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## The finds pattern of archaeological excavations: Correspondence Analysis as explorative tool

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This work arises from a project I have run in collaboration with Inger Marie Holm-Olsen and P. Urbańczyk (Warsaw) on the stratigraphic analysis of north Norwegian settlement mounds (farm mounds). The empirical basis and a more comprehensive theoretical discussion can be found in the first report from this project (Bertelsen & Urbańczyk 1985a). For a presentation of farm mound stratigraphy, see Holm-Olsen 1979.

Observed today, the majority of the units of such accumulations are thin, wide sheets of soil. For example, the Soløy farm mound, which is to be discussed here, gave a stratigraphic sequence of 58 units in a 3m by 3m trench, 1m deep. Most of the units were far wider than the trench, so one could only observe fragments of them. There is no reason to believe that our techniques were sufficiently advanced as to allow us to assume that our stratigraphic sequence was close to the stratificational reality. A process going on for c. 1000 years must have been responsible for a chain of more than 58 events and their accumulated deposits on this small part of the central area of the site.

Correspondence Analysis (CA) is a multi-variate statistical method, designed to explore the units vs the variables in a low dimensional hyperspace. It is based on the chi-square distance. One property of this method is to measure the distance of every unit from the gravitation centre of the studied universe (origin). The average finds pattern is in this case equal to the gravitation centre.

The variables are indicated by the following abbreviations: BONE fragments, unidentified; FISH bones; BIRD bones; MAMMAL bones; SLATE whetstones; STEATITE vessels; POTTERY; clay PIPES; fired CLAY; SLAG; FLINT pieces; METAL fragments; ORNAMENTED objects; IRON nails; and window GLASSs.

To avoid the time dimension interfering with the definition of the axes, we will exclude from further analysis finds classes STEA, POTT, PIPE and GLAS as they are exclusive to specific periods of the accumulation. The effect of material sensitive to time is demonstrated in Bølviken *et al.* 1982, pp. 51–56 (analysis by Holm-Olsen).

It is necessary to evaluate the quality of the plot (Fig. 3.1) before we approach a further discussion. Diagnostics of both the units representation and the importance of the different variables for the definition of the axes are presented by Bertelsen & Urbańczyk 1985b. Only units 15 and 23 can be considered badly represented in the plot and they should therefore be excluded from further discussion. The overall result, c. 67% of the total variation being exhibited in the plot, can be considered as fairly good. But there may still be interesting structure on the other axes.

Unit	BONE	FISH	BIRD	MAMM	SLAT	STEA	POTT	PIPE	CLAY	SLAG	FLIN	META	ORNA	IRON	GLAS
1	13	2	1	70	0	0	50	5	23	0	1	3	0	11	9
2	15	8	2	193	1	0	50	7	331	0	1	2	0	40	21
4	33	21	1	21	0	0	4	0	386	1	0	0	0	4	1
5	46	28	8	66	1	0	0	0	29	0	1	2	1	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
7	6	23	1	41	0	0	0	0	28	0	0	0	0	1	0
8	21	33	7	81	0	0	1	0	304	0	1	3	0	5	0
9	1	3	2	6	0	0	0	0	2	0	0	0	0	0	0
10	0	1	0	6	0	0	0	0	21	1	0	0	0	0	0
11	5	0	0	4	0	0	0	0	0	0	0	0	0	0	0
12	1	0	0	8	0	0	0	0	10	0	0	0	1	0	0
13	1	0	0	3	0	0	0	0	3	0	0	0	0	2	0
14	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	1	0	0	0	0	3	1	0	0	0	0	0
16	1	1	0	11	0	1	0	0	0	0	0	0	0	1	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
19	2	87	2	27	0	0	0	0	1	0	1	0	0	0	0
21	0	46	3	28	0	0	0	0	0	0	0	0	0	0	0
23	0	3	0	0	0	0	0	0	0	0	1	2	0	1	0
24	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
28	78	73	0	38	2	0	0	0	9	0	0	0	1	2	0
29	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	7	0	0	0	0	1	0
32	0	0	0	2	0	1	0	0	8	0	0	1	0	6	0
33	0	2	0	20	0	0	0	0	0	1	0	0	0	4	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
35	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0

Table 3.1: Finds from the 1981 excavation at the Soløy farm mound

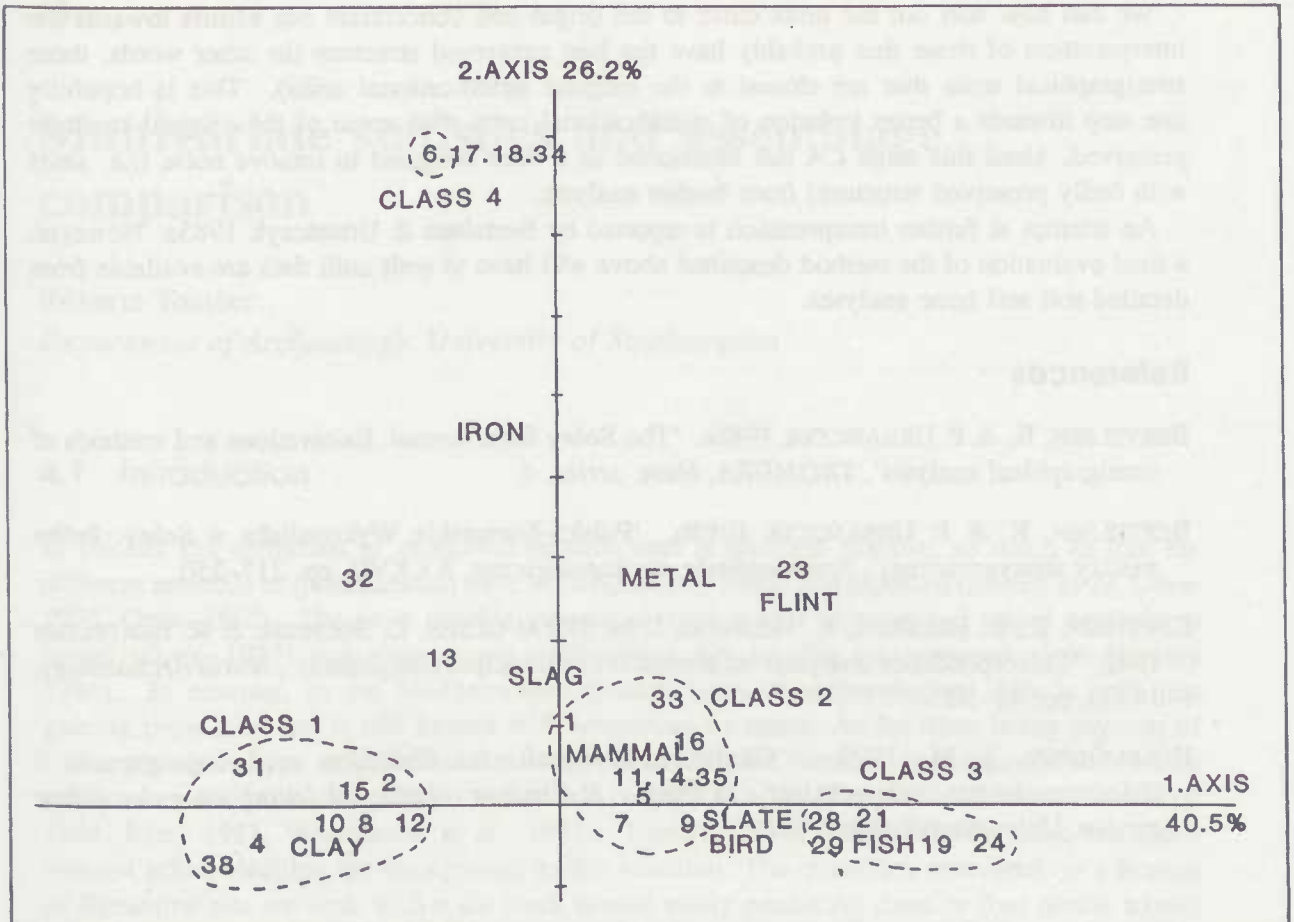


Fig. 3.1: Correspondence Analysis plot

There is no cluster of units close to the origin, but the distance to group 2 is not great. This means that these units are close to the average finds pattern. We find that they are relatively abundant on the variables MAMM and CLAY.

We can now sort out the units close to the origin and concentrate our efforts towards the interpretation of those that probably have the best preserved structure (in other words, those stratigraphical units that are closest to the original stratificational units). This is hopefully one step towards a better isolation of stratificational units with some of the original structure preserved. Until this stage CA has functioned as a filter designed to remove noise (*i.e.* units with badly preserved structure) from further analysis.

An attempt at further interpretation is reported by Bertelsen & Urbańczyk 1985a. However, a final evaluation of the method described above will have to wait until data are available from detailed soil and bone analyses.

### References

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