian samples makes this a rather academic exercise, since it was never archaeologically likely that the samples would turn out to be products of either Lincolnshire or the Thames valley. However, this is a necessary step in the analysis of the pottery and ensures that any further comparative analysis, using data from sites in East Anglia, is likely to be meaningful.

Methodologically, this analysis was useful in showing that where the chemical composition of a group of pottery is extremely varied this variability must be reduced before sensible results can be obtained from statistical analysis. In this case, splitting the dataset into groups using cluster analysis was sufficient to make the dataset manageable.