

# 38 Seriation of Iron Age settlement sites in NW Bohemia — system of databases, CAAF program

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## 38.1 INTRODUCTION

In addition to many indisputable advantages, the use of computers in archaeology also brings numerous disadvantages, and sometimes makes the communication between archaeologists even more difficult. Not only in Czechoslovakia, but in the whole of Central Europe, two general groups of researchers have formed — the first using large commercial packages, e.g. BMDP, SAS, SSPS, or even producing their own specialised programs, and the second using computers for word processing only or for collecting data for databases. Scholars of the former group make use of programs for modelling certain situations or for solving theoretical problems, while the latter and more numerous group of scientists rather deals with analyses of archaeological material. This situation cannot be improved even by special archaeological programs (e.g. Bonn Seriation by Scollar and Herzog). Most archaeologists who process large quantities of data and work with practical problems, cannot and do not want to devote their time to software studies.

The distance between the two research groups seems to increase rather than diminish in Czechoslovakia, and their lack of mutual co-operation brings about many practical problems. Obviously the best solution would be to build up a simple system, which would allow any archaeologist to process the data on his own, without any need of some specific knowledge. Due to the fact that chronology represents the basic problem in analysing archaeological material, the so-called seriation programs are thus most popular among the latter group of scholars.

With a background in this situation and the disproportion's mentioned above, a system of

databases (Figure 38.1) has been developed together with the program CAAF (Combination Analysis of Archaeological Finds), operating together with them. The aim of the whole system is to make it possible for all archaeologists, even those lacking experience, to use computers for evaluation.

The functionality of the system and of the program will be demonstrated here by an example of Iron Age settlement sites. It is obvious that even such a very simple system must be able to process particular material and produce logical results.

## 38.2 THE SYSTEM OF DATABASES

### 38.2.1 Databases of archaeological entities

*The database of regions* records major geographical regions in Bohemia and Moravia.

*The database of sites* records location of sites within particular regions and the characteristics of sites. For the time being this database contains 25 La Tene settlement sites.

*The database of features* records features and their qualities: type (Figure 38.2), metrical data, volume, number of fragments per cubic metre of fill, preliminary dating, occurrence of non-ceramic material — brooches, bracelets, etc., dating of non-ceramic material, and the so-called final dating. Almost 300 settlement features have been processed by this method so far.

*The database of finds* records are oriented towards the processing of the La Tene pottery. This database records fundamental data: site; number of the feature; inventory numbers; layer; and sector. Further the characteristics of the pottery: form of the vessel (Figure 38.3); rim; base; type of the surface; location and type of decoration (both can be recorded twice); diameter of the mouth;

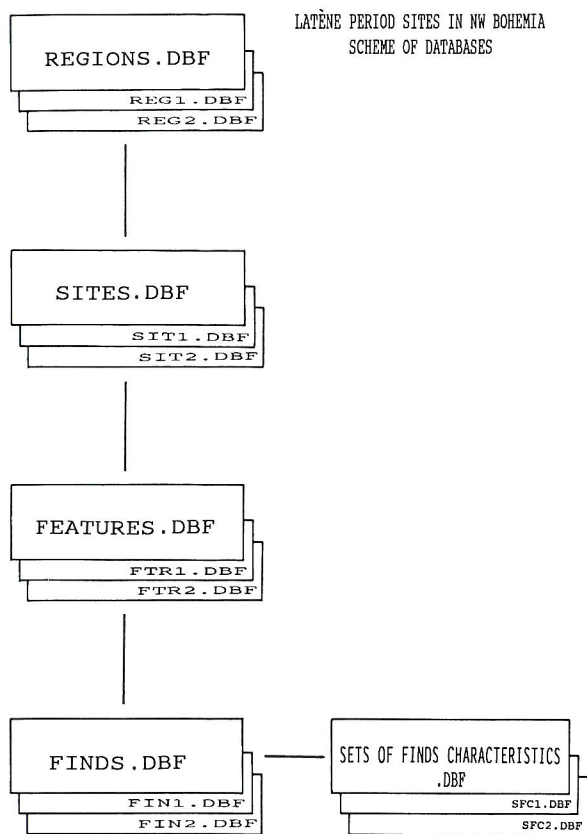


Figure 38.1: Scheme of the database system of La-Tène settlement sites in NW Bohemia

number of identical pieces. Code tables have been prepared for most of the items (Salač 1989). At present this database contains about 7000 records, which means almost 40,000 pottery fragments.

### 38.2.2 Database of sets of find characteristics

An important step in the use of programs for seriation, or rather for correspondence analysis, is to build up the initial matrix. In most cases, it is necessary to build the initial matrix manually, or at least to enter manually the chosen elements. The reason for this is that the archaeologist does not investigate relations between two characteristics (elements) only, but the whole range of relations between combinations of characteristics. For example, it is a well-known fact for the Iron Age that the location of smoothed-in decoration on S-shaped wheel-made bowls is of great chronological importance. At the same time, it is very important whether the outer or inner side of a vessel is decorated or not. This means that it is necessary to record all possible information: the form of the vessel, the surface of the vessel, the location and type of decoration, etc. All these data, which I call a "set of find characteristics", fill in merely a column or row of the matrix. It is obvi-

ous that to build up the initial matrix is rather difficult and time-consuming.

In the case of cemeteries, this work can be done once or a few times at the beginning, since the number of chronological elements is more or less known and limited. However, if we analyse a previously unknown material culture from settlement sites, matrices should be built up repeatedly. Only then the significance of various combinations of characteristics can be tested. However, with large find assemblages manual matrix building is extremely time-consuming.

In our case, the following solution has been applied: within the database of sets of find characteristics, any combination of find characteristics can be delimited from the data set (e.g. <230,239> = all S-shaped bowls, see Figure 38.3). To solve the chronological questions associated with the Celtic pottery, for instance, approximately 140 such categories have been created so far. Starting from the databases of sets of find characteristics and those of sites, features and finds, the CAAF program automatically builds up initial matrices for seriation, or for other statistical evaluation.

The database of sets of find characteristics consists of the following fields: the name of a set; form of the vessel from (e.g. 230); form of the vessel to (e.g. 239); rim from (e.g. 200); rim to (e.g. 299); base from; base to; surface type from (e.g. 100); surface type to (e.g. 199); location of decoration from (e.g. 100); location of decoration to (e.g. 199); type of decoration from (e.g. 600); type of decoration to (e.g. 699); type of decoration No. 2 to; diameter of mouth from; diameter of mouth to (in brackets, an example of S-shaped wheel-made bowls with smoothed-in decoration on the outer surface is given, regardless of the type of bottom, other types of decoration No. 2, and the diameter of the mouth, the significance of which has been mentioned above). Selected, delimited categories of one database branch then represent only one set of find characteristics.

The term "find characteristic" implies one category among the series of categories. With "characteristic" either the form of the vessel, form of the rim, or form of the base, etc. may thus be understood. The combination of characteristics is called "the set of find characteristics".

### 38.3 PROGRAM CAAF

To enable easy and undemanding work with the databases mentioned above, a new program has been developed in co-operation with a software

100	110	120	130	140	150					
POLCEVNICE SUNKEN HUTS										
NUMERICKÝ KÓD SÍDLIŠTNÍCH OBJEKTŮ V SZ ČECHÁCH NUMERIC CODE OF SETTLEMENT FEATURES IN NW BOHEMIA		200	300	400	500	510				
		ZÁHL. STAVBY SUNKEN BUILDINGS	ZÁSOBNÍ JÁMY STORAGE PITS	HILNÍKY CLAY-EXTRACTION PITS	JAMKY - ŽLÁBY POST HOLES					
600	610	620	630	640	650	660				
PECE OVENS					HRNČÍRSKÉ PECE POTTERY OVENS	TAVÍCÍ PECE FURNACES SMELT				
700	710	720	730	740	750	760				
JÁMY PITS										
800	KULTURNÍ VRSTVA CULTURAL LAYER		995	TORZA OBJEKTŮ FRAGMENTS OF FEATURES		999	OSTAŇNÍ (VÝJIMKY) OTHERS (EXCEPTIONS)			TOPENIŠTĚ FIRE PLACE

Figure 38.2: Code table of pits - a part of the descriptive system of archaeological settlement features

ZÁKLADNÍ DEFINICE DO STĚNY LZE VEPSAT PŘÍMKU IN DIE WAND KANN MAN EINE GERADE HINEINSCHREIBEN	1 OBLOUK V KŘÍVCE STĚNY 1 BOGEN IN DER WANDLINIE		2 OBLUKY V KŘÍVCE STĚNY 2 BOGEN IN DER WANDLINIE		3 OBLUKY V KŘÍVCE STĚNY 3 BOGEN IN DER WANDLINIE	GRUNDEFINITIONEN
Ø ÚSTÍ > v Ø DER MUNDUNG > H	Ø ÚSTÍ < v Ø DER MUND < H	Ø ÚSTÍ < v Ø DER MUNDUNG < H	Ø ÚSTÍ > v Ø DER MUNDUNG > H	Ø ÚSTÍ < v Ø DER MUND < H	Ø ÚSTÍ > v Ø DER MUNDUNG > H	
MÍSY 200 SCHÜSSELN	SOUDKY 100 FÄSSCHEN	SOUDKY 100 FÄSSCHEN	MÍSY 200 SCHÜSSELN	MÍSY 200 SCHÜSSELN	HRNCE 300 TÖPFE	POHÁRY 600 POKALE
CEDNÍKY 800 - TYPY NEROZLIŠENÝ SEIHER 800 - TYPEN NICHT UNTERSCHIEDEN				SITULY 400	SITULEN 400	
				LÁHVE 500	FLASCHEN 500	
				ZÁSOBNICE 700	YORRATSGEFÄSSE 700	
VARIANTY MÍSY ESOVITÉ PROFILACE VARIANTEN DER S-PROFIL SCHÜSSELN				NÁDOBY SE ZATA- ZENÝM OKRAJEM GEFÄSSE MIT EIN- BIEGEMEM RAND		
MĚŘENÍ ÚHLU α MESSUNG DES WINKELS α						

Figure 38.3: Code table of pottery forms - a part of the descriptive system of La-Tène settlement pottery

COMBINATION ANALYSIS OF ARCHAEOLOGICAL FINDS

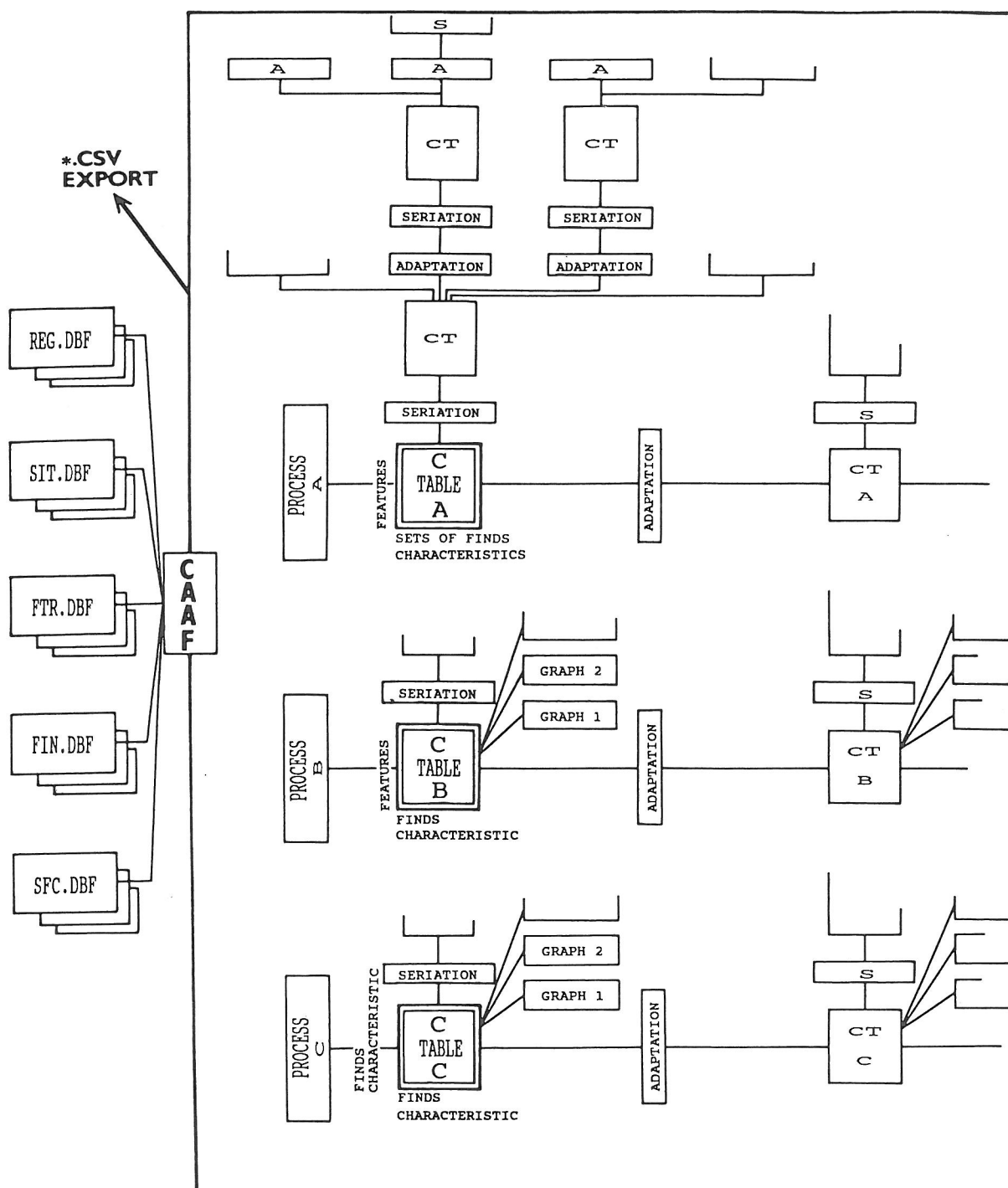


Figure 38.4: Scheme of CAAF program

company (E-Software Prague, author T. Kubalek). The CAAF program enables automatic production of contingency tables from the databases, their modification, seriation, graphical representation of results, etc. (Figure 38.4).

When started, the program offers a language menu. The user can select a menu and output ti-

ties in Czech, German or English. Screen text is not a permanent part of the program. It is held in an individual database, and is thus user accessible for changes.

The program allows automatic creation of three types of matrixes: A, B, C. If an initial matrix for a classical seriation is required — process

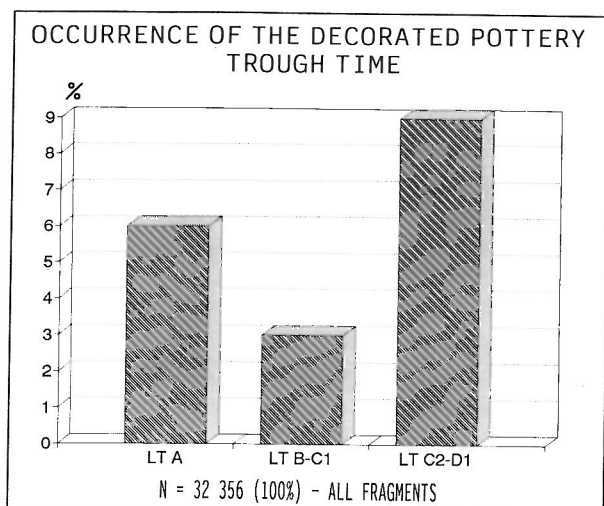


Figure 38.5: Percentage representation of decorated pottery sherds on La-Tène settlement sites in NW Bohemia

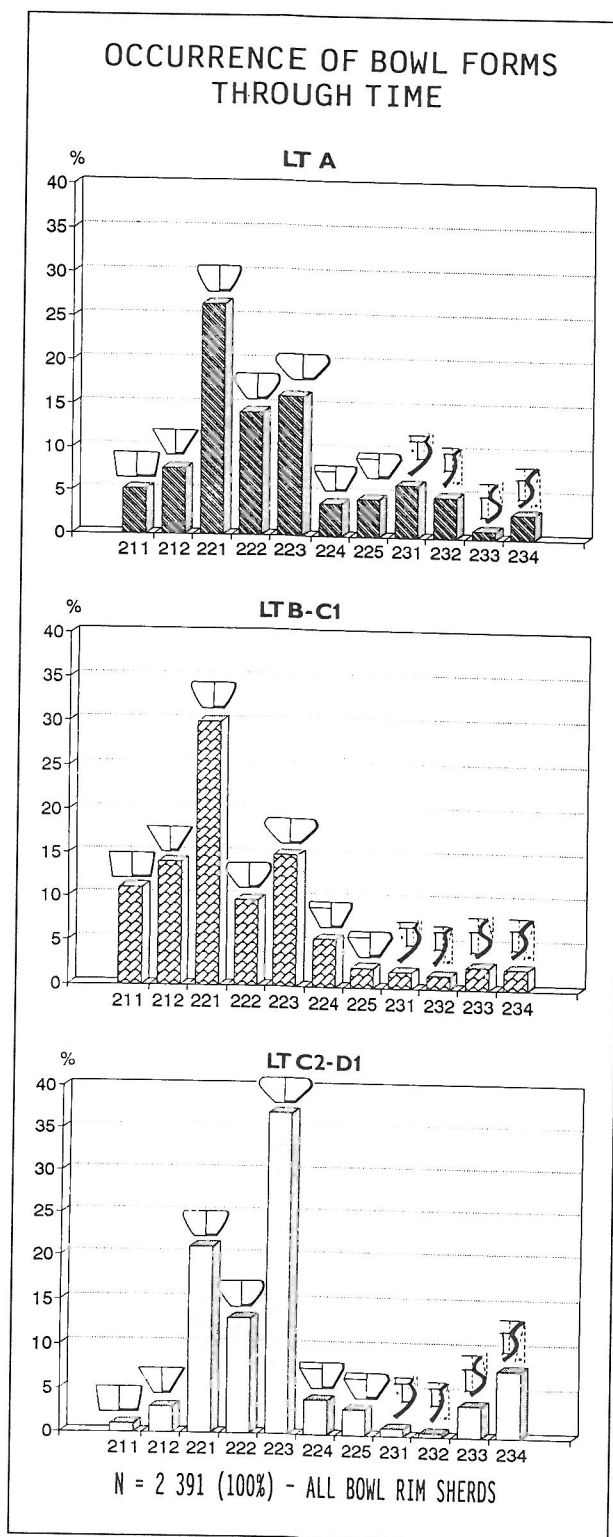
Figure 38.6: Quantitative representation of bowl types on La-Tène settlement sites in NW Bohemia

A should be applied. The user will then obtain a matrix containing single features in rows and sets of find characteristics in columns, as established in the database SFC. It is probable that a seriation of such a matrix would not bring satisfactory results, since it would include units containing either none or very few sets of find characteristics. Hence, it has to be modified — the program enables addition of both rows and columns, as well as the determination of minimum occurrence within both rows and columns, and their automatic deletion, if they do not meet the relevant limit. Rows and columns can be deleted individually as well, — in this way for instance features with evidently mixed /contaminated contents can be eliminated. Only then should the so-called seriation be performed, using the Ihm algorithm (Ihm 1983).

The matrix of type B is built up by a similar process. The result presents features in rows and single characteristics in columns, e.g. the form of the vessel.

The program also offers the option of observing the relations between two chosen characteristics — process C. Thus, this process will be used if the archaeologist wants for example to study the bowl shapes in association with the mouth diameters. In case of processes B & C, graphical representation of the results seems to be meaningful, too.

It should be stressed that it is possible to print, save or recall anything by pressing one single key.



### 38.4 RESULTS OF THE USE OF THE SYSTEM

The system of databases together with the program CAAF allows evaluation of a relatively large number of pottery assemblages, as well as solving their chronology. It can be claimed that

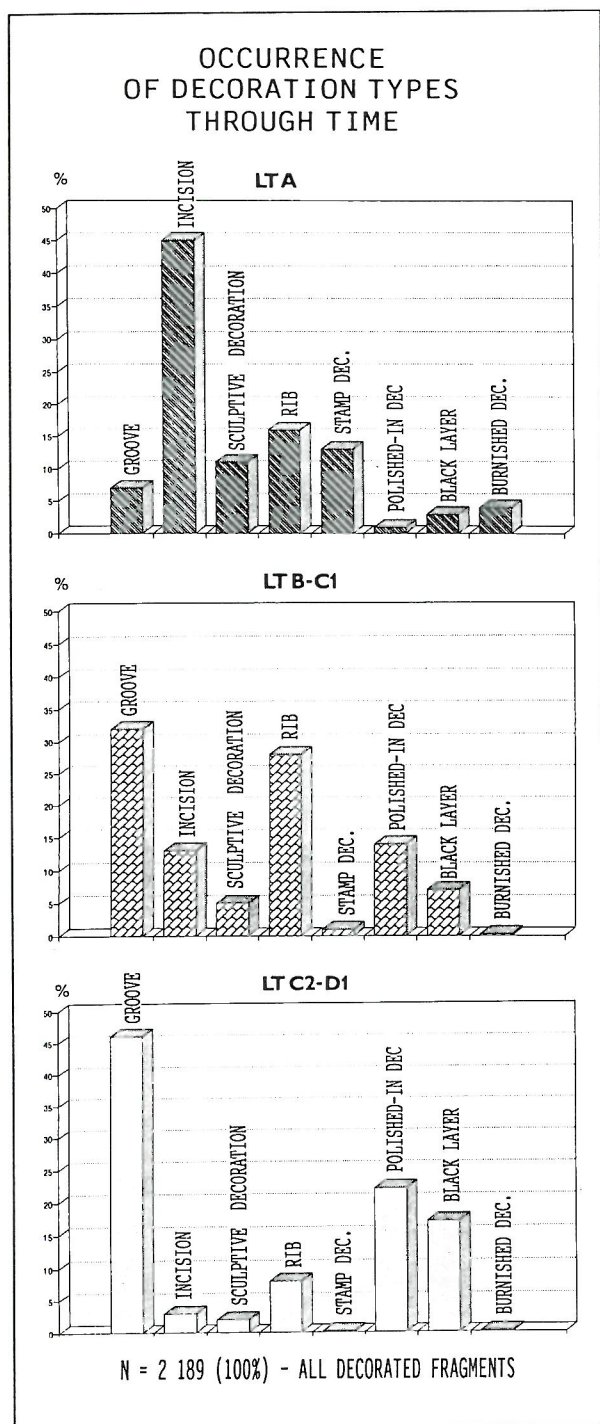


Figure 38.7: Quantitative representation of decoration types on La-Tène settlement sites in NW Bohemia

the chronology of the La Tène pottery from NW Bohemia has been solved to a great extent in this way (Salač & Smrž 1989, Salač 1990).

It is obvious that the evaluation of pottery from settlement sites is not possible without quantitative analyses. Figure 38.5 shows that pottery finds from the stages LT B-C1 are twice or

even three times less decorated than those of other La Tène periods. Clearly, just because of this we were not able to recognise either settlements or features dating from this period. Assemblages of mostly undecorated and indistinct pottery coming from LT B-C1 have been dated on the basis of a few decorated fragments, usually representing intrusions from earlier or later periods. This statement can be supported by further quantitative analyses, e.g. analyses of forms or bowl shapes (Figure 38.6), or of the occurrence of the type of decoration (Figure 38.7). It is the quantitative representation of otherwise indistinct shapes and types that provides us with new possibilities for the solution of chronological problems.

However, the analyses introduce further serious problems — for example when the atypical pottery assemblages of the LT B-C1 stages can be dated by the application of quantitative methods only, then settlements of this period cannot be effectively discovered by field walking. In fact a recent evaluation of field surveys has proved the absence of settlement sites from (LT B-C1); yet absence of settlement sites may be apparent only.

### 38.5 CONCLUSION

The whole system has been presented here as being oriented towards the solution of chronological questions. However, the program is able to process any database and it can thus be used for the solution of diverse problems, at least for the creation of initial contingency tables.

### References

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