

EAST CENTRAL AND EASTERN EUROPE IN THE MIDDLE AGES, 450-1450

The Rise of Medieval Towns and States in East Central Europe

*Early Medieval Centres
as Social and Economic Systems*



Jiří Macháček



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BRILL

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By

Jiří Macháček



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ABBREVIATIONS

AR	Archeologické rozhledy
ČSCH	Československý časopis historický
PA	Památky archeologické
PV	Přehled výzkumů
SLA	Slovenská archeológia
SPFFBU E	Sborník prací filozofické fakulty brněnské univerzity, řada E archeologicko-klasická
SPFFBU M	Sborník prací filozofické fakulty brněnské univerzity, řada M archeologická
ZfA	Zeitschrift für Archäologie des Mittelalters

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I dedicate this work to my family.

Pohansko, 25.6. 2009

Jiří Macháček

CHAPTER ONE

INTRODUCTION

The early Middle Ages is commonly viewed as a period of great significance in European history for such key issues as the emergence of individual ownership of land in areas never included into the Roman Empire; the legal codification; the conversion to Christianity; or the crystallization of new forms of social and political organization linked to appearance of medieval states. Chris Wickham's recent *Framing the Middle Ages*¹ deals with some of these, as well as other, transformation taking place in "Europe and the Mediterranean" between 400 and 800. However, most conspicuously absent from this massive synthesis of astonishing breadth and analytical depth is any reference to any region in Eastern Europe. The periphery of Wickham's "core area" in central and western Europe, which is now known as East Central Europe, remained outside his and other scholars' interest in the early Middle Ages. As Paul Barford² writes, the whole region "has been seen as 'too far away' for many western historians and archaeologists to consider in detail, and authors of general textbooks of European history...often satisfy themselves with a few generalizations on the subject."

From a long-term perspective, such a neglect verging on disdain is clearly to the detriment of any efforts at understanding the transformations taking place across the European continent during the second half of the first millennium. Clearly, the most interesting areas of current research on medieval Europe are the peripheral regions, which were only slowly and later incorporated, if at all, into the "framework" of the European medieval civilization belatedly. The situation in East Central Europe also has the advantage of inviting comparison not only with northwestern and central Europe, but also with the neighbouring Byzantine civilization. Moreover, since many of the lands now in East Central Europe have been outside the frontiers of the Roman Empire, the region offers excellent analogies for the social and economic

¹ Wickham (2005).

² Barford (2001).

transformations, which Chris Wickham has identified as typical for such other peripheral areas as Ireland or Denmark. There has been a tremendous amount of work done in recent years in East Central Europe, which now invites scholarly scrutiny and comparative work on a pan-European scale.

The proposed book is a contribution to this effort towards a broader basis for comparisons designed to help us understand the European Middle Ages. Instead of relying exclusively on written sources, We will turn to the results of archaeological research. Compared with other disciplines studying the history of humankind, archaeology is a very dynamic discipline with a continuously expanding source base (archaeological records), primarily because of extensive excavations. Recently, there have been important changes taking place not only in the in the quantity, but also in the quality of archaeological data. As a result of the application of sophisticated techniques of analysis, it is now possible to go beyond mere identification of the archaeological cultures and to explore such key aspects as the past landscape. A considerable portion of what we learned recently about the medieval landscape and the relation between humans and environment in the Middle Ages comes from archaeological studies. In contrast to other disciplines, which are often handicapped by a rather narrow and essentialist approach to sources, archaeology provides a wide range of sources of information on various aspects of life in the early Middle Ages, including important attributes of cultural and social identity (such as architecture, clothing, burial customs). The main source of archaeological data is currently excavation, complemented by various non-destructive methods and analyses from the various fields of natural science.

My goal is to draw conclusions primarily on the basis of the archaeological evidence from important early medieval central places in East Central Europe. A special emphasis will be placed on Pohansko near Břeclav, perhaps the best studied centre of its kind in the entire region. Pohansko is located in the southeastern part of the Czech Republic, not far from the Czech-Austrian border and close to the confluence of the Morava and Dyje rivers. The site has been the subject of systematic research ever since, in 1958, the first excavations were carried there by a team from the Masaryk University in Brno. To this day, over thirty-five acres have been excavated within the site itself and in its hinterland, with more than 1,300 settlement features and 880 inhumations producing a bewildering quantity and variety of artefacts (including,

but by no means restricted to, such things as five swords, twenty-two gold and a large number of silver earrings, five stirrups, dozens of spurs, silk imprints, etc.). The results of this systematic research have been duly published, and a relatively abundant body of literature on Pohansko is now in existence, which includes nine monographs and over 100 studies and contributions (mostly in Czech and German). Any attempt at making sense of the sheer quantity and variety of the archaeological record of Pohansko must begin with the definition of this (early medieval) centre as a complex system. We have chosen to do so in the terms of the system theory approach first introduced into the archaeological literature by advocates of the New Archaeology. My goal was to create a model of an early medieval centre on the basis of the Pohansko record, which could then be compared at a satisfactory level of generalization to the archaeological and historical information gained from other regions of early medieval Europe (especially from regions favoured by Chris Wickham in his book,³ e.g. England and Denmark).

With Pohansko, one begins to observe the system at work in the 500s, the date traditionally accepted for the earliest Slavic settlement in Moravia, and until the early 900s, the date of the final abandonment of the site. While limited chronologically to the period between the sixth and the tenth century, the book focuses on both the early medieval agglomeration and its broader agricultural hinterland. Moreover, for a so-called developed society like that underpinning the Pohansko system, a number of sub-systems must have been in existence, the analysis of which was inspired by Colin Renfrew's path-breaking study of the Aegean world in prehistory.⁴ Given the dynamics of any social system, Pohansko must be studied as continuously changing in time. The chronology of the site may be divided into four occupation phases, each sufficiently well defined to reflect the complex dynamics on the site as a whole.

The second part of the book compares the structure of an early medieval centre known exclusively from archaeological sources, such as Pohansko, with models of regional centres derived from the analysis of written sources. At least three such models come to mind when examining the structure of the Pohansko agglomeration: *munitio*,

³ Wickham (2005).

⁴ Renfrew (1972).

palatium, and *emporium*. As *munitio* Pohansko must be recognized among of the largest ninth-century forts of East Central Europe (so called Great Moravian Empire) mentioned in the Royal Frankish Annals (*munitiones*, *castella* and *civitates*). To regard Pohansko as a *palatium*⁵ implies the interpretation of the agglomeration as a lord's manor. In that respect, Pohansko may be compared with Carolingian and Ottonian *palatia* and, as such, the agglomeration may have in fact arisen in imitation of similar compounds erected for Carolingian rulers, an *imitatio imperii* of sorts. Finally, the reconsideration of the problem of urbanization in Pohansko involves the idea of emporium and drawing comparison between that agglomeration and ports-of-trade in northern and northwestern Europe. In that respect, the closest analogies for the site at Pohansko are the emporia at Hamwic and Hedeby. It is important to note that in terms of its formal and functional aspects, Pohansko may be best classified as an emporium of Hodges's type B,⁶ defined as a gateway community emerging as a result of massive investment by a certain ruler in order to gain control over the local production and the distribution of goods. These were permanent settlements with an archaeologically recognizable street grid and pre-planned, quasi-urban organization. Emporia of type B were not just trade, but also industrial centres, with numerous craftsmen in residence working perhaps in common workshops. The population of such sites was ten times larger than that of the surrounding rural settlements, which explains the size of emporia of type B, each with a total area of between 30 and 230 acres. Much like Hamwic and Hedeby, Pohansko ranked very high in the regional settlement hierarchy in terms of both size (136 acres) and function. The site was also a settlement built according to a previously conceived plan, with special quarters for a variety of crafts, from cloth production to metalworking. The presence of a ruler or of his deputy in Pohansko is betrayed by the palatial compound imitating a Carolingian *palatium*, which most likely played an important role in the control of the production and distribution of goods on the site and its hinterland. There are also striking parallels between consumption patterns in Pohansko (particularly in the *palatium*) and Hedeby, as revealed by the analysis of

⁵ We use *palatium* in the restricted sense of the palatial compound inside the Pfalz, i.e., the hall, the royal chapel or church, and other adjacent buildings with a residential or representational function.

⁶ Hodges (1982).

faunal remains. Unlike Viking-age emporia, however, Pohansko was already fortified in the ninth century, no doubt because of the specific political and military circumstances in Central Europe leading to the Moravian-Frankish wars. Much like Hamwic, Pohansko declined rapidly in the late 800s. After that, the leading role in the local settlement hierarchy was taken by smaller, newly built castles, similar to the *burhs* built by Alfred the Great.

In terms of methodology the book marks a new quality in interlinking methodological tools in use in Anglo-Saxon archaeology since the 1970s with new questions related to the cognitive approach in archaeology and the positivist tradition of Central European archaeology.

Although in this work we apply mainly procedures related to processualism we realize the possibilities and limits of this paradigm. In the interpretation of the identified archaeological structures we therefore attempt to overcome the functionalism, synchronism, overgeneralization and environmental determinism preferred by rigid processualists.⁷ In addition we make an effort to grasp the symbolic dimension of some phenomena, capture the diachronic transformation of society and study small local communities. We thus follow the main stream of North American archaeologists whom Michelle Hegmon⁸ classified into the “processual-plus” category.

In the practical solution of problems, probably the most important factor for us will be the archaeological method which was in the 1970s and 1980s independently formulated by E. Neustupný.⁹ Although working in the Communist Czechoslovakia, isolated from the main centres of theoretical archaeological thought in North America and Britain, his work can be clearly assigned to the progressive stream represented by personalities such as Binford, Clarke, C. Renfrew, Gardin and M. B. Schiffer.¹⁰

Following Neustupný's archaeological method the principal goal of our work can be outlined in a very simple way. We will strive to understand the practical function, social significance and symbolic meaning of the central places in East Central Europe.¹¹

⁷ More on the subject in Vašíček (2006), pp. 39–44.

⁸ Hegmon (2003).

⁹ Neustupný (1986); Neustupný (1993).

¹⁰ Neustupný (1993), pp. x–xi.

¹¹ More on these concepts in Neustupný (1993), p. 160.

As such, our work offers an alternative to traditional interpretations overstressing political developments, and attempts to place the archaeological record squarely within the lines of current developments in the historiography of the region, which stress social and economic processes over political or military events. Although several attempts were made to move away from the primarily culture-historical approach to the archaeological record of medieval Eastern Europe, no work has so far been produced that could be compared with the approach taken in this work. To put it simply, there is currently no such book anywhere in Eastern Europe or, given its subject, in Europe as a whole.

Historians, archaeologists, undergraduate and graduate students in Anthropology, Sociology, Slavic Studies, Medieval Studies, as well as Architecture will benefit from reading this book. Anyone with an interest in the early Middle Ages will also be interested in this book's comparison between sites in northwestern and central Europe. To the best of our knowledge, this is the first application of Colin Renfrew and Richard Hodges's theories to the medieval archaeology of Eastern Europe and East Central Europe. Its model of analysis will be easily recognized by those familiar with C. Renfrew and Hodges's works and will therefore contribute to a better understanding of the problems and perspectives of historical and archaeological research in East Central Europe among English-speaking scholars who often feel separated from that region of the Continent by both linguistic and methodological barriers. Nonetheless, the finds presented and the conclusions drawn in this book are unique and without precedent, a true contribution from East Central Europe to the current debate on "framing the Middle Ages."

CHAPTER TWO

METHODOLOGY

Archaeology of the Middle Ages was frequently considered an adjunct of history. Most often it merely illustrated historical facts, or emphasized artistic and architectural issues and neglected its role within archaeology itself.¹ The merging of the archaeological and historical arguments at the interpretation level would often cause the arguments to move in a circle.²

The methodological problems could be ascribed to the fact that there were no differences between the two disciplines with regards to the subject of interest that they both aim to investigate—namely the development of human society. Yet, archaeology and history are different. The fundamental distinction can be seen in the means employed by the two scientific disciplines in order to resolve the problems involved. The means of archaeology are all physical remains of past human activities denoted as archaeological records.³ In contrast to the historical written documents and oral accounts, expressed in a natural language which enables them to capture time, change, movement, purpose, motivation, or causality, the archaeological records are “dead”. This means that we are unable to observe change or indeed anything that relates to time through them.⁴ Archaeological records can only be scrutinized in terms of their form (shape, dimensions, decoration, etc.) and location in space (position, spatial relationships).⁵ This is because they have undergone a number of post-depositional transformations, i.e. they have been archaeologized. Archaeological records and their inherent structures are static, formal, material, and silent.⁶ They contain no causal relationships and consist of natural objects which are dead things without a noticeable purpose, which characterized them in a living culture of ancient people. Their original

¹ Cf. Hodges (1982), p. 11.

² Třeštík (2001a), pp. 357–361.

³ Neustupný (1986), p. 526; Neustupný (1993), p. 5.

⁴ Neustupný (2002), pp. 141–145.

⁵ Spaulding (1960); according to Neustupný (2002), p. 142.

⁶ Neustupný (1986), p. 544; Neustupný (1993), pp. 68–71, pp. 114–115.

purpose (practical function, social significance and symbolic meaning) cannot be directly “read” from archaeological records. They are retreating from a past social world back to nature and their entropy is much higher than the entropy of most of the living social entities.⁷ This fact is at the root of the distinct method that makes archaeology profoundly different from history.

Clearly, archaeological and textual sources are related in some way. The question is, however, in which way we are to relate them. It will hardly be beneficial to seek analogies to unique archaeological finds among unique historical ones, describing a particular historical event. This approach is rather problematic and in many aspects discredited.⁸ It is more reasonable to use models derived from history for the interpretation of structures inherent in archaeological records and their comparison based on structural similarity. Models derived from history (and other scientific disciplines such as ethnography, sociology, geography, cultural anthropology) are of extraordinary significance for archaeology as they can overcome the problem of time not being directly observable in archaeology.⁹

The deployment and creation of models in archaeology is a demanding task, more so in applications where we are not simply concerned with modelling partial uncomplicated phenomena but rather with investigating complex dynamic systems such as an early medieval central place or even a whole prehistoric or early medieval society.¹⁰ These require a holistic approach to the problem. The beginnings of this type of approach can be found as early as Aristotle, who was convinced that the properties of each examined object are not determined simply by the properties of its parts, but rather the properties of the whole that it is part of. In this case we investigate the system laws. The principles of holism have been integrated into a scientific discipline called the general systems theory.

From the above it ensues that the methodological foundation of this work must be the archaeological method augmented by the systems theory.

⁷ Neustupný (1998a).

⁸ Neustupný (2002); Třešník (2001a).

⁹ Neustupný (1986), pp. 542–548; Neustupný (1993), pp. 154–163; Neustupný (2002).

¹⁰ Neustupný (1986), pp. 542–548; Neustupný (1993), pp. 154–180.

2.1 THE ARCHAEOLOGICAL METHOD

As the archaeological records have only two observable types of properties—form and location in space—the method of their processing will accordingly consist of two principle components. The analysis and synthesis of archaeological structures can therefore take place in formal or geographic space. At the same time, one should always bear in mind that the archaeological records have undergone a number of profound transformations which act as a very efficient filter between the archaeologist and the past living human society that is under investigation. If we are serious about working with archaeological records we should also deal with the consequences of the post-depositional processes caused by the transformations.

2.1.1 *Depositional and post-depositional processes*

The study of the processes occurring during and after the discarding of parts of material culture from a living culture is of immense importance for methodology. As a result of those transformations parts of the original living culture were essentially changed (i.e. archaeologized). This change significantly determines our ability to learn about the past directly through the archaeological records. The existing distortion is too often neglected. Archaeologists work with an assumption that the assemblage of artefacts was created at the same time and that all the finds contained within were put out of use simultaneously and unselectively. This approach is described as the “*Pompeii premise*”.¹¹ However, the assumption is completely false. An archaeological record is a dead, formal, and static object” which is determined both by the past living culture and at the same time is the result of multiple qualitative and quantitative transformations”.¹² If we want to attempt a reconstruction of the past life we need to recognize the individual phases of the transformation of archaeological records so that we can invoke their inversion. “If the lost system—a human group with its activities and life conditions—is to be reconstructed, then those processes should also be identified, which produced the archaeological record.” (*Wenn das vergangene System—eine menschliche Gruppe mit ihren Tätigkeiten und Lebensumständen—rekonstruiert werden soll, so*

¹¹ Bernbeck (1997), p. 66—with references.

¹² Neustupný (1996), p. 490.

müssen zunächst die Prozesse identifiziert werden, die den archäologischen Befund produzierten).¹³ Research into the above processes is an indelible part of the archaeological method itself.¹⁴

The fundamental works on the subject of depositional and post-depositional processes were written by M. B. Schiffer.¹⁵ According to M. B. Schiffer we can distinguish two basic types of transformation to which archaeological finds are subjected: the c-transformation effected by people and the n-transformation due to natural causes.

The work of U. Sommer¹⁶ greatly contributed to the subject under discussion. Her system of the depositional and post-depositional processes is based on palaeontological taphonomy, a science examining extinction and transformation. It distinguishes between four basic phases in which organisms can occur from the viewpoint of palaeontology. The phases roughly match the phases in which ethnologists or archaeologists can find ensembles of objects from human material culture:¹⁷ *biocenosis*, *thantocenosis*, *taphocenosis* and *oryctocenosis*. In archaeological practice “*biocenosis*” might include, for example, a group of vessels occurring at the same time in a single household, “*thanatocenosis*” shards stacked on a single heap of waste; “*taphocenosis*” might embrace fragments sliding from the surface into an abandoned storage pit, while an assembly of finds acquired by archaeological excavation and kept in a museum belongs to “*oryctocenosis*”.

It seems, however, necessary that the approach of U. Sommer is added to by introducing important aspects of quantitative transformation¹⁸ not included in palaeontological taphonomy. These are fragmentation, accumulation and reduction.¹⁹ Quantitative transformation is most clearly apparent in the parts of archaeological records which occur in greatest numbers in the archaeological context. An example of this type of find is pottery, which can be used to demonstrate the consequences of qualitative transformations. The number of fragments (fragmentation) that a vessel or another item of material culture will break into after being discarded from “*biocenosis*” depends on many factors. It is influenced both by the n- and c-transformation, and the

¹³ Bernbeck (1997), p. 66.

¹⁴ Neustupný (1986), pp. 527–531; Neustupný (1993), pp. 44–67.

¹⁵ Shiffer (1972); Shiffer (1976); Shiffer (1987).

¹⁶ Sommer (1991).

¹⁷ Ibidem, p. 75.

¹⁸ Neustupný (1996a), p. 497.

¹⁹ Neustupný (1986), p. 528; Neustupný (1996a).

pottery type, technological properties, etc. Different types of finds after they have been through various transformations will fall apart into a different number of fragments. For example, shards from individual vessels or their great parts can accumulate, but not randomly, in pits (accumulation) into which they had been purposefully dropped or they had been transported there by n-transformation from surface refuse areas where shards from complete broken vessels form spatially related clusters. When pottery has been present in the cultural layer (especially its top section which is walked on and is exposed to weather, etc.) for a lengthy period, it suffers a significant quantitative reduction (up to 95%).

According to E. Neustupný²⁰ all the quantitative transformations (mainly accumulation) which are not random cause great problems regarding the statistical evaluation of finds from archaeological contexts. Virtually all the traditional statistical methods are based on the assumption of working with a random sample from the statistical population. With this in mind comparing assemblages by percentile distribution of specific attributes of the archaeological evidence that they contain may seem dubious. It can be side-stepped by working with sufficiently extensive samples where the non-randomness is balanced out (for pottery from the urn field period E. Neustupný estimates they could be assemblages amounting to hundreds of shards) or by using special procedures. To take an example, in processing pottery, shards proven to originate from a single vessel can be grouped for the purposes of statistics and the minimum number of individual vessels in the sample established (the procedure is not reliable in extensive samples), data can be dichotomized (only the absence or presence of properties in the sample is monitored), the values of deviations from the expected values are recorded, etc.

In consequence of applying the special procedures mentioned above, the results of which, based on empirical findings, do not unfortunately bring about a great improvement on the standard methods, the information potential contained in the archaeological data is significantly reduced. Therefore, in spite of the danger of distortion, archaeologists work with full numbers of finds.²¹

²⁰ Neustupný (1996a), pp. 502–505.

²¹ *Ibidem*, pp. 503–504.

In evaluating pottery, C. Orton²² proposes to work with pottery weight or complex calculations of vessel equivalents. According to him, as opposed to the number of shards or an estimate of the minimum/maximum number of individual vessels, those values make it possible with relative reliability to establish the proportionate representation of types in different assemblages. However, Orton's proposal only covers the fragmentation of pottery and ignores its accumulation and reduction.²³

The presented problem is partly resolved by the notion of "archaeologically homogenous assemblages". All the finds contained in them share the same post-depositional history. These samples are better suited for statistical purposes²⁴ and enable comparison with other assemblages of identical post-depositional history. The decision whether the assemblages are truly archaeologically homogenous, can only be made based on a detailed study of the transformations and post-depositional processes that the archaeological content have been subjected to. The study also includes the definition of a standard sample of finds, which is useful especially in establishing the value of the assemblages of numerous types of archaeological finds (here mainly pottery). We will use them in order to identify which samples are sufficiently representative to formulate general conclusions.²⁵

In this context it is necessary that we characterize the term assemblage. By no means should it be confused with the term "genuine or close association" as understood by Oscar Montelius, which permits the application of specific methodological procedures.²⁶ In this book, the assemblage is understood as a group of finds from a settlement feature, which occurs in the last taphonomic phase—*oryktocenosis*. This entails important restrictions in processing these assemblages and the necessity of the so-called inversion transformation, with the purpose of restoring information lost during the formation processes.²⁷

²² Orton, Tyers, Vince (1993), p. 171.

²³ Neustupný (1996a), p. 503.

²⁴ Orton, Tyers, Vince (1993), p. 168.

²⁵ Salač (1998).

²⁶ Vencl (2001).

²⁷ Neustupný (1986), 529–531; Neustupný (1993), 71–72.

2.1.2 *Archaeological records in formal space*

Formal, “mathematical” space, as defined by E. Neustupný,²⁸ is superimposed over the geographic space in which the real world is situated and which delineates the space in which humans live. As opposed to the three-dimensional real space it can be multi-dimensional and has been introduced in archaeology in order to help us specify the properties of the individual objects of the social world created and predetermined by human beings. The objects in the formal space are archaeological entities and qualities produced by the application of the archaeological method through the decomposition (analysis) of the archaeological context, or a set of archaeological records. The analysis is followed by a synthesis aiming to assemble the elements singled out by the analysis into archaeological structures, which reflect formal regularities in the record. The necessary validation of the structures must be followed by interpretation derived from archaeological models and expressed using normal, standard language.

2.1.2.1 *Archaeological analysis*

The analytical phase of the archaeological method is concerned with the decomposition (analysis) of the archaeological context and its properties, material (archaeological excavation) or mental (transformation of archaeological evidence into archaeological data—definition of entities and qualities, creation of a descriptive system). The context is decomposed into parts of two kinds: entities and qualities.²⁹ According to E. Neustupný entities are the structuring spatial elements, examples of which might be a region, a grave, a cemetery, a settlement pit, a concentration of stone industry, a vessel, a shard, etc. The success of an archaeologist’s work depends on whether he or she is able to pinpoint, from among an enormous quantity of archaeological points, those that are truly structuring (should an entity be a single shard in a pit, a single layer in a pit, the pit as a whole or the whole settlement?). The archaeological points carry important information about spatial relationships, locations and distances.

Qualities are the properties of the entities. They can include the particular decoration of a vessel, the number of rims of a particular type in a single assemblage, the area of a fortified settlement, etc. Theoretically,

²⁸ Neustupný (1996b).

²⁹ Neustupný (1986), pp. 532–537; Neustupný (1993), p. 80, pp. 89–96.

each entity has an infinite number of properties. It is up to the archaeologist to decide which ones to choose. Here, just as with the definition of entities, the archaeologist is to be assisted by a preliminary or previous model. In this particular case the model is based on the knowledge of analogical contexts, results of pilot projects, planned targets of the analysis, etc. The core problem is to assess whether the selected entities and their qualities can contribute to creating archaeological structures. The precise formulation of a preliminary model should entail all the pre-conditions that guided us in selecting the entities and qualities. It is important for a potential review of the points of departure and, at the same time, it helps us overcome subjective intuition which is a wide-spread and productive procedure in archaeology but it can hardly be controlled and reproduced.³⁰

The climax of the analytical phase of the archaeological method is the creation of a descriptive system and the description itself. The modern tool of archaeological description is relational databases. They are the practical realization of the data model, the design of which is based on the archaeological analysis. The database is comprised of database tables interlinked by relations. The database table consists of rows and columns. The rows represent the individual entities; the columns contain their qualities.³¹ The information held in the descriptive system is obtained either by direct observation (primary descriptive systems) or subsequent calculations which can yield, for example, a matrix of correlation coefficients (secondary descriptive systems). The language of archaeological description is formally or semi-formally encoded in an alphanumeric code. The code must be precisely specified. During description it facilitates the objectivization and formalization of the bits of information.³²

2.1.2.2 *Archaeological synthesis*

The decomposed, formalized and described archaeological records serve as the basis for the synthesis of archaeological structures. During the synthesis we search for non-randomness, regularities, and patterns. If we discover the structure of archaeological data, it can be hoped that through that we will also be able to identify patterns in

³⁰ Neustupný (1986), pp. 534–535; Neustupný (1993), pp. 78–79.

³¹ Macháček (1997).

³² Neustupný (1986), pp. 536–537; Neustupný (1993), pp. 105–112; Macháček (1997).

the behaviour of people from the past times. This idea, which is at the root of archaeological study of the past, is based on the assumption that if the behaviour of people creating their culture would not follow patterns, the entities and qualities of their material culture would be distributed randomly.³³

The structure of archaeological data in formal space is influenced by many factors. Traditionally, the greatest attention is paid to the question of time. Undoubtedly, other aspects—functional, social, ethnic, aesthetic and their combinations—played an important role as well. Most of the archaeological records are therefore arranged in multiple dimensions. This greatly affects (and in some cases even inhibits), the use of automatic seriation, based on the permutation of the rows and columns of the descriptive system, which in principle can be applied only to phenomena with a uni-modal model of development.³⁴ Many methods used in this book, such as the principal component analysis (PCA), derive primarily from factor analysis. This is an exploratory data analysis. It is an approach to analyzing data for the purpose of formulating hypotheses. It provides the optimal solution for the given descriptive system exploiting the contained information. The principal component analysis (also known as vector synthesis) was placed at the core of the archaeological method according to E. Neustupný.³⁵ In this book it will also form the technological basis for the synthesis of archaeological structures in formal space. It will, however, be accompanied by other multivariate methods, such as cluster analysis.

The principal component analysis belongs, together with correspondence analysis, factor analysis, discrimination analysis, etc., to a large family of multivariate statistical methods. They facilitate the interpretation of large sets of scientific data by means of the reduction of a great number of variables in the descriptive matrices. The fundamentals of the methods from the factor analysis family were initially developed in the 1920s and 1930s for research in psychology.³⁶

The starting point for the analyses mentioned above is a descriptive matrix. The rows of the matrix contain objects/archaeological entities (e.g. graves), which may be characterized by a (potentially) great

³³ Neustupný (1986), pp. 537–538; Neustupný (1993), p. 113.

³⁴ Salač (1997); Zimmermann (1997).

³⁵ Neustupný (1993), pp. 128–149; Neustupný (1997b).

³⁶ Gould (1998).

number of variables/archaeological qualities (e.g. depth, number of vessels, coffin length), organized in columns. Each object represents a point in multidimensional space, determined by the co-ordinates of the variables.³⁷ The points are usually not scattered evenly, which creates specific structures, e.g. they may be dispersed in a particular direction within a greater length than in the other direction. The study of their distribution can help us to establish the relationships between the variables, between the objects, to identify the main trends present in the data, and to estimate which variables contribute to the trends.³⁸

A practical procedure in calculating the main components and their interpretation are clearly explained, including study cases, by E. Neustupný:³⁹

In the first step we carry out calculations from a descriptive matrix which must be comprised of real numbers only and must not contain missing data, correlation coefficients which express the dependence between the individual variables. The correlation coefficients are then arranged into a symmetrical, square matrix, which can be used to establish the correlation between concrete variables. In the next step the correlation matrix is “orthogonalized”, i.e. one looks for vectors,⁴⁰ which are mutually independent, and are situated at a right angle to each other. Thereby we obtain the so-called eigenvectors, and from them the factors as well. “The factors—wrote E. Neustupný—represent specific ‘multi-relationships’, which are typically repeated in a given set of objects of the descriptive system.” By means of factors we then find out which variables in the matrix are significantly correlated. This is of great importance for later interpretation (we may for example discover that certain pottery attributes are found in settlement pits very often together which can be of significance for specifying a chronological phase or for the functional interpretation of the pit, etc.).

³⁷ It can be simply understood in a two-dimensional graph where the x-axis is the grave width and the y-axis is the grave length; each grave will be characterized by the intersection of its length and width. As the grave length and width most likely correlate (the greater the length the greater the width), the points will be dispersed in a particular direction (given by the relationship between the length and the width) up to a given distance. The distance and the direction will be different from other descriptors.

³⁸ Shennan (1988), pp. 241–244, 261.

³⁹ Neustupný (1993), pp. 128–149; Neustupný (1997b), pp. 237–258.

⁴⁰ Term explanation in Neustupný (1979), pp. 56–59.

At the end of the procedure we have a matrix of factor loadings (coefficients) which indicate to what extent a variable is typical for the given factor as a whole. The maximum number of factors cannot exceed the number of variables in the descriptive matrix. To continue with the analysis we choose a smaller number of factors partly in order to reduce as much as possible the confusing number of variables from the original descriptive matrix, and partly to eliminate the “noise” in the correlation matrix as well as insignificant factors. E. Neustupný⁴¹ provides guidance in selecting the appropriate number of factors, which is crucial. With a small number of factors a vital factor might be omitted, while choosing an excessive quantity of factors will generate insignificant “noise” difficult to interpret.

To obtain a clear result the factors are transformed by the so-called rotation. The outcome of the gradual transformations of the factor loading matrices is the so-called simple structure, i.e. a form of the factor matrix in which each variable has a very high loading, relative to only a single factor, while its loading, relative to the other factors, approaches zero. The rotated factors are much easier to interpret. The factor loadings are assigned values from 1 to -1, whereby variables with a high positive factor loading are very typical for the given factor while variables with a loading around zero are insignificant for the factor. Variables with high negative values counterbalance variables with high positive values and are typically characterized by their opposite.

If we want to establish to what extent a particular factor is characteristic for each of the objects of the original descriptive system, we calculate the so-called factor score which expresses the actual value of a given object for a given factor. The higher the absolute value of the factor score, whether positive or negative, the more typical is the object for the positive or negative pole of the factor.⁴²

The cluster analysis is based on relatively simple principles:⁴³

- objects/entities (e.g. vessels) have measurable variables/qualities; these can be numerical variables (e.g. vessel mouth diameter), or nominal variables, expressed through presence/absence (1/0) (e.g. decorated/undecorated)

⁴¹ Neustupný (1997b), p. 241.

⁴² Ibidem, pp. 237–244.

⁴³ Bernbeck (1997), p. 214.

- each object can be imagined as a point in multidimensional space; each variable represents one axis of the space
- the linear Euclidean distance between the objects in multidimensional space can be determined in metrical units
- points located near one another create clusters; objects belonging to a single cluster are similar and form a single type.

In the cluster analysis we search for groups of points which are as close to one another as possible (i.e. they have maximum similarity) and, at the same time, are at a maximum distance from the points in other groups (i.e. they are as little similar as possible).

There are more different methods of cluster analysis.⁴⁴ In archaeology it is the method according to Ward which is often used within the hierarchical agglomerative method. It is expected to produce very homogeneous clusters of roughly identical size. The single linkage method is less suitable for archaeological data as it often fails to identify fairly different clusters when there are additional points situated between the larger clusters.⁴⁵

The graphic output of the cluster analysis is the dendrogram—an agglomerative hierarchical tree which depicts the origin of the hierarchical structure of the clusters. The dendrogram may illustrate the clustering of both objects, and variables. It starts with single-element sets (the individual objects or variables/attributes), which are joined at various levels (in the subsequent steps) with other elements or previously formed groups based on mutual similarity. The process is finished at the moment when all the elements are contained within a single large group. The archaeologist needs to determine in which step the number of clusters makes most sense. Sometimes the decision making is based on common sense or external evidence, although there are procedures available (e.g. discrimination analysis, factor analysis), which can be employed in order to validate the clusters in an objective manner.⁴⁶

The cluster analysis has certain inherent methodological risks. Some are relatively simple to eliminate, while others may be more difficult to avoid.

⁴⁴ Dreslerová—Turková (1989), p. 416, p. 418; Shennan (1988), pp. 212–228.

⁴⁵ Aldenderfer (1982), p. 63; Dreslerová—Turková (1989), p. 420, p. 425.

⁴⁶ Aldenderfer (1982), pp. 61–71.

The former include problems related to the different scale of attributes. With regards to Euclidean space it is unimportant whether two vessels differ by 1 cm in the mouth diameter or by 1 cm in the wall width, the distance is identical. However, the factual difference between the two items of data is more profound. The different variables need to be standardized.⁴⁷ While this can be accomplished by various methods, the result is similar. The variables are converted from absolute to relative values which are comparable.

Another (more serious) problem related to Euclidean space is due to the fact that its axes defined by variables must be at a right angle to one another. This is to enable us to calculate the distances between points in rectangular space. The axes are at a right angle only when the variables are completely independent of one another. However, in practice such a situation never happens. When the variables are not independent, their axes are not at a right angle and the calculated distance between points, based on which we create clusters, is inaccurate. The solution consists in selecting mutually independent variables by means of the so-called orthogonalization, which is integral to the principal component method (PCA) (see above).⁴⁸ A selection of variables by means of the PCA will ensure that variables with an above average and false effect on the grouping of objects are eliminated while relevant variables important for the cluster analysis are retained.⁴⁹

2.1.2.3 *Validation and interpretation*

The structures produced by archaeological synthesis are abstract. This means that they are not concrete explanations, but rather patterns, contained in the archaeological record with which, however, they are not identical. Being generated by means of a formalized descriptive system, they are consequently formal as well.⁵⁰ They are just outputs of mathematical-statistical methods which need to be interpreted independently of the method through which they have been obtained.⁵¹ Prior to moving on to the interpretation proper, we must verify the reliability of our findings. The type and extent of data permitting, the goal can be accomplished by employing a statistical testing method.

⁴⁷ Bernbeck (1997), p. 215.

⁴⁸ Shennan (1988), 200.

⁴⁹ Bernbeck (1997), pp. 216–217.

⁵⁰ Neustupný (1986), p. 542; Neustupný (1993), pp. 114–115.

⁵¹ Müller (1997), p. 6.

Statistics provide us with various procedures to express the credibility of our results. The elementary ones include for example the Chi-square test applied to validate the statistical significance of differences between variables in a contingency table. The test is based on measuring the differences between the actually observed cases and the values to be expected provided that the compared variables are independent.⁵² Another simple statistical test used in this book is the two-sample test of equality between two selections. More often used in archaeology is the non-parametrical Kolmogorov—Smirnov test. This method checks whether the two data samples come from the same distribution.⁵³

In practice one often faces a situation where the archaeological data are not suitable for traditional statistical testing (failing to meet some initial conditions for statistical tests, such as normal distribution or extent). In such cases E. Neustupný⁵⁴ recommends a procedure called “validation of formal structures”, which will help us establish whether the discovered structures are really significant or not. Validation is carried out based on what is called external evidence, i.e. archaeological data, which were not part of the descriptive matrix used in the synthesis of formal structures. This can include, for example, the gender of the humans buried in the particular graves or spatial relationships (e.g. vertical stratigraphy or spatial grouping). The probability that the same structure would be expressed twice on different datasets is very low. The comparison of formal structures with external evidence is applicable beyond validation, in the next phase of the archaeological method—interpretation. The reliability of our findings can be heightened if we succeed in obtaining identical or similar results by various methods of formalized synthesis or through a modified descriptive system.

If we intend to bring back to life the formal and mute archaeological structures, in order to denote them and understand their function, significance and meaning within the framework of the system of living culture, the interpretation requires the deployment of models derived, for example, from history, ethnology or experimental archaeology, i.e. sciences concerned with observing in time the living human culture

⁵² Janssen–Laatz (1994), pp. 209–225.

⁵³ Macháček (1997), pp. 41–43 with references.

⁵⁴ Neustupný (1997b), 243.

directly or indirectly. As an alternative it is also possible to formulate general models created, e.g. by gradual development and more concrete specification of the consequences of the impact of a particular abstract category of living culture or events on the evolution of material culture.

The patterns of living material culture are expressed by categories of living culture. In contrast to archaeological records they are not limited by having only a material structure. They also possess function, which is a manner by which a specific fact of material culture is generally used in practical life, significance, attributed to the fact within social relationships among people, and, finally, meaning, which a material fact can acquire in the mental world of people and which can be substantially different from its function and significance.⁵⁵ The material structure is the form of the categories of living culture while their content is function, significance and meaning.

The model building is based on the assumption that the same or similar content produces in most cases the same or similar form and, vice versa, the same form of two phenomena is evidence of the same content. During modelling we formulate a model based on the categories of living culture using the knowledge of non-archaeological phenomena. "If the system of material structures of the context (archaeological—note by Jiří Macháček) is identical with the system of material structures of the model, we can justifiably consider it to be identical with regards to function, significance and sometimes even meaning."⁵⁶ To avoid problems caused by introducing random or misleading analogies or the historical determination of material structures, which may be affected by specific local or contemporary conditions, the models should not be approached as isolated analogies but rather as systems. Comparison is then not made between the individual structures, but between the whole networks of structures, which are causally linked together. A model must take the form of a theory!⁵⁷ With this point of view in mind it is obvious that the methodological foundation on which the modelling is based lies in the systems theory domain (see Chap. Systems theory in archaeology).

⁵⁵ Neustupný (1986), pp. 543–544; Neustupný (1993), pp. 157–159; Neustupný (1995).

⁵⁶ Neustupný (1986), p. 544.

⁵⁷ Neustupný (1986), pp. 542–548; Neustupný (1993), pp. 154–178.

2.1.3 *The archaeological record in geographic space*

Geographic space is the real space of our world. The location in geographic space is an essential property of the archaeological record.⁵⁸ As independent external evidence it is used to validate formal structures,⁵⁹ often vitally helpful in their interpretation, and sometimes itself becoming the basis of a synthesis.⁶⁰ The point of departure in spatial analysis and synthesis is the term “polygon” derived from topology. It is a continuous area in geographic space, determined by a final number of points connected by a line. The polygon refers to the location and spatial relationships.⁶¹ It is a two-dimensional representation of three-dimensional real objects. The necessity of abstraction is due, among other things, to the imperfect nature of computer technologies which in their absolute majority work only with two-dimensional space. Besides an area, the polygon can also express a point, when it has an infinitely small area and perimeter, and a line, when it has an infinitely small area.⁶² Its concrete definition is the task of the entity analysis during which we identify the archaeological points and bodies that are structuring in terms of the issues under examination by archaeologists.⁶³ According to E. Neustupný there are two basic types of archaeological polygons: delimiting polygons, which are a direct reflection of archaeological entities (e.g. settlements, graves, shards), and enclosing polygons, such as, for example, the squares of an arbitrarily specified grid; their archaeological significance is given by their relationship to the archaeological entities and by the different content of artefacts or ecofacts.⁶⁴

Spatial structures are often used for the validation and interpretation of formal structures and vice versa. The essential elements here are the different forms of grouping.⁶⁵ Combining formal structures with the spatial dimension is an important methodological procedure both in archaeology and other disciplines studying human society. A typical

⁵⁸ Neustupný (1993), p. 81.

⁵⁹ Neustupný (1997b), p. 244.

⁶⁰ e.g. Dreslerová—Turková (1989).

⁶¹ Neustupný—Venclová (1996), pp. 620–621.

⁶² Neustupný (1996b).

⁶³ Neustupný (1986), pp. 533–535; Neustupný (1993), pp. 80–82.

⁶⁴ Neustupný (1996b).

⁶⁵ Neustupný (1996b); Neustupný (1997b), p. 244.

example is an urban planning and infrastructure study (analogical procedures are appropriate as archaeology is also concerned with the study of the “infrastructure” of ancient society). Superimposing formal structures over real space is commonly used here in testing hypotheses (validation) and interpreting formal structures (e.g. clusters). The decisive criterion, similar to Neustupný’s, is the different manners of spatial grouping (“räumliche Konzentration”).⁶⁶ However, the method is not sufficiently potent for working with comprehensive and complex spatial structures. For their validation this study proposes and employs the so-called hierarchic structural method (see Chap. 4.5.2).

The technology that enables us to work with archaeological spatial structures is called the Geographic Information System (GIS). GIS is an imperfect image of the world where the real objects are converted into polygons (points and lines) and broken into layers of a two-dimensional static display. The image does not match up to the real situation, as it lacks many pieces of information and many errors are added to it. Despite the problems, GIS is currently one of the most efficient methods of collecting, organizing and using large volumes of spatial data.

There are two basic GIS data models: raster- and vector-based. The property that the two models have in common is the necessity to decompose the real world into, at least, two-dimensional geometrical elements (geo-objects)—points, lines, or areas.

At the heart of the raster-based model is the idea of dividing up the space using a regular grid into individual sections—cells of specified selected size. The different geo-objects cannot be displayed directly, it is only possible to observe the distribution of their properties in space. Each cell is assigned three numerical variables: the X, Y coordinates determining the location and the third Z variable denoting the state (value) of the cell. It can be a measurable value (e.g. the elevation of the cell) or a state expressed by an indicator (e.g. the type of the underlying geological strata). While the cell size can be defined at random, it should be a compromise between sufficient accuracy of the grid and the number of cells, as large quantities thereof slow down calculations. Raster-based geographic information systems are better suited for specialized tasks and they are furnished with a multitude of

⁶⁶ Hamacher—Preiser (1977), pp. 147–160; Rase—Paech (1977), pp. 133–146.

analytical functions to this purpose. The most important ones include interpolation of discontinuous data to a continuous surface, digital elevation model (DEM) creation, arithmetic operations between two layers, calculations of accessibility between two points based on cost distance, slope orientation and aspect, watershed area and a number of statistical operations.⁶⁷

In the vector data model the geometrical properties of geo-objects are expressed by means of geometrical elements—oriented line segments, the so-called vectors—combined to form polygons, points and lines. This creates the great precision of the graphic component of the vector data model. Each geo-object is assigned a unique identifier which provides a link to its non-graphic attributes, mostly stored in huge relational database tables. An advantage compared to the raster model is the fact it is possible to work directly with geo-objects (they can be edited, copied, moved, deleted, etc.), the result of which is very simple access to all of its attributes. The disadvantage can be seen in the fewer analytical functions that the vector model offers. The basic types of tasks solved in this model are related to identifying what is situated at a specific place or seeking out places which satisfy specific spatial and non-spatial conditions.⁶⁸

There is also a hybrid data model available which was developed out of a need for unified processing of vector and raster data. It is the hybrid model that will be used throughout the present book.

Only the appreciation of the archaeological records as remains of a structured system, which has a formal and spatial dimension, leads to learning about the development of human society in all of its complexities, without ignoring substantial aspects such as the relationship of people to the natural environment, social relationships within society, development of settlement precincts, etc.

Approaching this challenging task of enormous complexity is enabled by marrying GIS with the multivariate statistic. Based on the theoretical points of departure mentioned above it is possible, with the assistance of up-to-date computer software, to project the formal properties of archaeological records into real space or, in the opposite

⁶⁷ DeMers (1997), pp. 102–108; Kuna (1997), pp. 173–176; Rapant (1999).

⁶⁸ DeMers (1997), pp. 108–115; Kučera –Macháček (1997); Rapant (1999).

direction, to transfer geographical and topological properties into formal space.

2.2 SYSTEMS THEORY IN ARCHAEOLOGY

It has already been pointed out that modelling is an important part of the archaeological method. Without a model we are unable to interpret the archaeological structures obtained through the process of archaeological synthesis. However, the development of models is an extremely demanding task, more so in such dynamic and complicated systems as human society. It was for this reason that archaeology embraced the systems theory—a scientific discipline concerned with the formulation and deduction of general system laws, applicable to all systems of a particular type.

The systems theory strives to identify the most general characteristics and patterns of various systems based on their isomorphism (similarity in form and relations). It is a general method of scientific thinking which examines the functioning of complex wholes as a result of their structure. A systemic approach is based on the holistic assumption that interactions between parts of a whole are important for the property of the whole and that the whole can have properties which are not directly a result of the properties of its parts. In this respect, systems theory departs from the traditional Newtonian premise that the properties of the whole are the sum (or the result) of its parts' properties. Efforts to use the systems theory as a connecting bridge between the specific methods of the individual disciplines are also important. One of the founders of the systems science is Ludwig von Bertalanffy, who initially was interested in biological systems, but later extended his theory to formulate a general systems theory, close to cybernetics.⁶⁹

In archaeology the systems theory was introduced in the late 1960s mainly as an important methodological component of processual archaeology.⁷⁰ One of the pioneers of its application was K. Flannery's work on Central America. As revealed later, early processualism had

⁶⁹ Bernbeck (1997), pp. 110–11; Kučerová (2002/2003), p. 8; Tomis, Němec, Balcová (1989).

⁷⁰ E.g. Plogg (1975), p. 207.

unrealistic expectations from the systems theory.⁷¹ Processualist archaeologists thought rather unrealistically that the systems theory would allow us to penetrate to the core of the problems of human culture without a bias, as if from the outside. Part of the trend was also the idea that culture can be objectively expressed in mathematical terms, a notion that proved impossible. It was mainly post-processualists who exposed the subjective character of archaeological interpretations.

Historiography may have had the same experience as archaeology. While some historians continue to use terms originating from the systems theory (system, system elements, multi-dimensional relations) when describing the complicated world of human society,⁷² they consider its consistent application unfeasible.⁷³ Neither do archaeologists expect today that systems theory alone could help them explain why cultural changes occur. It is however still employed in order to effectively describe cultural processes and to model the relationships between the individual parts of cultural systems. Its application in archaeology leads to an improved logic of argument and to abandoning simplified mono-causal interpretations.⁷⁴ The systems theory can become the platform for exchanging knowledge between archaeology and other scientific disciplines and, most of all, the starting point in developing high-quality interpretation models which should be the main products of archaeological research.

As has often been pointed out by E. Neustupný,⁷⁵ archaeological records do not allow us to observe change nor anything depending on time or motion. Archaeological records are static, formal, material and mute. They do not provide us with clues regarding their function, significance and meaning.⁷⁶ Therefore, the archaeologist is forced to compare archaeological structures, defined by their formal and spatial properties, with models derived from disciplines, capable of working with the time category based on their own records (e.g. history). They are by no means chaotic hit-and-miss attempts at random analogies. Rather, it is the building of theoretical models which, as E. Neustupný

⁷¹ Johnson (1999).

⁷² Třeštík (1999), p. 76.

⁷³ E.g. Třeštík (2003), pp. 32–33.

⁷⁴ Bernbeck (1997), p. 123; Johnson (1999).

⁷⁵ E.g. Neustupný (2002), p. 143.

⁷⁶ Neustupný (1986), p. 544; Neustupný (1993), p. 154.

noted,⁷⁷ is a very delicate task. Modelling must follow precisely and logically formulated rules. Models cannot be understood as isolated analogies but as systems of interconnected categories of living culture. We compare whole networks of structures defined mainly by their links. This kind of comparison requires a certain degree of abstraction. In the modelling method we compare a system of categories of living culture with a system of structures/patterns, contained in the archaeological context—a set of archaeological records. From an agreement between the system of material structures of the dead archaeological context with the system of material structures of the model of living culture we arrive at conclusions about the agreement of function, significance and occasionally even meaning.⁷⁸

From what has been said so far about this issue, it follows that at the core of modelling is a solid description and definition of the system, including both the system of archaeological structures and that of the living culture. The indispensable methodological tool in the definition is systems theory.

According to systems theory, we introduce a system at the moment of defining its elements (parts) and their relations, which form the wholeness of the object, i.e. the structure and the function of the object. An element is a part of the system which cannot be subdivided any further. The structure is the set of relations between the elements within the system. Within complicated systems there might be found additional subsystems. Each system also has its environment, i.e. a collection of elements which are not part of the system, but their change can cause a change of the state of the system or, vice versa, their properties can be changed as a result of the system behaviour. Those external (outside) elements are adjoined to the system by boundary (input and output) elements, the set of which form the boundary (interface) of the system. Internal elements are only linked to elements from within the same system. During the system examination we try to isolate and simplify the system and then describe the interactions between the individual system elements.

The systems studied by archaeology are dynamic. This means that they are distinguished by targeted behaviour aimed at a particular

⁷⁷ Neustupný (2002).

⁷⁸ Neustupný (1986), pp. 543–544; Neustupný (1993), pp. 157–159.

future state or configuration. The system behaviour is manifested by the system's response to stimuli from its surroundings and in general by the way it realizes its goals. The basic operations taking place within a system are input (what goes into the system), output (what comes out of the system) and processing (the system behaviour). The system can transform itself into a different state, for example, by modifying, adding or removing a particular element. There may be feedback between input and output which makes input dependant upon output. We distinguish between positive and negative feedback. Positive feedback speeds up the system transformation in the same direction as the previous outputs (it has a cumulative effect). It causes exponential growth to explosion or, on the contrary, exponential decrease to extinction of the system. Negative feedback acts in the opposite direction. It ensures the balance in the system and its stability, or dynamics in harmony with the system's goals.⁷⁹

An example of a successful application of systems theory to archaeology is Colin Renfrew's now classic work *"The Emergence of Civilization"*.⁸⁰ The book deals with the problem of the origin of civilization and the cultural changes taking place in human society. Civilization is a specific type of culture and, at the same time, a certain level achieved in its development. Culture in general, as we understand it within the framework of the processual paradigm, is a specific adaptation of people to specific problems in their environment. This consists both of natural factors, (such as the local geological conditions, climate, and flora), and the cultural environment given that man lives surrounded by other people. It is obvious from the above that the environment of people is multidimensional, and therefore their culture—adaptation to the given environment—must be multidimensional as well. The environment is also highly variable. The surroundings of hunters and gatherers are not widely different from the environment of the animals they hunt; while the civilized man lives in an environment, a great part of which is his own creation. Imagine an astronaut in a rocket: the man inside is enclosed, cut off from direct contact with nature. Problems with searching for food or shelter, although still present, are now overshadowed by other worries, which could not arise out-

⁷⁹ Pazourek (1993); Kučerová (2002/2003).

⁸⁰ Renfrew (1972).

side civilization. To sum up: according to C. Renfrew civilization is a multidimensional artificial environment, created by man as insulation between man and the natural domain.

If we want to study human culture and civilization from the archaeological point of view, we need to start by describing it and defining it in time and space. However, the temporal/spatial systemization cannot signify the culmination of our work. It is just the beginning. Our efforts should be aimed at understanding the causative chains of events and changes, which were operating inside the culture due to the action of various factors. Their generalization is referred to as cultural processes. A necessary precondition of this “processual” approach is systems theory, which allows us to properly describe and model human culture.

We distinguish three basic components of the cultural system: members of society, artefacts, and natural objects. The components in the system are interconnected and they interact. It is worth bearing in mind the limitations of archaeology, which are determined by the fact that it works with artefacts—mere material remains of the cultural system. Originally, the system was much more complex and many of its parts cannot be archaeologically identified at all, although they may have played an important role in the system.

In constituting the system we have absolute freedom of the choice of specific elements: “the system is what we consider to be the system” (Brian Gaines). We also take arbitrary decisions concerning the system boundaries, which may be delimited differently for different purposes. It is also up to us which subsystems we define in complex units.

Colin Renfrew⁸¹ advances the following elements and subsystems for a system describing culture that has reached the civilization stage:

1. Subsistence subsystem. This is defined by the activities related to the distribution of food sources. The components of this subsystem are man and sources of food.
2. Technological/craft subsystem. This is determined by the activities of people, the result of which is the production of material artefacts. The subsystem components are man, raw material sources and finished artefacts.

⁸¹ Ibidem, pp. 22–23.

3. Social subsystem. This is defined by the activities and relationships between people.
4. Projective or symbolic subsystem. This covers the activities through which man expresses his feelings, faith or knowledge of the world around him. They can take on a concrete form as religion, art, language, or science. Within the framework of these activities man projects his thoughts and feelings (hence the projective subsystem) and gives them symbolic form in language, literature, art and religion.
5. Trading and communication subsystem. This is related to the activities during which the transfer of information or goods takes place between different settlements or over a great distance.

Defining the boundary between the subsystems is an extremely complicated task as there may be a particular human activity acting in multiple directions at the same time. However, if we want to understand the development and change in human culture, we must first isolate and describe the subsystems. Only having done that we can proceed to study the interactions between them.

In a culture which does not change, the subsystems find themselves in a state of balance. There is continual activity: food is produced and consumed, buildings become dilapidated and are repaired, commodities are traded, social relationships are maintained, religious services are given. People are born, they marry and die. Nothing is new. The same things are repeated year after year. However, no system can be so stable over a long period of time. The balance may be tipped by fluctuations of the natural environment. A crisis may appear as a result of external inputs into the system such as a military attack from the outside, or innovations within the system, such as the invention of new tools or dissatisfaction with the behaviour of the chief. The important fact here is that each subsystem acts homeostatically in relation to turmoil, i.e. it tries to preserve its inner stability and balance. A military attack is checked, a new tool is replaced by the old one, the chief takes steps to reinstate his authority. The variables of each subsystem (quantity of food in the food subsystem, level of population, integrity of defence systems, people behaviour in the social subsystem, etc.) are maintained within fixed limits necessary for survival. From this viewpoint, each subsystem could be considered self-regulatory. Nevertheless, we should not forget that in a cultural system the individual subsystems

do not act separately. On the contrary, they are interlinked. Naturally, this does not mean that a change in one subsystem must necessarily lead to a change in all the others. All cultures are in principle very conservative: the behaviour pattern is transferred from one generation to the next. Small changes which will emerge, such as variations in pottery decoration, do not have a significant effect on society. Only when the turbulence is so great that it gets beyond homeostatic control, is the model of life disturbed. The changes are acted against by negative feedback. In human society this takes on the form of a set of customs and traditional models of behaviour which does not just oppose aggressive changes that could upset the existing order, but automatically prevents any change at all. Therefore, negative feedback will not help us explain such substantial cultural changes as, for example, the origin of a particular civilization. They can be considered only when the mutual causative relations within the system amplify an, originally, insignificant or random deviation and affect the overall deviation of the system which moves away from the initial state. In this case positive feedback comes to the fore.

Civilization is not the product of simple quantitative growth. It is above all innovations that are vital as they are accepted and become part of normal human behaviour. Innovations appear at all times and in every society. What is important is the response they evoke. If they invoke negative feedback, related with the regulatory mechanisms in society, the innovation is rejected and no change is effected. The regulatory mechanisms can only be overcome by positive feedback, which amplifies the deviation brought about by the next innovation and promotes a particular type of growth. A special case of positive feedback, which Colin Renfrew⁸² calls "multiplier effect", is most important for the origin of civilization. It is a change or innovation in a single area of human activities (in a single cultural subsystem) which triggers off changes in the other subsystems. The multiplier effect then intensifies the transformation of the first subsystems.

The multiplier effect causes rapid growth and deep changes in the structure of a culture. It is a set of feedbacks between the interconnected subsystems which promotes innovations. If the changes occur in a single subsystem only, the multiplier effect will not become evident. It is preconditioned by steady growth in at least two cultural

⁸² Ibidem, pp. 27–44.

subsystems. A negative example, according to C. Renfrew,⁸³ can be the ancient culture of Malta, where there was a dramatic increase in religious activities, which was manifested by the frequent building of religious complexes. However, a change in a single subsystem was not, for various reasons, followed by positive development in the other areas of culture (e.g. technological and economic) and no original civilization arose.

The consequence of the multiplier effect is the fact that archaeological evidence from the early stages of the development of civilization does not include improved technology (e.g. irrigation systems) or stores for surplus produce independently without further evidence of social stratification (e.g. palaces) or religious development (e.g. churches). When a specific culture made clear progress in the social and religious area and reached the civilization level, the ongoing development was necessarily demonstrated for example in food production. This applies to the increase in trade and other activities as well.

The action of the multiplier effect produces cultural “revolutions” (e.g. Neolithic, urban, industrial) as understood by Vere Gordon Childe. However, those far-reaching cultural transformations do not constitute a sudden mass change but rather a continual process. At any rate, during the periods that we look upon as revolutions there is a substantial increase in innovations and an acceleration in structural changes.

Colin Renfrew⁸⁴ emphasizes that the idea of the subsystems and the feedback between them is a mere theoretical construct. But if it helps us formulate new hypotheses which can be tested against archaeological data it will be a fruitful construct. It is for exactly the same reason that the systems theory will be applied throughout this study.

⁸³ Ibidem.

⁸⁴ Ibidem.

CHAPTER THREE

POHANSKO NEAR BŘECLAV A PRELIMINARY MODEL

As stated in the previous chapter the theoretical foundations of this text are based on the archaeological method of E. Neustupný.¹ One of its principal rules is an iterative approach, one which gradually stabilizes our knowledge. Therefore, the analysis, i.e. the first method applied by the archaeologist to the context at hand always starts with “interpreted” terms. Only based on those is it possible to move to formalized description, synthesis of archaeological structures, and subsequently their interpretation. Obviously, the process of archaeological study starts with a preliminary model, which contains tentatively interpreted structurizing entities and qualities. “*A model built on theoretical constructs must be present from the very beginning of the archaeological method*”.² For those reasons, the present book on Pohansko necessarily begins with a summary of the results of the previous research and a description of the interpretive framework within which the discussion of the purpose of the early medieval agglomeration was based. The detailed evaluation of the archaeological records acquired by excavations in the Forest Nursery and the integration of the results of this research into the overall structure of knowledge of Pohansko will lead to a new, extended model containing new information on the development of early medieval society in Moravia.

3.1 THE HISTORY OF RESEARCH AT POHANSKO

Pohansko is situated in the south-east part of the Czech Republic near the Austrian border (Fig. 1), in the vicinity of the confluence of the river Morava (March) with the river Dyje (Thaya). Pohansko was first mentioned in literature in the late nineteenth century³ and it became generally known in expert circles thanks to the synthetic work by

¹ Neustupný (1986); Neustupný (1993).

² Neustupný (1998a).

³ d’Elvert (1892), p. 27.

I. L. Červinka⁴ *Slované na Moravě a říše velkomoravská* (The Slavs on the Morava and the Great Moravian Empire). Systematic investigation at Pohansko began when the first excavations were carried out in 1958 by the Institute of Archaeology and Museology of the Faculty of Arts of Masaryk University in Brno (the former Prehistoric Institute, Department of Prehistory, Department of Archaeology and Museology). However, the scientific exploration of the site involved many other research units of the Masaryk University in Brno as well as other universities and science institutes from all over the Czech Republic and recently even from abroad.⁵

The beginnings of modern archaeological research at Pohansko are connected with the name of František Kalousek, who built there a permanent scientific research base and thanks to the uncovering of a Great Moravian church and a cemetery rich in goods launched an era of large scale excavations.⁶ But it was through the work of Bořivoj



Fig. 1. Pohansko near Břeclav. Geographical position.

⁴ Červinka (1928), p. 92.

⁵ Macháček (2001a).

⁶ Kalousek (1960a); Kalousek (1960b).

Dostál and Jana Vignatiová, who committed their entire careers to the realization, processing and presentation of the excavations at Pohansko, that the site became familiar to wider circles.⁷

Following the trial trenches of 1958, the excavation of the site proceeded systematically since 1959, when the focus was the church and the adjoining cemetery. Prior to commencing work the whole stronghold precinct was mapped out on a scale of 1:1000 with contour lines at 20 cm. During the surveying a hectare grid, oriented by the points of the compass, was staked out and elevation points were installed. The topsoil and deposits were removed in squares of 5 × 5 m, marked with a constant identifier based on a predetermined identification system. The square grid introduced by F. Kalousek at Pohansko has remained in use to this day and is at the heart of the smooth processing of vast volumes of field documentation.⁸ Continuity has also been maintained in the inventory of finds, which in 2004 reached 222 424 items.

Pohansko was investigated in seven principal areas (Fig. 2; Tab. 1). Initially, alongside the excavation of the so-called Magnate Court, the uncovering of which marked the beginning of archaeological activities at Pohansko, work also continued in the area of the so-called Forest Nursery, the Cremation Cemetery, North-Eastern (NE) and Southern (S) Suburbs and cross-sections through the rampart. Later, trial trenches were also dug in the so-called Forest Dune, where the archaeologists returned in 1999–2004. By far the largest area was uncovered at Pohansko between 1975–1979 in connection with the rescue excavation preceding the building of a flood-control canal in the Southern Suburb. Between 1995–1998 the researchers' interest concentrated on the agricultural hinterland of Pohansko where a narrow part in the settlement at the Břeclav—Líbivá site was investigated.⁹

The results of the research in Pohansko were, in contrast to the other early medieval centres in the Czech Republic, regularly published. Today they constitute a remarkable bibliographic corpus that encompasses 7 monographs and more than 100 studies and contributions.¹⁰ Since 1998, when Jiří Macháček took over as the head of the scientific research station at Pohansko, large amounts of scientific data have been digitized and gradually transformed into relational

⁷ Vignatiová (1996), with references.

⁸ Dostál (1970c), p. 1; Kalousek (1971), pp. 7–9.

⁹ Dostál (1978); Dostál (1988d); Macháček (2001a); Macháček (2001b).

¹⁰ Macháček (2001a), pp. 9–19; Vignatiová (1996), pp. 264–266.

Tab. 1. Pohansko near Břeclav. Excavated areas (1958–2004).

Areas of excavation	Research campaigns	Excavated area in m ²	Number of features	Number of inhumation burials
Magnate Court (Velmožský dvorec)	1958–1965	14 650	131	423
Cremation Cemetery (Žárové pohřebiště)	1961–1963, 1966–1968, 1972–1973	5 416	76	32
Rampart cross-sections (Řezy valem)	1961–63, 1965–67, 1975–77, 1981–83	2 170	52	35
North-Eastern Suburb (SZ předhradí)	1960, 1968, 1970–72, 1975, 1977	5 850	124	50
Forest Dune (Lesní Hrúd)	1980, 1984, 1999–2004	5 000	105	34
Southern Suburb (Jižní předhradí)	1960, 1962, 1975–79, 1991–1994	83 444	480	210
Forest Nursery (Lesní školka)	1961, 1968–69, 1974–76, 1978–9, 1981–2, 1984–90	18 850	285	81
Before the Chateau (Před záměčkem)	1995	537	26	1
Břeclav-Líbivá	1995–1998	1 285	92	14
Excavated inside fortification	1958–2004	46 623	675	606
Excavated in the suburb (outside fortification)	1960–1994	89 294	604	260
Excavated in the agricultural hinterland of the stronghold	1995–1998	1 285	92	14
<i>Excavated in total</i>	<i>1958–2004</i>	<i>137 202</i>	<i>1 371</i>	<i>880</i>

databases, vector plans, and raster images.¹¹ As a result, the archaeological sources may now be partly published in electronic format.¹²

¹¹ Golán, Kučera, Macháček (2003); Kučera, Macháček (1997); Kučera, Macháček (1998); Kučera, Macháček (2001a); Kučera, Macháček (2001b); Kučera, Macháček (2003); Kučera, Macháček (2004).

¹² Macháček (2002a).



Fig. 2. Pohansko near Břeclav. Excavated areas (1958–2003): 1—Magnate Court, 2—Forest Nursery (the so-called craftsmen’s quarter), 3—North-Eastern Suburb, 4—Southern Suburb, 5—the so-called Cremation Cemetery, 6—Eastern Gate, 7—Forest Dune, 8—Liechtenstein Chateau.

3.2 *The source base and the current state of research*

Prehistoric and protohistoric finds from Pohansko are infrequent and most of them appear only in the topsoil. At that time settlement in this area was sporadic and temporary. The earliest finds include chipped stone industry of a microlithic nature from the Mesolithic. Importantly, some of those finds were probably uncovered in situ at a depth of 80–90 cm in the Magnate Court area. The following settlement from the Early Neolithic is represented by infrequent fragments of the Linear Pottery culture. More finds can be dated to the Eneolithic, to which we

attribute fragments of a funnel beaker and pottery of the Baden culture from the North-Eastern Suburb. Evidence from the Bronze Age includes for example the find of a bracelet fragment and a dagger from the urn-fields period, unearthened at the Forest Dune location, or an earlier bronze axe from the Forest Nursery. Before systematic excavations started in Pohansko, a cremation burial of the Horákov culture dated to Halstatt period is said to have been found. Evidence of Celtic settlement from the La Tène period is more prominent, including, alongside pottery, finds of glass bracelets, beads, and a rare clasp of the Mötschwil type. The Roman period is represented by so-called Germanic pottery with combed decoration, as well as Roman provincial wheel-made pottery, and a fragmentary, early Roman lamp. The pre-Slavic settlement at Pohansko culminated in the Migration Period to which may be attributed fragments of a wheel-made, gray ware found already in an early Slavic (Prague-type culture) context.¹³ However, it was not until the early Middle Ages (6th–10th c. AD) that Pohansko began to flourish. After the tenth century, the site was abandoned and never occupied again until the beginning of the nineteenth century. Between 1805 and 1811 two architects working for the Liechtenstein family, Josef Hardmuth and Josef Kornhäusel built a hunting lodge in Empire style, which is now part of the UNESCO-listed Lednice-Valtice area.¹⁴ Fortunately, the building of the chateau-like lodge affected only a small section of the early medieval settlement precinct (a section of the rampart in the southern part of the site). The remaining area has remained intact and luckily has been spared any destructive impacts—only part of the site was briefly tilled for the purposes of agricultural production or forest management; and clearly delineated interventions in the subbase (sand pits) occur at some spots.

An early Slavic (Prague-type culture) and Early Hillfort (Pre-Great Moravian) occupation (6th–8th century AD) has been identified at two locations in the northern section of the site during investigation in the Magnate Court area, at the Forest Nursery location, under the Great Moravian rampart and in the North-Eastern Suburb (Fig. 3). The occupation consists of 79 settlement features, which comprise 8 sunken-floored dwellings (Grubenhaus) with stone ovens in the

¹³ Dostál (1968b); Dostál (1975), pp. 118–120.

¹⁴ Kordiovský (2004), pp. 543–544.

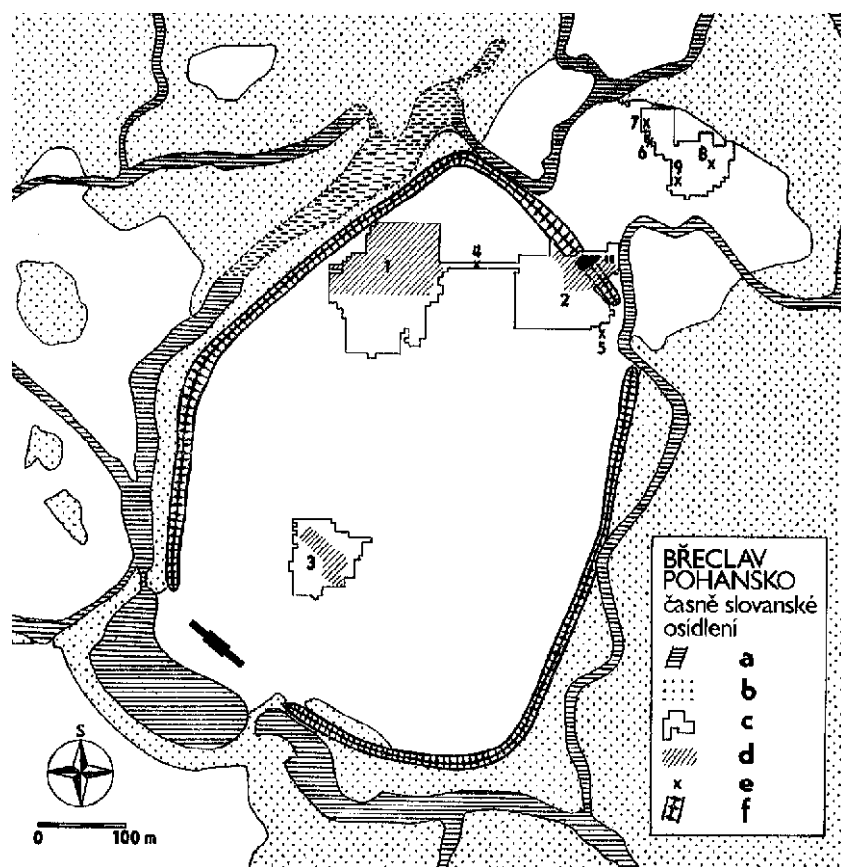


Fig. 3. Břeclav-Pohansko. Plan indicating the distribution of the early Slavic (Prague-type culture) finds (according to *Dostál 1985*). 1—Settlement I in the Magnate Court precinct; 2—Settlement II in the Forest Nursery, under the rampart and in the North-Eastern Suburb; 3—Cremation Cemetery; 4 to 9—dispersed early Slavic (Prague-type culture) features and finds.

corner, 11 fairly large sunken-floored outbuildings, 14 silos and 46 pits for storage, refuse, and other purposes.¹⁵ This was an open settlement, with no traces of fortification. Over the next three centuries the settlement location moved and it was gradually rebuilt. Chronologically, the features can be broken up into three groups: the first group contains only simple hand-made and undecorated early Slavic pottery

¹⁵ Dostál (1982b).

of the Prague type (around mid-6th c.), the second group consists of mixed pottery, i.e. the earlier undecorated ceramics and pottery made on a tournette by the coiling technique, with decoration (second half of the 5th and first half of the 7th century AD), and the third group has exclusively decorated pottery made on a tournette, recalling the pottery of the Middle Danubian cultural tradition (second half of the 7th and the 8th century AD). The dating is also supported by an ancient hook-shaped spur, a fragment of a single-sided comb with an elongated trapezoid grip, a triple-edged arrow tip, an iron bowl of the Silesian type and a mould for the making of star-shaped pendants of earrings of the Martynovka type. Traces of early Slavic (Prague-type culture) occupation were also found more recently in the Southern Suburb area.¹⁶

Besides the settlement, the early Slavic (Prague-type culture) and Early Hillfort (Pre-Great Moravian) periods are represented by a cremation cemetery located just 300 m to the south.¹⁷ The cemetery includes both pit (7 graves) and urn (55 graves) cremations. Apart from 15 urns, from which only typologically unidentifiable bottoms survive, the cremation graves contained 17 pots of the Prague type and 23 decorated pots made on a tournette of the Middle Danube cultural tradition.¹⁸ The remaining, overall poor grave goods included several knives, handle attachments for a bucket, a socketed, leaf-shaped arrow tip, a glass bead, and two iron buckles with bent sides.

A far-reaching qualitative and quantitative change in the settlement structures took place in the Middle Hillfort (Great Moravian) Period (9th—beginning of the 10th c.), when one of the most important Moravian centres arose at Pohansko. The vital element of the whole Great Moravian agglomeration is fortification. It principally consisted of a massive earth-and-timber rampart of a shell construction with a stone facing wall (Fig. 4—Fig. 5). The surviving part is a clearly visible bank extending over a length of 1.9 km, and delineating an area of 28 ha. It is one of the largest enclosed and finished fortifications from the central area of Great Moravia.¹⁹ The rampart was investigated between 1960–1963, 1965–1967, 1975–1977 and 1981–1983. Although the rampart excavation at Pohansko is considered to be the only work

¹⁶ Vignatiová—Klanicová (2001).

¹⁷ Dostál (1985).

¹⁸ Macháček (1995); Macháček (2000b).

¹⁹ Procházka (1990), Tab. 1—Tab. 2; Macháček (2001d), Abb. 7.

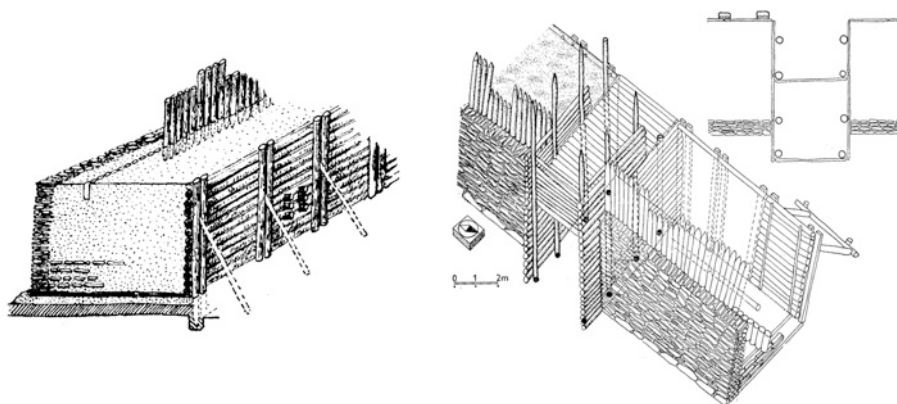


Fig. 4. Reconstruction of the fortification and gate from Pohansko near Břeclav (according to *Dostál 1979; Dostál 1984*).

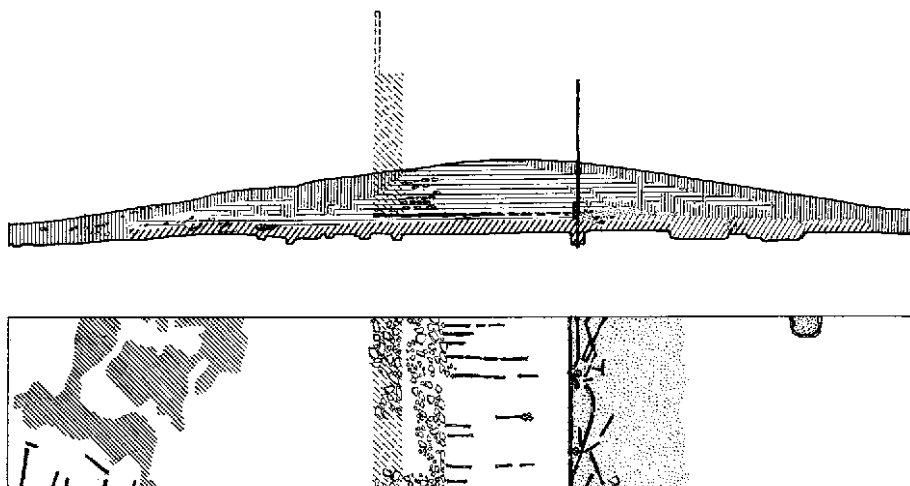


Fig. 5. Part of a cross-section of the rampart at Pohansko near Břeclav with the marked location of the stone front wall and the rear wooden wall (according to *Dostál 1978*).

in Moravia published with sufficient accuracy,²⁰ it still remains to be properly assessed in a monograph. Preliminary reports²¹ indicate that the rampart was originally 5.7–6.5 m wide and consisted of a stone facing wall, earth fill and an internal wooden wall from planks supported by pairs of posts at 1.5–2 m from each other. At irregular distances the face and inner wall were tied by beams passing through the fill. The earth fill was 4 m high; with a wooden parapet the fortification must have reached as high as 6 m. In the eastern section of the fortification a simple gate aligned with the rampart was uncovered. It was 2.5 m wide and outlined by four posts on each side. It is thought to have been surmounted by a tower-like superstructure, partly jutting out in front of the rampart face, and closed by a pair of gates on the ground floor. The gate probably opened onto a bridge over a river branch. Exactly when the defence work was erected remains unclear, but in none of the 17 cross-sections cut so far does the rampart appear to overlay the Great Moravian settlement. Great Moravian graves and settlement structures follow the rampart both on the inside and on the outside, sometimes being found under its debris but never underneath the actual body of the rampart. By contrast, earlier features of the early Slavic (Prague-type culture) and Early Hillfort (Pre-Great Moravian) periods are clearly superposed by the rampart.²² In his original work on the Magnate Court at Pohansko Bořivoj Dostál²³ assumed that the origin of the earth-and-timber rampart followed the extinction of the earlier palisade fortification of the palatial compound. Based on the results of further excavations he changed his opinion and argued that the destruction of the stronghold fortification coincided in time with the vanishing of the earlier palisade fortification of the Magnate Court which took place at some point between the middle of the ninth century and the beginning of the last third of that century.²⁴ Others found Dostál's interpretation problematic, and new opinions on the origin and appearance of the earth-and-timber rampart from Pohansko have meanwhile been published.²⁵ The results of new, as yet unpublished

²⁰ Procházka (1998), p. 363.

²¹ Kalousek (1965); Dostál (1979); Dostál (1984).

²² Dostál (1982b), p. 6, p. 10, Fig. 2; Dostál (1988d), p. 313.

²³ Dostál (1975), p. 243.

²⁴ Dostál (1977/78).

²⁵ Macháček (2001d); Měřinský (2001), pp. 72–74; Ruttkay (1998), p. 411.

research support a later dating of the rampart to the last quarter of the ninth century.

Based on certain suggestions it can be assumed that the two suburbs were also lightly fortified. This concerns mainly the palisade and related stone debris on the perimeter of the rise, on which the North-Eastern Suburb was built,²⁶ and a low earth bank next to the Southern Suburb.²⁷

The most important Great Moravian settlement structure at Pohansko is traditionally referred to as the Magnate Court.²⁸ Covering an area of approx. 1 ha it was enclosed by a massive square palisade built in at least two stages. Its function as fortification is beyond any doubt.²⁹ The Magnate Court was within a fortified area in the south-western section. Over 50 settlement features were excavated inside the enclosure (Fig. 6). It is possible to distinguish several functional areas within this settlement structure:³⁰ sacral precinct with a church and a cemetery, residential part with single-space and multi-space houses on stone-and-mortar bases, ancillary buildings with pens for cattle, stalls, barns and granaries, etc. and large, above-ground structures with post-holes, which may have been used for communal gatherings.³¹ Nothing indicates that the built-up area inside the enclosure included any workshops. Those to which B. Dostál referred in his work³² were either outside the enclosure or built inside that area, after the destruction of the palisade.

The church was erected within a separate area of the enclosure.³³ Judging from the surviving foundations it was a single-nave structure (18.65 m long, 7.2 m wide) with a protruding semi-circular apse and an almost square nartex; on the south-eastern side the nave was adjoined by a small annex (Fig. 7). The church was built in quarried stone bonded with lime mortar. The walls were plastered and whitewashed and on the inside painted in colour. The nave contained remains of a stone partition in front of the chancel with a passage in the middle. The founding of the church is usually connected with the earlier phase

²⁶ Dostál (1970b), pp. 118–120; Dostál (1978), p. 141.

²⁷ Vignatiová (1977/78), p. 136.

²⁸ Dostál (1975).

²⁹ Dostál (1969).

³⁰ Dostál (1988a), p. 283.

³¹ Dostál (1975), p. 80.

³² *Ibidem*, pp. 49–50, pp. 56–57.

³³ Kalousek (1961); Dostál (1992).

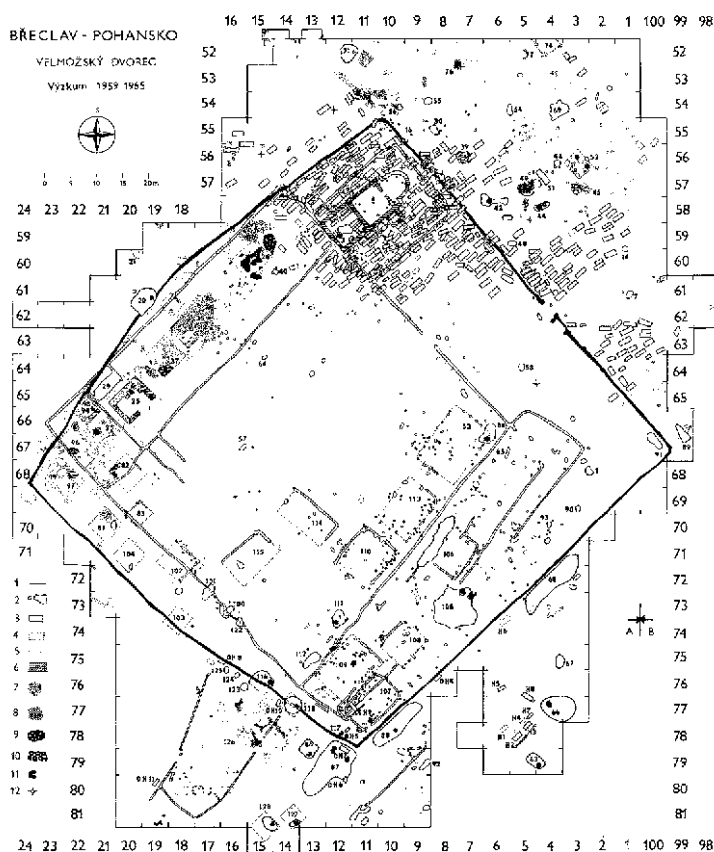


Fig. 6. Břeclav-Pohansko. The Magnate Court (according to Dostál 1978).

of the palatial compound, therefore dated to the first half of the ninth century. The church probably fell out of use during the first half of the tenth century, and was completely abandoned in the second half of that century when the initially sacral building was turned into a dwelling, as suggested by the remains of a fireplace in the narthex and by Late Hillfort (Post-Great Moravian) Period pottery found on the floor.³⁴ In the vicinity of the church (about 11 m SV from the apse, but outside the church's enclosure) a small, most likely pagan shrine was built at the same time (feature 39), which consisted of a mas-

³⁴ Dostál (1973/74); Dostál (1975), p. 103, p. 109, p. 243, p. 247; Měřinský (1986), p. 34, pp. 55–60.

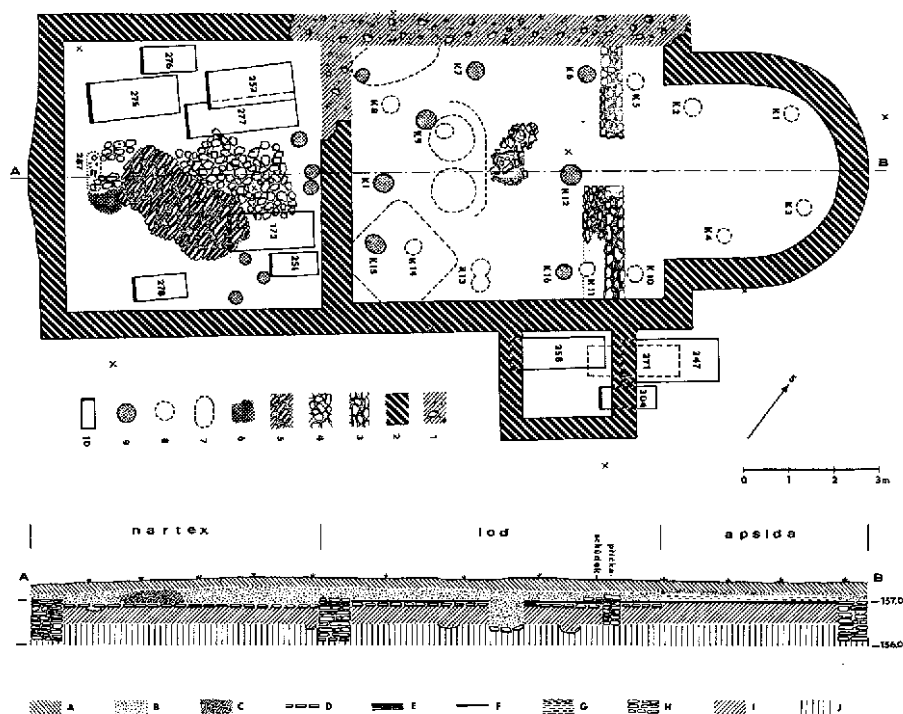


Fig. 7. Břeclav-Pohansko. Ground plan of the church remains and their longitudinal cross-section (according to Dostál 1992).

sive central post, eight post-holes arranged in a circle and a palisade trench, which partly framed the shrine. The whole feature, which cut a Great Moravian grave (and must therefore be of a later date) measured between 250–300 cm in diameter.³⁵

The former “cult” enclosure, in which the church had been founded, is thought to have fulfilled the function of a pagan sanctuary before the Christianization of the site.³⁶ Of the several postholes found within, some were remains of the scaffolding used during the construction of the church. Some delineate the ground plan of an earlier structure of unknown function. Most of the traces of earlier build-up were destroyed during the construction of the church, apparently the second building on a site which may have previously had a cultic, pagan

³⁵ Dostál (1968a); Dostál (1975), pp. 104–110; Macháček—Pleterski (2000).

³⁶ Dostál (1975), pp. 103–104; Dostál (1992), p. 81; Richter (1965), p. 203.

significance. Moreover, both the church and the adjacent inhumations follow the unusual orientation of the earlier pagan structure. It is rather remarkable that the axis points with great precision to the rising sun on the day of the summer solstice.³⁷

The graves excavated around the church and dated to the first half of the ninth century served the community residing in the palatial compound. A total of 407 inhumation burials were uncovered there. Of those, swords were found in 4, axes in 8, spurs in 32 and gold and silver jewellery of the Veligrad type in 46 graves.³⁸ The grave goods comprised three easily distinguishable groups of finds.³⁹ They were decorative objects of the so-called Blatnica-Mikulčice style, the so-called Veligrad-type jewellery and infrequent objects of the Late Hillfort (Post-Great Moravian) Period style from around the mid-tenth century (massive rings and S-shaped temple rings). The analysis of the skeletal remains has revealed a conspicuous gender imbalance, as most graves are of men, which points to the unusual structure of the population in the palatial compound.⁴⁰

Apart from at the location known as the Magnate Court, three additional extensive excavations were carried out within the area enclosed by ramparts. The most important is the so-called Forest Nursery, sometimes referred to as the craftsmen's quarter,⁴¹ where a total of 285 Great Moravian sunken-floored buildings and 81 inhumation burials were uncovered (Fig. 8). The great number of postholes (954) indicates that it was also a site of many above-ground houses and structures which are otherwise more difficult to detect by archaeological means. The relatively small number of square residential sunken-floored dwellings of square plan which are viewed as typically Slavic is surprising. By contrast, the characteristic feature in the Forest Nursery area is the building up to 20 m in length, 3 m in width, and a floor sunken up to 150 cm in depth. Since no heating facility was found in any such building, all of them may have served for some non-residential purpose. Judging from the loomweights, iron slag and various other implements found inside those buildings, they were most likely workshops. Whatever the activities performed in those workshop, there seems to

³⁷ Macháček—Pleterski (2000); Rajchl (2001).

³⁸ Kalousek (1971).

³⁹ Dostál (1978), p. 139.

⁴⁰ Drozdová (2001).

⁴¹ Dostál (1993a); Dostál (1993b).

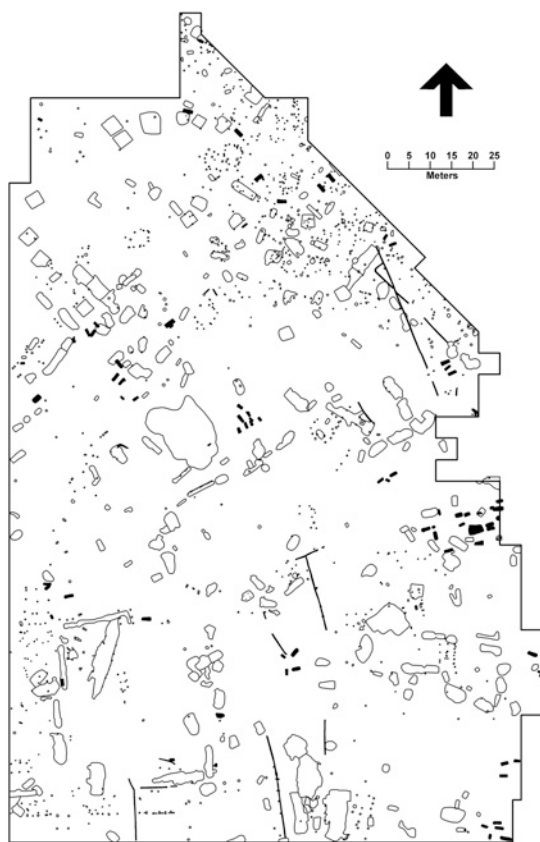


Fig. 8. Břeclav-Pohansko. The Forest Nursery.

have been a need for a permanent supply of water, as indicated by nine adjacent wells. Clay furnaces and open hearths have also been found, but most other features were pits of various sizes and depths. The large number of and variety of tools (socketed adzes, axes, saws, a chisel, a drawknife, carving knife, drills, crucibles, anvils, hammers, metal cutters, punches, grindstones, whetstones, clay loomweights, spindlewhorls, scissors, needles, needle-cases, bone “skates” and bone sharpened tools, iron tips), semi-finished products (an unfinished bronze shackle, bone board game pieces with drilled holes, iron rings from chain mail, antler cuttings, bone plates and tubes), raw materials (lead ingots, lead castings, axe-shaped iron ingots) and wasters (slag) bespeak the industrial character of this region of the site. It is therefore possible to identify different types of crafts in the settlement:

e.g. wood working, leather and fur processing, bone working, non-ferrous metalworking, blacksmithing, jewellery and textile production. The settlement features in the Forest Nursery are grouped in clusters separated by empty spaces or fences. Graves were scattered among standard settlement features, some isolated, others in groups. Most graves had few or no grave goods. In sharp contrast to the cemetery around the church in the Magnate Court, there were more skeletons of women than of men.⁴² Based on the above finds the excavated area in the Forest Nursery was therefore interpreted as a craftsman district.⁴³

The results of the excavations in the Forest Nursery were partly published in preliminary and partial reports and specialized studies dealing with the individual aspects of this settlement area or with the various categories of finds.⁴⁴ A new stage of work on the comprehensive evaluation and publication of the extensive settlement agglomeration in the Forest Nursery has been under way since 1995 employing the latest technologies, including geographic information systems deployed within the project under the working designation POHAN.⁴⁵ One result of that project was a complete digital catalogue of the field documentation and finds from the Forest Nursery.⁴⁶

The third largest area excavated within the interior of the stronghold is known as the Cremation Cemetery (Fig. 9). While some brief preliminary reports are available⁴⁷ it still awaits comprehensive evaluation. The Cremation Cemetery is situated in the southern part of the site. Apart from finds of graves from the early Slavic period, which gave the name to the excavated area, there is evidence of intensive Middle Hillfort (Great Moravian) Period occupation. It comprises 76 features and 32 inhumation graves and two horse burials. Six structures were typically square sunken-featured dwellings (Grubenhaus) with either a fireplace or an oven. Above-ground structures outlined

⁴² Drozdová (2001).

⁴³ Dostál (1993a); Dostál (1993b).

⁴⁴ Dostál (1993a); Dostál (1993b) with references; and also e.g. Dostál (1983); Dostál (1988c); Dostál (1993c); Dostál (1994a); Dostál—Vignatiová (1991); Dostál—Vignatiová (1993); Macháček (2001c); Macháček (2001d); Macháček—Pleterski (2000); Švecová (2000); Vignatiová (1996), p. 263 with further extensive literature.

⁴⁵ Golán, Kučera, Macháček (2003); Kučera, Macháček (1997); Kučera, Macháček (1998); Kučera, Macháček (2000); Kučera, Macháček (2001a); Kučera, Macháček (2001b); Kučera, Macháček (2003); Kučera, Macháček (2004).

⁴⁶ Macháček (2002a).

⁴⁷ Kalousek, Dostál, Vignatiová, Šik (1977/1978), pp. 161–163; Dostál (1970c), pp. 17–19; Dostál (1978), p. 139.

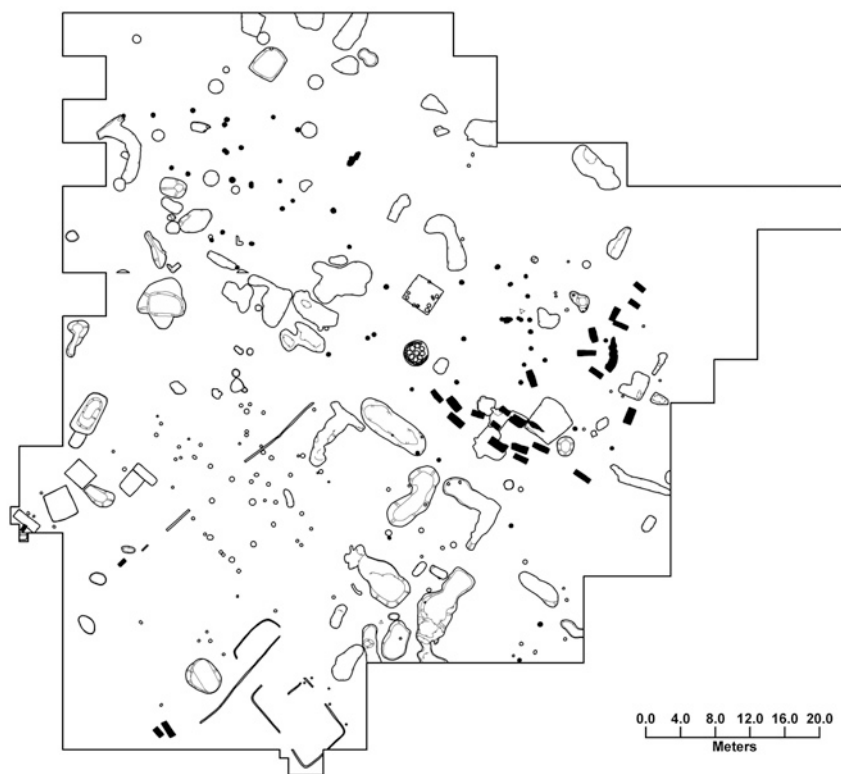


Fig. 9. Břeclav-Pohansko. The Cremation Cemetery.

by concentrations of stones or postholes are also present. One of the above-ground structures with wattle walls was probably a smithy, as suggested by finds of blooms and slag. The settlement features in the Cremation Cemetery form specific clusters. The palisade trenches detected between them provide evidence of the fencing of the individual parts of the settlement or homesteads. The inventory of finds includes household and craft implements (spindlewhorls, bone sharpened tools, knives, scissors, whetstones, firesteels, axe-shaped ingots, drills, keys, etc.) as well as other objects (spurs, spears, a fragment of a stirrup and shackles of the Blatnica style).

A remarkable feature is a circular posthole structure, consisting of eight perimeter holes and a single central hole. It is partly surrounded by a palisade trench. By its characteristics and dimensions this reminds one of the “pagan shrine” uncovered in the cemetery of the church in the Magnate Court. The posthole structure which stood in the Cremation

Cemetery in the middle of a larger cult area is associated with a group of 17 inhumation graves with identical orientation into which the corpses were laid supine without any grave goods. Some of the graves interfere with Great Moravian settlement features and can be roughly dated to the late ninth and early tenth century. The only exception from the standard was a grave with a child skeleton in flexed position and opposite orientation. All other graves are aligned to the axis between the centre of the posthole structure and the child burial which also corresponds exactly to the position of the sun at the winter solstice. The horse burials uncovered both in the Cremation Cemetery area and during the excavations in the nearby Forest Dune are also associated with the sacral structure.⁴⁸

Research in the so-called Forest Dune, which is the latest large-scale excavation situated in the area enclosed by the rampart, started with trial trenches in 1980 and 1983/84. It is a rise in the SE section of the stronghold, extending from the Cremation Cemetery to the Eastern Gate. In addition to a 142 m long half-metre trial trench and two shorter trenches, seven squares with standard dimensions 5 × 5 m were opened there. The results of the trial excavations indicated a fairly dense occupation in the Forest Dune.⁴⁹ The assumption was fully confirmed by more extensive excavations carried out between 1999 and 2004 (Fig. 10). In total, 105 settlement features, 34 inhumation graves and one horse burial were unearthed in the Forest Dune. The discoveries of two wells and a palisade fence are particularly interesting. The spectrum of finds roughly matches the findings from the Cremation Cemetery and the Forest Nursery with the exception of three graves with silver earrings of the so-called Veligrad type. Such earrings had until then been known in Pohansko only from the church cemetery. The remaining graves, mostly with few grave goods, fall within the standard known from the other excavated locations inside the stronghold. So far the investigation of the Forest Dune has not been comprehensively evaluated and published.

Evidence of intensive occupation at Pohansko was also found in the two suburbs (*suburbium*). The north-eastern suburb⁵⁰ was spread out over a slightly raised oval area surrounded by the oxbow lakes of the

⁴⁸ Dostál (1968a); Dostál (1970c), p. 19; Macháček—Pleterski (2000).

⁴⁹ Dostál (1988), pp. 320–321.

⁵⁰ Kalousek, Dostál, Vignatiová, Šik (1977/1978), pp. 158–161; Dostál (1970a); Dostál (1970b); Dostál (1970c), pp. 20–23; Dostál (1978), p. 141.

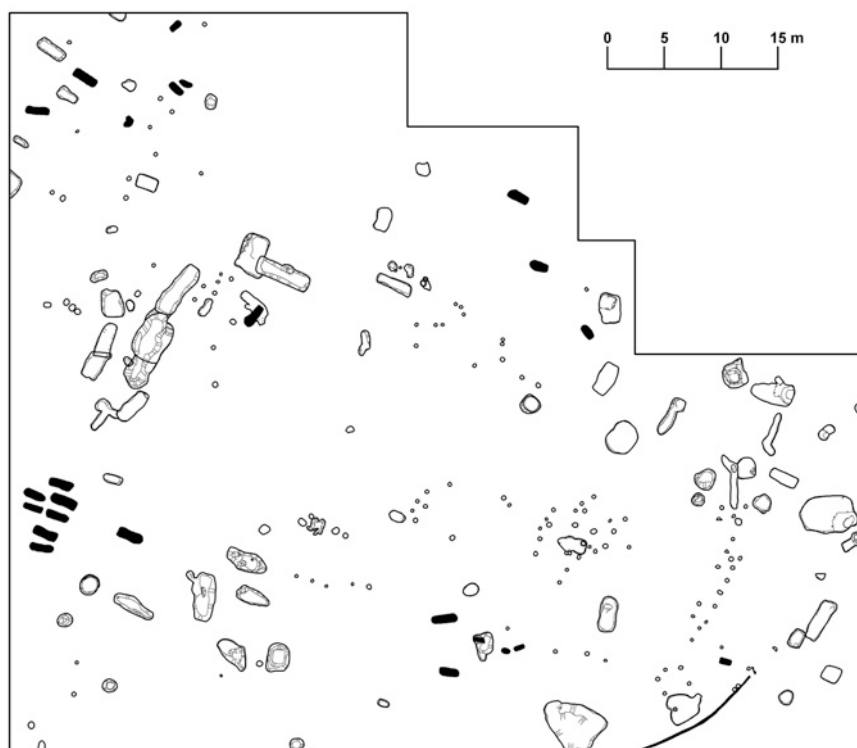


Fig. 10. Břeclav-Pohansko. The Forest Dune (1999–2003).

Dyje. Excavations began in 1960 in connection with the building of the scientific research station of the Masaryk University. More extensive open area excavations followed in 1968, 1970–72 and 1975 (Fig. 11). In addition to a sporadic occupation from the Eneolithic, late La Tène and Roman periods (two Eneolithic and two La Tène features, finds from the settlement layer), a total of 120 settlement features and 50 inhumation graves from the early Middle Ages were found, mainly of Great Moravian age. Seven early Slavic features belong to the so-called Settlement II. Among the settlement features from the North-Eastern Suburb it is possible to identify sunken-floored dwellings,⁵¹ above-ground dwellings with hearths, ancillary buildings, isolated fireplaces and above-ground structures outlined by rows of stones. But it is the pits of various shape and function that occur most frequently.

⁵¹ Only three of them had a regularly square plan; Vignatiová (1992), p. 91.

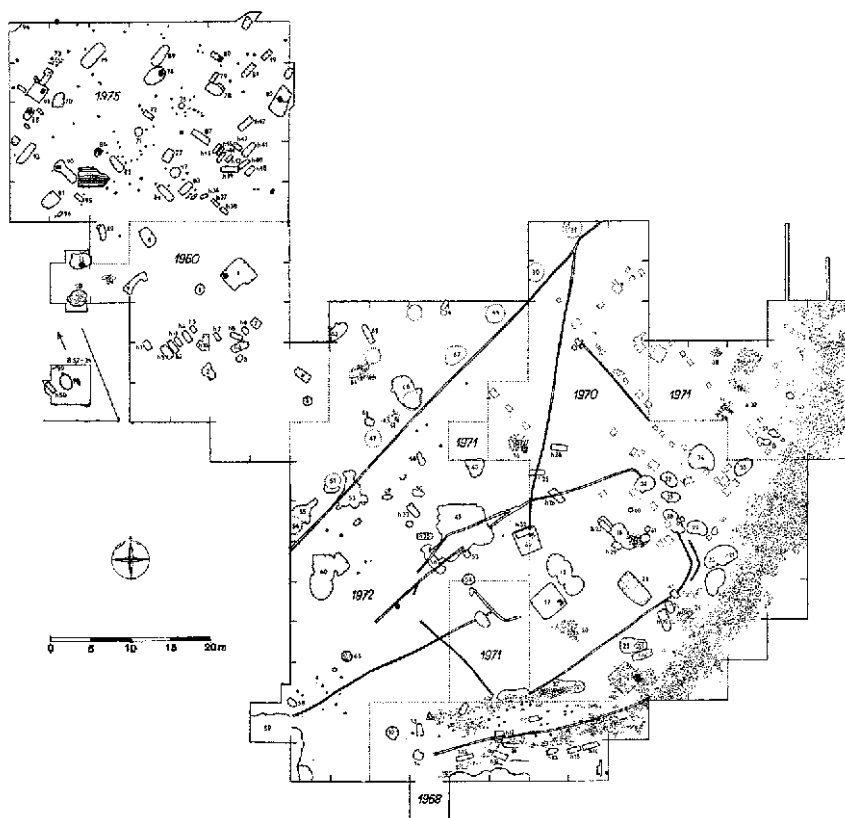


Fig. 11. Břeclav-Pohansko. North-Eastern Suburb (according to Dostál 1978).

Finds from the features have raised doubts as to the possibly industrial character of this area. Most interesting are hoards of iron implements, such as that of axe-shaped ingots from Feat. 17, which also produced several spurs, scythes, and a saw.⁵²

In the North-Eastern Suburb there are several conspicuous palisade trenches, some of which may well be of recent origin. Others, however, were undoubtedly remains of the fencing of an early medieval, trapeze-shaped homestead. The palisade trench, running alongside the edge of a rise, which is overlaid by a continuous, 2–4 m wide strip of stones, is part of the light fortification of the suburb. The wooden palisade was

⁵² Dostál (1983), pp. 180–187.

probably adjoined, on the inner side, by an earthen bank reinforced by posts, at a distance of 1–2 m from the palisade. The resulting platform was paved with stones, which after the collapsing of the palisade slowly slid down the slope of the rise.⁵³ Some of the graves uncovered had been dug alongside the palisade, mainly on its outer side. Most graves excavated in the North-eastern Suburb had simple grave goods which do not stand out from the average burial assemblage: knives, bucket fittings, bone combs, metal band rings, earrings with tubular or grape-shaped pendants, etc.). Only the lead, cast buttons, most typical for the Belo Brdo culture and for Magyar burial assemblages may be viewed as. The research in this section of Pohansko has, so far, been published only as preliminary reports and partial studies.

The settlement in the Southern Suburb, where extensive salvage excavations were carried out between 1975 and 1979 because of the construction of a flood-control canal (100 m wide and 1200 m long), had a much different character.⁵⁴ The exploration of this huge section of the site covering an area of 8.3 ha revealed a fairly dense occupation (Fig. 12). After the salvage excavation a small area was opened to the northwest between 1991 and 1995,⁵⁵ which showed that there was a dense settlement in that part of the Southern Suburb as well. A total of 480 settlement features and around 210 inhumation graves were unearthed. The occupation of the Southern Suburb may be divided into three groups. Most typical are the sunken-featured dwellings which make up almost a quarter of all settlement features. Also present are ancillary buildings of various sizes and functions, hearths, three wells, and various pits. Only a few features have been identified as workshops, although the exact nature of the industrial activities performed therein remains unclear. Given the high concentration of people and lack of good arable land in the environs, it is doubtful that the population of the Southern Suburb was involved in agriculture. As typical finds from the Southern Suburb include weapons and horse gear, it is more likely that at least some of those who lived there were members of a military retinue, living in separate quarters together with their families, and possibly servants. In other words, the Southern Suburb was in fact the settlement of the professional warriors, armed and fed by

⁵³ Dostál (1970), 41.

⁵⁴ Vignatiová (1992).

⁵⁵ Vignatiová, Klanicová (2001).

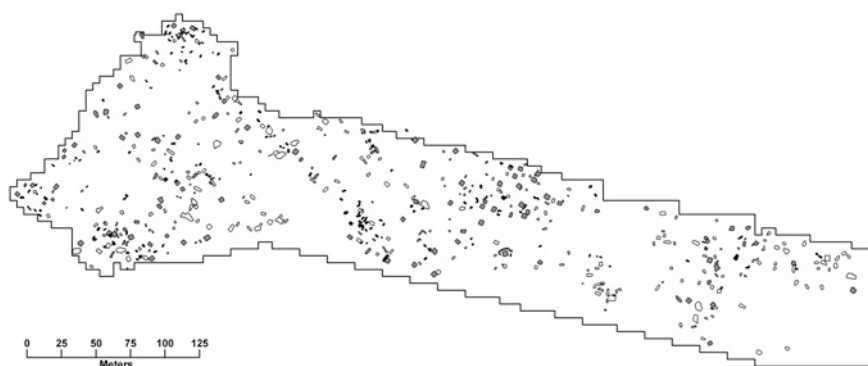


Fig. 12. Břeclav-Pohansko. The Southern Suburb (1975–1979).

the prince, who were responsible for the protection of the core of the Great Moravian state on its southern border.⁵⁶ Others have however advanced different interpretations based on the recognised division of the agglomeration into three groups (Settlement I–III), the layout of which is determined by the sunken-featured dwellings.⁵⁷ The group to the east, which consisted of houses built around a village green with a masonry-built well in the middle, was most likely dedicated to industrial activities. The central group displays houses arranged along a street with storing facilities and a significant number of quernstones. This may have been the village of those serving at the Magnate Court. Only the western group, which is equally arranged around a village green, but produced horse gear, may be viewed as the settlement of the military retinue, men who provided military service to the prince or his deputy residing at the Magnate Court.⁵⁸

That the Southern Suburb was indeed inhabited by warriors results from the analysis of finds from associated graves,⁵⁹ which, unlike those from the craftsmen's quarter, have produced a significant quantity of weapons (sword, spearheads, axes, arrow tips) and horse gear (spurs). Some of those graves appear to have clustered in two small burial grounds, with others scattered among the settlement structures, either isolated or in small groups. While the settlement structures have

⁵⁶ Vignatiová (1992), pp. 94–99.

⁵⁷ Vignatiová (1992), pp. 87–91.

⁵⁸ Dostál, Vignatiová (1985).

⁵⁹ Dostál (1988d), p. 316.

already been published in a monograph,⁶⁰ the graves from the Southern Suburb have only been made available to experts in a preliminary and incomplete way.⁶¹

Until recently, the dating of the Great Moravian stronghold at Pohansko was based primarily on the diagnostic artefacts. Weapons, belt sets, dress accessories, and pottery, all point without any doubt to a date within the ninth century. However, in the absence of a refined chronology of Great Moravian metal finds,⁶² that date cannot be established with more precision. The idea that the site was abandoned at some point during the second half of the tenth century is supported by the dating of the finds associated with the last occupation.

More detailed information on the chronology of the site has recently been made available by dendrochronological analyses.⁶³ To this day, only one reliable dendro-date is available for Pohansko, namely AD 882, the year in which the timber framing of the well in the craftsmen's quarter of the Forest Nursery district was built (unpublished expert statement by J. Dvorská, Brno 2001, see Chap. 4.2.2).

The vast early medieval agglomeration at Pohansko could not have existed self-sufficiently without an agricultural hinterland. The existence of the large concentration of population within the stronghold was apparently made possible by a system of smaller settlements, most of them dispersed on the gentle elevations outside the low-lying flood plain but at the same time in the vicinity of both Pohansko and the sources of water. The settlements supplied the stronghold with food, mainly grain crops, grown on fields outside the flood plain which was used as a source of timber and firewood, as well as grazing fields.⁶⁴ Based on the current state of research as reflected in the Official List of Archaeological Sites in the Czech Republic,⁶⁵ settlements clustered in the hinterland of important Great Moravian centres, mostly in the low-lying flood plains of the lower courses of the Morava and Dyje rivers (Pohansko near Břeclav, Mikulčice, Pohansko near Nejdek, Strachotín). The existence of such clusters may be inferred from the

⁶⁰ Vignatiová (1992).

⁶¹ Vignatiová (1977/1978); Vignatiová (1980).

⁶² e.g. Dostál (1991), pp. 81–87; Galuška (1996); Klanica (1990); Štefanovičová (2004).

⁶³ Poláček, Dvorská (1999).

⁶⁴ Goláň, Macháček (2004), p. 523.

⁶⁵ Krušínová (2004), with references.

evaluation of settlement find density using a raster-oriented GIS (Geo-Media Grid software, Local Scan command, scan window size 5 km). In the resulting image the highest density is indicated by a darker shade (Fig. 13).

One of the settlements in the agricultural hinterland of Pohansko was located at Břeclav—Líbivá, 1.5 km to the east from Charvatská Nová Ves.⁶⁶ The site was excavated between 1995 and 1998 by a joint team from the Institute of Archaeology and Museology at the Faculty of Arts of the Masaryk University, the Institute of Archaeology of the Czech Academy of Science, and the Municipal Museum and Gallery in Břeclav. Occupation was detected at an elevation of about 160 m above sea level on the edge of a sand dune, rising approximately 1.4

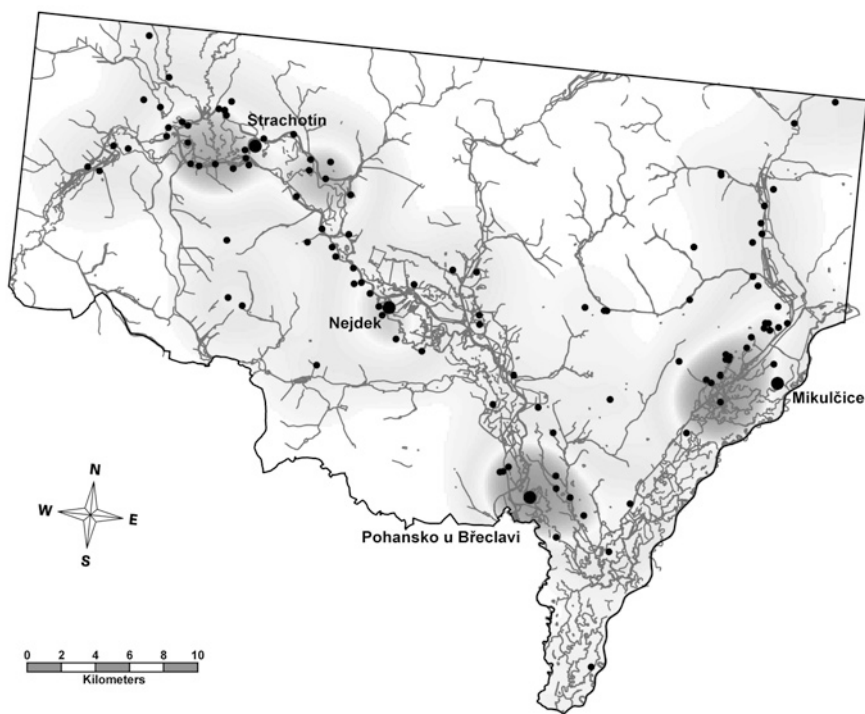


Fig. 13. Early medieval settlement downstream of the Morava and the Dyje (according to the State Archaeological Register).

⁶⁶ Macháček (2001b).

m above the surrounding flood plain of the Dyje river. The investigation was undertaken in order to pre-empt the destruction of the site where a new forest nursery was to be established, and originally had the characteristics of rescue excavation. However, given the importance of the finds it was later transformed into a systematic excavation project. All in all, Lívivá yielded 92 settlement features, 15 human graves, 5 dog burials, 37 postholes and one modern-age ditch. The finds provide evidence of the multi-layered nature of the site. It had been occupied from the Eneolithic (Funnel Beaker and Jevišovice cultures). A sunken-floored building dates back to the La Tène period and a burial ground with 15 burials may be attributed to the earlier phase of the Migration Period (mid-fifth century). However, the most numerous archaeological finds from Lívivá belong to an early medieval settlement, which continued without interruption from the early Slavic period to the end of the Great Moravian phase. The intensity of occupation is confirmed by the frequent superpositions between the structures from various phases of the early medieval development.

Thirty-two features can be associated with the early Slavic (Prague-type culture) to the Early Hillfort (Pre-Great Moravian) settlement (Fig. 14). Of those, sixteen have been identified as silos but there are also elongated oval pits and features of irregular shape. So far, no early Slavic (Prague-type culture) sunken-floored building has been uncovered. Interestingly, the early Slavic occupation concentrates within an area delimited by a row of grain pits, which in the excavated area forms a rectangular broken line, partly running alongside the edge of the sand dune.

The most intensive settlement activity in Lívivá is associated with the Great Moravian period. Thirty-seven settlement features, including two square sunken-floored buildings originate from this period (Fig. 15). The largest number of features (11) were silos. The pits cluster at the edge of the sand dune in a special district, at a distance of about 10 m from the sunken-floored dwellings.

The analysis of the early medieval storage pits and silos from Lívivá revealed some interesting aspects. During the Great Moravian period, there were two kinds of silos, which were different from each other in terms of size (Fig. 16). The deep and large ones are especially significant. Unlike smaller pits, the large silos appear in the proximity of the sunken-floored buildings, but are all grouped together in a special area. This may have been an area associated with the status of the settlement at Lívivá as is one of the units in the agricultural hinterland

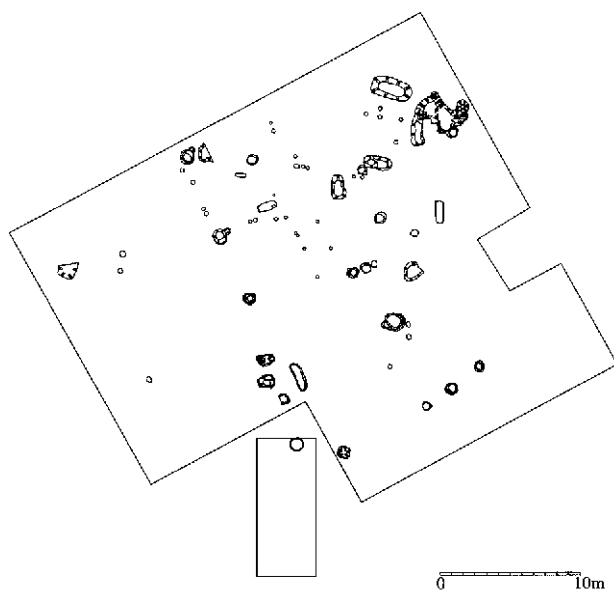


Fig. 14. Břeclav—Líbivá. The early Slavic (Prague-type culture) and Early Hillfort (Pre-Great Moravian) phases (according to *Macháček 2001b*).

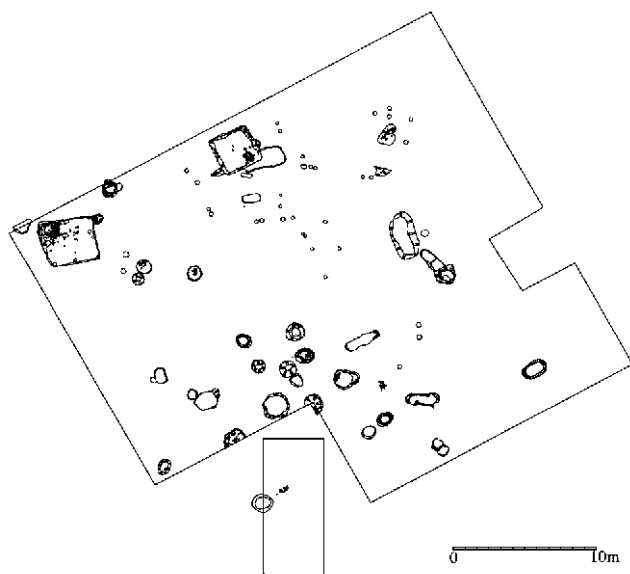


Fig. 15. Břeclav—Líbivá. The Great Moravian phase (according to *Macháček 2001b*).

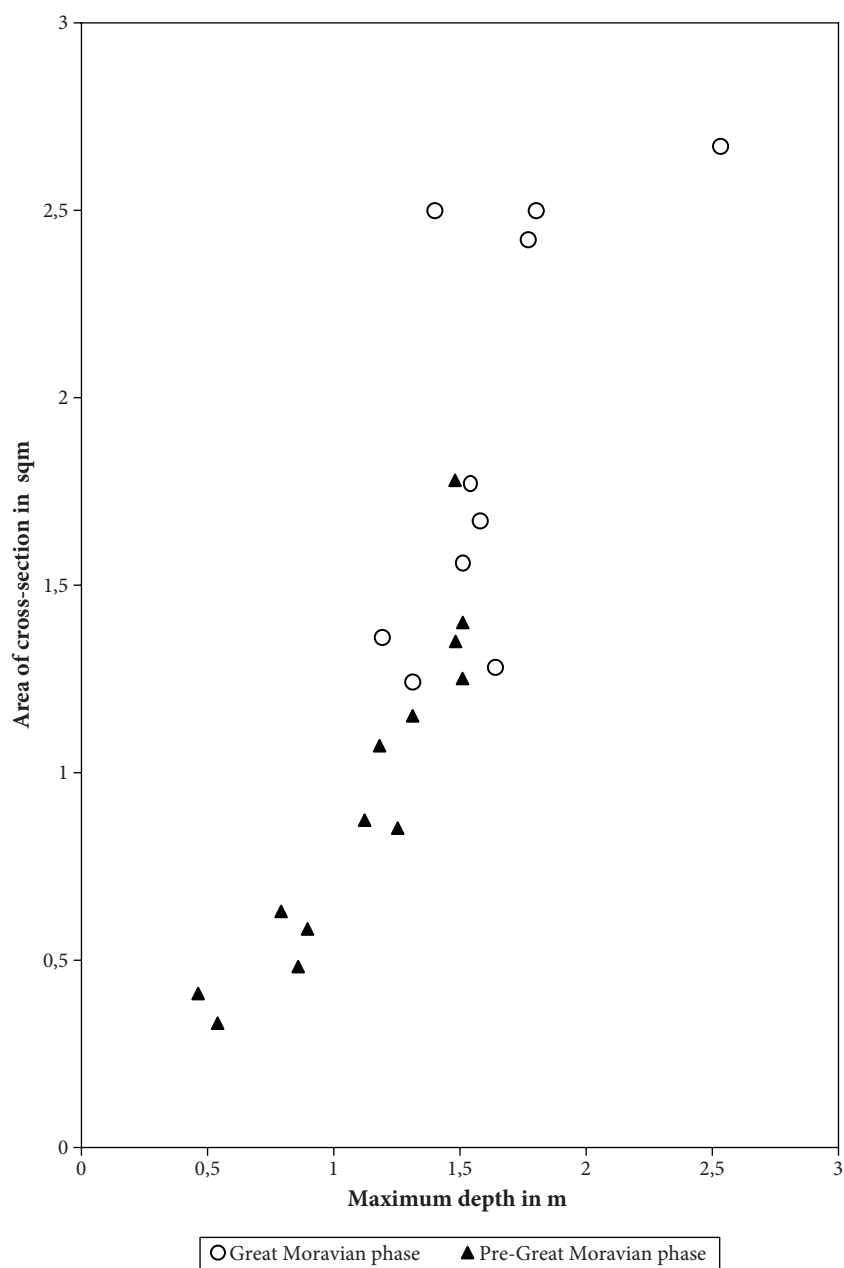


Fig. 16. Břeclav—Líbivá. Dimensions of storage and grain pits (according to Macháček 2001b).

of Pohansko in the Great Moravian period, at a distance of only 5.5 km from the stronghold. The subdivision of the storage pits into two categories may reflect the fact that a settlement of this type must have been produced not only for the subsistence of its own inhabitants, but also for the provisioning of the densely populated centre at Pohansko. In this context it is important to point out that no such similar silos and storage pits have so far been found inside the stronghold at Pohansko.

The sunken-featured dwellings in Lébivá had stone ovens. One of them was found in an exceptionally good state of preservation, including large fragments of a roasting tray made of clay, which was most likely placed on top of the oven. Both sunken-featured buildings are large,⁶⁷ especially when compared with sunken-floored features from the Southern Suburb in Pohansko. This confirms Peter Donat's observation⁶⁸ according to which the houses in the Southern Suburb are smaller than similar houses in the neighbouring rural settlements.

An unusual find at Lébivá is five dog burials, which were discovered either in pits of the Great Moravian settlement phase in small shallow pits just below the surface. When the skeleton was found intact, it was possible to establish that the dog was interred on one side with crouched limbs.

The Great Moravian features at Lébivá produced mainly pottery remains. In addition to standard Middle Hillfort (Great Moravian) Period wares, the assemblages produced some outstanding examples of types identified at Pohansko as well as in other Great Moravian centres. Especially noteworthy are vessels with grooved rims (Group 4 according to B. Dostál⁶⁹ or Group B according to J. Macháček),⁷⁰ an example of Dostál's⁷¹ Group Ia with a lip profiled by a central moulded strip and decorated with dense incised lines,⁷² as well as variants of the *Blučina* type. One of the vessels is reminiscent by its shape⁷³ and decoration⁷⁴ of very late, perhaps even post-Great Moravian pottery.

⁶⁷ Dostál (1987a), p. 14.

⁶⁸ Donat (1995), p. 81.

⁶⁹ Dostál (1975), pp. 163–164.

⁷⁰ Macháček (2001c), p. 138.

⁷¹ Dostál (1975), p. 161.

⁷² Group A according to Macháček (2001c), pp. 137–138.

⁷³ Broad shoulders, with the maximum width just below the neck—compare Dostál (1975), p. 172, tab. 111/1.

⁷⁴ Wide wavy line incised with a single-pronged tool—Dostál (1975), p. 172, tab. 111/1; Poláček (1995), pp. 143–144.

3.3 *Pohansko near Břeclav—preliminary interpretation models*

Any discussion of the purpose of the Pohansko stronghold must take into account previous interpretations of that site. Their outcome is a preliminary model which is a necessary pre-condition for the proper application of the iterative archaeological method to the archaeological context under investigation.

One of the first to express an opinion on Pohansko on the basis of the systematic excavation of the site was F. Kalousek. He viewed Pohansko as one of the most important Great Moravian strongholds, “*which were solid fortresses...and the mainstay of the Great Moravian Empire in the unrelenting heroic struggles of the Moravians against German aggression.*”⁷⁵ Given its location and size he identified the site with “*ineffabilis munitio Rastici*”, which is mentioned in association with events dated to the year 869 in the Annals of Fulda. F. Kalousek was quick to point out that Pohansko was the largest Great Moravian stronghold known at that time. He (wrongly) estimated the area of the whole agglomeration including the suburbs to some 100 ha. From the rich finds in the church cemetery he supposed that Pohansko was the seat of an important feudal lord, maybe a prince.⁷⁶ Later he also commented on the Magnate Court, which, according to him, must have been in the early ninth century the seat of an important lord. He referred to it as “court”. A well fortified stronghold, however, only appeared in Pohansko at the beginning of the second half of the ninth century, under Prince Rostislav. Based on the grave finds F. Kalousek highlighted the differences in the social standing of the inhabitants of the stronghold proper and the suburb. He believed that a strong garrison was stationed at Pohansko, with the large fortress serving as gathering point for the military forces before campaigns abroad or defensive operations at home. However, Pohansko was primarily, according to F. Kalousek, one of the Great Moravia’s “*urban settlements*”.⁷⁷

Dostál’s interpretation of the site’s purpose was primarily based on the excavation of the Magnate Court. According to B. Dostál, the Magnate Court was a fortified residence, but also an economic unit associated with the beginnings of feudalism. He advanced a number of analogies with *curtes* of the Carolingian age and proposed that the

⁷⁵ Kalousek (1960a), 496.

⁷⁶ Ibidem.

⁷⁷ Kalousek (1965), pp. 45–56.

Magnate Court was in fact a palace (*palatium*), as suggested by its emphatically representational function. B. Dostál believed that the Mojmirids resided temporarily in individual palatial compounds, always accompanied by their retinue of warriors. He viewed the Magnate Court as an early feudal residence, associated with surrounding manorial estates.⁷⁸ It was, in other words, a simpler version of a Carolingian *Pfalz*. B. Dostál could not decide whether the lord of the Court was a member of the local tribal aristocracy, a Mojmirid, a member of the prince's retinue, or an official. Nonetheless, he suggested that initially, the Magnate Court was inhabited by a local lord, but later was taken over by the deputy of the Moravian prince, who witnessed the rebuilding of the enclosure and the devastation of the stronghold fortification.⁷⁹ According to B. Dostál, the Magnate Court was erected between the 820s and 840s and abandoned at some point in the 880s or 890s. Originally, it was thought that the extensive earth-and-timber and stone fortification around the whole stronghold was built after the extinction of the earlier palisade defences of the Magnate Court. Later, based on new finds,⁸⁰ B. Dostál became convinced that the Magnate Court was established, or at least functioned, over a longer period within a previously fortified settlement.⁸¹

The Magnate Court is believed to be the illustration of a Carolingian institution adopted by the Moravian noblemen. As such, the Magnate Court appears as the centre of an early medieval, large estate, although nothing indicates the direct involvement of its inhabitants in agricultural production. It may have been simply the centre where the various activities on the estate were organized and where dues were paid. The needs of the population living at the Magnate Court were met by the so-called service organization, which is believed to have been the economic backbone of the East Central European early feudal state. According to B. Dostál, the Forest Nursery excavation had revealed an attendant settlement specializing in craft production and other types of activities. Judging from the grave goods from that area, he believed the inhabitants of the attendant settlements to have been of low social status—slaves, prisoners of war, and possibly foreigners with no connections to the community at the Magnate Court, who could therefore

⁷⁸ Dostál (1975), pp. 253–259.

⁷⁹ Dostál (1988a), p. 284.

⁸⁰ Dostál (1977/1978).

⁸¹ Dostál (1990a), 283.

not be buried in the church cemetery. In the environs of the Magnate Court and in the Forest Nursery settlement it is possible to see groups of features with wells and remains of fencing, which B. Dostál identified as homesteads with a conspicuous craft/industrial function. He compared them with features known from such centres as the Viking-age Hedeby or the East Slavic Novgorod. Given the great concentration of people within the stronghold and the lack of available land for the cultivation of crops, the inhabitants of the attendant settlement must have been supplied with food by the lord of the Court. Even more distant settlements had attendant status as they had plenty of agricultural land available in their surroundings.⁸²

On the other hand, B. Dostál⁸³ also emphasised the early urban character of Pohansko, which he associated with the advanced level of craft production, such as illustrated by his excavations in the Forest Nursery district, and with the evidence of long-distance trade. The latter derived more from the strategic location of Pohansko at the crossroads of important routes, and less from the rare finds of imported goods. To B. Dostál, the unfortified agglomeration in the Southern Suburb, which he otherwise interpreted as the quarter of the retinue of warriors, was very similar to a West European *wik*. The burials with weapons and equestrian equipment uncovered in that area could have been the tombs of Great Moravian members of the retinue or of armed merchants. Equally characteristic for the early urban nature of Pohansko, according to B. Dostál, was the fortification, as well as the elements of settlement planning, which appear to have been linked to a clear social stratification of the population. Pohansko is now considered to be both the cultural and religious, as well as a political and administrative centre of the surrounding region. Evidence of this is seen in the spacious religious structure, the Magnate Court, and the presence of a military force. Pohansko had all the basic characteristics of an early medieval Slavic town.

In her interpretation of the site, J. Vignatiová⁸⁴ focused primarily on the Southern Suburb. She viewed its inhabitants as members of a large retinue of warriors, who had been settled there together with their families and servants (craftsmen or herdsman) at the behest of

⁸² Dostál (1988a), pp. 283–287; Dostál (1990a).

⁸³ Dostál (1988b).

⁸⁴ Vignatiová (1992), 97–99.

the lord of the Magnate Court. They may have been able to provide in part for themselves by means of agriculture, but they must have been supplied with foodstuffs from the Magnate Court. The lord of the manor must have had a close relationship to the members of the retinue. They were very likely his direct subjects. If this interpretation is correct, then the lord of the Court could not have been an independent one, but a dependent deputy of the ruler, who was allocated the function of the commander (or administrator) of the stronghold. He could also have been of a higher rank, perhaps a member of the ruling Mojmirid family.

In short, the interpretation of the site changed over the years, which is to be explained both in terms of an increasing source base and the prevailing socio-political situation, which greatly affected what scholars wanted, or were allowed, to see in Pohansko. The ideas archaeologists advanced about the purpose of Pohansko gradually stabilized. Their current interpretation may thus become a preliminary model to be tested by means of this study. The premise of this book is therefore that Pohansko fulfilled important economic, administrative, military and cult functions in ninth-century Moravia whereby it clearly met the criteria of a complex centre, as defined by E. Gringmuth-Dallmer.⁸⁵ Following the new evaluation of extensive excavations in the Forest Nursery and comparisons of the results with the structures identified within Pohansko and on other sites of early medieval Europe. We will then try to confirm, refute the model or, alternatively, change it.

⁸⁵ Gringmuth-Dallmer (1999).

CHAPTER FOUR

EXCAVATION IN THE FOREST NURSERY AT POHANSKO

The area designated after a forest nursery which was in operation on the site until 1974 was excavated in a total of 17 campaigns between 1961–1990 (Fig. 17). The digging did not take place every year. In 1961, the work involved just initial trial trenches. Large-scale excavation was not carried out until 1968/69. The standard of the research in those years was influenced by adverse climatic and socio-political conditions. Systematic excavation could not be realized there until 1974 when the forest nursery was closed and after the forest in the eastern half of the stronghold was cut down in 1979. In the final years of the excavation (1988–1990) the digging stopped at the edge of the newly

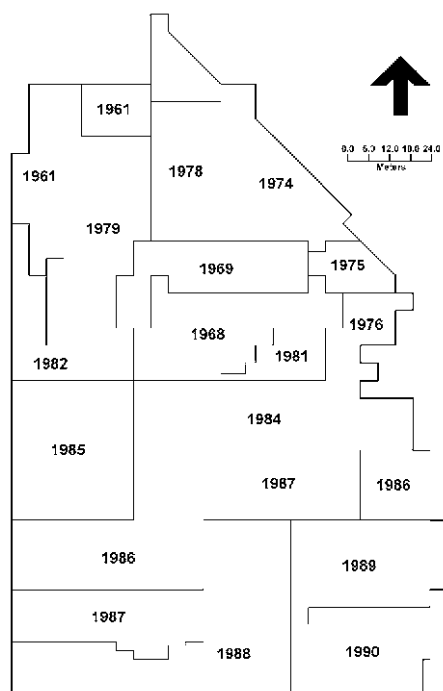


Fig. 17. Břeclav-Pohansko. The Forest Nursery. Excavation campaigns.

planted trees. After the start of the systematic work on the Forest Nursery site it was interrupted for organizational and financial reasons in the years 1977, 1980 and 1983. The whole Great Moravian agglomeration under investigation was delineated, on the southern and eastern side, by a rampart, the excavation trenches of which—made in 1962, 1965, 1966 and 1975—were a continuation of the excavation in the Forest Nursery.

The investigated area in the Forest Nursery amounts to about 1.9 ha. The whole excavation was located within the basic square sector B (500 × 500 m), set out together with the other sectors inside the area of the stronghold in 1959.¹ The sector was divided into a grid of 5 × 5 m squares. During the excavations in the Forest Nursery a total of 762 squares were examined.

The top soil was first removed by heavy machinery and then, from about twenty centimetres above the subsoil, it was done manually. In this way the upper, dark humus layer 40 to 80 cm thick was scraped down to the light coloured sterile subbase. Conspicuous stone or daub destructions or concentrations of finds in the top soil were, if captured, prepared and documented. Their identification was made difficult by the fact that the forest nursery, after which the excavation area is named, taking up approximately 2/3 of the whole excavation, was previously tilled and ploughed and by the deployment of heavy machinery itself. After the exposing of the subbase the fill in the sunken-floored settlement features, grave pits and post holes was carefully scooped and any destructions, substructions or concentrations of finds inside the dug up trenches were prepared and documented.

The basic find unit, documented either by a drawing or in writing or photographically, was one feature or one grave. Throughout the investigation in the Forest Nursery they were continually numbered by particular numerical sequences. Occasionally, it was found from the situation in the field that a settlement feature, initially thought to be one whole, had to be divided into multiple independent parts. In this case the original numerical feature identifier was extended by an alphabetical suffix (e.g. 111a, 111b, 111c, 111d). In the course of the investigation some (not all) above-ground poshole structures were randomly designated by an identifier from the numerical sequence of the sunken-floored features (e.g. 102, 121, 260, 272). For the pur-

¹ Kalousek (1971), 7.

poses of a detailed systematic analysis of the above-ground features (see Chap. 4.1.2) they were assigned different numbers from a special numerical sequence.

In removing the fill from the sunken-floored settlement features one or more control cross-sections perpendicular to each other were preserved in situ in order to check their fill. However, the identified stratification was usually not the subject of evaluation and the fill of the features was removed as a whole. Also, in the cross-section drawings the stratification was not systematically documented in accordance with contemporary standards. Only in some settlement features was the fill, partly or as a whole, floated.²

4.1 SETTLEMENT FEATURES FROM THE FOREST NURSERY— ANALYSIS AND SYNTHESIS OF THEIR FORMAL STRUCTURE

During the excavations in the Forest Nursery area a total of 294 structures of Great Moravian and pre-Great Moravian age were uncovered, according to a preliminary estimate by B. Dostál.³ They were mostly sunken-floored features. However the number of postholes (954) allows us to assume that there were many above-ground structures on the site, at least 25 according to B. Dostál. Following a critical review of the field documentation a total of 285 sunken-floored features, of which some are part of more complex structures, and 43 above-ground posthole structures were identified in the final phase of processing the excavations in the Forest Nursery.

B. Dostál⁴ pointed out the remarkable variety of features in the Forest Nursery. He distinguishes square sunken-floored dwellings, above-ground postholes structures, large sunken-floored features, trough-shaped features, wells, furnaces and hearths. The largest group consists of unclassifiable pits of various ground plans, sizes and depths. In the following chapter we will attempt to characterize the individual groups of features singled out by B. Dostál, and define their formal attributes. In this case, the formalized synthesis methods will not be applied exploratorily (in order to search), but rather as a confirmation or proof. Our task will consist, above all, in verifying or detailing/

² Čáp (1983).

³ Dostál (1993a), p. 33; Dostál (1993b).

⁴ Ibidem.

expanding our previous knowledge of the types of settlement features, so far identified in the Forest Nursery settlement.

4.1.1 *Sunken-floored dwellings*

According to B. Dostál,⁵ no doubts exist about the interpretation of the sunken-floored dwellings of a roughly square plan (Fig. 18). In the excavated area of the Forest Nursery, 8 belonged to the Great Moravian period (features 22, 54, 55, 56, 57, 58, 91, 166) and 4 to the early Slavic to Early Hillfort period (25, 28, 50, 66). Those were typically Slav dwellings, with a floor area between 9 to 12 m² and a depth between 10 to 70 cm from the initial walking ground (only the later floor in feature 54 was identified above the level of the medieval walking ground). While hearths may be expected in all sunken-floored dwellings, in some cases the fireplace was damaged to such an extent, that it can

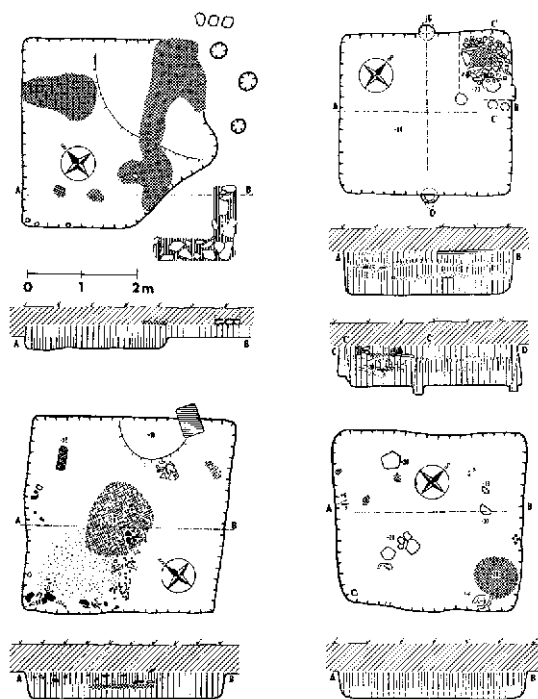


Fig. 18. Břeclav-Pohansko. The Forest Nursery. Sunken-floored dwellings (after Dostál 1993b).

⁵ Dostál (1987b); Dostál (1993a); Dostál (1993b).

be assumed only on the basis of specific indications—large stones and burnt potsherds in feature 57, remains of hearth bottoms in features 55 and 56. Elsewhere, such structures were equipped with stone ovens (features 22, 91, 166?). The hearths appear in different corners of the sunken-floored dwellings. An exceptional occurrence is the centrally located fireplace in feature 55. In two sunken-floored dwellings (feat. 22 and 91) there were traces of posts bearing the roof. Such dwellings may have had wattle-and-daub walls as is suggested by finds of daub. The other houses had most probably timber walls. Sunken-floored dwelling no. 54 is remarkable for its masonry corner, an indication of the occasional use of technologically sophisticated procedures for the building of sunken-floored dwellings.

For the purposes of formalized processing, dwelling 166 could not be classified as a sunken-floored structure, having been indicated only by the find of a stone oven and an inconspicuous depression, which extended outside the excavated area; nor could feature 22, which was considerably damaged by a large rectangular pit, whereby the outlines of both features merged. The data of the two features were either incomplete or secondarily modified. On the other hand, features 9, 87 and 104 were included among the sunken-floored dwellings, because in our opinion they meet at least some important criteria, characteristic for this group of settlement features (shape, dimensions, in case of feature 87 a hearth in the corner). When there is no fireplace, such features, according to B. Dostál,⁶ must have served for storage.

Another important group of structures from the Forest Nursery, which B. Dostál⁷ distinguished, are the so-called large sunken-floored features (Fig. 19). Most of them are 6–15 m long (only exceptionally reaching 19.5 m in length), 1.3–3 m wide and 0.5–1.6 m deep. They often had a stepped bottom and a partition of the floor area. They were usually not furnished with hearths. In some cases at the origin of such features was a merger of several separate pits. In some features of this type it is impossible to identify traces of a house construction, in others there appear holes along the longitudinal axis or along the walls, even outside the sunken part. Their above ground section could have outreached the footprint of the sunken area. B. Dostál supposes that the majority of the large sunken-floored features were used

⁶ Dostál (1993b), p. 44.

⁷ Dostál (1986); Dostál (1993a); Dostál (1993b).

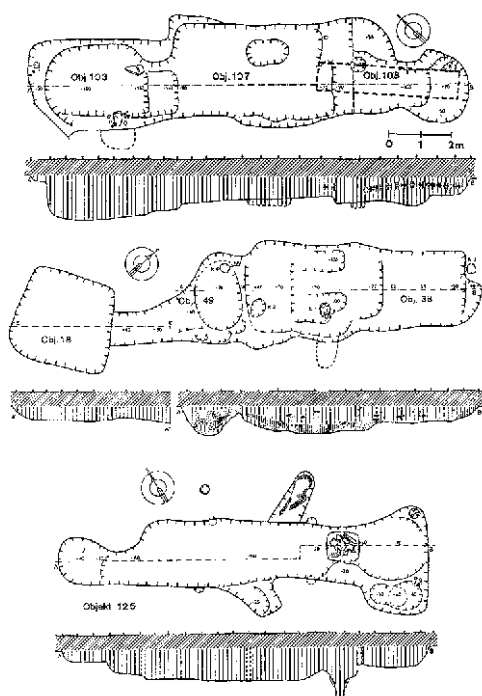


Fig. 19. Břeclav-Pohansko. The Forest Nursery. Large sunken-floored features with workshop characteristics (after Dostál 1993b).

for manufacturing/craft production. In this respect he draws attention, for example, to troughs in the bottom of feature 38, which could have been remnants of a vertical loom, or to the slag and tools found in other features of this type. B. Dostál compares the large sunken-floored features with the Merovingian-Carolingian workshops, e.g. the *gynaecea*—workshops of textile production employing female workers. According to him some may have also served as smithies, others as workshops for non-ferrous metalworking. The large sunken-floored features also include feature No. 38 (forming a complex with feature 18 and 49, with different characteristics), 93, 103, 105, 106, 107, 108, 125, 196, 215, 216, 218, 221, 233, 235, 241 and 247.

Comparatively much easier to interpret are the wells.⁸ At the subbase level they were mostly circular in ground plan with a diameter of 1.8–2.6 m (Fig. 20). They had a funnel-shaped top section which gradually

⁸ Dostál (1990c); Dostál (1993a); Dostál (1993b).

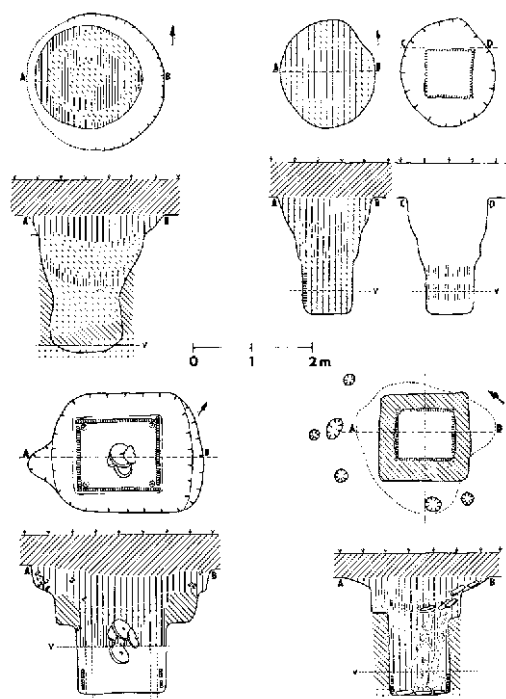


Fig. 20. Břeclav-Pohansko. The Forest Nursery. Wells (after Dostál 1993b).

changed into a rectangular shaft, only exceptionally in a cylindrical pit. Originally, the rectangular shafts were lined with wooden boards supported by posts in the corners, which rarely survived in situ. The top segment of the fill contained larger stones, occasionally even quern-stones. Dostál's opinion that the stones formed a rim on the surface or reinforced the access to the well is not sufficiently convincing. This phenomenon is perhaps less of a utilitarian, and more of a ritual nature. Most wells were dug in the gravel-sand layer at a depth of 1.65–2.2 m. An exception is the 238 which was 140 cm deep. In the Forest Nursery, the following features were identified as wells: 125a, 157, 174, 194, 203, 209, 238, 266. Well 83A probably interfered with oval feature 83B and the ground plans merged. As a result, this feature could not be included in the group of wells during the formalized processing.

Various types of hearths occur in the Forest Nursery quite frequently.⁹ They are found both as integral parts of larger features or isolated. A

⁹ Dostál (1993a); Dostál (1993b).

special group consists of clay ovens (Fig. 21), occurring in two basic dimensions and modifications: smaller ones with a diameter of 0.6–0.7 m and larger ones with a diameter of 1.2–1.4 m with a daub bottom lined with stones and potsherds. Smaller ovens are often associated with small pits dug in front of the oven's gate. Also presents are open hearths with a fired bottom and blacksmith hearths, the infill of which contained pieces of slag. The following features were classified as isolated hearths: 24, 89, 118, 120, 122, 137, 140, 146, 152, 162, 165, 169, 181, 193, 197, 198, 200d, 200a, 202, 212, 213, 217, 253 and 262.

Another important type are trough-shaped features,¹⁰ 3–15 m long and 0.4 to 1.5 m wide (Fig. 22). Some are shallow (up to 0.3 m), but most reach 0.9–1 m in depth. They are typically elongated, oval features with the exception of features 256 and 177 with a horseshoe-shaped plan. Such features rarely contain remains of fireplaces or post-support structures. The trough-shaped features include nos. 159, 160, 172, 177, 191, 192, 224 and 256.

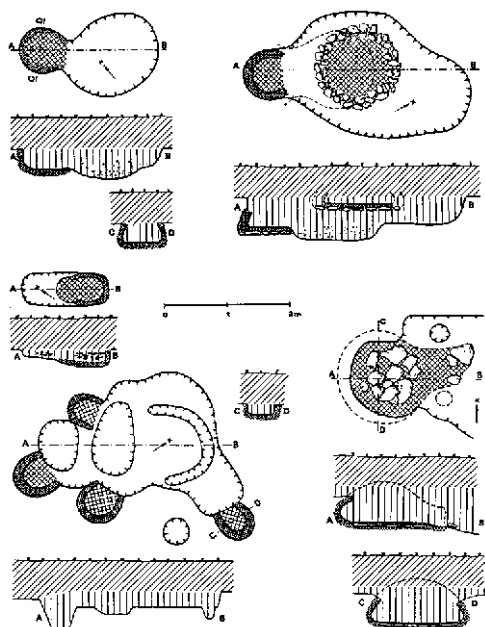


Fig. 21. Břeclav-Pohansko. The Forest Nursery. Clay ovens (after Dostál 1993b).

¹⁰ Ibidem.

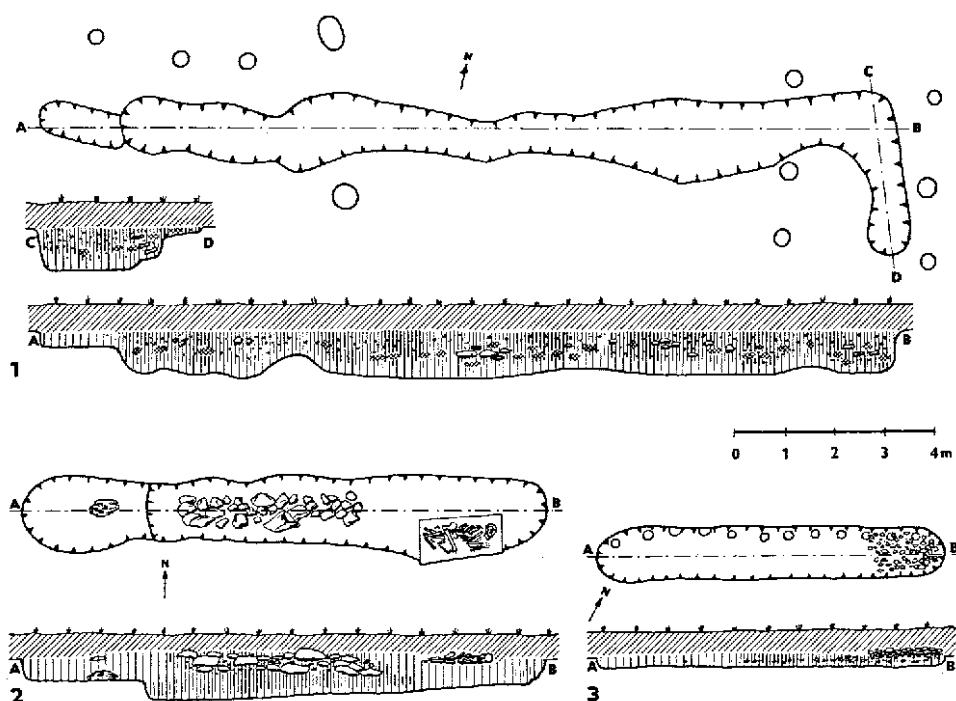


Fig. 22. Břeclav-Pohansko. The Forest Nursery. Trough-shaped features (after Dostál 1993b).

Most other features situated in the Forest Nursery are difficult to classify formally. They are pits of various shapes and sizes. B. Dostál¹¹ makes an additional distinction between larger, elongated pits (which can be either shallow or deep), smaller elongated pits (which can also be shallow or deep), and oval pits, either large or small. There also appear trapezoidal pits, small rectangular pits and pits which are almost circular, although only one of them has a pear-shaped cross-section and may have been a silo. Several pits are simply irregular. Pits appear to have served various functions.

4.1.1.1 *Analysis and formalized description of sunken-floored settlement features*

Given our previous knowledge of the nature of sunken-floored settlement features from the Forest Nursery at Pohansko, based both on the

¹¹ Dostál (1993a), pp. 44–46.

field documentation, and the preliminary studies by B. Dostál,¹² we can draw some conclusions concerning the entities and the qualities of the analyzed archaeological context.

Entities, in this case, are individual sunken-floored features, singled out during the excavation and verified during the critical review of the field documentation. From the great number of qualities identified during the excavation and recorded in the primary descriptive system,¹³ only those will be used for formal analysis, which can significantly contribute to creating archaeological structures. The end result of the analysis is a higher-rank descriptive system with a prevalence of evaluated attributes.¹⁴ The system is also created with reference to the specific requirements ensuing from the application of statistical procedures, which are employed in the following phases of the archaeological method.¹⁵

The individual sunken-floored settlement features (“entities” or “objects”) may be described using the following qualities (descriptors or attributes):

Area (FLACHE): floor area of the sunken-floored feature at the subsoil level; the area is precisely calculated using GIS software tools
 Depth (TIEFE): the maximum depth established for the feature
 Length-to-width Index (LAN_BREI): the ratio between the maximum length and the maximum width of the feature
 Irregularity (UNREGEL): a value between 0 or 1 indicating whether the sunken-floored feature has a regular geometric shape in the ground plan or whether it is more or less irregular
 Rounding (RUND): a value between 0 and 1 indicating whether the feature is rounded (oval, circular) or not (square, rectangular, trapezoid)
 Steps in Profile (PROFSTU): a value 0 or 1 indicating whether there are one or more steps in the longitudinal or transversal cross-section
 Vertical Pit Walls (WAND1SRE): a value between 0 or 1 indicating whether the walls of the feature are perpendicular to the floor of the feature

¹² Dostál (1986); Dostál (1987b), Dostál (1990c); Dostál (1993a), Dostál (1993b).

¹³ Macháček (2002a).

¹⁴ Pavlů (1978), 242.

¹⁵ The descriptive matrix must form the so-called linear vector space, for which see Neustupný (1997b), p. 239.

Concave Profile (PROF1KON): a value between 0 and 1 indicating the degree of concavity of the lower part of the feature's transverse cross-section, either bowl-shaped (or pear-shaped) or rough-shaped

Hearth in Corner (FS_ECKE): a value between 0 and 1 indicating the presence of a hearth in the corner of the feature

Hearth in Pit Wall or Bottom (FS_W_B): a value between 0 and 1 indicating the presence of a hearth in the wall or on the bottom of the feature

Postholes (PF_0_1): a value between 0 and 1 indicating the presence or absence of postholes in the feature

Pottery Density (KER_DICH): the density of the pottery remains found in the feature, which is established from the number of pottery fragments and the idealized volume of the feature (itself obtained by multiplying the feature area by its maximum depth)

Bone Density (KN_DICHT): the density of the bone remains in the feature established from the number of bones and the idealized volume (itself obtained by multiplying the feature area by its maximum depth)

Number of Artefacts Other Than Pottery (ANDFUN_S): number of non-ceramic finds in the feature

4.1.1.2 *Synthesis of the formal structure of sunken-floored settlement features*

The first stage in the formalized description of sunken-floored settlement features from the Forest Nursery is the building of a matrix with 226 rows. The rows represent all the settlement features of Great Moravian and pre-Great Moravian age for which we have complete data available. Features where it was impossible to establish any of the required qualities were eliminated from the descriptive matrix (for the preparatory work leading to principal component analysis).¹⁶ Examples of such features may include those found beyond the excavated area, where it was impossible to establish their actual length.

The columns of the descriptive matrix represent the 14 qualities (descriptors) mentioned above (Tab. 2). Thus, the descriptive matrix easily meets the general requirement that it should contain roughly five times more features (rows) than the number of descriptors. The

¹⁶ See Neustupný (1997b), p. 239.

descriptive matrix is now ready for the initial statistics of the principal component analysis:

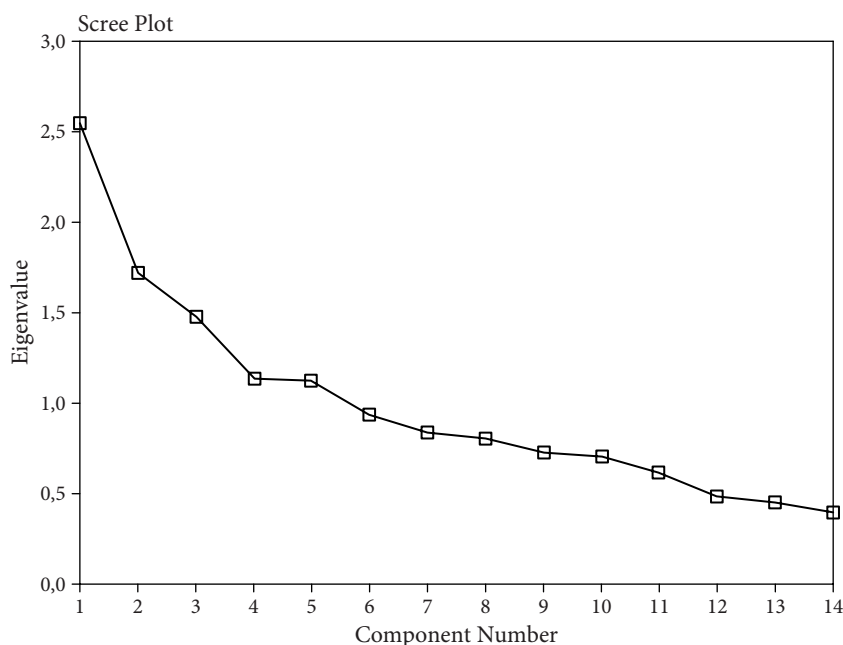
Tab. 2. Descriptive Statistics.

	Mean	Std. Deviation	N-Analysis
LAN_BREI	2.0419	1.1813	226
TIEFE	51.1947	39.1188	226
KER_DICH	69.7920	92.1604	226
WANDISRE	0.27	0.45	226
PROFIKON	0.33	0.47	226
PROFSTU	0.39	0.49	226
FLACHE	65108.4496	80800.1484	226
UNREGEL	0.34	0.47	226
RUND	0.47	0.50	226
PF_0_1	0.3628	0.4819	226
KN_DICHT	59.8130	102.9400	226
FS_W_B	0.1593	0.3668	226
FS_ECKE	5.752E-02	0.2334	226
ANDFUN_S	5.0044	9.3901	226

Tab. 3. Eigenvalues.

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.549	18.208	18.208	2.522	18.016	18.016
2	1.719	12.280	30.488	1.662	11.870	29.886
3	1.476	10.544	41.032	1.560	11.146	41.032
4	1.140	8.146	49.178			
5	1.129	8.067	57.245			
6	0.942	6.729	63.974			
7	0.843	6.019	69.994			
8	0.806	5.760	75.753			
9	0.731	5.219	80.973			
10	0.709	5.065	86.037			
11	0.615	4.391	90.429			
12	0.483	3.453	93.881			
13	0.456	3.260	97.142			
14	0.400	2.858	100.000			

Extraction Method: Principal Component Analysis.



The criterion employed for establishing the number of factors to be used as the basis for principal component analysis (PCA) is was the last significant drop between the eigenvalues of the third and fourth factors which is also clearly visible in the eigenvalue diagram¹⁷ (Tab. 3). We will stick to this PCA even though the total cumulative variability of the first three factors is relatively low (41%).

A rotation of the three factors through the Varimax method yields the following result. For the sake of clarity, the table below shows only factor loadings greater than 0.2, which are, in addition, ordered by their absolute values (Tab. 4).

All of the obtained factors are bipolar (Tab. 4).

Qualities such as area size (FLACHE), steps inside the feature (PROFSTU), depth (TIEFE), number of artefacts other than pottery (ANDFUN_S), irregular ground plan (UNREGEL), and, to a lesser extent, the length-width index (LAN_BREI) and the presence of post-holes (PF_0_1) have strong positive loadings on *factor 1*, while vertical

¹⁷ Nestupný (1997b), p. 241.

Tab. 4. Rotated Component Matrix.

	Component		
	1	2	3
FLACHE	0.739		0.237
PROFSTU	0.633	−0.285	
TIEFE	0.629	−0.348	
ANDFUN_S	0.628		
UNREGEL	0.566		
LAN_BREI	0.343	0.324	
KER_DICH		0.805	
KN_DICHT		0.751	
FS_W_B			
FS_ECKE			0.591
PROF1KON			−0.541
RUND		0.233	−0.531
WAND1SRE	−0.428		0.500
PF_0_1	0.357		0.488

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

pit walls (WAND1SRE), with a negative loading on this factor, is in sharp contrast to the other descriptors.

Factor 2 is principally characterized by a contrast between variables with negative factor loadings, steps inside the feature (PROFSTU) and depth (TIEFE), on the one hand, and positive loadings, such as pottery density (KER_DICH), bone density (KN_DICHT), the length-to-width index (LAN_BREI), and a round shape of the ground plan (RUND), on the other hand.

Factor 3 is also clearly bipolar. On one side there are variables with positive factor loadings: hearth in the corner (FS_ECKE), vertical pit walls (WAND1SRE), postholes (PF_0_1), and, to a smaller extent, area size (FLACHE). In stark contrast to those variables are those with negative loadings—concave cross-section (PROF1KON) and roundness of the ground plan (RUND).

4.1.1.3 Validation and interpretation of the formal structures

The principal component analysis based on the matrix compiling data from all sunken-floored features in the Forest Nursery showed important trends contained within that set of data. To appreciate and verify the formal structures of that set, we will employ a preliminary model,

which for our purpose is the classification of settlement features proposed by B. Dostál.¹⁸ The following series of plots (Diagram 1–Diagram 3) visualizes factor scores showing the typical character of each entity (“object”) in the original descriptive system (sunken-floored settlement features) for each factor.¹⁹ The settlement features which can be clearly identified with the types recognized by B. Dostál are marked on the plots by different symbols (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells). The two-dimensional scatterplots show the plots of the combined scores for all the three factors obtained by such means.

The factor score diagrams show that the most important structures considered for the descriptive matrix are related to the typical and classified settlement features. Large sunken-floored features (GEO) can be associated mainly with the positive pole of factor 1 (Diagram 1–

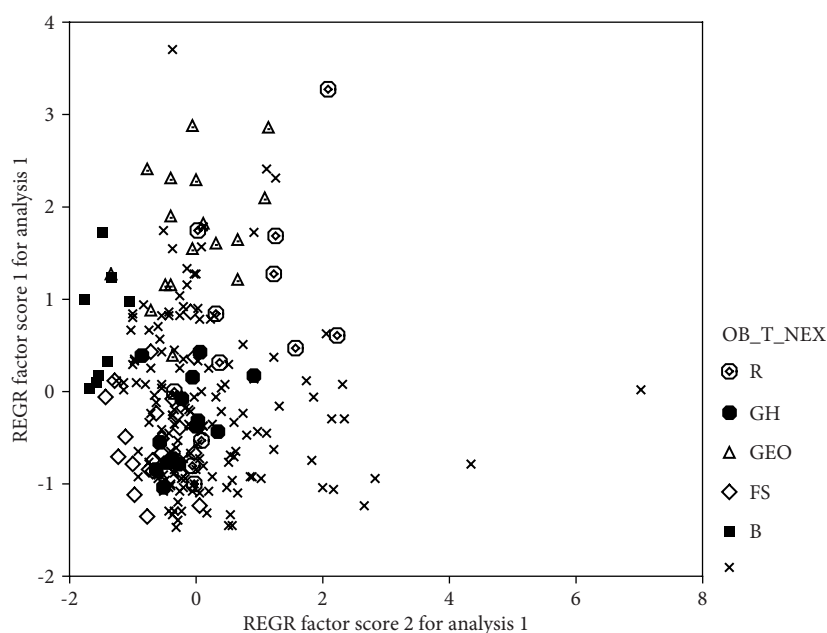


Diagram 1. Factor scores of sunken-floored settlement features from the Forest Nursery (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells).

¹⁸ See above; Dostál (1986); Dostál (1987b), Dostál (1990c); Dostál (1993a), Dostál (1993b).

¹⁹ Neustupný (1997b), p. 242–243.

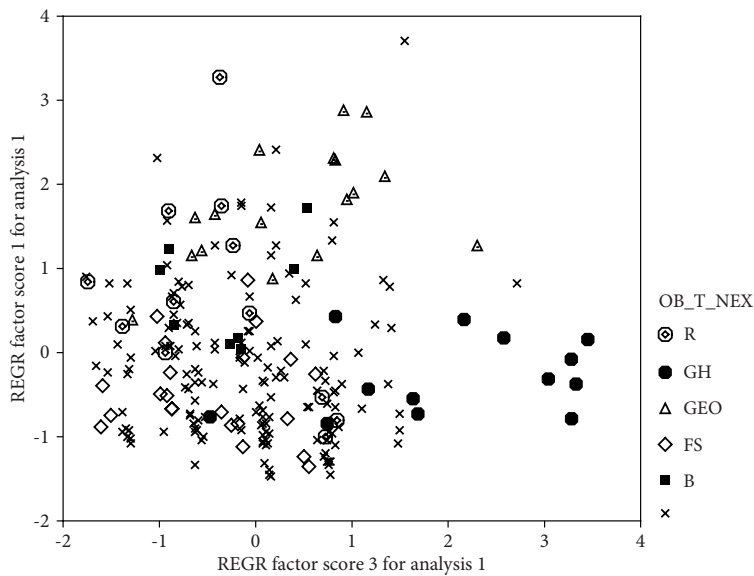


Diagram 2. Factor scores of sunken-floored settlement features from the Forest Nursery (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells).

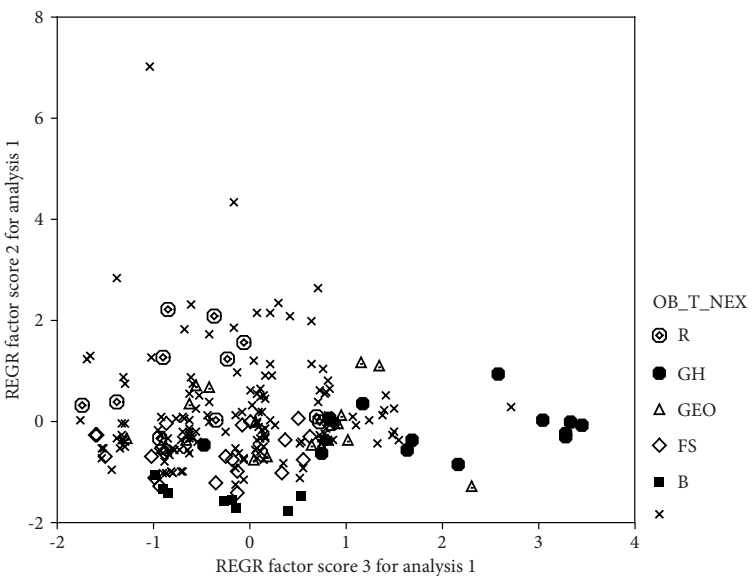


Diagram 3. Factor scores of sunken-floored settlement features from the Forest Nursery (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells).

Diagram 2). Slightly weaker is the relationship of this factor with trough-shaped features (R), which however are linked to the positive pole of factor 2 and the negative pole of factor 3. Sunken-floored dwellings (GH) are clearly associated with the positive pole of factor 3 (Diagram 2–Diagram 3). There is a similarly strong relationship between wells (B) and the negative pole of factor 2 (Diagram 1, Diagram 3). Isolated hearths (FS) are linked to the negative pole of factor 1 (Diagram 1). The features which have not been assigned to any of the main types maintain various positions in the factor score plots. A significant number of them relate to the negative pole of factor 1 and, at the same time, to the positive pole of factor 2. This position is not occupied by any of the typical settlement features and appears to be the exclusive attribute of a specific group of settlement pits (small, shallow, elongated pits with vertical walls and a relatively high density of bones and pottery).

To specify the trends in greater detail and confirm their validity we shall now proceed with another principal component analysis. The descriptive matrix will be modified so that its objects (rows) are only the typical settlement features from the Forest Nursery, selected on the basis of the criteria defined by B. Dostál. The variables will be identical with those employed for the previous analysis. The matrix (Tab. 5) now has 67 rows and 14 columns. It will be used as the basis for the principle component analysis (PCA). The result will be rotated using the Varimax method. The three factors are extracted according to the same criterion as in the previous analysis (Tab. 6), i.e. by a significant drop of the eigenvalue between the third and fourth factor (see the eigenvalue scree plot).

Just as in the previous analysis the factor scores will be visualized by a series of scatterplots where different types of features are shown by means of specific symbols (Diagram 4–Diagram 6).

In this factor analysis (Tab. 7) large sunken-floored features (GEO) display a strong affinity to the positive pole of factor 2 and factor 3 (Diagram 6). This means that they are mainly characterized by a large area (FLACHE), depth (TIEFE), steps (PROFSTU), the presence of postholes (PF_0_1), a great number of artefacts other than pottery (ANDFUN_S), relatively high density of pottery (KER_DICH) and bones (KN_DICHT), hearths placed in the corner (FS_ECKE), elongated shape (LAN_BREI) and certain irregularities of ground plan (UNREGEL).

Tab. 5. Descriptive Statistics.

	Mean	Std. Deviation	N-Analysis
LAN_BREI	2.4154	1.8393	67
TIEFE	65.2836	51.1959	67
KER_DICH	45.4105	45.9853	67
WANDISRE	0.24	0.43	67
PROFIKON	0.27	0.45	67
PROFSTU	0.52	0.50	67
FLACHE	102635.6224	114285.5400	67
UNREGEL	0.39	0.49	67
RUND	0.45	0.50	67
PF_0_1	0.5224	0.5033	67
KN_DICHT	41.7879	48.2939	67
FS_W_B	0.4179	0.4969	67
FS_ECKE	0.1343	0.3436	67
ANDFUN_S	5.5970	7.4672	67

Tab. 6. Eigenvalues.

Initial Eigenvalues				Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.349	23.919	23.919	2.817	20.121	20.121
2	2.140	15.285	39.204	2.503	17.881	38.002
3	1.894	13.526	52.730	2.062	14.728	52.730
4	1.120	7.998	60.728			
5	0.995	7.104	67.832			
6	0.851	6.077	73.909			
7	0.720	5.140	79.049			
8	0.692	4.941	83.990			
9	0.547	3.906	87.895			
10	0.495	3.537	91.432			
11	0.431	3.078	94.510			
12	0.355	2.535	97.046			
13	0.244	1.744	98.790			
14	0.169	1.210	100.000			

Extraction Method: Principal Component Analysis.

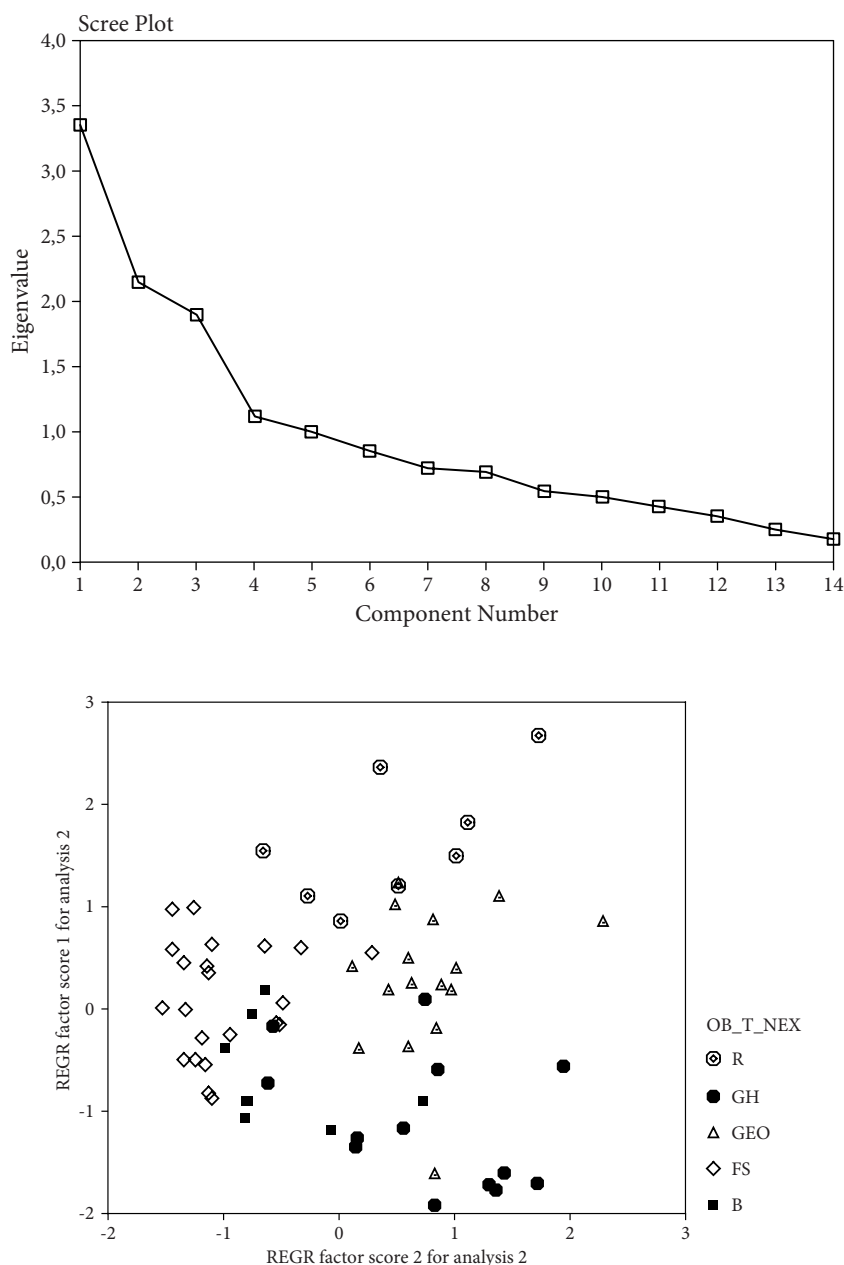


Diagram 4. Factor scores of typical sunken-floored settlement features from the Forest Nursery (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells).

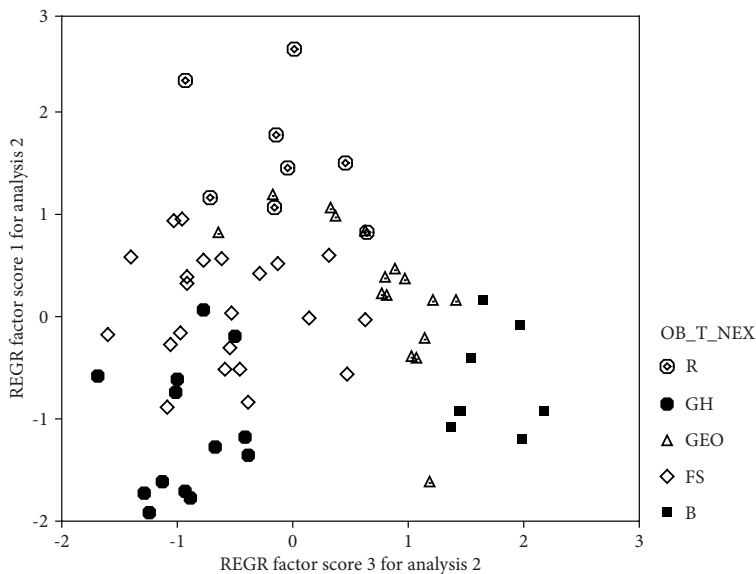


Diagram 5. Factor scores of typical sunken-floored settlement features from the Forest Nursery (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells).

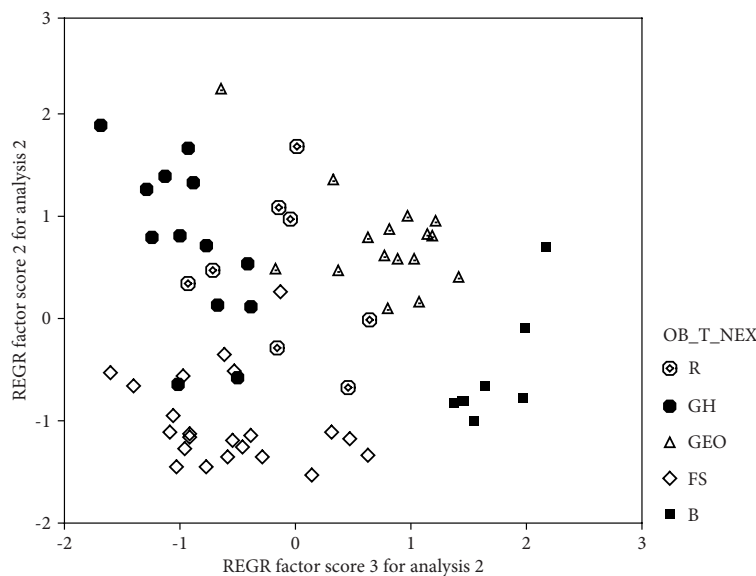


Diagram 6. Factor scores of typical sunken-floored settlement features from the Forest Nursery (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells).

Tab. 7. Rotated Component Matrix.

	Component		
	1	2	3
RUND	0.735		
LAN_BREI	0.731	0.301	
KN_DICHT	0.686	0.331	
UNREGEL	0.558	0.244	
WAND1SRE	-0.541		-0.515
PROF1KON	0.391		
PF_0_1		0.722	
ANDFUN_S	0.274	0.648	
FS_W_B		-0.579	-0.409
KER_DICH	0.373	0.570	-0.362
FS_ECKE	-0.495	0.540	-0.309
FLACHE		0.535	0.301
TIEFE			0.832
PROFSTU			0.722

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

Trough-shaped features (R) are typically associated with the positive pole of factor 1 (Diagram 4–Diagram 5). This means that they are characterized by a rounded plan (RUND), elongated shape (LAN_BREI), greater density of bones (KN_DICHT) and pottery (KER_DICH), irregularities in the ground plan (UNREGEL) and a concave transverse cross-section (PROF1KON).

Sunken-floored dwellings (GH) are linked to the negative pole of factor 1 and factor 3 (Diagram 5), as their walls are vertical (WAND1SRE) and they contain a hearth, most often in the corner (FS_ECKE). Most sunken-floored dwellings are inclined towards the positive pole of factor 2. They are mainly characterized by the presence of postholes (PF_0_1), artefacts other than pottery (ANDFUN_S), higher pottery density (KER_DICH) and a greater floor area (FLACHE).

Wells (B) cluster near the highest values of factor 3 (Diagram 6). Therefore, it can be stated that their most important attributes are depth (TIEFE) and steps in the cross-section (PROFSTU).

Isolated hearths (FS) are typically next to the negative pole of factor 2 (Diagram 1, Diagram 6), which is hardly surprising. The high negative loading has only one descriptor, namely, the presence of a hearth in the wall or the bottom of the feature (FS_W_B). The majority

of hearths are also related to the negative pole of factor 3, with such variables as vertical walls (WAND1SRE) and hearths (FS_W_B a FS_ECKE).

A comparison of the factor analyses of a different number of “objects” in the descriptive matrix (226 and 67, respectively) reveals that the main formal structures contained within are similar to a considerable extent (although they are differently separated from the other factors) and predominantly connected with typical settlement structures, which could have been defined in advance based on the criteria proposed by B. Dostál. The validity of the division of the features into the main groups is underscored by the plots of factor scores, where the individual types of features are concentrated in characteristic clusters, which only slightly overlap. This means that the individual types of sunken-floored settlement features, defined by their position in a multi-dimensional space, delimited by fourteen selected variables are significant from the statistical point of view and can be further employed as an objective value. This piece of knowledge is essential for the next stages of our work, where the settlement feature types will be used for the validation of other archaeological structures.

Given the statistical analyses carried out, our conclusions, based on the given descriptive system, can be considered authoritative and thereby we confirm the validity of the division of the sunken-floored settlement features from the Forest Nursery made by B. Dostál.

The differences between the cardinal attributes of the individual groups of settlement features can be represented for greater clarity in a series of the so-called box plots, which show the extent of the sets, their median and extreme values. The basis is a box, the top and bottom side of which is given by the value of the element found in one quarter (lower quartile), or three quarters (upper quartile) of the set ordered by magnitude. The median, or the value of the element situated in the middle of the set, is marked in the box by a distinctive line. The diagram also shows the extent of the set and extreme values identified by the number of the feature (Diagram 7–Diagram 12).

Finally, the groups of typical features are marked separately on the site plan of the Forest Nursery area. In the sunken-floored dwellings, the Great Moravian and pre-Great Moravian structures are distinguished by different graphics (Fig. 23–Fig. 27).

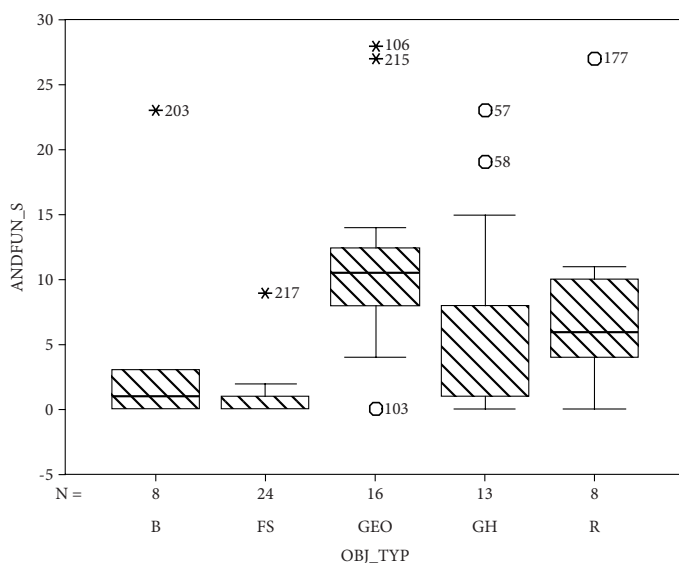


Diagram 7. Number of non-ceramic finds by sunken-floored settlement feature types. Box plot (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells).

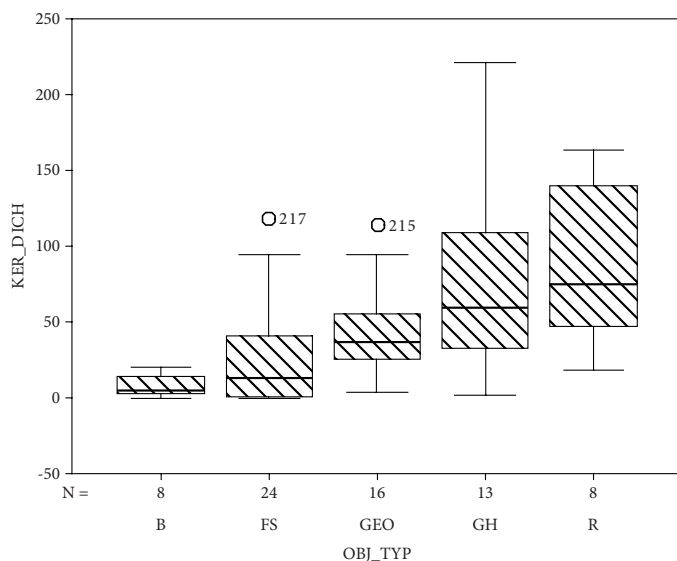


Diagram 8. Pottery density by sunken-floored settlement feature types. Box plot (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells).

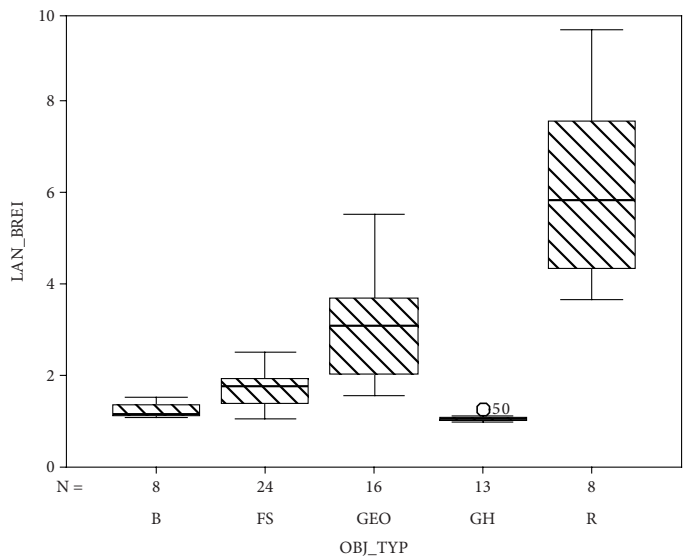


Diagram 9. Length-width index by sunken-floored settlement feature types. Box plot (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells).

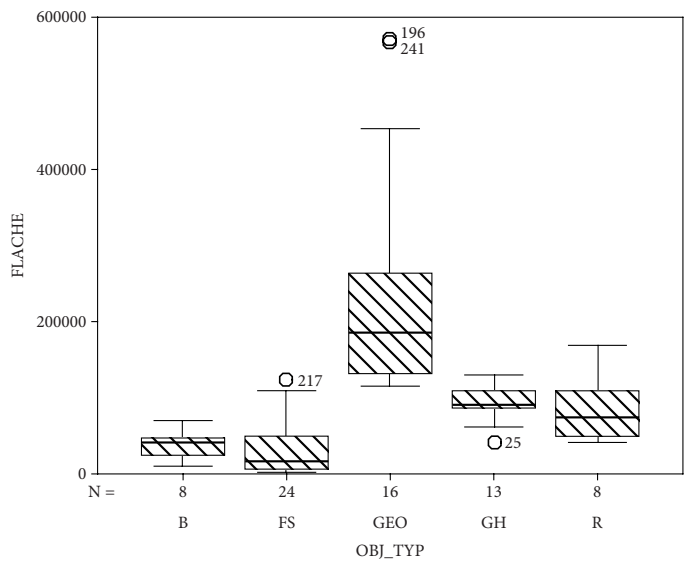


Diagram 10. Area by sunken-floored settlement feature types. Box plot (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells).

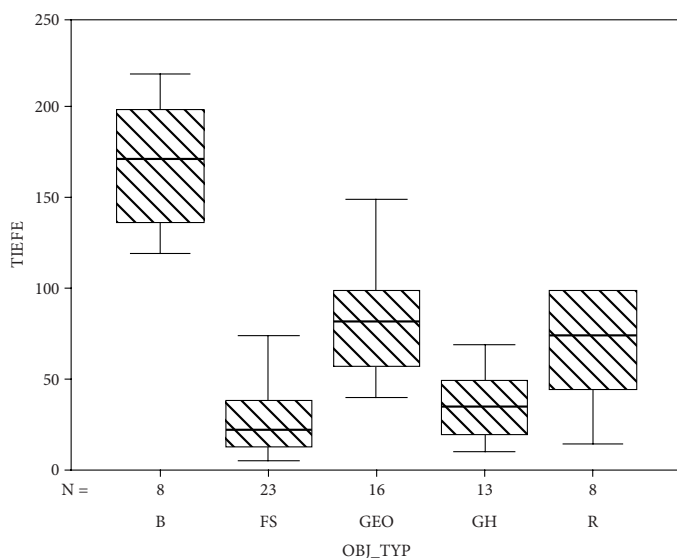


Diagram 11. Depth by sunken-floored settlement feature types. Box plot (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells).

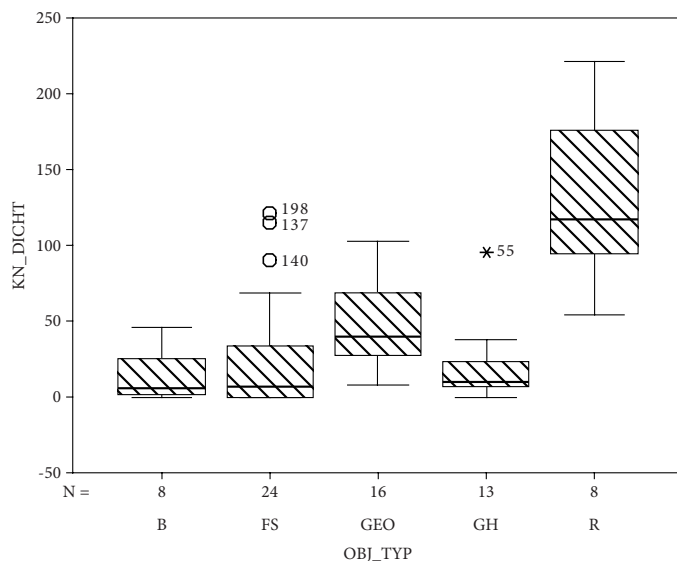


Diagram 12. Bone density by sunken-floored settlement feature types. Box plot (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—hearths, B—wells).

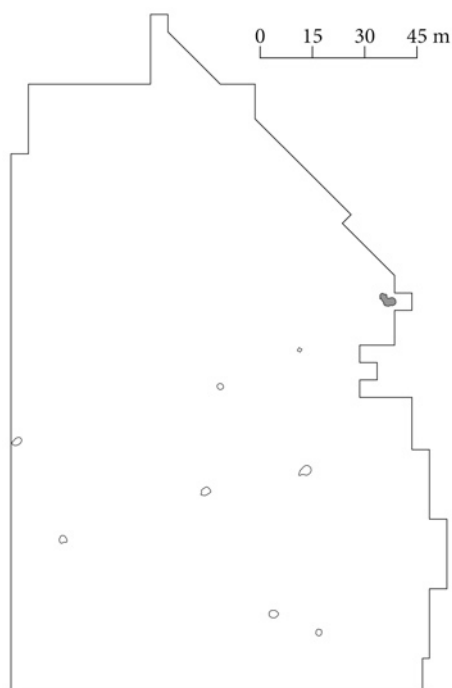


Fig. 23. Břeclav-Pohansko. The Forest Nursery. Wells (in grey—well no. 83a not included in the principal component analysis (PCA)).

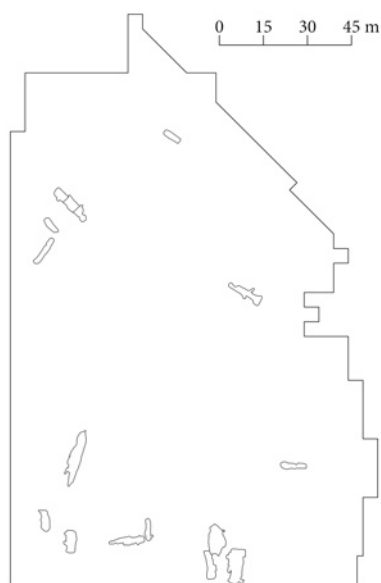


Fig. 24. Břeclav-Pohansko. The Forest Nursery. Large sunken-floored features.



Fig. 25. Břeclav-Pohansko. The Forest Nursery. Sunken-floored dwellings (in grey—sunken-floored dwellings of pre-Great Moravian age).

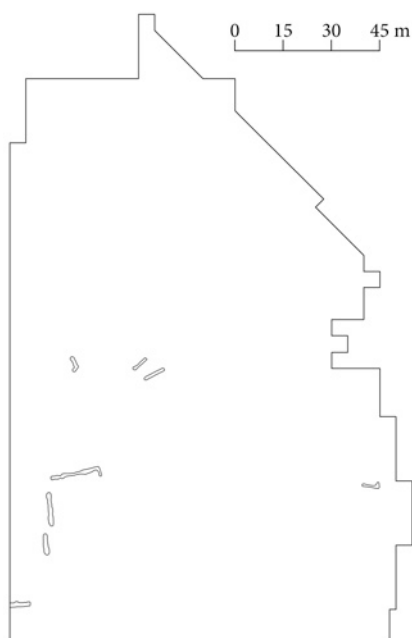


Fig. 26. Břeclav-Pohansko. The Forest Nursery. Trough-shaped features.

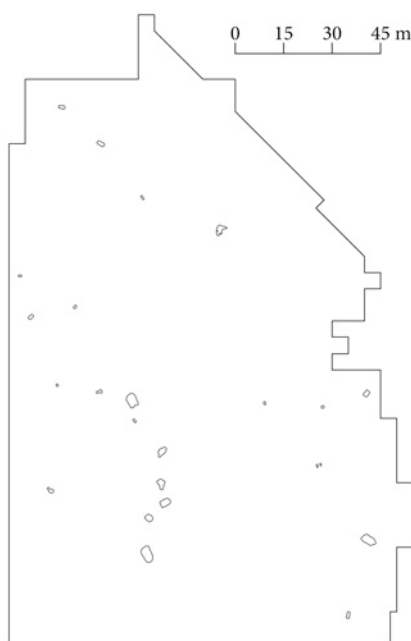


Fig. 27. Břeclav-Pohansko. The Forest Nursery. Ovens and hearths.

4.1.2 *Above-ground settlement features in the Forest Nursery*

In addition to the sunken-floored settlement features, discussed in the previous chapter, the excavation of the Forest Nursery site produced structures identified as relating to above-ground buildings. The great majority were posthole structures which will be at the centre of our attention. Exceptions include, for example, an accumulation of stones in square B 79–84 and B 79–85 (feature 195), interpreted as the underpinning of a timber dwelling or the mortar and gravel underpinning identified above the fill of an earlier sunken-floored feature no. 108.²⁰

The interpretation of the prehistoric and early medieval structures with their floor on or above the ground level at that time is rather complicated methodologically.²¹ As a result of the exit transformations and destruction of the surface layers the level of their floors is usually lost, just as are their interior furnishings, including the hearths. In general, only the lower sections of the postholes have survived from this type

²⁰ Dostál (1993b), p. 33.

²¹ Vencl (1968).

of buildings. The function and nature of the posts and their dating are therefore difficult to establish in any detail. The interpretation is often based on some *a priori* assumptions which may but need not be true to reality—e.g. all the columns with the same function leave identical remains, or the posts of the individual walls were always in a single line. Comparisons with sites where the house structure was well preserved thanks to the favourable environmental conditions show that in reality things could be more complicated. Given this situation, one is hardly inclined to advance any interpretation for above-ground buildings.²² It is, however, beneficial to observe certain principles in order to minimize incorrect or misleading interpretation due to the negative impact of extinction transformations:²³

- the settlement needs to be excavated over a sufficient area bearing in mind that the interpretation of a feature requires knowledge of the surroundings
- one needs to publish not just the conclusions and a selection of interpreted structures, but also the complete documentation of the configuration on which that the work has been based
- one needs to distinguish between “clear”, “probable” and “possible” interpretations
- one should not attempt a clear interpretation from minor remains surviving only below the floor level.

In what follows we will try to uphold those principles. Our interpretation will be based on a sufficiently large excavation area in the Forest Nursery. In addition to the actual interpretation plans we will show the overall configuration as well. We will not attempt a clear interpretation of the structures in terms of structural details and their function. Rather, we will concentrate on observing the general trends such as the arrangement of the above-ground structures in space, their orientation and approximate size. The reconstruction of the floor plan of the above-ground structures from the Forest Nursery will be considered probably or possible. No structure has been found on the site, which could be clearly interpreted. The probable interpretation of some structures is based on analogies from the house culture of the

²² E.g. Dostál (1986), p. 132.

²³ Vencel (1968), pp. 490–510.

northwestern Slavs, the Vikings or the Frisians.²⁴ The structures had already been registered by B. Dostál and some of them were numbered as settlement features (features 31b/31, 42a/38, 64a/23, 69a/29, 102/36, 121/25, 128a/21, 176a/11, 177a/14, 208a/19, 210a, 260/18, 269/5, 272/6—the feature numbers are suffixed by newly introduced identifiers of above-ground posthole structures). All in all, there are about seventeen structures. Further reconstructions may be considered possible. As such, they are simply one of a number of possible interpretations of posthole structures.

4.1.2.1 *Analysis and synthesis of the structure of the above-ground buildings with a posthole construction of the walls*

The evaluation of the above-ground buildings with a posthole construction of the walls in the Forest Nursery area is based on an extensive set of 954 postholes. At a quick glimpse at the site plan of the excavated area it becomes clear that the postholes cluster in a non-random manner and form specific structures and accumulations (Fig. 28). We will attempt to find those which, from the traditional point of view, may be considered as remains of house structures. The primary criterion will be the parallel or perpendicular arrangement of rows made up of a number of postholes. In addition to parallel rows we will take into consideration converging rows, which form trapezoid-based ground plans. Some of the buildings are typified by an “*apse layout*”²⁵ where the postholes are not arranged in straight lines but rather in a curve. An auxiliary criterion will be the identical or similar length of the rows making up the opposing sides of the ground plan of a single building (Fig. 29).

Apart from the structures which could be interpreted as probable or possible remains of above-ground buildings, the excavated area yielded other regular structures (Fig. 30). They are mainly isolated rows of postholes of various length. Shorter ones could have been part of above-ground buildings, the ground plans of which have not survived in any identifiable form. The possibility cannot be ruled out that some of them were above-ground parts of sunken-floored features. Longer rows are most probably remnants of fences or palisades.

²⁴ Dostál (1993b), pp. 33–36.

²⁵ Dostál (1993b), p. 36.



Fig. 28. Břeclav-Pohansko. The Forest Nursery. Postholes.



Fig. 29. Břeclav-Pohansko. The Forest Nursery. Remains of above-ground buildings (posthole structures).

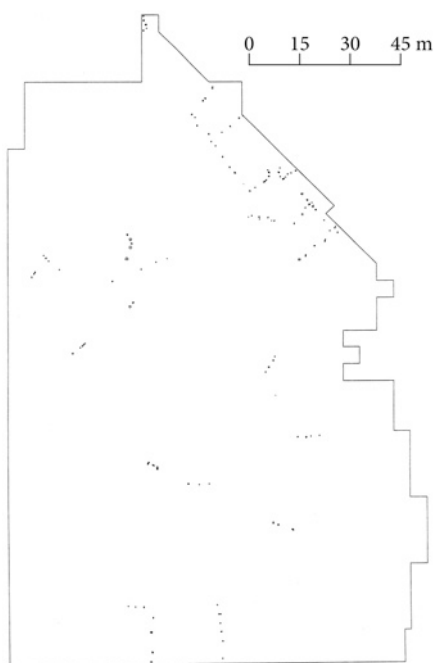


Fig. 30. Břeclav-Pohansko. The Forest Nursery. Postholes forming other regular structures.

Unfortunately, there are currently no formalized exploration methods available enabling us to find the optimum solution given the extensive set of postholes from the Forest Nursery. The existing tools did not yield satisfactory results at Pohansko.²⁶ The search for structures was therefore conducted on an empirical basis, using the criteria described above, in GIS software. The subjectively defined structures can be verified by subsequent testing in the validation phase.

Overall, there were 43 probable and possible above-ground buildings with a posthole construction (Fig. 31). A special numerical sequence (1–43) was introduced for their systematic identification.

Each buildings is characterized by its length (LAENGE), width (BREITE), area (FLAECHE) and the number of postholes (PF). One should bear in mind that those are only approximate values, which moreover are affected by exit transformations. We are thus limited

²⁶ E.g. the PostHole program by I. Scollar—see <http://www.uni-koeln.de/~al001/posthole.html>.



Fig. 31. Břeclav-Pohansko. The Forest Nursery. Above-ground buildings (post-hole structures).

in our capacity to reconstruct complete ground plans from the few surviving remains.

The whole set of the above-ground buildings from the Forest Nursery can be described by means of the above mentioned attributes and descriptive statistics (Tab. 8). The tables show the mean, median, standard deviation, range of the set, minimum and maximum values. The distribution of the values in the set is presented in graphic form by a histogram (Diagram 13–Diagram 16).

Above-ground buildings with posthole construction are only a minor part of all known Slavic dwellings (approx. 3%), although they appeared in Central Europe, alongside sunken-floored structures from the early Slavic period. Such buildings appear in the northwestern and western part of the Slavic world, but are not found among the southern or eastern Slavs. This is one of the reasons why they are believed to have originated in the Germanic and Scandinavian environment.²⁷

²⁷ Dostál (1987a), p. 14; Šalkovský (2001), p. 62.

Tab. 8. Descriptive statistics of the set of 43 above-ground structures with postholes.

	Statistics	
LAENGE (length in cm)	Mean	611
	Median	540
	Std. Deviation	220.7
	Minimum	300
	Maximum	1290
	Range	990
BREITE (width in cm)	Mean	387
	Median	379
	Std. Deviation	98.95
	Minimum	167
	Maximum	560
	Range	393
FLAECHE (area in m ²)	Mean	22.8
	Median	18
	Std. Deviation	12.4
	Minimum	6.1
	Maximum	60.2
	Range	54
PF (number of postholes)	Mean	12.8
	Median	12
	Std. Deviation	5.6
	Minimum	4
	Maximum	29
	Range	25

They are predominantly associated with proto-urban central places,²⁸ for they are completely missing in villages with prevalent sunken-floored dwellings and various storage pits.²⁹ It is remarkable, that in the Forest Nursery at Pohansko, above-ground buildings with a post-hole construction make up 13 percent of all the recorded features, including various pits of unspecified purpose. The question is what caused this unusual occurrence. To a certain extent, this might be in connection with the nature of the long-term excavation at Pohansko which provided better conditions for exploring those structures. However, it is very likely the central function of the site which distinguishes it from a standard village settlement.

²⁸ Donat (1980), p. 26.

²⁹ E.g. Ruttkay, M. (2002a); Ruttkay, M. (2003).

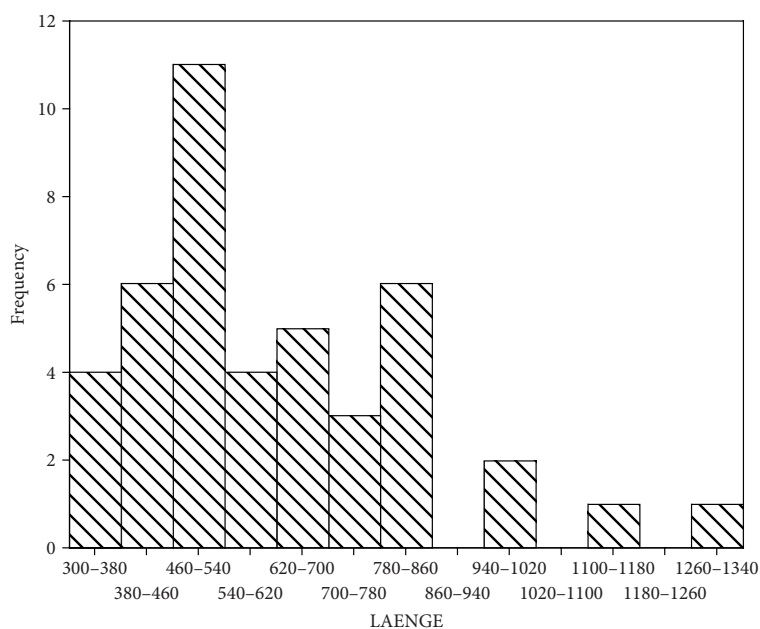


Diagram 13. Břeclav-Pohansko. The Forest Nursery. Posthole structures (remains of above-ground buildings). Length in cm. Histogram.

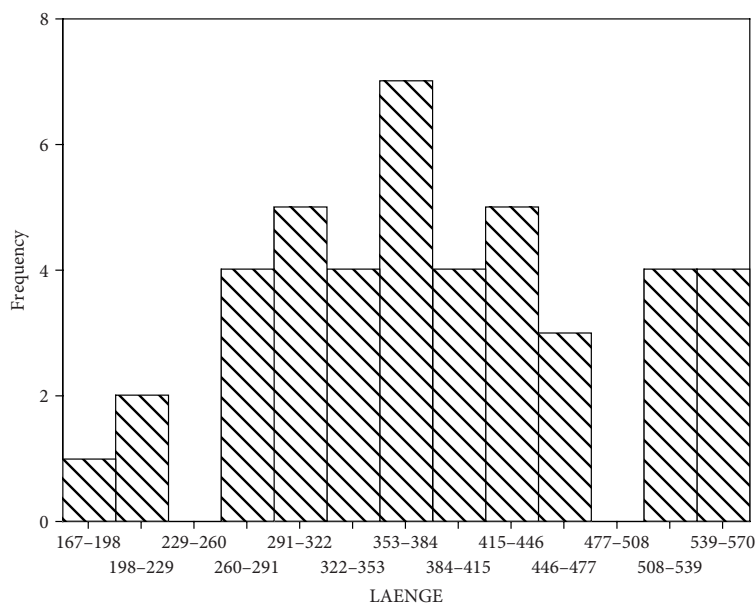


Diagram 14. Břeclav-Pohansko. The Forest Nursery. Posthole structures (remains of above-ground buildings). Width in cm. Histogram.

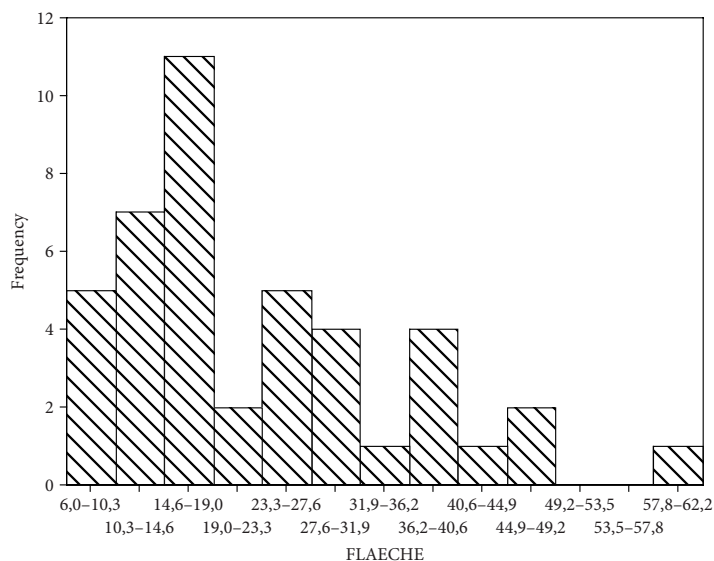


Diagram 15. Břeclav-Pohansko. The Forest Nursery. Posthole structures (remains of above-ground buildings). Area in square metres. Histogram.

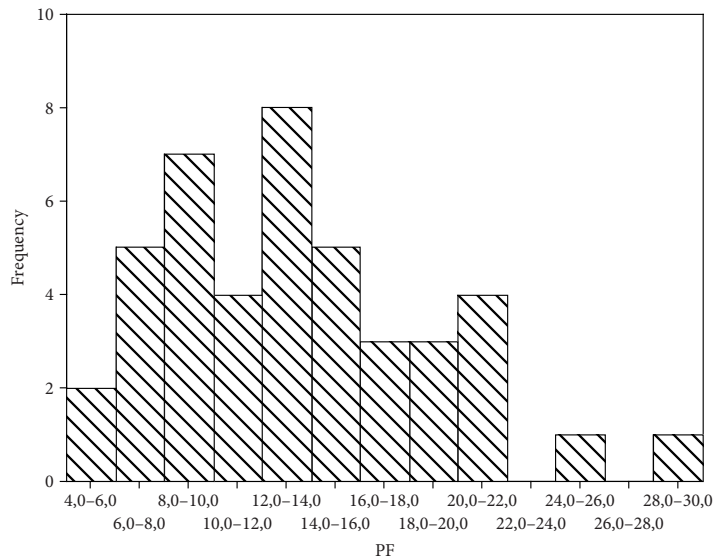


Diagram 16. Břeclav-Pohansko. The Forest Nursery. Posthole structures (remains of above-ground buildings). The number of surviving postholes in the structure. Histogram.

In terms of dimensions the houses from the Forest Nursery follow the general parameters. In the Danube basin houses are often between 12 and 28 square metres of floor area. As such, they appear to be smaller than those of the northwestern Slavs (typically 31–50 square metres).³⁰ The number of preserved postholes from their construction does not vary from the standard at that time.³¹

Given the exit transformations it is impossible to make a clear statement about the function of those buildings. Medium-sized and large buildings could have been used as dwellings while smaller ones could have served for storage or other ancillary purposes, B. Dostál³² presumes that the large houses with a posthole construction in the Forest Nursery could have served as the living quarters of female slaves working as weavers in textile workshops (gynaecaea). Only rarely have hearths been found inside the buildings (e.g. posthole structure 21, originally denoted as 128a, or 127—a hearth). Above-ground building no. 5 (originally 269), which contained a buried horse, could have fulfilled a cult function.³³

4.1.2.2 *Statistical testing and validation of the structure of above-ground settlement features*

The building structures that we have managed to identify need to be validated. The validation is particularly desirable in a situation where the structures were identified by purely intuitive means, without employing formalized methods. The validation is conducted with the assistance of the so-called external evidence, i.e. data that is different from the information that served as the basis in the search for archaeological structures.³⁴ We will use the dimensions of postholes and the spatial distribution of the above-ground houses.

For validation purposes, postholes can be divided into three categories): postholes associated with above-ground houses (PH); postholes making up independent rows (PR); isolated postholes (P)

Each of the postholes is defined by two descriptors: depth (TIEFE) and area (FLAECH), established from digital plans using GIS tools. Tests could be made only on postholes for which values had been

³⁰ Šalkovský (2001), p. 59.

³¹ 6–15 postholes; after Šalkovský (2001), p. 64.

³² Dostál (1988b), p. 148.

³³ Dostál (1987a); (1993b), pp. 35–36.

³⁴ Neustupný (1997b), p. 243.

specified. Each of the three categories can be visualized by means of a box plot and, most importantly, statistically tested (Tab. 9–Tab. 14; Diagram 17–Diagram 18). We begin with the assumption that the small pits remaining after posts or supports of various function (e.g. posts and columns from a house construction as opposed to posts from palisades, fencing) have different dimensions.

We will establish whether all of the three selections come from the same basic set and are therefore identical, or whether they are significantly different. This will be done using the robust non-parametric Kolmogorov-Smirnov test, which is particularly useful for situations in which little is known about the parameters of the distribution of the variable concerned in the population. In the tests we will always compare two sets. The significance level chosen for the tests is a standard value of 0.05:

Tab. 9. Břeclav-Pohansko. The Forest Nursery. Comparison of posthole sets P (isolated postholes) and PH (postholes associated with above-ground houses). Frequencies.

	PF_TYP2	N
FLAECHE (area in square centimetres)	P	280
	PH	551
	Total	831
TIEFE (depth in cm)	P	215
	PH	490
	Total	705

Tab. 10. Břeclav-Pohansko. The Forest Nursery. Comparison of posthole sets P (isolated postholes) and PH (postholes associated with above-ground houses). Test Statistics.

		FLAECHE	TIEFE
Most Extreme Differences	Absolute	0.079	0.143
	Positive	0.079	0.020
	Negative	–0.011	–0.143
Kolmogorov-Smirnov Z		1.071	1.745
Asymp. Sig. (2-tailed)		0.201	0.005

a Grouping Variable: PF_TYP2

Tab. 11. Břeclav-Pohansko. The Forest Nursery. Comparison of posthole sets P (isolated postholes) and PR (postholes making up independent rows). Frequencies.

	PF_TYP2	N
FLAECHE (area in square centimetres)	P	280
	PR	123
	Total	403
TIEFE (depth in cm)	P	215
	PR	105
	Total	320

Tab. 12. Břeclav-Pohansko. The Forest Nursery. Comparison of posthole sets P (isolated postholes) and PR (postholes making up independent rows). Test Statistics.

		FLAECHE	TIEFE
Most Extreme Differences	Absolute	0.071	0.065
	Positive	0.071	0.050
	Negative	-0.038	-0.065
Kolmogorov-Smirnov Z		0.656	0.545
Asymp. Sig. (2-tailed)		0.782	0.928

a Grouping Variable: PF_TYP2

Tab. 13. Břeclav-Pohansko. The Forest Nursery. Comparison of posthole sets PH (postholes associated with above-ground houses) and PR (postholes making up independent rows). Frequencies.

	PF_TYP2	N
FLAECHE (area in square centimetres)	PH	551
	PR	123
	Total	674
TIEFE (depth in cm)	PH	490
	PR	105
	Total	595

Tab. 14. Břeclav-Pohansko. The Forest Nursery. Comparison of posthole sets PH (postholes associated with above-ground houses) and PR (postholes making up independent rows). Test Statistics

		FLAECHE	TIEFE
Most Extreme Differences	Absolute	0.135	0.149
	Positive	0.135	0.000
	Negative	-0.004	-0.149
Kolmogorov-Smirnov Z		1.350	1.385
Asymp. Sig. (2-tailed)		0.052	0.043

a Grouping Variable: PF_TYP2

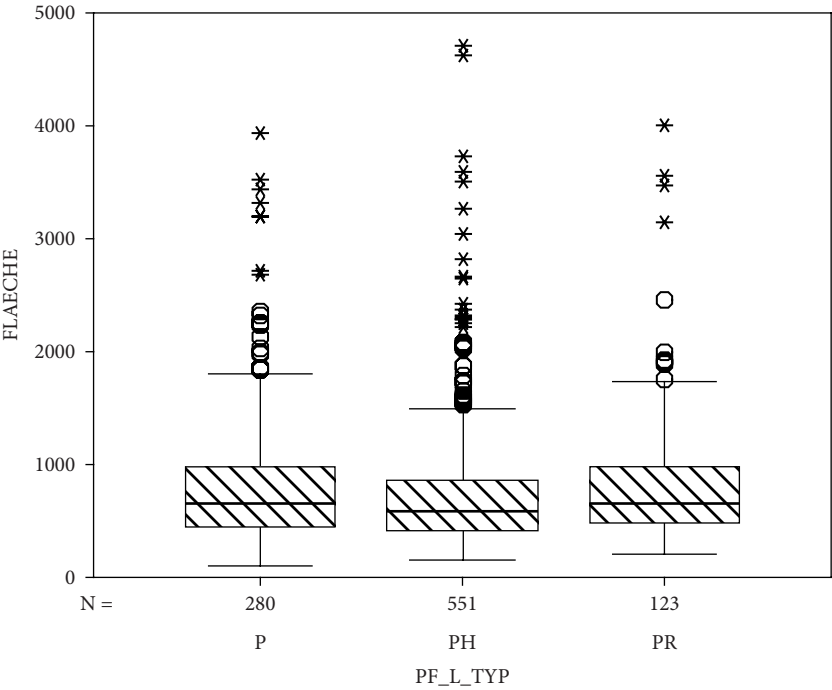


Diagram 17. Břeclav-Pohansko. The Forest Nursery. Area of postholes (in cm²) associated with above-ground houses (PH), making up independent rows (PR) or isolated (P).

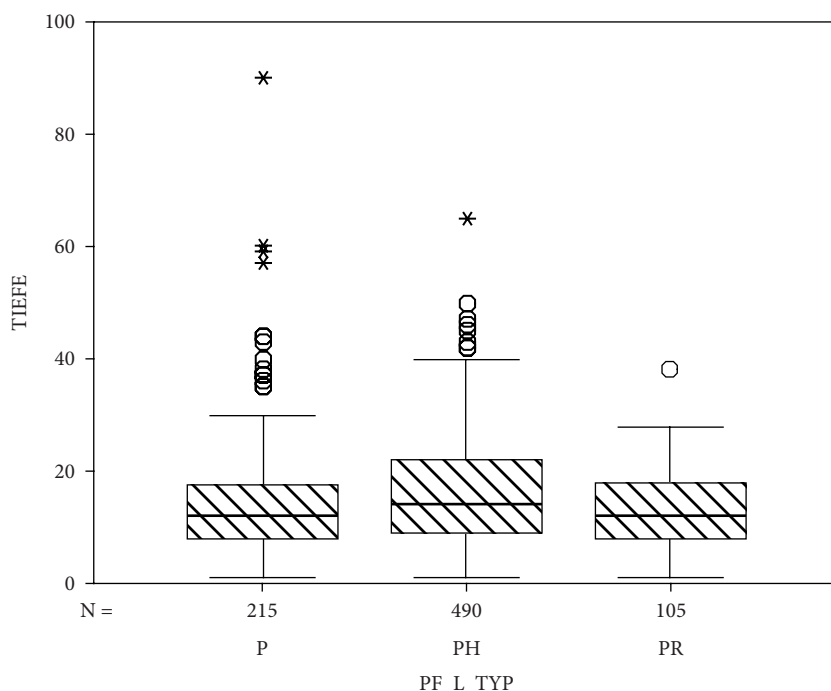


Diagram 18. Břeclav-Pohansko. The Forest Nursery. Depth of postholes (in cm) associated with above-ground houses (PH), making up independent rows (PR) or isolated (P).

The statistical testing shows that at a significance level of 0.05 with regards to depth (TIEFE) postholes associated with above-ground buildings (PH) are significantly different from isolated postholes (P), and postholes in independent rows (PR). On the contrary there are no differences in terms of the posthole area (FLAECHE). There is no evidence of difference between isolated postholes and those from independent rows in any of the tested parameters.

We can state that the statistical tests independently confirmed the fact that the postholes which, based on the given criteria, were determined as parts of above-ground houses, are significantly different from the other postholes identified in the Forest Nursery. The difference mainly consists in greater depth of the structural posts and supports.

The individual sets can also be characterised by means of descriptive statistics (mean, median, standard deviation, range, minimum and maximum value; Tab. 15–Tab. 16).

Tab. 15. Břeclav-Pohansko. The Forest Nursery. Area of postholes and depth of postholes. Case Processing Summary.

Cases							
		Valid		Missing		Total	
	PF_L_TYP	N	Percent	N	Percent	N	Percent
FLAECHE	P	215	76.8%	65	23.2%	280	100.0%
	PH	490	88.9%	61	11.1%	551	100.0%
	PR	105	85.4%	18	14.6%	123	100.0%
TIEFE	P	215	76.8%	65	23.2%	280	100.0%
	PH	490	88.9%	61	11.1%	551	100.0%
	PR	105	85.4%	18	14.6%	123	100.0%

Tab. 16. Břeclav-Pohansko. The Forest Nursery. Area of postholes and depth of postholes. Descriptive statistics.

PF_L_TYP		Statistics	
FLAECHE (area in square centimetres)	P	Mean	789
		Median	634
		Std. Deviation	581.9
		Minimum	107
		Maximum	3514
		Range	3407
	PH	Mean	741
		Median	607
		Std. Deviation	534
		Minimum	162
		Maximum	4618
		Range	4456
	PR	Mean	872
		Median	647
		Std. Deviation	685
		Minimum	214
		Maximum	4012
		Range	3798
TIEFE (depth in cm)	P	Mean	14.8
		Median	12
		Std. Deviation	11.1
		Minimum	1
		Maximum	90
		Range	89

Tab. 16 (*cont.*)

PF_L_TYP		Statistics
PH	Mean	16.5
	Median	14
	Std. Deviation	9.5
	Minimum	1
	Maximum	65
	Range	64
PR	Mean	13.1
	Median	12
	Std. Deviation	7.0
	Minimum	1
	Maximum	38
	Range	37

Another criterion which lends itself for use in validating the above-ground houses with a posthole construction is their spatial orientation and distribution. We begin with the assumption that in the case that the interpretation is correct the houses and structures will not be distributed chaotically and randomly in the area, but following a particular system.

We will divide the above-ground buildings and rows of postholes into two groups by their orientation. The first group will include buildings oriented roughly in the NE-SW and NW-SE direction. The second group will encompass structures approximately in the N-S, E-W direction (precisely or with a small deflection). When we separately visualize both groups in the Forest Nursery site plans, we find that the buildings with the NE-SW and NW-SE orientation are non-randomly accumulated in the northern part of the area (Fig. 32). Buildings oriented in the N-S and E-W form two separate clusters—in the southern and northern part of the area (Fig. 33). This spatial division justifies our considering the detected structure to be non-random.

In the next steps of the validation we will concentrate on the problem of two groups of posthole constructions with N-S, E-W orientation. At the heart of the problem is the northern group which interferes with the accumulation of houses oriented in the NE-SW and NW-SE direction. A hypothetical superposition of two different above-ground structures can be verified by evaluating the posthole density (Fig. 34), using the tools of a raster-oriented GIS (Smooth Data command—GeoMedia Grid). On this basis it is possible to define, within the excavation area,



Fig. 32. Břeclav-Pohansko. The Forest Nursery. Above-ground buildings and posthole rows oriented approx. in the NE-SW and NW-SE direction.

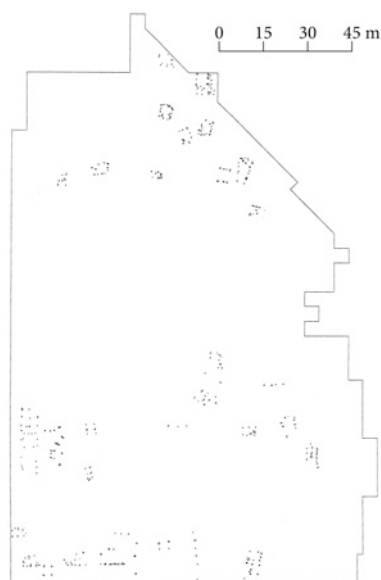


Fig. 33. Břeclav-Pohansko. The Forest Nursery. Above-ground buildings and posthole rows oriented approx. in the N-S, E-W direction.

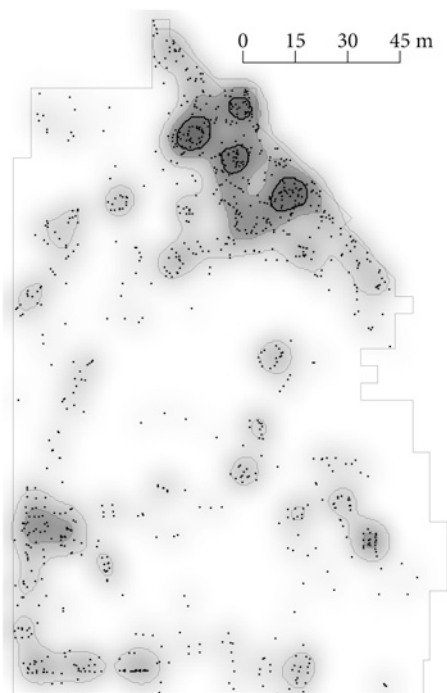


Fig. 34. Břeclav-Pohansko. The Forest Nursery. Posthole density.

four zones with different posthole densities (Fig. 35). The visualization of the zones reveals that the highest concentration of postholes can be found in the north-eastern part of the Forest Nursery, i.e. where there is an interference between the posthole structures oriented in the NE-SW and NW-SE direction and the northern cluster of houses with the N-S, E-W orientation.

An explanation for the high density of postholes and overlapping of above-ground structures with two different orientations, will ensue from a comparison of above-ground houses with the N-S, E-W orientation and sunken-floored features dated on the basis of the associated finds, to the pre-Great Moravian, i.e. to the early Slavic and Early Hillfort periods (Fig. 36). It is evident that in the northern group the majority of the above-ground houses under discussion are situated in the immediate vicinity of the pre-Great Moravian sunken-floored features (within a distance of 10 m, see the buffer zone). The sunken-floored dwellings of early Slavic and Early Hillfort periods, which are the most important elements of the pre-Great Moravian settlement,



Fig. 35. Břeclav-Pohansko. The Forest Nursery. Density of postholes with sunken-floored features of pre-Great Moravian age (in black).



Fig. 36. Břeclav-Pohansko. The Forest Nursery. Above-ground posthole structures oriented approx. in the N-S, E-W direction with buffer zones (10 m) around sunken-floored settlement features of pre-Great Moravian age.

have identical orientation in the direction of the main compass points.³⁵ This is what distinguishes them from the Great Moravian sunken-floored features (see Chap. 4.5.1) in the northern half of the Forest Nursery.

The evaluation shows that there is an overlapping of the pre-Great Moravian by the Great Moravian settlement phase in the north-eastern part of the of the Forest Nursery. The consequence is a high density of postholes in this area. The above-ground houses oriented N-S and E-W can be assigned with great probability to the earlier settlement. One of them (no. 31) was thought to be early Slavic even by B. Dostál.³⁶ He used as argument the spatial relationships between that house and the sunken-floored features with reliably datable finds. The existence of above-ground buildings from the early Slav period can be confirmed in other locations at Pohansko as well.³⁷

If we display, in the plans, only the above-ground buildings that we consider Great Moravian, their spatial distribution will be highlighted even more. Houses oriented N-S and E-W appear, with two exceptions (no. 24, 25), solely in the southern part of the excavated area (Fig. 37). The northern part is dominated by structures with the NE-SW and NW-SE orientation (Fig. 32). Two of the structures that stand apart from the norm (no. 8 and 10) are located within the second area of a higher concentration of postholes in the south-western part of the explored area (Fig. 34–Fig. 35). It is very likely that there are other spots where several settlement phases overlap. Given the absence of any evidence of early Slavic or Early Hillfort settlement in that location we may be dealing with two Great Moravian phases (more in Chap. 4.5.1).

The existence of the structures, for which we looked in the large set of postholes found in the Forest Nursery on the basis of the given criteria, is validated through the statistical test by means of a comparison with the independent data from the so-called external evidence. We will work with them as with the remains of various early medieval structures (e.g. houses, fences, palisades). They will play an important part in the discussion of the urbanization concept of the whole site. The question of the function of the above-ground posthole structures

³⁵ Dostál (1982), pp. 60–73; Macháček (1992).

³⁶ Dostál (1982b), p. 15.

³⁷ Dostál (1987a), p. 14.

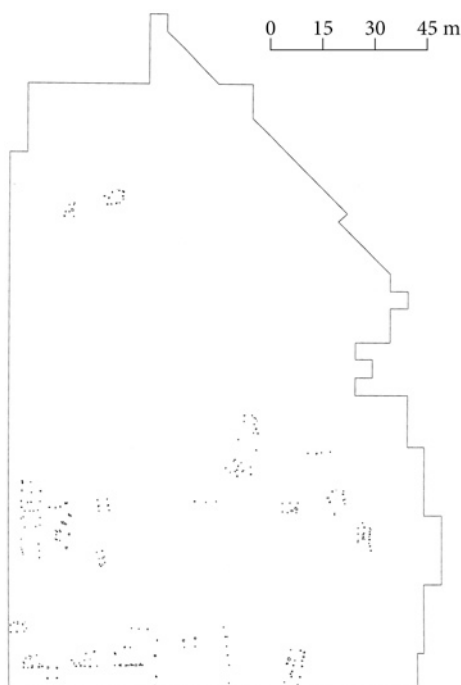


Fig. 37. Břeclav-Pohansko. The Forest Nursery. Above-ground posthole structures oriented approx. in the N-S, E-W direction, hypothetically dated to the Great-Moravian period.

will remain open for the time being. However, it cannot be ruled out that, in the Forest Nursery area, where an unusually low number of typical sunken-floored dwellings were unearthed, many of them also served as houses.³⁸

4.2 CHRONOLOGICAL FRAMING OF THE SETTLEMENT IN THE FOREST NURSERY

Comprehensive knowledge of relative and absolute chronology is a necessary precondition of any discussion of the evolution and function of an early medieval centre. Without some sense of chronology it would be impossible to grasp the complicated genesis of this type of

³⁸ Dostál (1986), p. 132.

site. The question of the internal chronology of Pohansko, and especially of the settlement in the Forest Nursery, should therefore be paid special attention.

The principal chronological divide of the early medieval settlement can be placed between the pre-Great Moravian and the Great Moravian phase. The early Slavic (6–7th century AD) and Early Hillfort (7–8th century AD) settlement features from the Forest Nursery, which we ascribe to the pre-Great Moravian period have already been recognized by B. Dostál.³⁹ They contain typical finds of pottery of the Prague type and vessels of Central Danubian cultural tradition. Those can be well synchronized both with the urns from the cremation cemetery investigated in Pohansko, and with finds from other sites.⁴⁰ The end of the whole pre-Great Moravian horizon may be dated back to the second half of the 8th century.⁴¹ From the point of view of relative chronology it is important that the extinct houses from the early Slavic and Early Hillfort settlement were partly overlain by the later fortification.⁴² However, under the original fortification of the stronghold in the Forest Nursery area there are no Great Moravian features (not even graves).⁴³

The dating of the Great Moravian settlement features is, in most cases, based on the associated pottery.⁴⁴ There is no doubt about the Great Moravian age of the vessels which had already been confirmed by B. Dostál based on their finds within the Magnate Court and in the church cemetery graves containing typical 9th century objects.⁴⁵ However, not all of the Great Moravian settlement features from the Forest Nursery area were contemporary. There is evidence of several occurrences of their overlapping and the digging of early medieval graves in the fill of the settlement features of Great Moravian age.⁴⁶ Nevertheless, determining the individual phases and synchronizing the settlement features from Pohansko is not a simple task. The problem has to be addressed on the basis of extensive sets of fragmented pottery.⁴⁷ The

³⁹ Dostál (1982b); Dostál (1985).

⁴⁰ Macháček (2000b).

⁴¹ Dostál (1993c); Dostál (1994c); Macháček (2000b), pp. 36–37.

⁴² Dostál (1982b), pp. 6–8.

⁴³ Dostál (1993b), p. 48.

⁴⁴ Dostál (1993b), p. 50.

⁴⁵ Dostál (1975); Dostál (1994b).

⁴⁶ Dostál (1993b), 48.

⁴⁷ Dostál (1993b), p. 50; (1994b), p. 20.

methodology suitable for their evaluation has already been defined, just as the basic typological-chronologic scheme of the evolution of pottery at Pohansko.⁴⁸ Now it is possible to elaborate on the conclusions published so far.

Particularly difficult proved to be the absolute dating of finds from Pohansko. Until now, archaeologists at Pohansko had to resort to the interpolation of known historical data or to artefacts other than pottery, such as jewellery of the Veligrad type or finds from the so-called Blatnice-Mikulčice horizon,⁴⁹ although both methods are not without problems. The dangers resulting from the combined historical-archaeological approach were recently exposed by several researchers.⁵⁰ Moreover, the dating of various groups of artefacts, previously thought to be precisely datable, are presently being corrected.⁵¹ In terms of absolute dating, the most promising are the methods of natural science. At Pohansko, thanks to new investigations, it is possible to apply one of the most accurate methods—dendrochronology.

4.2.1 *Relative chronology—analysis and synthesis of the formal structures of pottery assemblages*

B. Dostál⁵² concluded that the numerous pottery assemblages unearthed during the excavations in the Forest Nursery could be of significant assistance in the dating of the Great Moravian settlement features. The assumption was subsequently verified on a sample of 37 525 fragments (642.5 kg) from 147 features in the Forest Nursery. They were subjected to a selection where the assemblages found to be sufficiently representative in terms of quantity and quality were chosen for further processing. These were used as the basis for a successful determination and validation of five relative chronological phases from the Early Hillfort period to the period associated with the post-Great Moravian development.⁵³ Using multivariate statistical methods the pottery was further sub-divided into nine basic typological groups (A to CH) which are

⁴⁸ Macháček (2001c).

⁴⁹ Dostál (1975), p. 240; (1994b), pp. 16–17.

⁵⁰ E.g. Neustupný (2002); Třeštík (2001a).

⁵¹ More on the Veligrad-type jewellery of the Byzantine or “Oriental” style—e.g. Dostál (1991); Štefanovičová (2004) with references; on the so-called Blatnica-Mikulčice horizon see Mitchell (1994).

⁵² Dostál (1993b), p. 50; Dostál (1994b), p. 20.

⁵³ Macháček (2001), pp. 168–218.

either in line with the spectrum known from the works by B. Dostál⁵⁴ or expand upon it (*Macháček 2001, 115–167*). The most important typological groups were validated based on the results of the vessel dimension and shape analysis which showed that at Pohansko we are faced with two principal groups of pottery. On the one hand, they are vessels originating from professional workshops (groups A, B, C, D, and partly F), the manufacture of which was subject to clearly specified production standards, both in terms of material and morphology as well as decoration and size; on the other hand they were vessels made probably at home, where we do not note any significant attempts at standardization (group E, H).

Today the complete ceramic material from the settlement features in the Forest Nursery has been processed. We have therefore at our disposal a set of 58,543 fragments with a total weight of 962.4 kg, which can be related to some of the assemblages (overall, there are 63,505 ceramic fragments in the Pohansko database, i.e. 1,105,875 g). In order to address some specific questions (validation by means of stratigraphic relationships) the set will be extended by more finds from the other parts of the pagan agglomeration (stratified features from the Magnate Court).

The problems that need to be resolved in the processing of pottery from the Forest Nursery can be divided into several areas. Foremost is the creation of a data model. The starting point for its definition was the data acquired over many years of work by B. Dostál,⁵⁵ who clearly defined the entities and the substantial qualities of early medieval pottery from Pohansko. This served as the basis for creating the primary data model, which was further developed.⁵⁶ The tasks that followed were connected with the formative processes (archaeologization) of early medieval pottery. The solution to this problem is essential for the understanding of depositional and post-depositional processes, the action of which may insert a particularly efficient filter between archaeologists and the ancient living culture, thus making it more difficult to study the past from archaeological records. After the problems mentioned above have been resolved it will be possible to proceed to the main task being the search for the formal structures which came

⁵⁴ Dostál (1975), pp. 159–167.

⁵⁵ e.g. Dostál (1975), pp. 125–182; Dostál (1994c).

⁵⁶ Macháček (2001c).

into being through the action of time. Our work will be principally based on a descriptive matrix, with pottery assemblages as entities. The matrix will be created following the data model and the knowledge of the depositional and post-depositional processes. In each of its phases we have to check the quality of the data that produced our results and, mainly, validate the formal structures obtained during our work. We need to verify the assumption that the structures do reflect the chronological point of view, and/or identify and define other causes which gave rise to them.

4.2.1.1 *Analysis of the pottery assemblages and a formalized descriptive system*

In describing the pottery from Pohansko we opted for a formalized description, which is in line with the experience and proposals by other archaeologists the essence of which was summed up by K. Tomková:⁵⁷ “If we decide to describe pottery, the most suitable form of description of large pottery assemblages is a formalized description. In this case drawing can be reduced to examples and illustrations.”

The descriptive system that we proposed for the description of pottery from Pohansko can be classified as a “descriptive system of a higher order with a prevalence of evaluated attributes” according to the definition of I. Pavlů.⁵⁸ In contrast to the very complicated and extensive primary descriptive systems they are much simpler as experience tells us that the needs of archaeological description are satisfied with lists of just several dozen attributes (variables). To create such a system we had to base our definition on a preliminary model, in this case B. Dostál’s work.⁵⁹ The initial model was subsequently tested and improved,⁶⁰ whereby we gradually discarded the less substantial attributes. The result was a simple and verified descriptive system of a higher order, with the assistance of which it is possible to efficiently record extensive assemblages.

Some parts of the descriptive system were narrowed down, such as the description of the ceramic material, as a result of its relatively homogeneous nature (e.g. the type of temper), others were expanded, such as the incised ornamental patterns. We have completely left out

⁵⁷ Tomková (1993), p. 124.

⁵⁸ Pavlů (1978), p. 242.

⁵⁹ Dostál (1975), pp. 125–182; Dostál (1994c).

⁶⁰ Macháček (2001c).

the description of the overall shape and type of vessels. This was due to the fact that the absolute majority (more than 99 percent) of the pottery found in Pohansko consists of pots of which 80 percent are egg- or barrel-shaped.⁶¹ When another shape (e.g. a bowl, a bottle, or a plate) appear among the finds it is described in a special note of the descriptive system. Its individual parts were then classified following a standard procedure.

In developing the data model for the purposes of processing the pottery from Pohansko we took into consideration, among other things, the minimization of errors arising in the course of data entry. The difficulties include the objectivization of the description in nominal values, and ensuring disjunction and identification independent of the observer.⁶² For the definition of the qualities on the basis of the preliminary model, we selected elements that would be structuring as far as our problems were concerned and which at the same time would minimize the subjectivity of the description. There were additional problems with, for example, qualities related to the pottery fabric and the surface of the vessels. In our discussions we attempted to reach a compromise where the selected elements would be sufficiently and justifiably structuring (e.g. based on scientific analyses) and, at the same time, the least subjective. Given those preconditions we refrained from the description of the vessel surface and dropped some wares (pottery fabric classes) from the data model originally contained within it.⁶³

The resulting data model should be regarded as a compromise. It is difficult to say how close the model comes to the ideal solution, as we have only vague ideas of an ideal descriptive system for early medieval pottery. The words of I. Boháčová and J. Frolík published in 1994 are still valid: "Sowohl bei der Technologie, als auch beim Studium der Randprofilierung und der Zierelemente sind das Maß der Genauigkeit der Verfolgung und der Evidenz einzelner Merkmale noch problematisch. Ihre kleine Anzahl gestattet es nicht, die notwendigen Details zu erfassen, ihre große Anzahl dagegen macht die Lage im Gegenteil unübersichtlich."⁶⁴

The structuring entity in the descriptive system is an assemblage (the term is explained in Chap. 2.1.1), i.e. the content of a mostly

⁶¹ Dostál (1975), pp. 141–143.

⁶² Rulf (1993), p. 168.

⁶³ Macháček (2001c), pp. 168–175.

⁶⁴ Tomková at all (1994), p. 171.

sunken-floored archaeological feature, as recognized and recorded by the excavator. The basis of the description is the quantification of pottery with identical qualities in the assemblage (e.g. the quantification of a specific category of fragments from vessels with a particular rim type, decorated with a particular type of motifs and made from a particular fabric in the given settlement feature).

The first group of data in the descriptive system contains information on the precise location of the assemblage we are describing and auxiliary database items.

- *location*: site and area (e.g. Břeclav-Pohansko, Forest Nursery)
- *ID*: index—auxiliary database item to speed up operations,⁶⁵ it is a sequence of numbers identifying individual records.
- *feature no.*: archaeological feature number; based on the existing numbering of objects at Pohansko.
- *feature identifier*: additional identification of the archaeological feature (e.g. 'A').
- *depth/part*: identification of the part of the feature from where the classified finds originate (in material from excavations after 1995 it is the context number).

An important portion of the descriptive system is related to the quantification of pottery assemblages. This is accomplished by three methods: 1) number of fragments; 2) weight; 3) number of individuals (i.e. identifiable vessels). The proposed procedure is to improve the maximum objectivization of the data in the collection (compare the issue of the post-depositional processes and their impact on pottery) and, at the same time, make use of preferably all data, which in modern treatises on pottery are thought to be essential for a thorough analysis, and for the publishing and analysis of the complexes of early medieval pottery.⁶⁶

- *number of specimens*: quantification of the number of vessels with identical qualities in the assemblage. The specimens that were identified included both complete vessels and fragments of rims, and shards from the bodies and bases that undoubtedly belonged to the lips (e.g. were glued to them). No specimens were defined based on

⁶⁵ Smutný (1997), p. 25.

⁶⁶ Heege (1995), p. 87.

isolated fragments from the bodies or bases (unless the fragments from this category can be glued to better identifiable shards of rims with lips, or possess a very specific attribute, it is impossible to assign them to individual vessels. Using the quantification of specimens in the assemblage partly addresses the problem of fragmentation, or pottery reduction in the post-depositional processes.

- *total weight*: (in grams) weight of the pottery with identical qualities in the assemblage. This kind of quantification partly solves the pottery fragmentation problem.
- *absolute number of pottery fragments with identical qualities in the assemblage classified into fragment categories*: This quantification conveniently combines two types of information—the number of fragments possessing particular qualities, and categories of the fragments (number of fragments from: the rim, rim with upper part of decorated body, rim with undecorated body, decorated bodies, undecorated bodies, base, base with lower part of decorated body, number of complete vessels and number of fragments of other type—mainly tiny unrecorded fragments).

This quantification can essentially take one of two forms: when we describe a particular specimen (or several specimens with identical attributes), we record the number and category of fragments making up a particular specimen (e.g. a particular vessel is made up of 3 rim fragments, 5 decorated and 3 undecorated body shards and 1 base fragment). However, when we describe various fragments that cannot be identified with a particular specimen this specification simply expresses the number of shards of any given category in the assemblage (e.g. 20 decorated body shards, made of the same fabric and decorated with the same motif).

The application of the proposed system introduces some bias to the information related to the ornament analysis, because the two types of quantifying the number of fragments are incompatible. While in the description of fragments not identifiable with a particular specimen the description of the decoration concerns only a small section of the decoration appearing on the shard, fragments associated with a particular specimen provide information on the complete motif observed on that specimen (for example, if we describe a vessel decorated with a single wave above horizontal lines, in the descriptive system each of the decorated fragments of the vessel will carry information on the complete motif, even though some are decorated only with a wave and others only with horizontal

lines). However, the problem outlined above can be resolved in the synthetic phase of the work where we can conveniently group and generalize the individual decoration motifs on the basis of the applied hierarchical model of decoration description (see Chap. 4.2.1.3).

Fragments classified as tiny unrecorded fragments were not described any further except by recording their number and weight.

The next section of the descriptive system concentrates on the actual description of pottery. At first, it is described with regards to the technology and fabric.

- *technology* (*HAN_SCHW*): description of the principal forming techniques. In general, the technology was examined only in complete vessels or their upper parts where the technological attributes are best preserved. It is possible to distinguish hand-made production, turntable-made ceramics shaped on a slow or faster turning turntable and wheel-made ceramics. The determining factor for establishing the technology were the traces on the vessel and/or their nature. In the absence of turntable shaping on irregularly shaped pottery with smooth strokes in multiple directions we thought of production without applying rotation, i.e. hand-made; in slightly profiled simple rims with light traces of turntable shaping and slightly irregular walls and irregular decoration the ceramics was classified as built by coiling and shaped on a slow-turning turntable; in vessels with regular walls and more complicated profiled and outflaring rims, and/or conspicuous traces of turntable shaping the pottery forming technology was classified as shaping on a faster turning turntable (the absolute majority of Great Moravian pottery); high-quality turned pottery is characterized by thin walls and fine horizontal grooves inside. The only structuring attribute incorporated into the final data model serving as the basis for the synthesis of the formal structures was *HAN_SCHW* denoting pottery manufactured either by hand or built by coiling and shaped on a slow turning turn-table.
- *fabric* (*T_GRAPH*, *T_FEIN*): In the description of the fabric we originally worked with 10 fabric classes. The pottery fabric from Pohan-sko was divided into three basic groups which are easy to specify both archaeologically and petrologically⁶⁷—i.e. mainly fine pottery,

⁶⁷ Štelcl at all (1987), pp. 289–292.

graphite pottery and other coarse pottery. The fine pottery is made of washed, fine clay with an admixture of microscopic grains of sand, and, rarely, larger grains. It is typical for the so-called Class 5 of B. Dostál.⁶⁸ Graphite pottery is characterized by a great admixture of graphite, observable to the naked eye and leaving a significant trace on fingers or paper.⁶⁹ Graphite appears in the fabric either as grains of various sizes (coarse graphite fabric) or finely ground (fine graphite fabric). Some of the graphite vessels were found to be coated with an engobe without graphite.

Pottery with clearly visible temper of various quantity, size and type was included in the coarse pottery without any further classification based on temper. We completely refrained from establishing the ratio between temper and bond as this value is difficult to assess objectively without the use of special equipment (e.g. a microscope with a grid). For the same reason we did not study the type of temper which most often consists of siliceous sand grains of various sizes.

Within the above groups we attempted a subdivision by the degree of firing. However, during work it became clear that the level of the subjective influence by each member of the staff macroscopically describing the fabric remained relatively high and could potentially and adversely influence some of the results, in spite of the fact that the description was based on a comparative series of samples.⁷⁰ In the end, the fabric classes were noticeably reduced and we continued to use only two of them: fabric with an admixture of graphite (T_GRAPH) and pottery from washed, fine clay. (T_FEIN).

The following part of the descriptive system deals with the decoration of pottery. The decoration description system could be characterized as hierarchical and formally—morphological. In its development we were led by our desire to record even data from small decorated fragments so that in the synthetic phase of our work they were compatible with the data obtained from complete vessels or their large fragments, where we were able to describe the whole decorative motif.

⁶⁸ Dostál (1975), p. 164.

⁶⁹ Natural scientists identified graphite in virtually all samples examined at Pohansko—Štelcl at al (1987), 283; however in most cases the quantity is very low and cannot be taken into consideration in the archaeological classification.

⁷⁰ Macháček (2001c), pp. 168–175; Orton—Tyers—Vince (1993), pp. 72–75.

- *decoration location: (HALS_VRZ)* The decoration can be situated on different parts of the vessel (neck, upper part of the body, lower part of the body, body/in general). The attribute selected during the testing of the data model as structuring was HALS_VRZ, which denotes the location of the decoration on the neck.
- *incised decoration motifs:* From the original, fairly extensive list of decorative motifs⁷¹ the selection for the final data model included only those that can be considered significant for resolving our issues. Standard motifs that are not structuring were discarded from further processing. Some related and less frequent decorative motifs were joined to form larger groupings. In the definition of the decorative motifs we took into consideration the preliminary model derived from the work by B. Dostál, and/or other sources.

With regards to terminology it should be noted that in this work we used the following terms: for decoration made with a comb tool—a combed wave, combed band, or comb imprints, and for decoration made with a single-pronged instrument—a simple wave, simple line or imprint. A single-pronged instrument was also applied to make notches, which, as opposed to imprints, are drawn. The descriptors selected for further processing are clearly organized in the following table (Tab. 17).

- *combed waves:* Special attention was paid to the description of the combed waves (Tab. 18). We examined their characteristics (symmetrical/regular, sloping, pointed, Early Hillfort period, irregular), height and density. In smaller fragments it was often possible to record only some items of data listed above. On the contrary in complete vessels there often occurred combed waves with different parameters on a single specimen. The testing of the data model showed that only some properties of the combed waves are structuring. We selected the following attributes: combed wave of the Early Hillfort period style (KWB_D), which is crudely incised without routine, and without using the faster rotation of the wheel; the irregular combed wave (KWB_F); and the low and densely combed wave (KW_N_D).

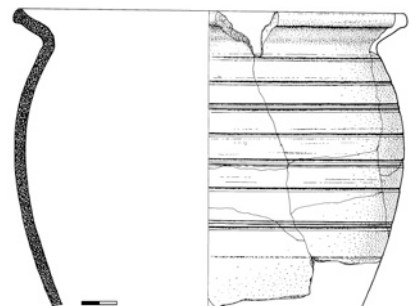
In the original descriptive system we described even more attributes related to incised decoration. In decoration made with a single-pronged instrument it was specific properties such as the width of the single

⁷¹ Macháček (2001c), pp. 51–53.

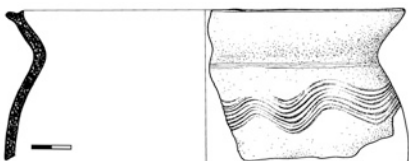
Tab. 17. Břeclav-Pohansko. The Forest Nursery. Pottery. Decorative motifs.



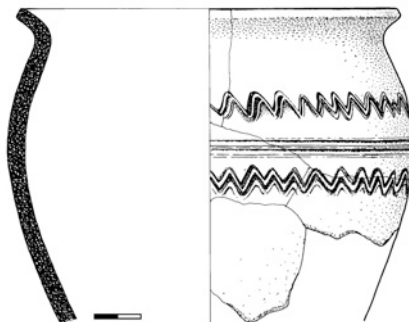
V_A1 – single combed band

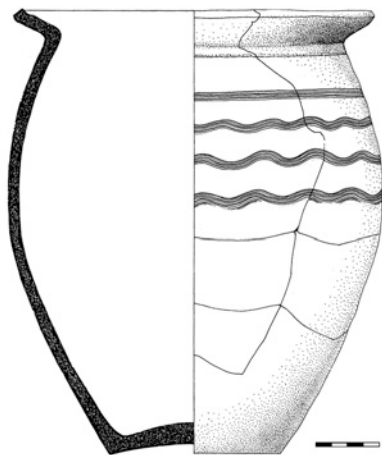


V_A2 – sequence of combed bands

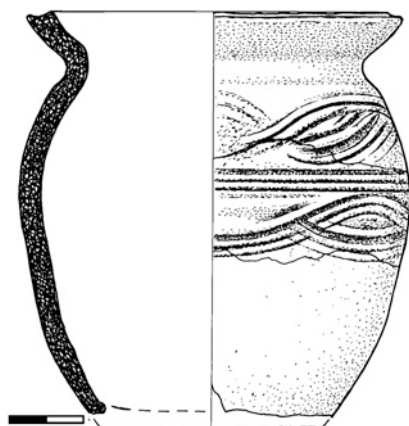


V_B1 – single combed wave

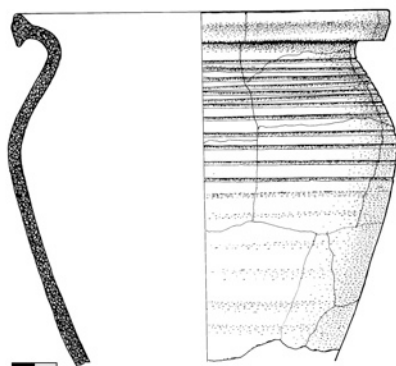
V_C3 – single combed band
between two combed waves

Tab. 17 (*cont.*)

V_C5 – combed band(s) above combed waves



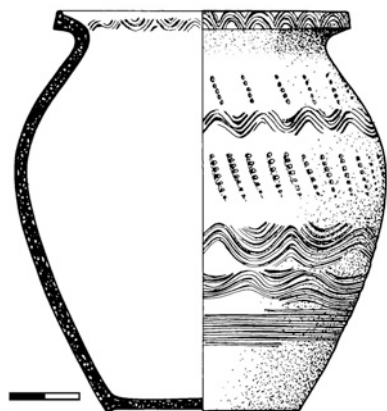
V_C7 – intertwined combed waves and combed bands



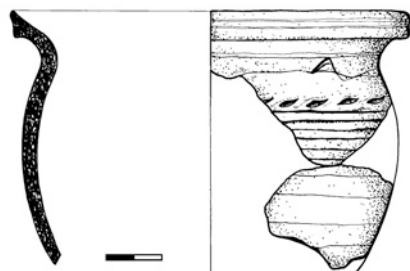
V_D2 – simple lines made with a single-pronged instrument

Tab. 17 (*cont.*)

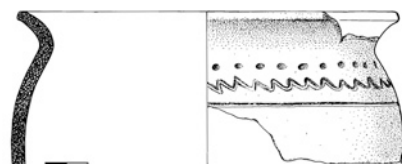
	V_E1 – simple wave made with a single-pronged instrument
	V_E2 – sequence of simple waves made with a single-pronged instrument
	V_F1 – simple wave above lines made with a single-pronged instrument
	V_F4 – combination of simple waves and lines made with a single-pronged instrument
	V_F5 – Blučina motif made with a single-pronged instrument
	V_G – combed ornament combined with simple lines or waves made with a single-pronged instrument

Tab. 17 (*cont.*)

KAM_STI – comb imprints
(independent or combined with other
motifs)

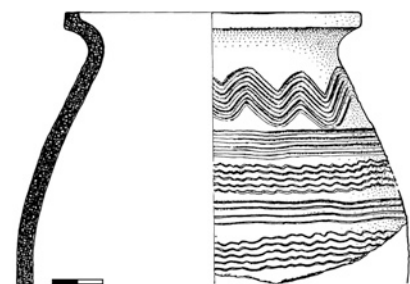


KERBE – notches (independent or in
combination with other motifs)

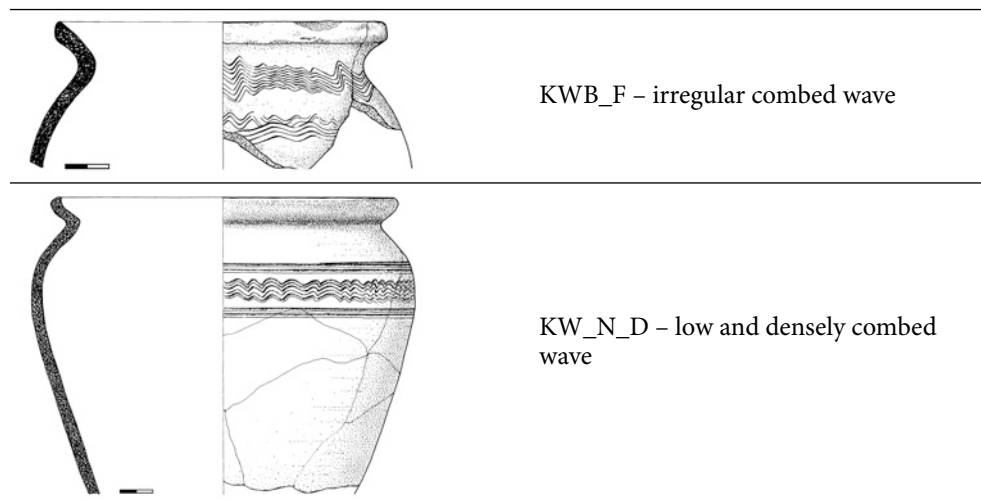


STICH – pin pricks (independent or in
combination with other motifs)

Tab. 18. Břeclav-Pohansko. The Forest Nursery. Pottery. Combed waves.



KWB_D – combed wave of Early Hillfort
period style

Tab. 18 (*cont.*)

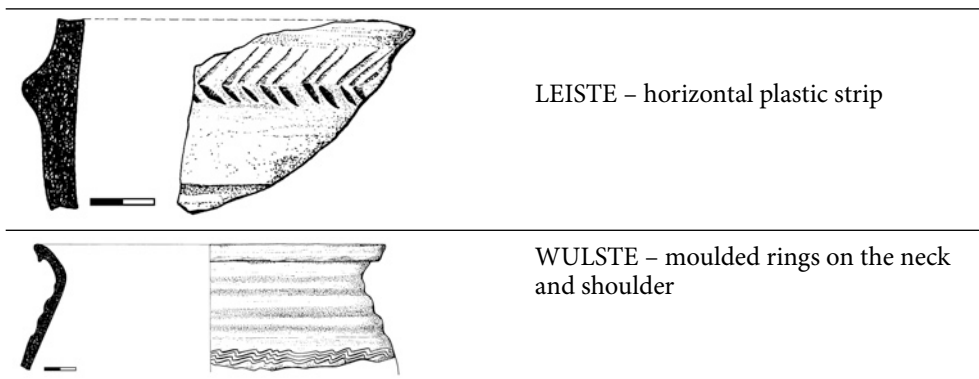
line or simple wave or the density of the lines. We also noted down decoration on the inner and outer side of the lip.⁷² However, none of the attributes can be considered as structuring.

- *moulded decoration (LEISTE, WULSTE)*: In contrast to incised decoration, moulded decoration occurs in far lower quantities. However, during the testing of the data model it was these attributes that showed themselves to be significant. Moulded decoration may consist of the plastic strip (LEISTE) and moulded rings on the neck and shoulder (WULSTE) (Tab. 19).
- *rim*: A large group of attributes used to describe the pottery is related to the rim. The most important attribute is the ending of the rim—the lip. Additional properties (extent of the shoulder, rim decoration or outflaring of the rim), described in the original descriptive system proved to be less important. The definition of the different types of rims was based on the partly modified morphology of lips proposed by B. Dostál.⁷³ Similar types of lips were merged into larger groups. Some less numerous or less significant types of lips were dropped from further analyses. The system incorporated only the main types

⁷² Macháček (2001c), p. 47.

⁷³ Dostál (1975), pp. 145–153.

Tab. 19. Břeclav-Pohansko. The Forest Nursery. Pottery. Moulded decoration.



of lips which were aimed at by the craftsman, rather than individual and partly random deviations occurring during manufacture. The data model testing confirmed that some simple lips (rounded or simply conically or cylindrically truncated) appeared on profoundly different categories of pottery.⁷⁴ For the purposes of further evaluation they were combined with two basic fabric classes (fine fabric, coarse fabric). The individual lips are illustrated in the table below (Tab. 20).

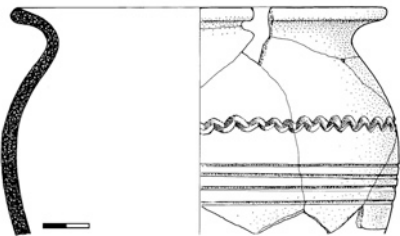
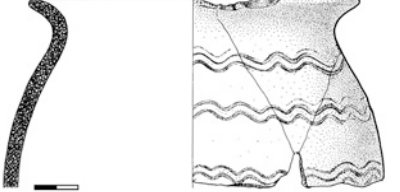
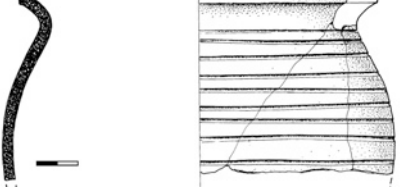
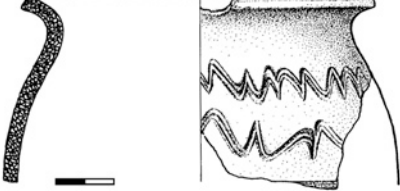
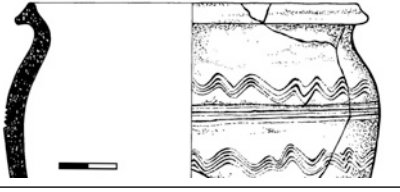
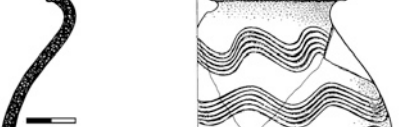
- *base mark (BOZEI_PL)*: The last group of attributes used to describe the pottery is related to the marks on the bottom. They can be technological, by which we mean traces of the turning wheel axis, or moulded in the form of various motifs (imprints) found on the base. Only the moulded marks (BOZEI_PL) were of significance for further processing.

4.2.1.2 *The taphonomy of pottery assemblages*

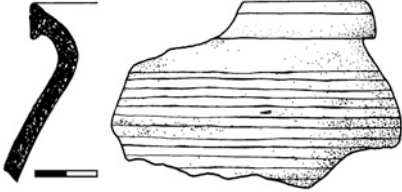
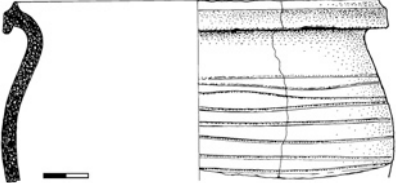
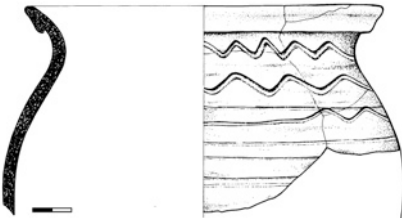
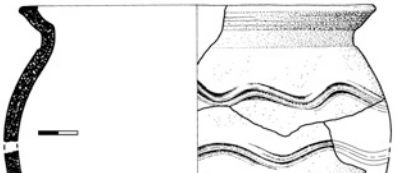
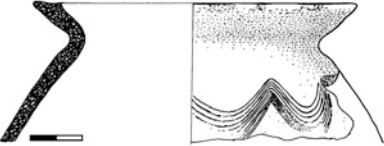
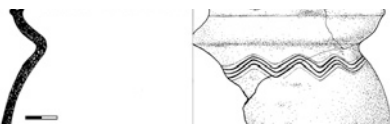
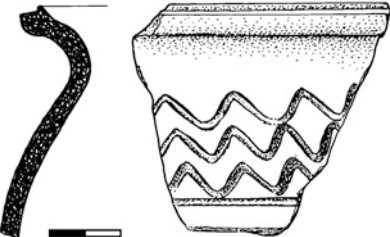
Before we proceed with the actual formalized synthesis and interpretation of archaeological structures, that are reflected in the settlement pottery, we must acquire detailed knowledge of the assemblages that our conclusions will be based on. The first principal task is the identification of the assemblages which are sufficiently representative for the formulation of general conclusions. Along the way, we will try to get a grasp on the post-depositional history of the assemblages that

⁷⁴ Macháček (2001c), pp. 115–167.

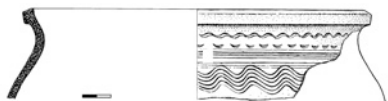
Tab. 20. Břeclav-Pohansko. The Forest Nursery. Pottery. Rims.

 Profile and fragment of pottery rim R_A_F. The profile shows a rounded lip. The fragment shows a rim with a wavy pattern and a small scale bar.	R_A_F – rounded lip made of fine fabric
 Profile and fragment of pottery rim R_A_GR. The profile shows a rounded lip. The fragment shows a rim with a wavy pattern and a small scale bar.	R_A_GR – rounded lip made of coarse fabric
 Profile and fragment of pottery rim R_B1_F. The profile shows a simple cylindrical or conical truncated lip. The fragment shows a rim with a wavy pattern and a small scale bar.	R_B1_F – simple cylindrical or conical truncated lip made of fine material
 Profile and fragment of pottery rim R_B1_GR. The profile shows a simple cylindrical or conical truncated lip. The fragment shows a rim with a wavy pattern and a small scale bar.	R_B1_GR – simple cylindrical or conical truncated lip made of coarse material
 Profile and fragment of pottery rim R_B2. The profile shows a simple cylindrical or conical truncated lip with a protruding lower edge. The fragment shows a rim with a wavy pattern and a small scale bar.	R_B2 – simple cylindrical or conical truncated lip with protruding lower edge
 Profile and fragment of pottery rim R_B3. The profile shows a simple cylindrical or conical truncated lip with a protruding upper edge. The fragment shows a rim with a wavy pattern and a small scale bar.	R_B3 - simple cylindrical or conical truncated lip with protruding upper edge

Tab. 20 (*cont.*)

	R_B4 - simple cylindrical or conical truncated lip with protruding lower and upper edge
	R_B4PROF - simple cylindrical or conical truncated lip with protruding lower and upper edge and central moulded band
	R_C - funnel-shaped lip (various modifications)
	R_D1 - simple horizontal truncated lip
	R_D2_4 - horizontal truncated lip with protruding outer or inner edge
	R_E - grooved lip (various modifications)
	R_G1 - richly profiled thickened lip

Tab. 20 (*cont.*)

	R_G2 – cut-out thickened lip

we are to work with.⁷⁵ In this way we can reduce the risks involved in the application of the quantitative methods to processing settlement pottery, described by E. Neustupný.⁷⁶

Based on the preliminary processing of a representative sample of pottery from the Forest Nursery it was found that assemblages too small to be statistically significant need to be eliminated from further processing. The specified limit for reliability was 100 fragments or 2000 grams of pottery in the assemblage.⁷⁷ In the Forest Nursery at Pohansko the criterion was met by 117 assemblages. They can be characterized by several basic items of data, which are generally used in defining a standard set of settlement pottery and from previous experience with early medieval pottery at Pohansko we know they are relevant for the discussion of post-depositional processes:⁷⁸

- total number of shards in the feature (ANZAHL)
- density (DICHTTE): ratio between the number of shards and the idealized volume of the sunken-floored feature, calculated by multiplying the maximum depth and the ground plan area of the feature at the subsoil level; the value will only be calculated provided we know all the necessary dimensions of the feature
- ratio of related shards from individual vessels made up of three or more fragments to the total amount of shards from the feature expressed by their number (INDIVID_AN): individual items were defined based on rim shards from a single vessel, to which we added other categories of fragments that we had found; groups of fragments from a single vessel which did not contain any rim shards were not included in this category
- average weight of a pottery fragment in the feature (DR_GEW)
- average weight of a fragment from the base (GEW_BOD)

⁷⁵ More in Orton—Tyers—Vince (1993), p. 168.

⁷⁶ Neustupný (1996a), p. 503; Neustupný (1998), pp. 77–94.

⁷⁷ Macháček (2001c), p. 71.

⁷⁸ Macháček (2001c), pp. 67–94; Salač (1998), pp. 43–76.

- average weight of a rim with an upper part of the body (GEW_RANB)
- per cent ratio of rims with an upper part of the body (RAN_B_P), rims (RAN_P), decorated body shards (VR_PR), undecorated body shards (UNVR_PR), bases (BOD_PR) and bases with a decorated lower part of the body (BOD_B_PR) to the total number of shards in the feature
- minimum number of individuals (individual vessels) in the assemblage based on rim shards (INDIVID)
- idealized volume of the sunken-floored feature (INHALT): calculated by multiplying the maximum depth and the ground plan area of the feature at the subsoil level.

The values under observation can be characterized by the main features of descriptive statistics such as the range, minimum, maximum, mean and standard deviation (Tab. 21). The frequency distribution (Diagram 19–Diagram 30) is visualized by means of the so-called box plot (see Chap. 4.1.1.3).

From the attributes described above it will be possible to determine, which pottery assemblages are a result of similar depositional and post-depositional processes, and/or what the nature of the processes was. This work is not an end in itself. Its outcome will help us understand

Tab. 21. Břeclav-Pohansko. The Forest Nursery. The taphonomy of pottery assemblages. Descriptive Statistics.

	N	Range	Minimum	Maximum	Mean	Std. Deviation
ANZAHL	117	3178	72	3250	455	552.6
BOD_B_%	117	2	0	2	0.2	0.4
BOD_%	117	13	3	0.16	9.2	2.7
DICHTE	99	487.2	14.4	501.7	94.3	88.9
DR_GEW	117	19.3	11.9	31.2	18.5	4.1
GEW_BOD	117	70.3	15.7	86	37.9	11.1
GEW_RANB	117	95	0	95	33.7	13.2
INDIV_AN	117	0.71	0	0.71	0.16	0.15
INDIVID	117	227	0	227	31	35
INHALT	99	47.1	0.25	47.4	7.4	8.2
RAN_B_%	117	10	0	10	4.2	2.3
RAN_%	117	14	0	14	8	2.4
UNVR_%	117	77	14	90	32.7	10.7
VR_%	117	65	0	65	45.6	10.1

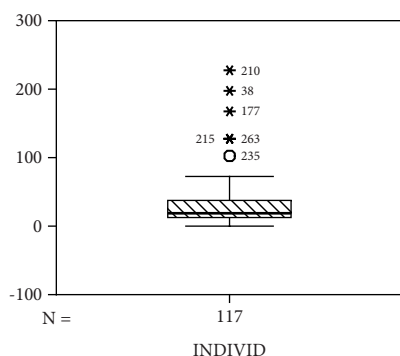


Diagram 19. Břeclav-Pohansko. The Forest Nursery. Minimum number of individuals (vessels) per assemblage.

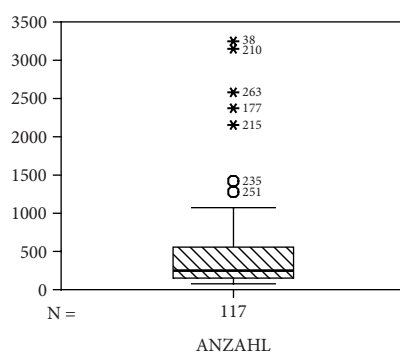


Diagram 20. Břeclav-Pohansko. The Forest Nursery. Total number of shards per assemblage.

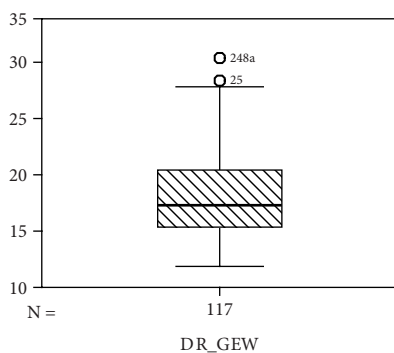


Diagram 21. Břeclav-Pohansko. The Forest Nursery. Average weight (in g) of a ceramic fragment per assemblage.

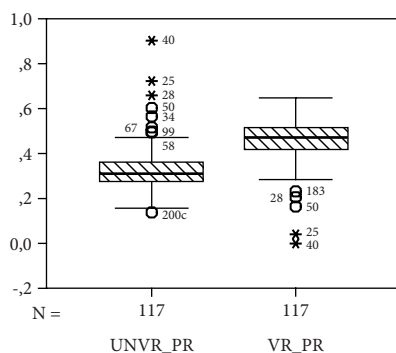


Diagram 22. Břeclav-Pohansko. The Forest Nursery. The share of decorated and undecorated body shards in the total number of shards per assemblage.

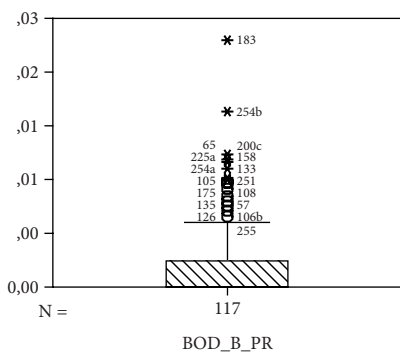


Diagram 23. Břeclav-Pohansko. The Forest Nursery. The share of bases with a decorated lower part of the body in the total number of shards per assemblage.

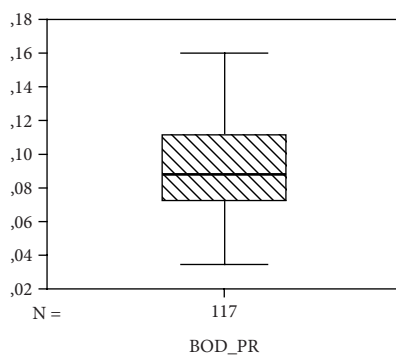


Diagram 24. Břeclav-Pohansko. The Forest Nursery. The share of bases in the total number of shards per assemblage.

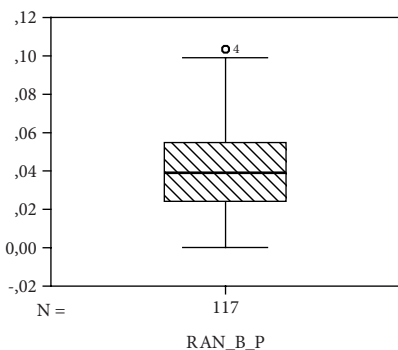


Diagram 25. Břeclav-Pohansko. The Forest Nursery. The share of rims with an upper part of the body in the total number of shards per assemblage.

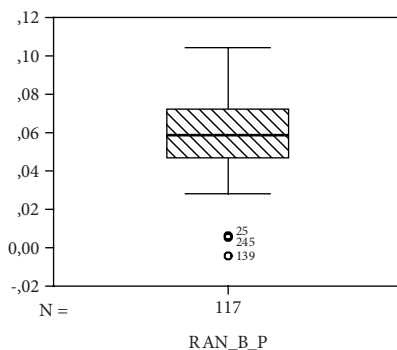


Diagram 26. Břeclav-Pohansko. The Forest Nursery. The share of rims in the total number of shards per assemblage.

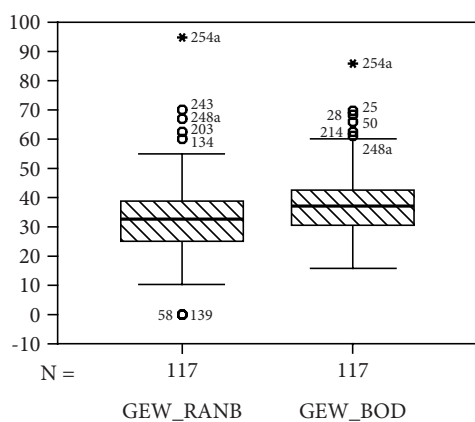


Diagram 27. Břeclav-Pohansko. The Forest Nursery. Average weight of rims with an upper part of the body and bottom fragments per assemblage.

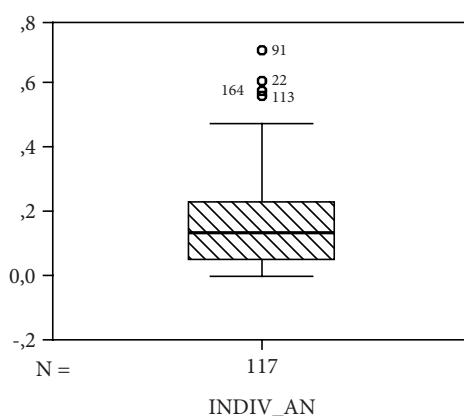


Diagram 28. Břeclav-Pohansko. The Forest Nursery. Ratio of related fragments to the total number of shards per assemblage.

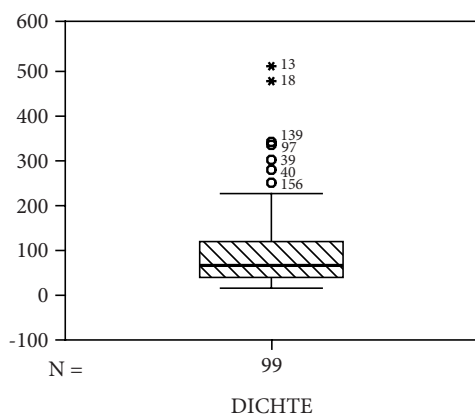


Diagram 29. Břeclav-Pohansko. The Forest Nursery. Density of pottery per sunken-floored feature.

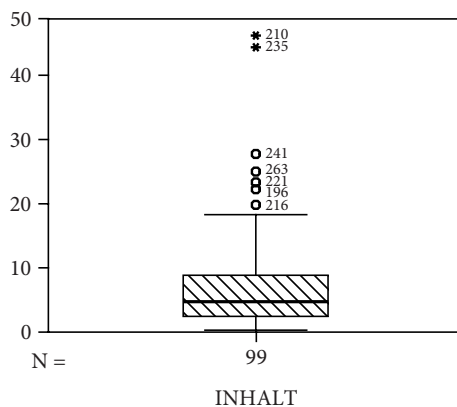


Diagram 30. Břeclav-Pohansko. The Forest Nursery. Idealized volume of a sunken-floored feature (in cubic meters).

the processes that gave rise to the settlement assemblages, which is of paramount importance for the discussion of how reliable can be the application of quantitative statistical procedures to the processing of settlement pottery.⁷⁹

The study of the consequences of the depositional and post-depositional processes is based on the presupposition, that their impact significantly affected the values of the attributes we found to be relevant in terms of archaeological “taphonomy”. Our main task is to find pottery assemblages characterized by close values of the attributes. Those will be considered archaeological homogenous.⁸⁰

The evaluation involved 99 features from the Forest Nursery containing more than 100 fragments or 2000 g pottery and in which it was, at the same time, possible to obtain data concerning the pottery density.

The pottery assemblages from the features can be characterized by eight most significant descriptors: total number of shards in the feature (ANZAHL), ratio of related shards from individual vessels made up of three or more fragments to the total amount of shards from the feature expressed by their number (INDIVID_AN), idealized volume of the sunken-floored feature (INHALT), average weight of a pottery fragment in the feature (DR_GEW), average weight of fragments from the base (GEW_BOD), ratio of rims with an upper part of the body (RAN_B_P), decorated body shards (VR_PR) and bases with a decorated lower part of the body (BOD_B_PR) to the total number of shards in the feature.

In this work we will use two methods of multivariate analysis: the principal component analysis (PCA) and the hierarchical agglomerative cluster analysis.

The principal component analysis was chosen in order to define the relationships between variables and objects of the descriptive system and to discover the main trends inherent in the data.

The relative position of the individual pottery assemblages in terms of depositional and post-depositional history can also be studied from factor score visualization—one of the outputs of the PCA.

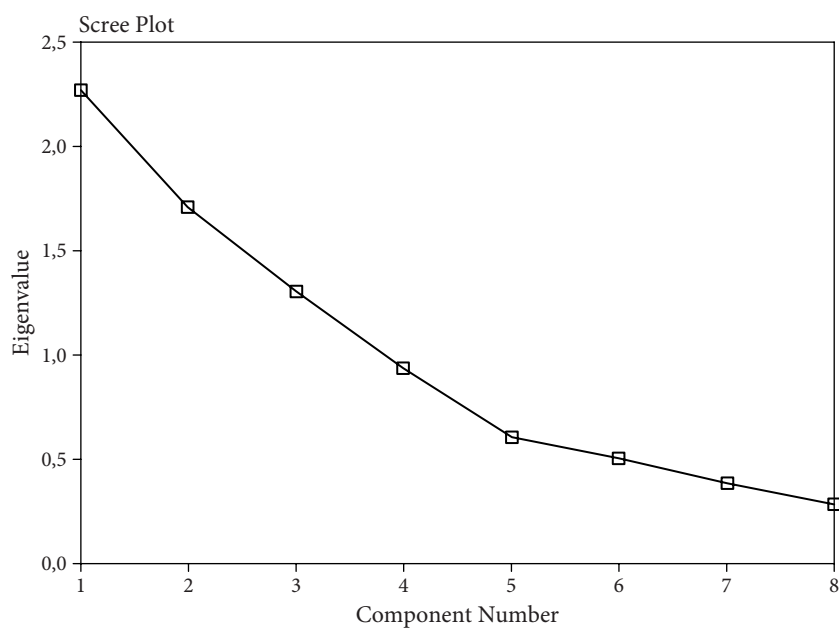
⁷⁹ Neustupný (1996), pp. 502–506.

⁸⁰ More in Macháček (2001c), pp. 13–17, pp. 95–106.

The initial statistics of the principal component analysis (PCA) is based on a matrix (Tab. 22) with 99 rows (objects) and 8 columns (variables).

Tab. 22. Descriptive Statistics.

	Mean	Std. Deviation	N-Analysis
INDIV_AN	0.1568	0.1466	99
RAN_B_P	4.051E-02	2.342E-02	99
DR_GEW	18.0828	3.7025	99
BOD_B_PR	2.299E-03	4.147E-03	99
INHALT	7.3901	8.1562	99
ANZAHL	481.7778	592.7714	99
GEW_BOD	38.3450	10.9600	99
VR_PR	0.4477	0.1035	99



The number of factors that we will continue to work with is determined following a procedure proposed by E. Neustupný.⁸¹ In this the decisive criterion will be the magnitude of the eigenvalue greater than 1 (Tab. 23). This criterion is met by three factors which represent 66 percent of the total variability of the correlation matrix. The factors are rotated using the Varimax method (Tab. 24).

Tab. 23. Eigenvalues.

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.268	28.348	28.348	1.926	24.072	24.072
2	1.708	21.350	49.698	1.733	21.660	45.732
3	1.308	16.348	66.046	1.625	20.314	66.046
4	0.939	11.738	77.784			
5	0.610	7.619	85.403			
6	0.501	6.264	91.667			
7	0.384	4.796	96.463			
8	0.283	3.537	100.000			

Extraction Method: Principal Component Analysis.

Tab. 24. Rotated Component Matrix.

	Component		
	1	2	3
INDIV_AN	0.808		
RAN_B_P	0.802		
DR_GEW	0.647		0.552
BOD_B_PR	0.375		
INHALT		0.908	
ANZAHL		0.901	
GEW_BOD			0.879
VR_PR	0.220	0.294	-0.714

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 5 iterations.

⁸¹ Neustupný (1997b), p. 241.

The variables affected by the level of pottery fragmentation have highest loading on *factor 1*. Those include, mainly, the attribute denoting the share of mutually related shards per assemblage (INDIVID_AN), percentage of slightly fragmented shards extending from the rim or bottom to the body (RAN_B_P, BOD_B_PR), and finally the overall average weight of a fragment (DR_GEW).

Factor 2 is mostly related to assemblages consisting of a great number (ANZAHL) of fragments originating from large (INHALT) settlement features.

There is, at the same time, some positive loading with regards to the percentage of decorated fragments per assemblage on factor 1 and factor 2.

Factor 3 is clearly bipolar as opposed to the previous factors. On its positive pole we find variables such as the average weight of fragments from the bottom (GEW_BOD) and the average weight calculated from all the fragments in the assemblage (DR_GEW). They are in opposition to the percentage of decorated shards (VR_PR) on the opposite side of the factor.

The relationship between the objects of the original descriptive system and the individual factors can be expressed by means of the so-called factor score. Their values for the second and third factor are visualized in a scatter plot. The pottery assemblages that are characteristic for the factors are identified by their numbers in the diagram (Diagram 31).

The diagram provides us with substantial evidence for considering the meaning of some of the formal structures reflected in the extracted factors. Features 25, 40, 50, 28 a 214, particularly typical for factor 3, date back to the pre-Great Moravian (early Slavic and Early Hillfort) period.⁸² The result is a low percentage of shards with decoration, which appears only rarely on early Slav pottery and to a limited extent on Early Hillfort vessels. It is evident that this pottery becomes fragmented in a different way than the later Great Moravian vessels. This is due to the different production technology (hand-made vessels or those shaped on a slow turning turntable have thick walls) and the different morphology of the early pottery (thick round bases of early Slav vessels).

⁸² Dostál (1982b); Dostál (1985).

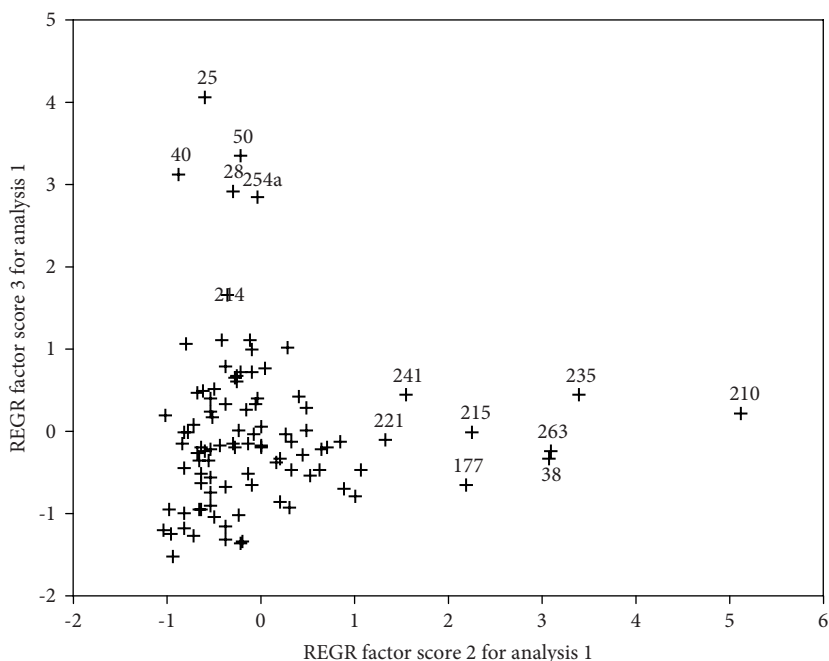


Diagram 31. Břeclav-Pohansko. The Forest Nursery. The factor score of pottery assemblages, calculated from taphonomic attributes.

Objects typical for factor 2 belong in great part to the large sunken-floored features (GEO—38, 215, 221, 235, 241), long troughs (R—177) or other extensive features (210, 263). The factor informs us of the fact that there is a specific group of assemblages made up of a considerable amount of pottery originating from the large sunken-floored features in the settlement.

Based on the results of the principal component analysis (PCA) it is possible to choose variables which most aptly characterize the main trends in the existing data and, at the same time, to form an orthogonal space, i.e. they are independent of (not correlated to) one another.⁸³ Only variables that are thought to be the product of identical “taphonomic” processes are suitable for use in a cluster analysis which helps us define clusters of similar pottery assemblages. From each factor we select one attribute that is the most typical: the percentage of rims with an upper part of the body (RAN_B_P), the total number of shards in

⁸³ Shennan (1988), p. 200.

the assemblage (ANZAHL), and the average weight of fragments from the bottom (GEW_BOD).

Before we perform the actual cluster analysis, we need to standardise the variables, i.e. converge the absolute quantities to relative quantities. This is done in order to eliminate the influence of the different scales of the variables. In this particular case we will use the so-called Z-transformation of the variables. The distance between the clusters will be calculated in a squared Euclidean space using the method according to Ward (popular with archaeologists, it is based on minimizing the loss associated with each group defined in terms of an error sum-of-squares criterion).

The results are visualized in the following dendrogram (Diagram 32):

From what we have learned it seems most reasonable to divide the 117 objects into four clusters. Objects marked by different symbols in accordance with their belonging to the individual clusters, can be visualized in a three-dimensional diagram (Diagram 33), where the most important variables are projected onto its axes (RAN_B_P, ANZHAL and GEW_BOD). The diagram allows us to arrive at conclusions comparable with the findings reached based on the PCA. Among the pottery assemblages from the Forest Nursery there are two very specific groups, of which one is made up of features with abundant assemblages of pottery (cluster No. 3) and the second by assemblages with heavy fragments from the bottom (cluster No. 4). The latter group mostly originates from the early Slav and Early Hillfort features. The bulk of the objects is divided into two roughly identical groups, distinguished by the percentage of rims with an upper part of the body. These two principle groups (cluster No. 1 and 2) are evidently related to the different stages of fragmentation of Great Moravian pottery (see above factor 1). Our previous research,⁸⁴ and the new results (see Chap. 4.2.1.4.2) indicate that the different level of fragmentation depends on the relative chronological position of the individual features in the settlement where the pottery was found. The explanation of this fact is based on the theory⁸⁵ that the assemblages with pottery less affected by fragmentation partly contain secondary or quickly transported tertiary settlement refuse which could have been produced only when the site was inhabited. These assemblages are older than the features filled only with tertiary refuse, carried into them gradually and slowly by natural

⁸⁴ Macháček (2001), pp. 186–188.

⁸⁵ Neustupný (1998b), p. 91.

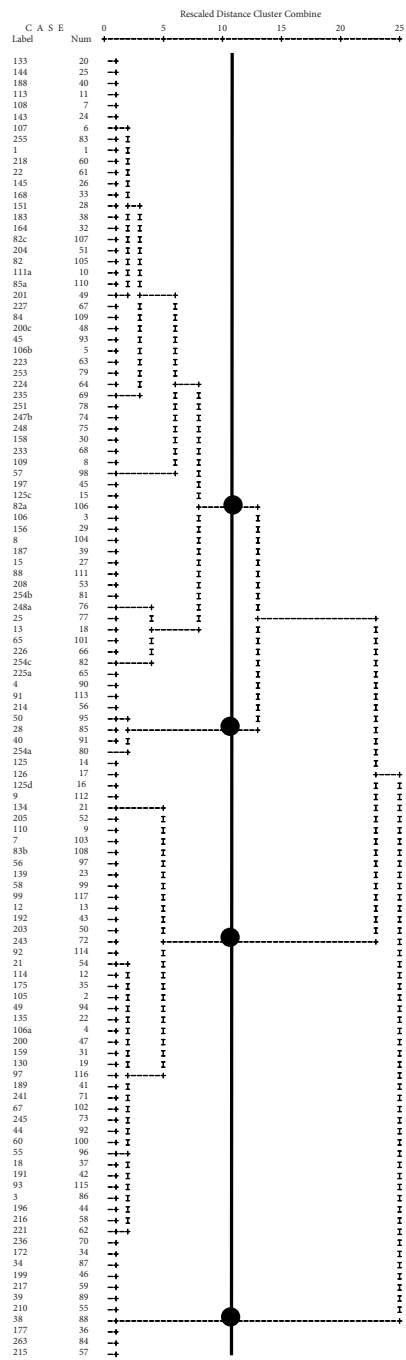


Diagram 32. Břeclav-Pohansko. The Forest Nursery. Dendrogram of pottery assemblages ordered by taphonomic attributes.

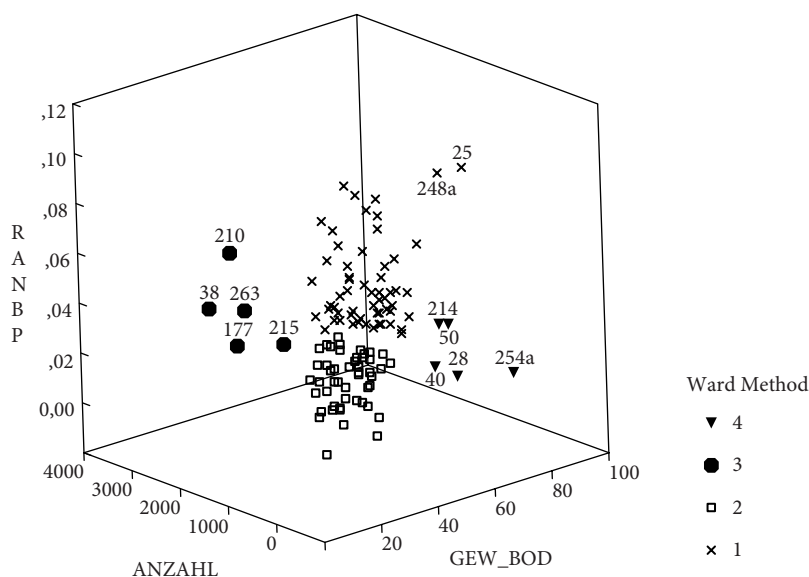


Diagram 33. Břeclav-Pohansko. The Forest Nursery. Three-dimensional diagram (percentage of rims with an upper part of the body in the total number of shards, average weight of bottom shards and total number of shards per assemblage) with pottery assemblages, divided into four clusters by taphonomic attributes.

n-transformations from deserted surface waste dumps where the pottery had been exposed to fragmentation for a long period.

At the end of the chapter dedicated to the taphonomic study of pottery assemblages we should point out some features that have extreme positions in regards to the observed variables. Features 254a and 248a have parameters very similar to Early Hillfort and early Slavic features, although they belong to the Great Moravian period. At the same time they are characterized by a very low number of fragments on the very limits of the selected statistical threshold. Pottery from those features cannot be compared with the standard Great Moravian pottery assemblages in further analyses. We also had to exclude feature 139 from further processing as it does not contain any rim shards, and feature 183 in which there were found very few classifiable pottery individuals and which exhibits extreme values in some variables.

4.2.1.3 *Synthesis of the formal structure of pottery assemblages*

At the core of research into the relative chronology of settlement in the Forest Nursery is the search for formal structures extracted from a matrix where the rows represent the individual pottery assemblages

from the settlement features (objects) and the columns stand for the attributes of the pottery (variables). The individual cells of the matrix contain the percentage values expressed in relations between the attributes in the particular pottery assemblages. The calculated percentages are relative to the total amount of pottery with attributes of a given category (e.g. decoration, lips, fabric) in the assemblage. The pottery quantification method on which our calculations are based is related to a particular category of variables. Building on what we had learnt from the analysis of post-depositional processes⁸⁶ we made an effort to select a type of quantitative data which would enable us to minimize as much as possible the impact of post-depositional processes. As a result, in the case of fabric we worked with weight, the decoration was quantified by the number of fragments and the attributes related to the lip by the number of specimens (min. number of vessels) in the assemblage.

Compared to the original, still fairly extensive, descriptive system⁸⁷ the selection of the variables for the matrix, which would serve as the basis for the formalized synthesis, was considerably narrowed down. It no longer featured variables where the action of subjective influences during description had been found (e.g. some categories of the fabric). We only worked with attributes which carry the most important pieces of information on the characteristics of the pottery and which were confirmed to be structuring with regards to our aims.⁸⁸

We processed only representative assemblages of pottery containing, as a minimum, 100 fragments or 2,000 grams of pottery. However, our knowledge of post-depositional processes (see 1.2.1.2) suggested that some of the pottery assemblages needed to be eliminated from further processing as unreliable or non-representative. The first basic solution of the PCA⁸⁹ was therefore performed with a matrix consisting of 108 rows (pottery assemblages from the individual settlement features) and 40 columns (pottery attributes/variables). Only features that belonged to the Great Moravian period were involved in the processing (Tab. 25).

⁸⁶ Macháček (2001c), 67–106.

⁸⁷ Ibidem, pp. 43–66.

⁸⁸ Ibidem, pp. 168–194.

⁸⁹ Here, as well as in the subsequent pages of this book, we use “solution” in a technical, statistical sense to refer to a particular output of a principal component analysis. In doing so, we follow the usage of Neustupný (1993).

Tab. 25. Pottery attributes/variables. Communalities.

	Initial
R_A_F	1.000
R_A_GR	1.000
R_B1_F	1.000
R_B1_GR	1.000
R_B2	1.000
R_B3	1.000
R_B4	1.000
R_B4PROF	1.000
R_C	1.000
R_D1	1.000
R_D2_4	1.000
R_E	1.000
R_G1	1.000
R_G2	1.000
V_A1	1.000
V_A2	1.000
V_B1	1.000
V_C3	1.000
V_C5	1.000
V_C7	1.000
V_D2	1.000
V_E1	1.000
V_E2	1.000
V_F1	1.000
V_F4	1.000
V_F5	1.000
V_G	1.000
KAM_STI	1.000
KERBE	1.000
STICH	1.000
LEISTE	1.000
WULSTE	1.000
KWB_D	1.000
KWB_F	1.000
KWB_N_D	1.000
HALS_VRZ	1.000
BOZEI_PL	1.000
T_FEIN	1.000
T_GRAPH	1.000
HAN_SCHW	1.000

Extraction Method: Principal Component Analysis.

From a rigorously statistical point of view this matrix does not satisfy the initial conditions required for a standard principal component analysis (PCA).⁹⁰ The number of objects contained within should be at least five times higher than the number of variables. The solution derived from our matrix may therefore be statistically unstable. However, archaeological data is so unique and unrepeatable, that it can only be extended with extreme difficulty. The assurance of a statistically stable solution must therefore be replaced by validation with external evidence to verify the validity of the identified formal structures which can be statistically unreliable.⁹¹ The vectors calculated from the matrix will not be a highly reliable estimate of the characteristics of the basic set of which our pieces of data are a sample (this is also due to the fact that it is impossible to expect multi-variate normal distribution of archaeological data), but merely what is termed a consistent estimate.⁹² The results will have exactly the same characteristics.

For the following analysis we will consider four factors. The decisive criterion is the last significant drop between the eigenvalue of the fourth and fifth factor which is clearly visible in the scree plot⁹³ (Tab. 26). The total cumulative variability of the four factors is very low, a mere 28.8 percent. The obtained factors thus explain only a small portion of the information contained in the descriptive matrix. The low value of the cumulative variability may be in connection with the great number of variables in the matrix and the nature of the input data. The objects in the matrix are made up of more or less mixed pottery assemblages from the fill of sunken-floored features, to where the settlement refuse was transported by different ways. Data like this has a high level of entropy and principally cannot form such firm structures as, for example, grave goods.

The four factors will be rotated using the Varimax method. Loadings greater than 0.2 are ordered by size in the following table (Tab. 27).

⁹⁰ SPSS Inc. (1998), p. 294.

⁹¹ Neustupný (1997b), p. 243.

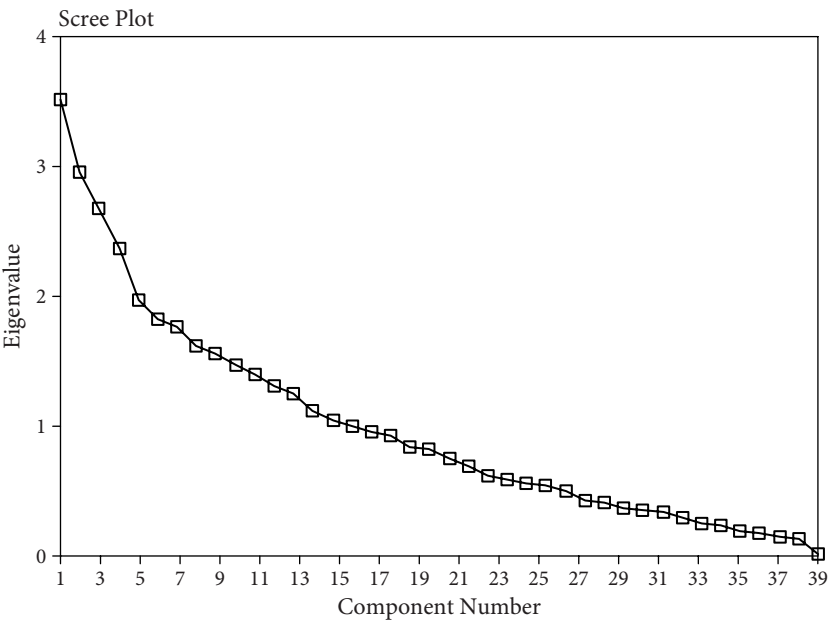
⁹² Hebák—Hustopecký (1987), p. 381.

⁹³ Neustupný (1997b), p. 241.

Tab. 26. Eigenvalues.

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.516	8.791	8.791	2.973	7.433	7.433
2	2.959	7.397	16.188	2.928	7.319	14.752
3	2.682	6.706	22.894	2.864	7.160	21.911
4	2.368	5.919	28.813	2.761	6.902	28.813
5	1.963	4.908	33.721			
6	1.823	4.557	38.278			
7	1.767	4.418	42.696			
8	1.615	4.039	46.735			
9	1.553	3.881	50.616			
10	1.466	3.666	54.282			
11	1.396	3.490	57.772			
12	1.305	3.263	61.035			
13	1.253	3.133	64.169			
14	1.115	2.788	66.957			
15	1.047	2.618	69.574			
16	1.003	2.508	72.082			
17	0.961	2.404	74.486			
18	0.929	2.323	76.808			
19	0.840	2.101	78.909			
20	0.817	2.043	80.953			
21	0.747	1.867	82.820			
22	0.697	1.743	84.563			
23	0.614	1.535	86.098			
24	0.584	1.459	87.557			
25	0.561	1.403	88.960			
26	0.543	1.356	90.316			
27	0.507	1.267	91.583			
28	0.433	1.081	92.665			
29	0.415	1.037	93.702			
30	0.374	0.934	94.636			
31	0.357	0.893	95.529			
32	0.337	0.842	96.370			
33	0.291	0.728	97.098			
34	0.253	0.633	97.731			
35	0.235	0.588	98.319			
36	0.198	0.495	98.814			
37	0.180	0.450	99.264			
38	0.153	0.382	99.645			
39	0.133	0.332	99.977			
40	9.179E-03	2.295E-02	100.000			

Extraction Method: Principal Component Analysis.



Tab. 27. Rotated Component Matrix.

Component				
	1	2	3	4
T_FEIN	0.749			
V_D2	0.626			
R_A_F	0.601			
R_B1_F	0.561			
R_B4PROF	0.528	0.206		
R_B1_GR	-0.524	0.240	0.316	-0.362
V_A2	-0.362			
R_B4	-0.230			
V_C7	0.219			
BOZEI_PL	0.214			
KERBE		0.681		
LEISTE		0.575		
T_GRAPH		0.571		
WULSTE		0.536	-0.210	
V_E1		-0.524	-0.325	
KAM_STI		0.462	-0.260	0.437
R_G1		-0.398		
KWB_N_D		0.386		0.304
STICH		0.330		
V_F4		-0.285		

Tab. 27 (*cont.*)

	Component			
	1	2	3	4
R_B3		-0.256	0.204	
KWB_D		-0.256		
V_E2		-0.208		
V_C5				
R_E			-0.567	
V_A1		0.229	-0.547	
R_B2		-0.231	0.542	
V_B1	-0.385		-0.532	0.234
V_G			0.475	0.293
R_D2_4	0.333		-0.432	
V_F1			0.408	
R_G2			0.362	
V_F5			0.337	
HALS_VRZ			0.323	-0.236
R_C	0.243		-0.323	-0.212
HAN_SCHW				0.786
V_C3				0.651
R_D1				0.602
R_A_GR				0.491
KWB_F	-0.210		0.261	0.310

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

Factor 1 is bipolar as are the other factors. The highest loadings are positive and are related to the following variables: fabric with washed, fine clay (T_FEIN), decoration in the form of incised lines (V_D2), rounded lip, made of fine fabric (R_A_F), simple cylindrical or conical truncated lip, made of fine material (R_B1_F), and cylindrical or conical truncated lip with protruding lower and upper edge and central moulded band (R_B4PROF). To a lesser extent they relate to the positive pole of factor 1 and variables such as horizontal truncated lip with protruding outer or inner edge (R_D2_4), funnel-shaped lip (R_C), intertwined combed waves and combed bands (V_C7) and a moulded mark on the bottom (BOZEI_PL). In contrast to the variables above are those with negative loadings. They are mainly simple cylindrical or conical truncated lip made of coarse material (R_B1_GR), single combed wave (V_B1), sequence of combed bands (V_A2), simple cylindrical or conical truncated lip with protruding lower and upper edge (R_B4) and irregular combed wave (KWB_F).

A group of variables related to incised and moulded decoration has high positive loadings to *factor 2*. This includes notches (KERBE), pricks by a single-pronged instrument (STICH), comb imprints (KAM_STI), plastic strip (LEISTE), moulded rings on the neck and shoulder (WULSTE) and low and dense combed wave (KW_N_D). The variables are complemented by a fabric with a content of graphite (T_GRAPH) and a few other attributes with a lower loading, such as simple cylindrical or conical truncated lip made of coarse material (R_B1_GR), or cylindrical or conical truncated lip with protruding lower and upper edge and central moulded band (R_B4PROF). The negative pole side of the factor is loaded by variables such as decoration in the form of a simple wave made with a single-pronged instrument (V_E1) and a combination of simple waves and lines made with a single-pronged instrument (V_F4) or a richly profiled thickened lip (R_G1) and a simple cylindrical or conical truncated lip with protruding upper or lower edge (R_B3, R_B2).

Factor 3 is clearly bipolar. The following variables have a high loading on it: grooved lip (R_E), horizontal truncated lip with protruding outer or inner edge (R_D2_4) and funnel-shaped lip (R_C) as well as decoration in the form of single combed band (V_A1), single combed wave (V_B1) or simple wave made with a single-pronged instrument (V_E1). The following variables have a high positive loading on this factor: simple cylindrical or conical truncated lip with protruding lower edge (R_B2), cut-out thickened lip (R_G2) and simple cylindrical or conical truncated lip made of coarse material (R_B1_GR), as well as combed ornament with simple lines or waves made with a single-pronged instrument (V_G), simple wave above lines made with a single-pronged instrument (V_F1), typical Blučina motif made with a single-pronged instrument (V_F5) and decoration situated on the neck (HALS_VRZ).

The last *factor 4* is loaded by the following variables: pottery made by hand or shaped on a slow turning turntable only (HAN_SCHW), rounded lip made of coarse fabric (R_A_GR) and simple horizontal truncated lip (R_D1) or decoration in the form of a single combed band between two combed waves (V_C3), comb imprints (KAM_STI), irregular combed wave (KWB_F), and/or a low and dense combed wave (KWB_N_D).

To make a comparison we will perform the second principal component analysis, where the assemblages of Great Moravian pottery from

the Forest Nursery are added to finds from three features dated to the Early Hillfort period.⁹⁴ The total number of objects in the descriptive matrix will thus be increased to 111. The number of variables is identical with the previous solution (Tab. 28).

In the same way as in the previous solution we extract four factors based on an evident drop of the eigenvalue between the fourth and fifth factor (Tab. 29). Although in this solution the total cumulative variability is slightly higher, the restrictions mentioned above apply to it in full.

It can be stated that on the whole the basic structure remained the same, only some factors exchanged their positions (Tab. 30). Factor 2 from the second solution corresponds with factor 2 from the first solution, factor 3 is identical with factor 1 and the new factor 4 is almost identical with factor 3. There were some changes only in factor 1 from the second analysis. Although it is very similar to factor 4 extracted from the matrix of solely Great Moravian pottery assemblages, we do find some difference there. The factor is also bipolar, however, it has negative loadings related to variables such as hand-made pottery or pottery shaped on a slow turning turntable only (HAN_SCHW), rounded lip made of coarse fabric (R_A_GR) and a crudely incised combed wave of the Early Hillfort period style (KWB_D). The negative factor loadings are not so high. There appear simple cylindrical or conical truncated lip made of coarse material (R_B1_GR), some decorative motifs incised by a single-pronged instrument (V_E1, V_E2, V_F4) and decoration situated on the neck (HALS_VRZ). It is evident that the negative pole of the factor is related to the newly added pre-Great Moravian (Early Hillfort period) pottery assemblages. The finding that the main variables that determined the characteristics of factor 4 from the first solution now appear in the “Early Hillfort period” factor.

4.2.1.4 *Validation and interpretation of the formal structures*

The identified structures need to be independently confirmed/validated and interpreted. To do this we will use the so-called external evidence, i.e. data not included in the descriptive matrix that the principal component analysis was based on. First and foremost, we will take advantage of the information about the stratigraphic relationships between features, data on the types of the settlement features, from

⁹⁴ Dostál (1982b).

Tab. 28. Pottery attributes/variables. Communalities.

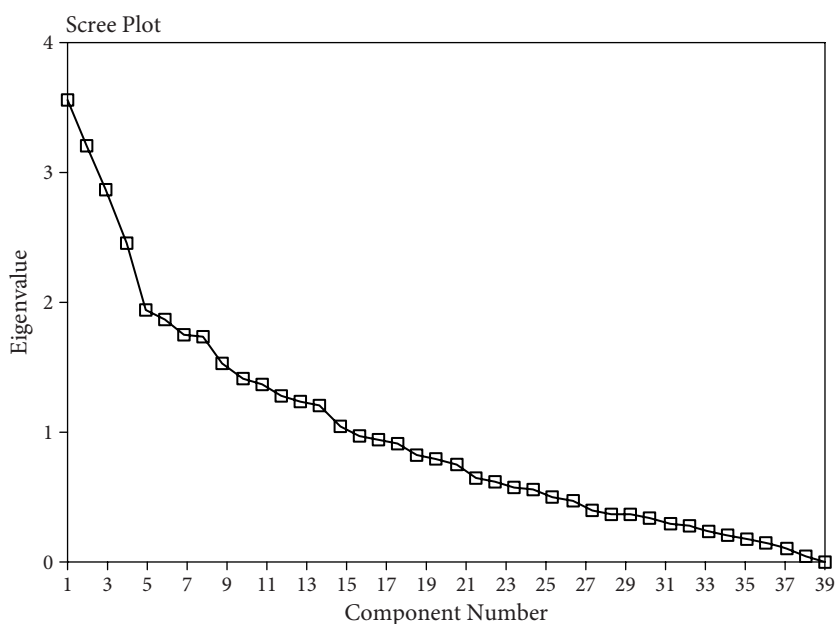
	Initial
R_A_F	1.000
R_A_GR	1.000
R_B1_F	1.000
R_B1_GR	1.000
R_B2	1.000
R_B3	1.000
R_B4	1.000
R_B4PROF	1.000
R_C	1.000
R_D1	1.000
R_D2_4	1.000
R_E	1.000
R_G1	1.000
R_G2	1.000
V_A1	1.000
V_A2	1.000
V_B1	1.000
V_C3	1.000
V_C5	1.000
V_C7	1.000
V_D2	1.000
V_E1	1.000
V_E2	1.000
V_F1	1.000
V_F4	1.000
V_F5	1.000
V_G	1.000
KAM_STI	1.000
KERBE	1.000
STICH	1.000
LEISTE	1.000
WULSTE	1.000
KWB_D	1.000
KWB_F	1.000
KWB_N_D	1.000
HALS_VRZ	1.000
BOZEL_PL	1.000
T_FEIN	1.000
T_GRAPH	1.000
HAN_SCHW	1.000

Extraction Method: Principal Component Analysis.

Tab. 29. Eigenvalues.

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.556	8.891	8.891	3.427	8.567	8.567
2	3.205	8.014	16.904	2.994	7.486	16.053
3	2.863	7.158	24.062	2.914	7.284	23.337
4	2.456	6.140	30.203	2.746	6.866	30.203
5	1.943	4.858	35.060			
6	1.863	4.659	39.719			
7	1.748	4.370	44.089			
8	1.731	4.327	48.416			
9	1.529	3.823	52.239			
10	1.418	3.544	55.783			
11	1.370	3.425	59.209			
12	1.280	3.201	62.409			
13	1.243	3.107	65.516			
14	1.203	3.008	68.524			
15	1.043	2.607	71.130			
16	0.972	2.430	73.561			
17	0.946	2.365	75.925			
18	0.914	2.284	78.210			
19	0.824	2.060	80.270			
20	0.797	1.993	82.263			
21	0.743	1.857	84.120			
22	0.650	1.625	85.745			
23	0.614	1.535	87.281			
24	0.580	1.450	88.730			
25	0.562	1.404	90.134			
26	0.498	1.246	91.380			
27	0.476	1.190	92.570			
28	0.402	1.004	93.575			
29	0.375	0.937	94.512			
30	0.372	0.929	95.441			
31	0.345	0.864	96.305			
32	0.290	0.725	97.030			
33	0.276	0.690	97.720			
34	0.235	0.588	98.308			
35	0.202	0.504	98.812			
36	0.174	0.435	99.246			
37	0.146	0.365	99.611			
38	0.109	0.274	99.885			
39	3.876E-02	9.690E-02	99.982			
40	7.339E-03	1.835E-02	100.000			

Extraction Method: Principal Component Analysis.



which the pottery originates, and the taphonomic characteristics of the pottery assemblages.

4.2.1.4.1 Validation based on stratigraphic relationships

Stratigraphic observations made in the Forest Nursery show that not all of the Great Moravian settlement features were contemporary. There is evidence of several cases of superposition of features.⁹⁵ However, the number of their occurrences in the Forest Nursery is limited. To increase the reliability of the validation based on stratigraphic relationships the Great Moravian features from the Forest Nursery will be added to by two representative assemblages from the Magnate Court (20VD and 116VD) unearthed in features which are in a significant stratigraphic relationship to the palisade trenches from the enclosure. The new descriptive matrix, presently containing 110 pottery assemblages from Great Moravian features, is the basis for another principle component analysis (PCA) that needs to be made. Except for minute differences, the results, after rotation (Tab. 31), are almost identical with the first factor solution based on the Great Moravian features originating exclusively from the Forest Nursery (see chap. 4.2.1.3).

⁹⁵ Dostál (1993b), p. 48.

Tab. 30. Rotated Component Matrix.

Component		1	2	3	4
HAN_SCHW	-0.933				
R_A_GR	-0.926				
KWB_D	-0.897				
V_E2	0.216				
V_C3					
KERBE			0.707		
KAM_STI			0.644		
WULSTE			0.610		
LEISTE			0.533		
T_GRAPH			0.510		
V_E1	0.278		-0.436		-0.346
KWB_N_D	-0.247		0.384		
R_G1			-0.341		
R_D1			0.322		
V_F4	0.265		-0.279		
STICH			0.250		
R_B3			-0.233		0.204
V_C5					
T_FEIN				0.759	0.208
V_D2				0.627	
R_A_F				0.599	
R_B1_F				0.582	
R_B4PROF				0.520	
R_B1_GR	0.438			-0.448	0.307
V_A2	0.261			-0.347	
V_C7				0.237	
R_B4				-0.231	
BOZEI_PL				0.226	
R_B2			-0.208		0.549
V_A1			0.218		-0.544
R_E					-0.531
V_G					0.494
V_B1			0.210	-0.372	-0.490
V_F1					0.424
R_D2_4				0.340	-0.404
R_G2					0.367
R_C				0.256	-0.351
V_F5					0.339
HALS_VRZ	0.236				0.305
KWB_F					0.288

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Tab. 31. Rotated Component Matrix.

	Component			
	1	2	3	4
T_FEIN	0.751			
V_D2	0.629			
R_A_F	0.601			
R_B1_F	0.564			
R_B4PROF	0.531	0.205		
R_B1_GR	-0.527	0.232	0.328	-0.351
V_A2	-0.360			
V_C7	0.225			
R_B4	-0.222			
BOZEI_PL	0.220			
KERBE		0.683		
LEISTE		0.576		
T_GRAPH		0.574		
WULSTE		0.538	-0.206	
V_E1		-0.522	-0.307	
KAM_STI		0.462	-0.243	0.431
R_G1		-0.393		
KWB_N_D		0.385		0.308
STICH		0.332		
V_F4		-0.283		
KWB_D		-0.254		
R_B3		-0.252	0.213	
V_E2		-0.208		
V_C5				
R_E			-0.580	
R_B2		-0.225	0.556	
V_A1		0.226	-0.552	
V_B1	-0.382		-0.533	0.232
V_G			0.472	0.297
R_D2_4	0.303		-0.415	
V_F1			0.406	
R_G2			0.351	
V_F5			0.335	
HALS_VRZ			0.330	-0.235
R_C	0.240		-0.311	-0.212
HAN_SCHW				0.786
V_C3				0.652
R_D1				0.599
R_A_GR				0.491
KWB_F	-0.207		0.254	0.316

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

The following table (Tab. 32) provides an overview of all the important stratigraphic relationships between settlement features contained in the descriptive matrix that served as the basis for the principal component analysis described above. We disregarded superpositions with graves which, based on preliminary findings, proved to be of little substance for the validation of the identified formal structures.⁹⁶ We also set aside feature 38 from the Forest Nursery which overlays feature 75 (dated to the Early Hillfort period), as it cannot be used for the discussion of the internal chronology of the Great Moravian settlement. Feature 251 was also eliminated, as it is only vaguely related to the accumulation of daub from the above-ground feature 260. All the other features are described by their stratigraphic position and defined by factor scores. The factor score expresses the actual values of the objects from the original descriptive system for the particular factor. The higher the absolute value of the factor score, whether positive or

Tab. 32. Břeclav-Pohansko. The Forest Nursery and the Magnate Court. Stratigraphic relationships between settlement features. Factor scores of pottery assemblages from stratified features.

Feature	Stratigraphy		Factor score			
			fac1_1	fac2_1	fac3_1	fac4_1
111a	above	111b	0.93998	1.19068	0.23744	-0.01048
200c	above	200b	-0.68286	1.24223	2.37637	0.44165
20VD	above	later palisade in the Magnate Court	0.25546	-0.04362	-0.83671	-0.05639
224	above	223,225a	0.07736	0.85835	-0.49360	0.29264
235	above	233	-0.31789	0.68619	-0.66662	-0.02777
156	above?	155	0.92851	-1.11298	-1.17007	0.04100
108	below	stone-and-mortar underpinning	0.36081	-0.69040	0.55074	-0.45376
116VD	below	later palisade in the Magnate Court	-0.87640	0.02067	0.76057	-0.28529
223	below	235	0.74747	-0.35805	1.74001	0.55951
225a	below	224, 225	-0.78668	-0.33414	0.43789	0.91946
233	below	235	-0.26503	-0.35972	1.18922	-0.51333
44	below	rampart destruction	-0.84715	-0.15639	0.81357	0.41392
125c	below?	125a	-0.61259	-0.63375	0.14695	-0.44334
125d	below?	125a	-2.03753	0.21209	0.77081	0.10815

⁹⁶ Macháček (2001c), p. 191.

negative, the more typical the object is for the positive or negative pole of the factor.⁹⁷

The tabulated factor scores are visualized in a matrix scatter plot, whereby we can view, in a single picture, all the relationships between the stratified features and the individual factors (Diagram 34). The different graphic symbols mark features stratigraphically situated below or above.

Evident relationship between the stratigraphic position of the features and their factor scores can be found in factors 2 and 3. The scatterplot documenting this relationship in the best way is shown separately (Diagram 35). The different features in it are identified by

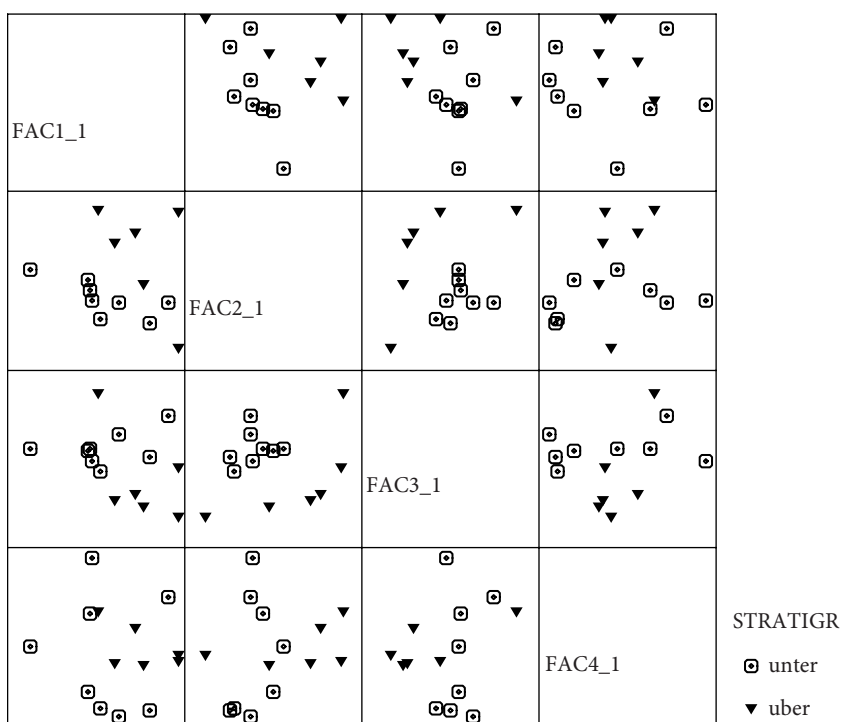


Diagram 34. Břeclav-Pohansko. The Forest Nursery. Scatterplot matrix of factor scores of pottery assemblages from stratified features (UBER—stratigraphically above; UNTER—stratigraphically below).

⁹⁷ Neustupný (1997b), pp. 237–244.

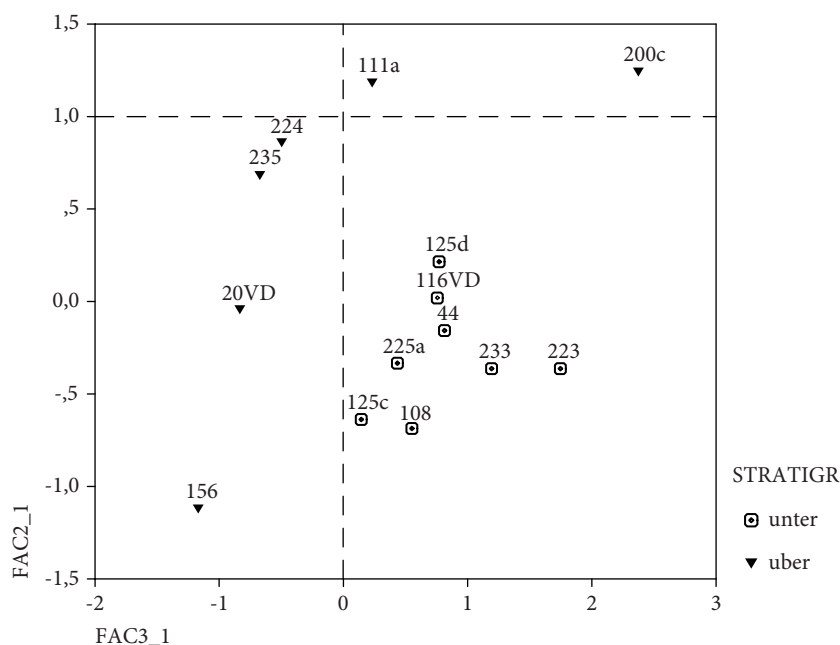


Diagram 35. Břeclav-Pohansko. The Forest Nursery. Factor scores of factor 2 and 3 of the pottery assemblages from stratified features (UBER—stratigraphically above; UNTER—stratigraphically below).

their numbers. It is obvious from the graph that later features (i.e. those stratigraphically situated above) are related to the negative pole of factor 3 or the positive pole of factor 2. Earlier features (stratigraphically below) have a significant relationship with the positive pole of factor 3 (factor 3 scores are greater than 0), and/or an ambivalent relationship with factor 2 (their factor scores hover around zero values of factor 2).

From the relationship between the factor scores and the stratigraphic position of the different features we conclude that the formal structures related to factor 2 and 3 primarily reflect the chronological position of the pottery assemblages from the features, and thus the age of the settlement features from which the pottery originates. These findings correspond with our existing knowledge of how early medieval pottery developed. Variables positively loading on factor 2, in particular the graphite fabric, various notches and imprints, and simple lips, do not appear until the very end of the Great Moravian period heralding a further post-Great Moravian development of pottery. Those

observations were not made just at Pohansko,⁹⁸ but on other important Great Moravian sites as well.⁹⁹ The variables that load negatively on the third factor (mainly grooved lips, decoration incised with a comb), are generally considered to be a product of the later phase of Great Moravian pottery. On the contrary, variables from the positive pole of factor 3 (different alternatives of cylindrical or conical truncated lips, decoration incised with a single-pronged implement, decoration on the neck) indicate, for example in Mikulčice (some of type 2 vessels), earlier settlement horizons.¹⁰⁰ The chronological significance of factor 2 and 3 is therefore supported both by the stratigraphic relationships and analogies from other sites (e.g. Mikulčice, Olomouc).

4.2.1.4.2 Validation by taphonomy

Another criterion which can be of assistance to us in the validation of the identified formal structures is a group of attributes related to taphonomy and the impact of post-depositional processes on pottery. As was stated above (see Chap. 4.2.1.2) the degree of pottery fragmentation is related to the relative chronological position of the individual features on the site. It is a consequence of both the differences in the pottery making technology in the different periods (early Slav and Early Hillfort/pre-Great Moravian pottery vs. Great Moravian pottery), and the different ratio of secondary and tertiary refuse in the settlement features (secondary refuse could only be produced when the site was inhabited). If we take this as a premise, the formal structures determined by time and defined on the basis of pottery assemblages must also differ from the point of view of taphonomic attributes.

We carried out a new principal component analysis with pottery assemblages, in which the existing attributes were extended by the most important variables related to pottery fragmentation (average weight of a pottery fragment in a feature—DR_GEW, percentage of rims with an upper part of the body in the total number of shards in the feature—RAN_B_P, share of related shards from individual vessels made up of three or more fragments in the total number of shards from a feature expressed by their weight—INDIV_GE, average weight of a fragment from the bottom in the pottery assemblage—GEW_BOD). The number of variables in the new solution reaches 44 (Tab. 33).

⁹⁸ Dostál (1975), pp. 171–175; Dostál (1994a); Dostál (1994c); Dostál (1998).

⁹⁹ E.g. Bláha (1980); (2001), pp. 51–52; Poláček (1998), p. 149.

¹⁰⁰ E.g. Kavanová (1995), p. 121; Kavanová (1996); Poláček (1995), p. 154; Poláček (1998), p. 147.

Tab. 33. Pottery attributes/variables. Communalities.

	Mean	Std. Deviation	Analysis N
R_A_F	1.3753	3.1410	111
R_A_GR	9.1801	14.3603	111
R_B1_F	1.9110	3.8795	111
R_B1_GR	36.9877	15.3132	111
R_B2	5.1662	6.1972	111
R_B3	3.7768	4.5351	111
R_B4	2.3414	4.5001	111
R_B4PROF	1.5017	4.2405	111
R_C	2.5273	3.9334	111
R_D1	11.4624	9.0458	111
R_D2_4	5.1664	6.0981	111
R_E	12.0567	11.8231	111
R_G1	0.9249	2.1462	111
R_G2	3.3894	4.9941	111
V_A1	15.2125	7.1456	111
V_A2	4.8547	5.4561	111
V_B1	18.0488	7.9765	111
V_C3	0.5373	2.2621	111
V_C5	0.7531	2.6107	111
V_C7	1.2254	3.3144	111
V_D2	12.5266	9.4198	111
V_E1	2.9996	3.0503	111
V_E2	1.7156	2.4599	111
V_F1	1.2928	2.5792	111
V_F4	2.4534	3.2972	111
V_F5	0.6402	4.1129	111
V_G	2.1605	5.9170	111
KAM_STI	1.1392	1.9350	111
KERBE	0.4452	1.7370	111
STICH	6.892E-02	0.3090	111
LEISTE	0.1158	0.3434	111
WULSTE	5.569E-02	0.2032	111
KWB_D	3.3405	15.7654	111
KWB_F	8.1625	12.8896	111
KWB_N_D	28.2928	21.4519	111
HALS_VRZ	3.4587	4.8486	111
BOZEI_PL	1.3157	2.9814	111
T_FEIN	4.1062	5.5811	111
HAN_SCHW	3.8273	16.0015	111
T_GRAPH	0.4124	1.3644	111
DR_GEW	18.2580	3.7925	111
RAN_B_P	4.143E-02	2.174E-02	111
INDIV_GE	0.6785	0.4307	111
GEW_BOD	36.9354	9.3510	111

Extraction Method: Principal Component Analysis.

The descriptive matrix includes 111 Great Moravian and Early Hillfort (pre-Great Moravian) pottery assemblages from the features (objects).

It is obvious from the drop of the eigenvalue between the fourth and fifth factor that the number of factors that will be extracted and subsequently rotated using the Varimax method will be the same as in the previous solution, i.e. four (Tab. 34).

The four extracted factors roughly correspond with the second basic PCA solution based on the matrix with Great Moravian and pre-Great Moravian pottery assemblages (see Tab. 30). The factors are only reshuffled (Tab. 35). Factor 1 of the new solution remains the same, factor 2 corresponds with factor 4 of the second basic solution, the new factor 3 is virtually identical with the original factor 2 and factor 4 with factor 3.

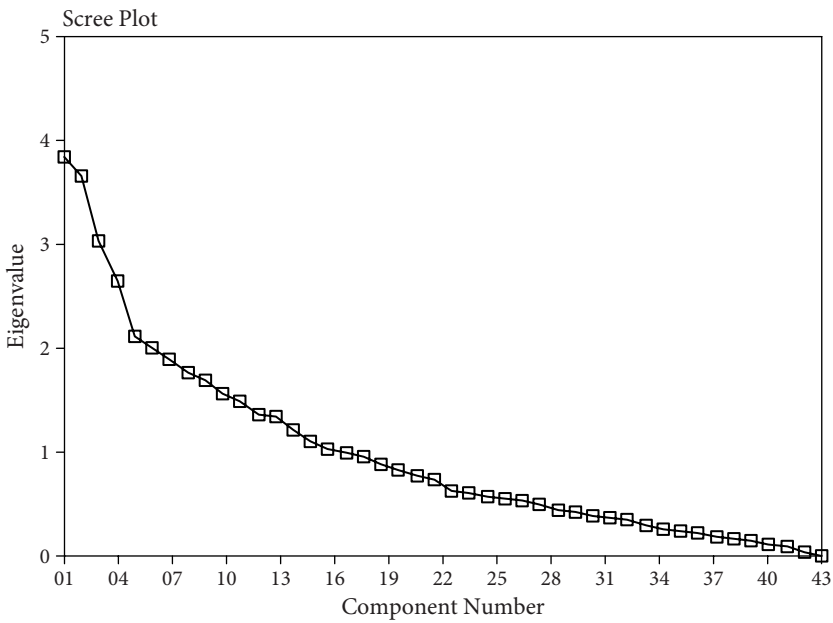
The new variables added to the matrix hold important positions in the extracted structures. They load mainly positively on factor 2. A high loading on factor 2 is noticeable in the share of related shards from individual vessels made up of three or more fragments (INDIV_GE), the average weight of a pottery fragment (DR_GEW) and the percentage of rims with an upper part of the body (RAN_B_P). They are attributes indicating a lesser degree of pottery fragmentation in the assemblages. On the positive pole of factor 2, alongside the above taphonomic attributes, there is a grouping of variables characteristic of earlier assemblages of Great Moravian pottery at Pohansko, which have already been defined based on stratigraphic relationships. On the opposite, i.e. negative pole of factor 2, there appear pottery attributes standing in contrast to the additionally entered taphonomic variables. Pottery typified by these attributes occurs to a greater extent, as we already know, in stratigraphically later assemblages (see Chap. 4.2.1.4.1). The result is fully compliant with the initial hypothesis that the degree of fragmentation is related to the relative chronological position of the pottery assemblages on the site. The assemblages with pottery less affected by fragmentation partly contain secondary or quickly transported tertiary refuse which could have only been produced when the site was populated. Those pottery assemblages are older than those made up of solely tertiary refuse gradually and slowly shifted to the sunken-floored features by natural transformations from surface dumps in an abandoned settlement where the pottery had long been exposed to fragmentation factors.¹⁰¹

¹⁰¹ Neustupný (1998b), p. 91.

Tab. 34. Eigenvalues.

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.847	8.744	8.744	3.819	8.679	8.679
2	3.654	8.304	17.048	3.301	7.502	16.182
3	3.036	6.900	23.948	3.038	6.903	23.085
4	2.656	6.035	29.983	3.035	6.898	29.983
5	2.106	4.787	34.770			
6	1.998	4.542	39.312			
7	1.889	4.293	43.605			
8	1.766	4.014	47.619			
9	1.684	3.828	51.446			
10	1.566	3.560	55.006			
11	1.491	3.389	58.395			
12	1.359	3.088	61.483			
13	1.349	3.065	64.548			
14	1.210	2.749	67.297			
15	1.096	2.490	69.787			
16	1.029	2.338	72.125			
17	0.985	2.239	74.364			
18	0.965	2.192	76.556			
19	0.885	2.011	78.567			
20	0.827	1.880	80.447			
21	0.767	1.744	82.191			
22	0.742	1.687	83.878			
23	0.617	1.402	85.280			
24	0.607	1.380	86.660			
25	0.578	1.313	87.974			
26	0.553	1.258	89.231			
27	0.527	1.199	90.430			
28	0.494	1.122	91.552			
29	0.442	1.005	92.557			
30	0.420	0.954	93.511			
31	0.381	0.866	94.377			
32	0.370	0.841	95.218			
33	0.349	0.793	96.011			
34	0.291	0.661	96.672			
35	0.263	0.598	97.271			
36	0.244	0.555	97.826			
37	0.213	0.483	98.309			
38	0.181	0.410	98.719			
39	0.174	0.395	99.114			
40	0.139	0.315	99.429			
41	0.113	0.257	99.686			
42	9.438E-02	0.215	99.900			
43	3.668E-02	8.337E-02	99.984			
44	7.170E-03	1.630E-02	100.000			

Extraction Method: Principal Component Analysis.



Tab. 35. Rotated Component Matrix.

Component				
	1	2	3	4
HAN_SCHW	0.920			
R_A_GR	0.915			
KWB_D	0.911			
GEW_BOD	0.660			
R_B1_GR	-0.471	0.253		-0.447
V_A1		-0.666		
INDIV_GE		0.558		0.255
V_B1	-0.213	-0.547		-0.286
DR_GEW	0.359	0.538		0.222
R_E		-0.521		
RAN_B_P		0.512		0.234
R_B2		0.481	-0.232	
V_G		0.445		
HALS_VRZ		0.347		
V_F1		0.329		
V_F5		0.326		
R_G2		0.248		
KWB_F		0.241		-0.230
KERBE			0.686	

Tab. 35 (*cont.*)

Component				
	1	2	3	4
KAM_STI			0.648	
WULSTE			0.604	
LEISTE			0.493	
T_GRAPH			0.482	
V_E1		-0.261	-0.442	
V_F4			-0.366	
R_D1			0.360	
R_G1			-0.338	
KWB_N_D			0.328	
R_B3		0.222	-0.241	
V_C3			0.200	
V_C5				
STICH				
V_E2				
T_FEIN		0.212		0.671
R_A_F				0.607
V_D2				0.585
R_B1_F				0.552
R_B4PROF				0.460
R_D2_4		-0.260		0.432
R_C				0.383
V_A2	-0.288			-0.335
R_B4				-0.264
V_C7				0.236
BOZEI_PL				0.220

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 7 iterations.

Other taphonomic variables load on factor 1. They are, above all, the average weight of a fragment from the bottom (GEW_BOD) and the average weight of a shard calculated from all fragments (DR_GEW). As was pointed out above, those attributes are typical for assemblages with early pottery from the early Slavic and Early Hillfort periods manufactured in a different technique (hand-made or shaped on a slowly turning turntable only), and morphologically is distinguished from Great Moravian pottery (e.g. thicker bases). There are no doubts about the dating of the features and the fact that factor 1 has a chronological dimension, given the other variables included (such as hand-made pottery or pottery shaped on a slowly turning turntable only—HAN_SCHW,

rounded lip made of coarse fabric—R_A_GR, combed wave of the Early Hillfort period style—KWB_D). The conclusion is in line with what is otherwise known about the development of pottery production in Pohansko and the surrounding region.¹⁰²

4.2.1.4.3 Validation based on settlement feature types

Although the processing of pottery from the settlement features in the Forest Nursery at Pohansko was based on the assumption that the formal structures obtained would primarily reflect the chronological dimension and changes in the development of pottery,¹⁰³ other explanations cannot be ruled out. The validation will therefore incorporate a comparison of formal structures derived from pottery with the settlement feature types from which the pottery originated. To verify their relationships we start by creating two scatterplots, and project on their axes the factor scores of factor 1 to 4 from the first basic analysis of the PCA, which express the relationships between the objects of the original descriptive system (Great Moravian pottery assemblages) and the individual factors. The features are depicted in the plot as points. Special markers highlight two most important types of settlement features—sunken-floored dwellings (GH) and large sunken-floored features (GEO), in which the pottery assemblages were found (Diagram 36–Diagram 37).

The factor score diagrams indicate that the pottery assemblages originating in sunken-floored dwellings (GH) are especially typical for the positive pole of factor 1. On the other hand, there is no evidence of links between the formal structures derived from pottery and large sunken-floored features (GEO).

To verify those findings, we performed two additional principal component analyses. In the first, to the descriptive matrix consisting of rows with Great Moravian pottery assemblages and columns with pottery attributes we added a new variable which, by attaining a value of 0–1 denotes whether or not the assemblage comes from a sunken-floored dwelling (GH). In the second solution the GH descriptor will be replaced by another dichotomic variable—GEO (large sunken-floored features).

¹⁰² Dostál (1982b); Dostál (1985); Dostál (1994); Macháček (1992); Macháček (2000b).

¹⁰³ More in Dostál (1994a); Dostál (1994b); Dostál (1994c), pp. 228–231.

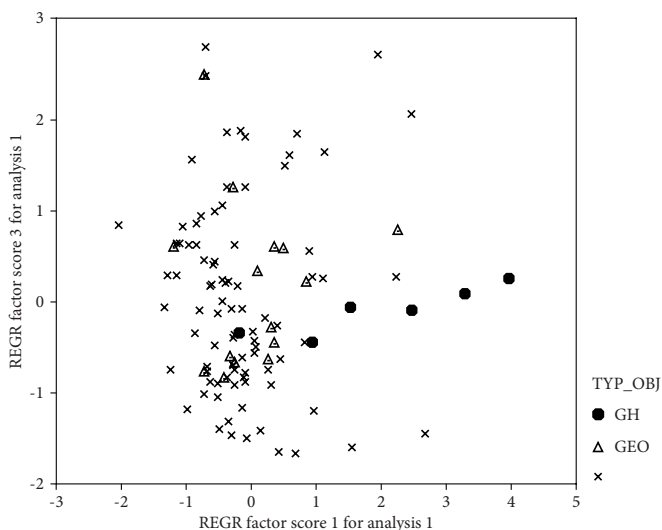


Diagram 36. Břeclav-Pohansko. The Forest Nursery. Factor scores of pottery assemblages with marked sunken-floored dwellings (GH) and large sunken-floored features (GEO).

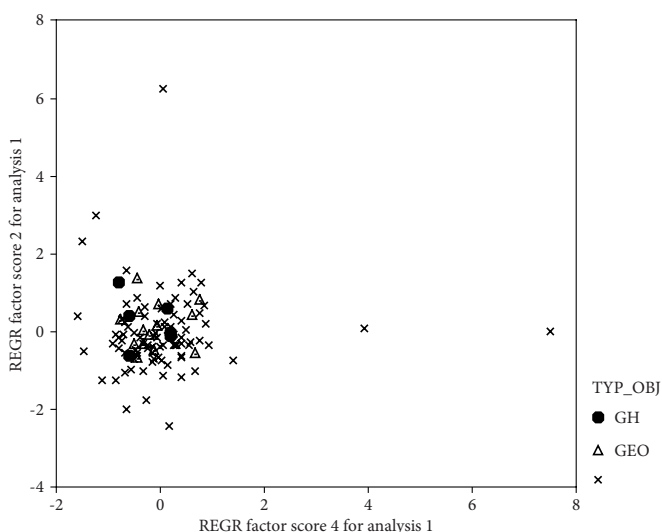


Diagram 37. Břeclav-Pohansko. The Forest Nursery. Factor scores of pottery assemblages with marked sunken-floored dwellings (GH) and large sunken-floored features (GEO).

The descriptive matrix of the first solution has 108 rows and 41 columns (Tab. 36).

Tab. 36. Descriptive Statistics.

	Mean	Std. Deviation	Analysis N
R_A_F	1.41346	3.17621	108
R_B1_F	1.9640	3.9201	108
R_A_GR	7.0197	6.0869	108
R_B1_GR	37.7987	14.6809	108
R_B2	5.3097	6.2220	108
R_B3	3.8817	4.5534	108
R_B4	2.4065	4.5454	108
R_B4PROF	1.5434	4.2920	108
R_C	2.5975	3.9650	108
R_D1	11.7191	9.0212	108
R_D2_4	5.3099	6.1205	108
R_E	12.3916	11.8117	108
R_G1	0.9506	2.1704	108
R_G2	3.4836	5.0308	108
V_A1	15.1935	7.1113	108
V_A2	4.9896	5.4703	108
V_B1	18.2300	7.9460	108
V_C3	0.5522	2.2918	108
V_C5	0.7608	2.6443	108
V_C7	1.2322	3.3522	108
V_D2	12.8613	9.3286	108
V_E1	3.0628	3.0638	108
V_E2	1.7633	2.4771	108
V_F1	1.3287	2.6059	108
V_F4	2.5216	3.3171	108
V_F5	0.6580	4.1687	108
V_G	2.2205	5.9882	108
KAM_STI	1.1709	1.9524	108
KERBE	0.4576	1.7596	108
STICH	7.083E-02	0.3131	108
LEISTE	0.1190	0.3476	108
WULSTE	5.724E-02	0.2058	108
KWB_D	0.7611	2.5651	108
KWB_F	8.3893	12.9954	108
KWB_N_D	27.9606	21.3521	108
HALS_VRZ	3.5547	4.8809	108
BOZEI_PL	1.3522	3.0147	108
T_FEIN	4.2203	5.6157	108
HAN_SCHW	1.4096	6.3445	108
T_GRAPH	0.4238	1.3816	108
GH	5.556E-02	0.2301	108

From the magnitude of the eigenvalues of the individual factors it is clear that, just as in all the previous cases, we extracted four factors (Tab. 37). However, in contrast to the previous principal component analyses, the table with the rotated solution shows all loadings, i.e., not just those greater than 0.2. This will allow us to observe in detail the relationships of the new variable with the individual extracted factors (Tab. 38).

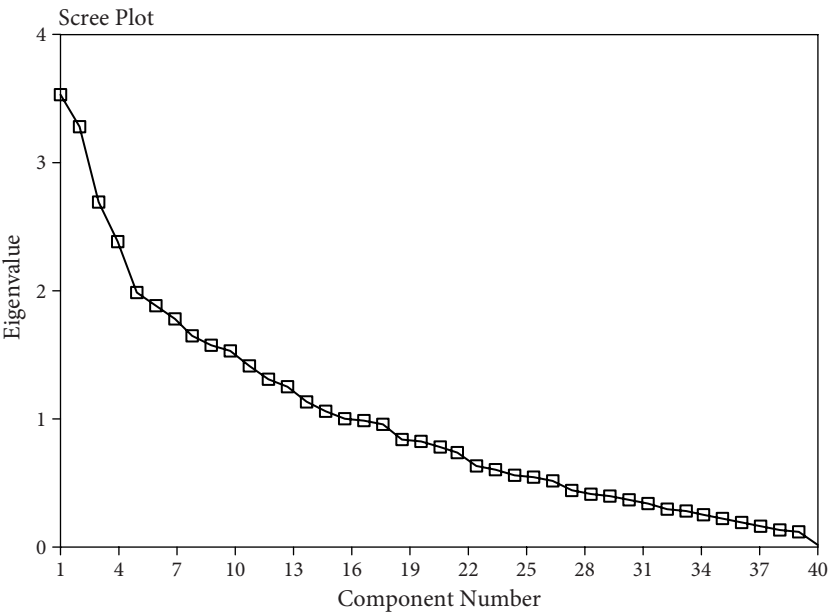
Tab. 37. Eigenvalues.

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.528	8.605	8.605	3.312	8.078	8.078
2	3.285	8.012	16.616	2.948	7.190	15.268
3	2.686	6.552	23.168	2.867	6.993	22.261
4	2.380	5.805	28.972	2.752	6.711	28.972
5	1.990	4.855	33.827			
6	1.877	4.578	38.405			
7	1.779	4.340	42.745			
8	1.646	4.015	46.760			
9	1.573	3.837	50.598			
10	1.526	3.722	54.319			
11	1.413	3.445	57.765			
12	1.305	3.184	60.948			
13	1.253	3.057	64.006			
14	1.127	2.749	66.754			
15	1.053	2.567	69.322			
16	1.006	2.453	71.775			
17	0.986	2.406	74.181			
18	0.952	2.321	76.501			
19	0.841	2.050	78.552			
20	0.818	1.996	80.547			
21	0.779	1.900	82.447			
22	0.731	1.784	84.231			
23	0.635	1.548	85.780			
24	0.606	1.478	87.258			
25	0.561	1.369	88.627			
26	0.545	1.329	89.956			
27	0.510	1.244	91.200			
28	0.442	1.078	92.277			
29	0.415	1.012	93.289			
30	0.392	0.956	94.246			

Tab. 37 (cont.)

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
31	0.362	0.882	95.128			
32	0.339	0.828	95.956			
33	0.294	0.716	96.672			
34	0.280	0.682	97.354			
35	0.247	0.602	97.956			
360	0.220	0.537	98.493			
37	0.189	0.461	98.954			
38	0.158	0.386	99.340			
39	0.138	0.337	99.677			
40	0.123	0.301	99.978			
41	9.167E-03	2.236E-02	100.000			

Extraction Method: Principal Component Analysis.



Tab. 38. Rotated Component Matrix.

	Component			
	1	2	3	4
T_FEIN	0.689	-0.036	-0.168	0.220
GH	0.675	0.092	0.071	-0.082
V_D2	0.667	0.033	-0.143	-0.175
R_B4PROF	0.662	0.228	0.052	-0.126
R_A_F	0.566	-0.101	0.096	0.162
R_B1_F	0.503	-0.150	0.015	-0.125
R_B1_GR	-0.466	0.254	-0.337	-0.390
V_A2	-0.337	-0.020	-0.041	-0.150
BOZEI_PL	0.233	0.020	-0.027	-0.167
V_C7	0.172	-0.103	-0.004	-0.011
KERBE	-0.008	0.663	0.030	0.021
LEISTE	0.122	0.563	0.073	-0.051
T_GRAPH	-0.024	0.555	0.077	-0.130
V_E1	0.009	-0.527	0.324	-0.127
WULSTE	-0.056	0.526	0.209	0.099
KAM_STI	0.033	0.464	0.262	0.435
R_G1	0.046	-0.420	-0.063	-0.035
KWB_N_D	0.017	0.417	-0.084	0.275
STICH	-0.062	0.317	0.034	-0.178
V_F4	-0.091	-0.291	0.040	-0.128
R_B3	0.070	-0.263	-0.201	-0.119
KWB_D	0.147	-0.250	-0.041	-0.007
V_E2	-0.169	-0.208	0.168	-0.040
R_E	-0.142	0.009	0.561	-0.100
R_B2	-0.116	-0.236	-0.548	0.010
V_A1	-0.082	0.240	0.543	-0.123
V_B1	-0.406	0.093	0.513	0.216
V_G	0.042	0.037	-0.475	0.299
R_D2_4	0.280	0.002	0.446	0.078
V_F1	0.024	0.047	-0.406	-0.093
R_G2	0.033	-0.136	-0.362	0.036
V_F5	-0.049	0.030	-0.339	-0.087
R_C	0.219	-0.147	0.332	-0.200
HALS_VRZ	-0.008	-0.081	-0.325	-0.236
R_B4	-0.156	-0.030	-0.170	-0.027
HAN_SCHW	-0.042	0.007	0.063	0.780
V_C3	-0.077	-0.040	0.012	0.648
R_D1	-0.041	0.089	0.120	0.610
R_A_GR	0.093	0.161	-0.110	0.485
KWB_F	-0.207	0.029	-0.271	0.302
V_C5	-0.041	0.146	0.124	-0.147

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

In the same way, we will now perform the other principle component analysis where the GH variable is replaced by the GEO variable (Tab. 39–Tab. 41).

Tab. 39. Descriptive Statistics.

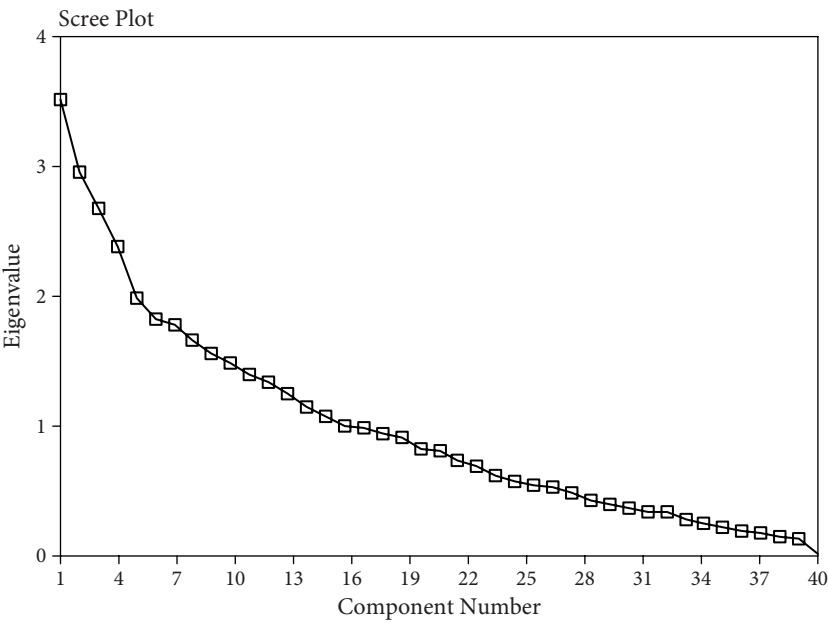
	Mean	Std. Deviation	Analysis N
R_A_F	1.41346	3.17621	108
R_B1_F	1.9640	3.9201	108
R_A_GR	7.0197	6.0869	108
R_B1_GR	37.7987	14.6809	108
R_B2	5.3097	6.2220	108
R_B3	3.8817	4.5534	108
R_B4	2.4065	4.5454	108
R_B4PROF	1.5434	4.2920	108
R_C	2.5975	3.9650	108
R_D1	11.7191	9.0212	108
R_D2_4	5.3099	6.1205	108
R_E	12.3916	11.8117	108
R_G1	.9506	2.1704	108
R_G2	3.4836	5.0308	108
V_A1	15.1935	7.1113	108
V_A2	4.9896	5.4703	108
V_B1	18.2300	7.9460	108
V_C3	0.5522	2.2918	108
V_C5	0.7608	2.6443	108
V_C7	1.2322	3.3522	108
V_D2	12.8613	9.3286	108
V_E1	3.0628	3.0638	108
V_E2	1.7633	2.4771	108
V_F1	1.3287	2.6059	108
V_F4	2.5216	3.3171	108
V_F5	0.6580	4.1687	108
V_G	2.2205	5.9882	108
KAM_STI	1.1709	1.9524	108
KERBE	0.4576	1.7596	108
STICH	7.083E-02	0.3131	108
LEISTE	0.1190	0.3476	108
WULSTE	5.724E-02	0.2058	108
KWB_D	0.7611	2.5651	108
KWB_F	8.3893	12.9954	108
KWB_N_D	27.9606	21.3521	108
HALS_VRZ	3.5547	4.8809	108
BOZEI_PL	1.3522	3.0147	108
T_FEIN	4.2203	5.6157	108
HAN_SCHW	1.4096	6.3445	108
T_GRAPH	0.4238	1.3816	108
GEO	0.1389	0.3474	108

Extraction Method: Principal Component Analysis.

Tab. 40. Eigenvalues.

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.517	8.578	8.578	2.974	7.254	7.254
2	2.959	7.218	15.796	2.916	7.112	14.366
3	2.683	6.543	22.339	2.874	7.009	21.375
4	2.378	5.800	28.139	2.773	6.764	28.139
5	1.978	4.825	32.964			
6	1.824	4.449	37.412			
7	1.779	4.339	41.751			
8	1.666	4.063	45.814			
9	1.565	3.818	49.632			
10	1.488	3.629	53.261			
11	1.401	3.417	56.679			
12	1.344	3.278	59.956			
13	1.256	3.062	63.019			
14	1.149	2.803	65.822			
15	1.078	2.630	68.452			
16	1.003	2.447	70.899			
17	0.983	2.397	73.296			
18	0.947	2.311	75.607			
19	0.914	2.230	77.836			
20	0.826	2.016	79.852			
21	0.802	1.956	81.808			
22	0.731	1.782	83.590			
23	0.697	1.701	85.291			
24	0.611	1.490	86.781			
25	0.580	1.414	88.195			
26	0.550	1.341	89.535			
27	0.535	1.306	90.842			
28	0.491	1.199	92.040			
29	0.428	1.044	93.084			
30	0.390	0.952	94.035			
31	0.367	0.895	94.931			
32	0.341	0.832	95.763			
33	0.336	0.820	96.583			
34	0.284	0.692	97.275			
35	0.251	0.613	97.888			
36	0.216	0.527	98.416			
37	0.186	0.453	98.869			
38	0.173	0.423	99.292			
39	0.152	0.371	99.663			
40	0.129	0.315	99.978			
41	8.934E-03	2.179E-02	100.000			

Extraction Method: Principal Component Analysis.



Tab. 41. Rotated Component Matrix.

Component	Component			
	1	2	3	4
T_FEIN	0.75	-0.01	0.20	0.18
V_D2	0.63	0.05	0.18	-0.19
R_A_F	0.60	-0.10	-0.07	0.14
R_B1_F	0.56	-0.13	0.00	-0.16
R_B4PROF	0.53	0.20	-0.02	-0.11
R_B1_GR	-0.52	0.25	0.31	-0.36
V_A2	-0.36	-0.04	0.02	-0.13
R_B4	-0.23	-0.06	0.16	0.00
V_C7	0.22	-0.07	0.02	-0.04
BOZEI_PL	0.21	0.03	0.04	-0.17
KERBE	0.03	0.68	-0.04	0.03
T_GRAPH	0.00	0.58	-0.08	-0.13
LEISTE	0.15	0.57	-0.07	-0.04
V_E1	0.02	-0.54	-0.33	-0.13
WULSTE	-0.02	0.53	-0.22	0.11
R_G1	0.11	-0.39	0.07	-0.07
KWB_N_D	-0.06	0.38	0.08	0.31
STICH	-0.04	0.33	-0.04	-0.17
V_F4	-0.07	-0.28	-0.04	-0.14

Tab. 41 (*cont.*)

	Component			
	1	2	3	4
KWB_D	0.12	-0.27	0.04	0.00
R_B3	0.07	-0.25	0.21	-0.13
V_E2	-0.16	-0.21	-0.17	-0.04
V_C5	-0.01	0.16	-0.13	-0.15
GEO	0.05	0.08	0.08	-0.07
R_E	-0.10	0.02	-0.56	-0.11
V_A1	-0.09	0.22	-0.56	-0.10
R_B2	-0.11	-0.23	0.54	0.00
V_B1	-0.38	0.08	-0.53	0.23
V_G	0.05	0.03	0.47	0.30
R_D2_4	0.33	0.01	-0.43	0.06
V_F1	0.06	0.09	0.42	-0.12
R_G2	0.02	-0.15	0.35	0.04
V_F5	-0.08	0.02	0.33	-0.08
HALS_VRZ	-0.02	-0.07	0.33	-0.24
R_C	0.24	-0.13	-0.32	-0.22
HAN_SCHW	-0.04	-0.02	-0.06	0.79
V_C3	-0.06	-0.05	0.00	0.64
R_D1	0.01	0.08	-0.12	0.60
R_A_GR	0.09	0.14	0.11	0.49
KAM_STI	0.06	0.44	-0.27	0.45
KWB_F	-0.21	0.01	0.26	0.31

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

The two solutions yield the following information. There were virtually no changes in the factor coefficient matrix compared to the first basic solution regardless of the addition of new variables. It was revealed that the variable representing large sunken-floored features (GEO) is not particularly typical for any of the factors, extracted from the matrix made up of pottery assemblages from the Forest Nursery. Therefore, there is no relationship between that feature type and the associated pottery. There is a similar vagueness in the relation of the sunken-floored dwellings (GH) to the three pottery factors. On the other hand, the high loading of the GH variable on factor 1 is quite exceptional. In this case we can talk about a very strong link between the feature type (sunken-floored dwelling) and some pottery assemblages, characterized by variables with high coefficients on factor 1. Those are mostly

attributes of vessels which, in terms of technology, belong to the most sophisticated goods (typological group A and C), and their manufacture was subject to a relatively high level of standardization. The group includes pottery which is assumed to have served as tableware (typological group C).¹⁰⁴

Given the fact that the formal structure which appeared as factor 1 in the first basic solution could not be validated based on criteria related to chronology (stratigraphy, taphonomy), it seems very likely that the interpretation of this structure is not primarily chronological. We must therefore continue the discussion of its significance and meaning. But even now we can take into consideration, for example, social aspects. On the other hand, it is obvious that the pottery assemblages making up this structure must have been created in a specific, limited period of time. The question that remains is their synchronization with the other factors interpreted as chronological. In addressing this problem we can be helped by the completed and published formalized processing of the pottery based on a descriptive matrix, containing roughly fifty per cent of the representative assemblages from the southern part of the excavated area in the Forest Nursery.¹⁰⁵ As the features in which the pottery was unearthed excluded typical sunken-floored dwellings, no formal structure corresponding with factor 1 of the present basic solution appeared.¹⁰⁶ However, the variables forming the new structure related with the sunken-floored dwellings were present in the original descriptive matrix. They loaded on factors that were interpreted as chronological based on the validation within the solution then. A total of five chronological phases were defined and within their framework a calculation was made to establish the average shares of the different pottery attributes. The variables now typical for factor 1 of the basic solution then appeared to a great extent either in the late phase of the development of Great Moravian pottery (T_FEIN—fine washed ceramic fabric, R_C—funnel-shaped lip, BOZEI_PL—moulded mark on the bottom) or towards its end (R_B4PROF—simple cylindrical or conical truncated lip with protruding lower and upper edge and central moulded band, V_D2—decoration in the form of simple lines made

¹⁰⁴ Macháček (2001c), pp. 137–167.

¹⁰⁵ Macháček (2001c).

¹⁰⁶ *Ibidem*, pp. 176–178.

with a single-pronged instrument, R_D2_4—horizontal truncated lip with protruding outer or inner edge).¹⁰⁷

Although factor 1 is not essentially chronological, we can justifiably hold that the assemblages, which are typical for it, rather belong to the late phase of Great Moravian development in the Forest Nursery at Pohansko.

The following table (Tab. 42) and diagrams (Diagram 38–Diagram 40) illustrate the average shares of typical variables (R_B4PROF—simple cylindrical or conical truncated lip with protruding lower and upper edge and central moulded band, T_FEIN—fine washed ceramic fabric, R_E—grooved lip) in the various feature types (wells—B, isolated hearths—FS, large sunken-floored features—GEO, sunken-floored dwellings—GH, trough-shaped features—R). The calculation used only sufficiently representative, in terms of quantity, pottery assemblages. The result clearly pinpoints the different nature of the pottery assemblages originating from sunken-floored dwellings, which gave rise to factor 1 of the first basic solution.

Tab. 42. Břeclav-Pohansko. The Forest Nursery. Pottery. The average shares of typical variables in the various feature types. Case Summaries.

OB_T_NEX		T_FEIN	R_B4PROF	R_E
B	N	1	1	1
	Mean	4.0856	0.0000	11.1111
FS	N	2	2	2
	Mean	2.0016	0.9259	8.3333
GEO	N	14	14	14
	Mean	5.0760	1.2937	13.7126
GH	N	6	6	6
	Mean	9.1438	14.3363	7.9774
R	N	6	6	6
	Mean	5.8865	1.5046	13.7654
Total	N	29	29	29
	Mean	5.8392	3.9658	12.0762

¹⁰⁷ Ibidem, pp. 197–206.

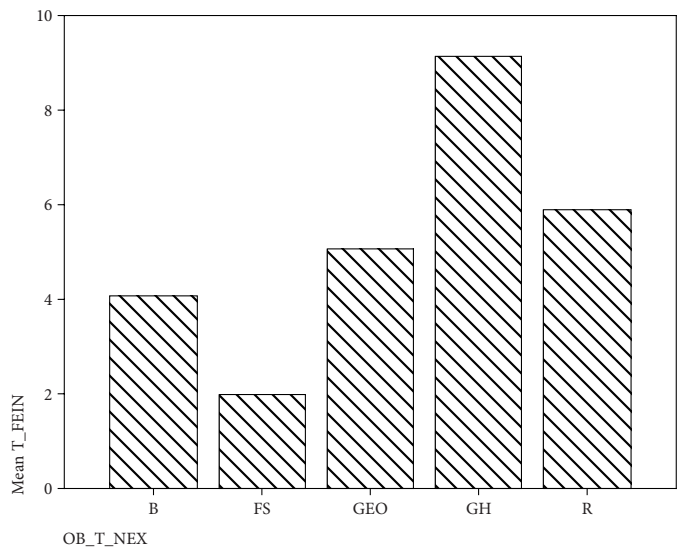


Diagram 38. Břeclav-Pohansko. The Forest Nursery. Average percentages of fine washed ceramic fabric in the various feature types (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—isolated hearths, B—wells).

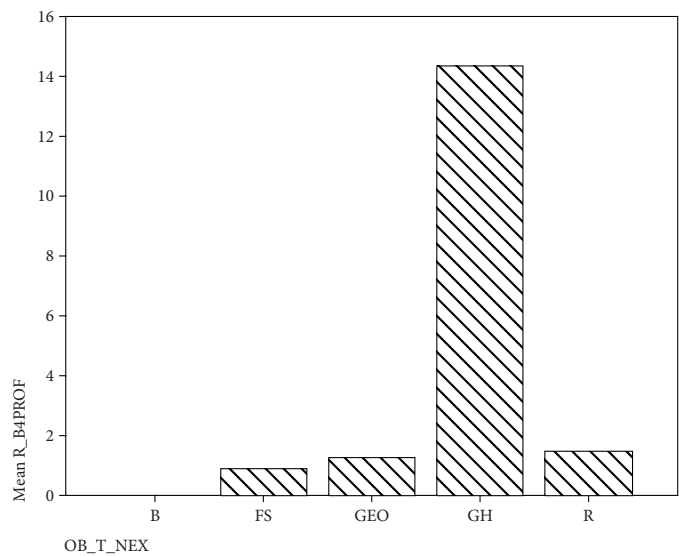


Diagram 39. Břeclav-Pohansko. The Forest Nursery. Average percentages of cylindrical or conical truncated lips with protruding lower and upper edge and central moulded band in the various feature types (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—isolated hearths, B—wells).

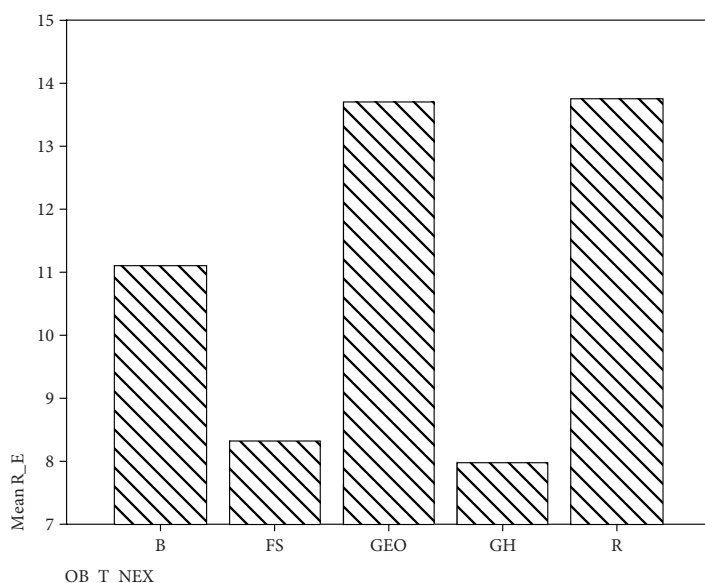


Diagram 40. Břeclav-Pohansko. The Forest Nursery. Average percentages of grooved lips in the various feature types (R—trough-shaped features, GH—sunken-floored dwellings, GEO—large sunken-floored features, FS—isolated hearths, B—wells).

4.2.1.5 *Chronological groups and the dynamics of the development of pottery from the Forest Nursery*

Based on the validation results we arrived at a conclusion that the formal structures extracted from the descriptive matrix of the assemblages are valid and are mainly related to the changes of pottery over time as they correlate with specific chronological horizons. If this statement is correct it will be possible to identify the development trends manifested by gradual changes in pottery attribute percentages in the different phases of the development.¹⁰⁸ But at first we need to define the chronological phases.

Each pottery assemblage is an object of the original descriptive matrix. Its actual values for the different factors are estimated from factor scores. The latter allow us to determine for which of the above defined formal structures (factors) the particular feature is most typical. Making the decision is not very easy as the assemblages consist of various mixed and homogenized pottery assemblages, which cannot

¹⁰⁸ Ibidem, pp. 194–210.

be readily divided into clearly separated groups. The boundaries and the number of groups must be specified *ad hoc*. Such groups are neither rigid nor permanent, but rather more or less auxiliary categories, the specification of which is to some extent influenced by our previous experience and knowledge.

The definition of the chronological groups will be based on the second basic solution of the principal component analysis (PCA), containing both assemblages with Great Moravian and assemblages with pre-Great Moravian Early Hillfort pottery. In this way it will be possible to capture the dynamics of the development of the pottery from the Forest Nursery at Pohansko over a longer time.

Based on what we learnt about the characteristics of the extracted factors and variables during the principal component analyses and subsequent validations we defined five basic chronological groups (Tab. 42). Chronological group 1 comprises objects with a factor score value of the first factor ≤ -4 . Chronological group 2 consists of objects with the score of factor 4 ≥ 0.2 , and chronological group 3 of objects with the score of factor 4 ≤ -0.2 . Group 4 is defined by the relationship of the objects with factor 3. Objects belonging to this group have the score of factor 3 ≥ 0.9 . The last, fifth, chronological group includes objects with the factor score of factor 2 ≥ 1 .

The numerical sequence used to mark the chronological groups was selected so that the earlier groups had a lower sequence number than later groups. Chronological group 1 falls as a whole in the pre-Great Moravian Early Hillfort period. Group 2 contains assemblages with finds from the beginning of the development of Great Moravian pottery at Pohansko. Group 3 is made up of pottery assemblages of the high Great Moravian phase, while Group 5 consists of assemblages from the end of Great Moravian development at Pohansko. In terms of position on the time axis the only, slight, problem is with Group 4. In this case it is a structure which, based on the validation, cannot be considered primarily chronological, and we have reasons to believe (see Chap. 4.2.1.4.3) that it belongs to the high to late phase of Great Moravian development in the Forest Nursery at Pohansko. It is, however, impossible to assess its relation to groups 3 and 5, which can be as well contemporary as slightly earlier or later.

The individual objects of the original descriptive system (i.e. the pottery assemblages) can be tabulated including their factor scores. The values are also visualized in two scatterplots (Diagram 41–Diagram 42). The chronological groups to which the objects belong are marked both in the table (Tab. 43) and the diagrams.

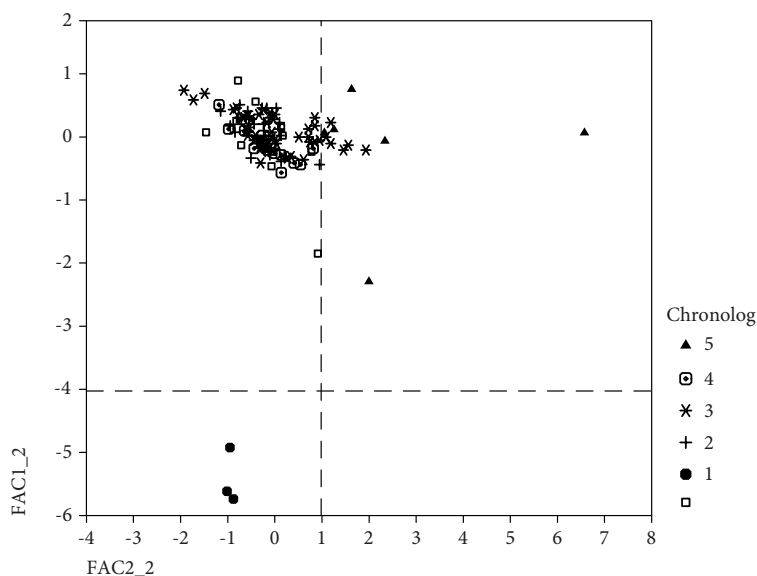


Diagram 41. Břeclav-Pohansko. The Forest Nursery. Factor scores of pottery assemblages from the second basic principal component analysis with indicated chronological groups.

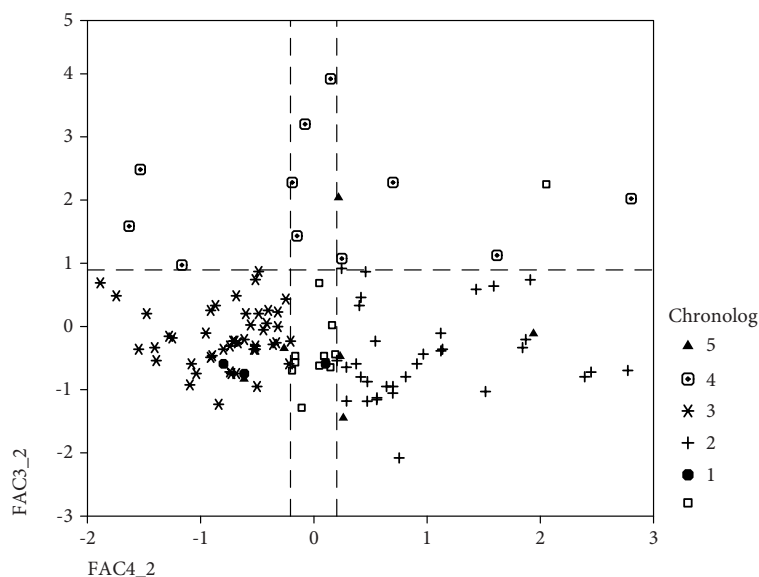


Diagram 42. Břeclav-Pohansko. The Forest Nursery. Factor scores of pottery assemblages from the second basic principal component analysis with indicated chronological groups.

Tab. 43. Břeclav-Pohansko. The Forest Nursery. The definition of the chronological groups based on factor score values.

Chronological groups	Factor (second basic solution)	Factor score
1	FAC1	≤ -4
2	FAC4	≥ 0.2
3	FAC4	≤ -0.2
4	FAC3	≥ 0.9
5	FAC2	≥ 1

Some of the pottery assemblages cannot be readily assigned to a single chronological group by the selected criteria due to two reasons. The one that is probably more important is the fact that the various pottery types made in different periods had some of the attributes similar (e.g. the early typological group E from phase 2 and the later group A from phase 4 are typified by decoration incised with a single-pronged implement; Early Hillfort pottery H from phase 1 was decorated with combed ornament just as the later pottery in typological group B from the 3rd phase; pottery with an admixture of graphite G from the latest phase is characterized by simple truncated lips just as the earlier pottery in group E).¹⁰⁹ The other reason for the unclear chronological position of some assemblages is the intermingling of pottery from two subsequent phases (e.g. 3 and 5) or phases which can be partially contemporary (e.g. 3 and 4). In this situation we must make an arbitrary decision as to which chronological group the object is to be assigned (see Chronological group 2 in the table).

Some features remained unassigned. The ceramic material therein was, probably because of depositional and post-depositional processes, homogenized to such an extent that it was impossible to assign those objects to the chronological groups described above (e.g. feature 210).¹¹⁰

The factor score table (Tab. 44) also incorporates groups defined in 2001¹¹¹ based on a matrix consisting of 50 pottery assemblages from the southern half of the Forest Nursery. Regardless of the number of objects in the matrix, the whole solution shows itself to be very stable. All objects from the original group I, which according to what was known then represented the high point in the development of Great

¹⁰⁹ Ibidem, pp. 137–15.

¹¹⁰ Ibidem, p. 191.

¹¹¹ Ibidem, pp. 168–185.

Tab. 44. Břeclav-Pohansko. The Forest Nursery. Factor scores of pottery assemblages from the settlement features.

Feature No.	Chronological group	Chronological group 2	Solution 2001	FAC1_2	FAC2_2	FAC3_2	FAC4_2
28	1	1		-5.59732	-1.0235	-0.5382	-0.80393
50	1	1		-5.73554	-0.89783	-0.55544	0.106435
214	1-3	1	II.	-4.91079	-0.95977	-0.69496	-0.61222
106	2	2		0.154958	0.133365	-0.67538	2.442521
106a	2	2		-0.28526	0.122387	-0.98528	1.523392
106b	2	2		-0.09738	-0.22997	-0.15455	1.873858
108	2	2		0.300219	-0.9572	0.387709	0.403673
113	2	2		0.154891	-0.18701	-0.65363	2.773138
125	2	2		0.59412	0.03906	-1.12823	0.559532
125d	2	2		0.365907	0.098037	-2.05487	0.749237
13	2	2		0.538156	-0.56447	-0.83797	0.475336
133	2	2		0.427384	-0.70521	-0.30241	1.136463
144	2	2	III.	-0.02877	-0.25572	-1.08187	0.552639
158	2	2	III.	0.421627	-0.53072	0.648277	1.425281
159	2	2	III.	0.237735	0.086486	-1.13146	0.477598
187	2	2	II.	0.199018	-0.8504	-0.39444	0.962012
188	2	2	II.	-0.18099	-0.08996	-0.59329	0.289508
196	2	2	III.	0.438387	-0.5293	0.531553	0.419069
197	2	2	II.	0.12121	-0.38637	-0.90734	0.636233
200	2	2		0.643261	-0.74173	-0.28064	1.8449
200c	2	2	III.	-0.31593	0.932586	-0.746	2.387949
203	2	2	III.	0.429386	-0.79537	-0.5409	0.905685
208	2	2	III.	0.437762	-0.09993	-1.01764	0.694428
223	2	2	III.	-0.11562	-0.20561	0.814741	1.910179
225a	2	2	II.	-0.10752	-0.13795	-0.74215	0.411105
226	2	2	III.	0.534889	-1.14496	0.721122	1.58255
233	2	2	II.	0.205444	-0.56731	-0.32421	1.123727
243	2	2	III.	0.590367	-0.27265	-0.16591	0.537392
38	2	2		0.219055	-0.24334	-0.49273	0.205857
44	2	2		-0.05921	-0.27251	-0.89934	0.700453
49	2	2		0.321457	-0.22976	-0.53957	0.372254
7	2	2		0.333207	-0.43859	-1.13127	0.288046
82c	2	2		0.576931	-0.15995	-0.05466	1.125781
88	2	2		-0.21399	-0.50265	-0.76166	0.808645
1	3	3		0.134769	-0.41176	-0.22629	-0.35882
105	3	3		0.076836	0.934694	0.277693	-0.60282
107	3	3		0.147011	-0.562	0.314087	-0.41085
12	3	3		0.247763	0.710064	-0.67653	-0.7369
126	3	3		-0.23303	0.254383	-0.70925	-1.04211
130	3	3		0.413871	-0.51553	-0.42673	-0.91821
135	3	3		-0.19517	0.334447	0.824155	-0.51256
143	3	3	I.	0.226541	-0.60275	-0.04826	-0.95012
151	3	3	I.	0.557882	-0.87828	0.548623	-1.7495
172	3	3	I.	0.039923	0.831185	-0.55441	-0.22629
175	3	3	I.	0.013651	-0.18095	0.092107	-0.56505
177	3	3	I.	0.3491	-0.18538	0.508286	-0.24767
18	3	3		0.572551	-0.24416	-0.29447	-0.7982
189	3	3	I.	0.281394	-0.53844	-0.18494	-0.71299
191	3	3	I.	-0.03837	-0.20837	0.002263	-0.44099

Tab. 44 (*cont.*)

Feature No.	Chronological group	Chronological group 2	Solution 2001	FAC1_2	FAC2_2	FAC3_2	FAC4_2
199	3	3	I.	0.073249	-0.00454	-0.27051	-1.40597
201	3	3		0.812879	-1.48571	0.7566	-1.88867
205	3	3	I.	0.599429	-0.8285	0.256261	-1.48285
215	3	3	I.	0.023875	0.050333	-0.42477	-0.89556
217	3	3	I.	-0.0858	-0.01791	-0.90736	-0.49647
218	3	3	I.	0.488135	0.002288	-0.1946	-0.67843
22	3	3		0.103352	-0.07655	-0.2063	-0.33293
221	3	3	I.	0.120986	0.723563	-0.71052	-0.68629
235	3	3	I.	0.302187	0.833217	-0.30415	-0.51026
245	3	3		0.032399	0.748422	-0.70129	-0.72669
255	3	3	I.	0.443109	0.837283	0.119973	-0.42253
263	3	3	I.	0.11502	0.516441	0.31584	-0.90912
34	3	3		0.192673	-0.06887	-0.53112	-1.08478
39	3	3		0.467865	-0.58849	-0.12879	-1.24846
45	3	3		0.065307	-0.4496	-0.47853	-1.39825
67	3	3		0.721259	-1.72649	-0.31583	-1.54805
8	3	3		0.394927	-0.04897	-0.87519	-1.10189
82	3	3		0.445985	-0.58003	0.544983	-0.68296
83b	3	3		0.50166	-0.09578	-1.2073	-0.84175
84	3	3		-0.03916	-0.29956	-0.18636	-0.69991
85a	3	3		0.074706	-0.32096	-0.17346	-0.21262
9	3	3		-0.30948	-0.29379	-0.24933	-0.52095
92	3	3		0.474547	-0.3346	0.291574	-0.32489
97	3	3		0.880835	-1.92189	0.407388	-0.87243
134	5-3	3		-0.08321	1.94472	-0.10277	-1.27644
21	5-3	3		-0.0077	1.556116	-0.31848	-0.52503
224	5-3	3	I.	0.118272	1.080762	0.053259	-0.31423
236	5-3	3	I.	-0.07947	1.470939	-0.14763	-0.62181
241	5-3	3	I.	0.002669	1.198039	0.280852	-0.48597
248	5-3	3	I.	0.347757	1.194655	-0.26456	-0.7405
55	4	4		-0.17084	0.151061	4.048744	0.140776
56	4	4		-0.44907	0.146228	2.398411	-0.19722
57	4	4		-0.06152	0.828702	1.526479	-0.14391
91	4	4		0.221713	-0.65031	3.326224	-0.08275
192	4-2	4		-0.33062	0.539727	1.209595	1.622045
82a	4-2	4		-0.0648	-0.44185	1.169164	0.240895
93	4-2	4		-0.13228	-0.00655	2.390324	0.693169
99	4-2	4		0.252727	-0.98274	2.119332	2.796526
216	4-2	4	I.	0.065303	-0.17268	0.987959	0.248499
4	4-2	4		-0.19817	0.195409	0.935940	0.458529
156	4-3	4	I.	0.413688	-0.70246	1.049938	-1.16686
204	4-3	4	I.	0.644757	-1.17365	1.689887	-1.6349
58	4-3	4		-0.25688	0.607261	0.938445	-0.4836
65	4-3	4		-0.29085	0.411846	2.584945	-1.52732
145	1-5-3	5		-2.20528	2.009425	-0.77656	-0.62053
109	5-2	5		0.236696	1.239285	-0.42034	0.234566
110	5-2	5		0.905074	1.641567	-1.39703	0.257162
251	5-2	5	III.	0.188661	1.067218	-0.04977	1.938118
254b	5-3	5	IV.	0.201497	6.563873	-0.27631	-0.26578
227	5-4-2	5	IV.	0.0612	2.334599	2.140231	0.222019

Tab. 44 (*cont.*)

Feature No.	Chronological group	Chronological group 2	Solution 2001	FAC1_2	FAC2_2	FAC3_2	FAC4_2
164	1-4-2			-1.77306	0.911003	2.369804	2.046769
254c				0.703625	-0.40747	-0.65556	-0.19853
114				0.03056	-0.23564	-0.40488	0.093514
253				1.038302	-0.77277	-1.25244	-0.1037
15				-0.36544	-0.07959	-0.3934	0.183323
168				0.201715	-1.46225	-0.50976	0.1034
125c				0.368083	-0.81622	-0.57137	0.041861
60				-0.00441	-0.72151	-0.40502	-0.16669
3				0.138495	0.161331	-0.51889	-0.16274
210				0.270844	0.132809	-0.58669	0.144613
247b				0.077723	-0.28838	0.077508	0.162045
111a				-0.10748	0.788814	0.763483	0.047707

Moravian pottery at Pohansko, were divided between later chronological groups 3 and 4 (group 4 was not defined in the solution from 2001 as it excluded pottery from sunken-floored dwellings, which was typical for the group). The new chronological group 2, which is approached on a broader basis compared to the solution from 2001, is exclusively made up of features which belonged to earlier chronological groups II and III. Features from the original late group IV were reclassified to the late chronological group now marked with the number 5.

For the chronological groups defined above we will calculate average percentages of the attributes which were shown to be relevant for the description of pottery. We will thus obtain values which aptly characterize pottery from the different phases. However, we should bear in mind the important fact that this set of data is not a direct reflection of living culture (i.e. it does not describe the production of potters in the individual phases), but was formed by multiple factors (e.g. various degrees of transformation).

The obtained data is visualised in a series of diagrams (Diagram 43–Diagram 49). On the horizontal axis we plot the groups in the chronological order verified during the validation of the identified formal structures. The vertical axis will indicate the percentages of the visualized attribute. The plotted symbols in the area between the axes will show the average share of the attributes in the individual phases. The lines connecting the symbols will characterize the trends in the changes of the pottery attributes over time. A single diagram will in most cases show multiple related attributes.

From the first diagram (Diagram 43) it is obvious that the very early pre-Great Moravian chronological group 1 is clearly dominated by

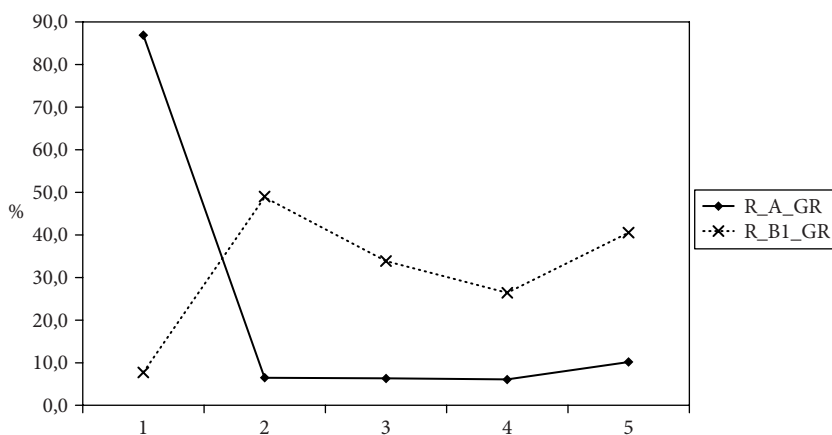


Diagram 43. Břeclav-Pohansko. The Forest Nursery. Changes in the average share of rounded and simple cylindrical or conical truncated lips in subsequent pottery-chronological groups.

rounded lips made of coarse fabric (R_A_GR), which were replaced in the next phase (chronological group 2) by cylindrical or conical truncated lips made of coarse material (R_B1_GR). The share of the simple lips constantly declined over time. A slight increase is only observable towards the end of the development of Great Moravian pottery where there was general simplification and conformity of production.¹¹²

In the earliest Great Moravian phase (chronological group 2) there is a concentration (Diagram 44–Diagram 45) of more sophisticated variants of simple cylindrical or conical truncated lips (with protruding lower or upper or both edges—R_B2, R_B3, R_B4), and especially various decorative motifs incised with a single-pronged instrument (e.g. a combination of simple waves and lines—V_F4, the Blučina motif—V_F5, combed ornament with simple lines or waves—V_G).

On the other hand, in chronological group 3 we note (Diagram 46) the highest increase in grooved lips (R_E), which are usually calix-shaped (KELCH) and have a pronounced shoulder (ABSATZ).¹¹³ Group 3 is also typified by well fired, fairly coarse fabric (T_GUT).

Pottery made of washed, fine clay (T_FEIN) has the largest representation in the 4th chronological group (Diagram 47–Diagram 48),

¹¹² Ibidem, p. 246.

¹¹³ Ibidem, pp. 64–65.

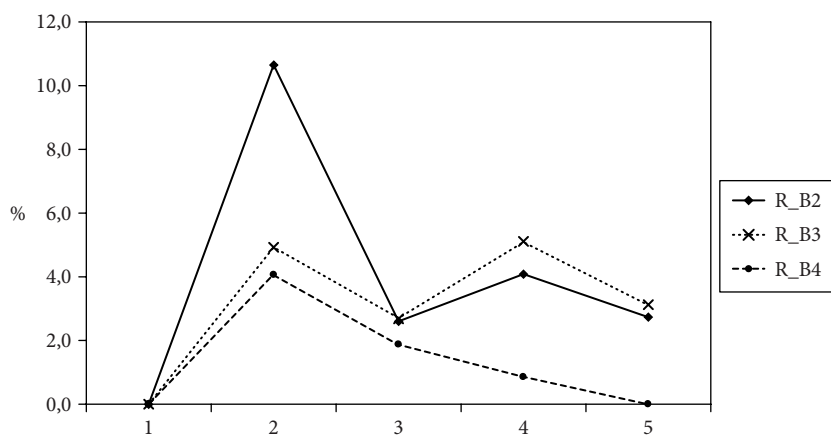


Diagram 44. Břeclav-Pohansko. The Forest Nursery. Changes in the average share of cylindrical or conical truncated lips with protruding lower, upper or both edges in subsequent pottery-chronological groups.

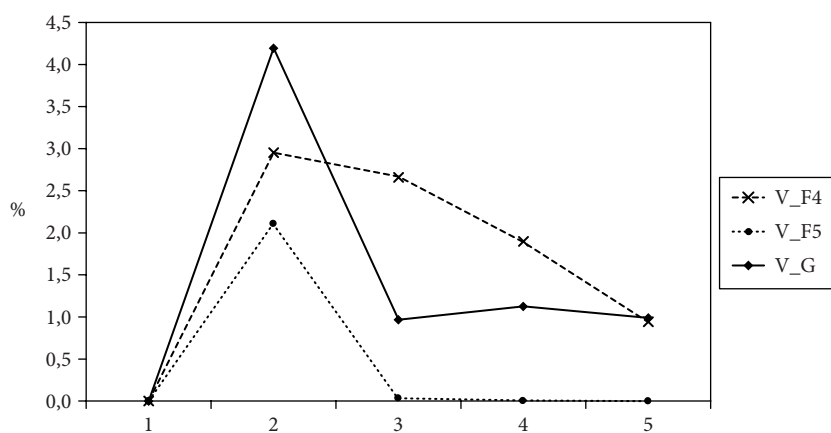


Diagram 45. Břeclav-Pohansko. The Forest Nursery. Changes in the average share of fragments decorated with a combination of simple waves and lines drawn with a single-pronged instrument, Blučina motif or combed ornament with simple lines or waves in subsequent pottery-chronological groups.

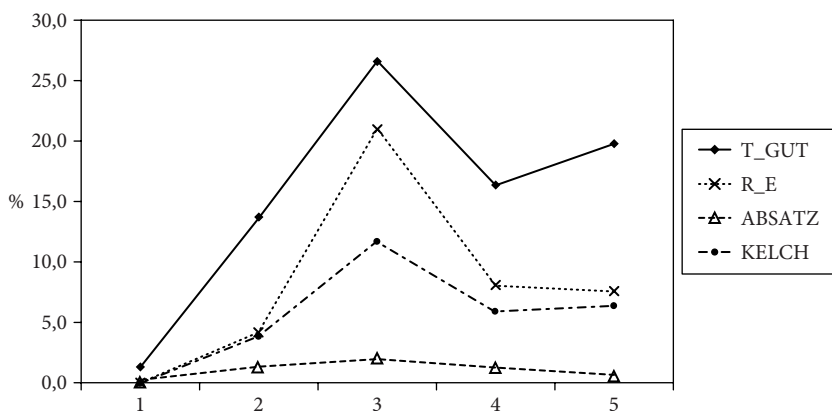


Diagram 46. Břeclav-Pohansko. The Forest Nursery. Changes in the average share of well fired pottery, grooved lips, pronounced shoulder and calix-shaped rim in subsequent pottery-chronological groups.

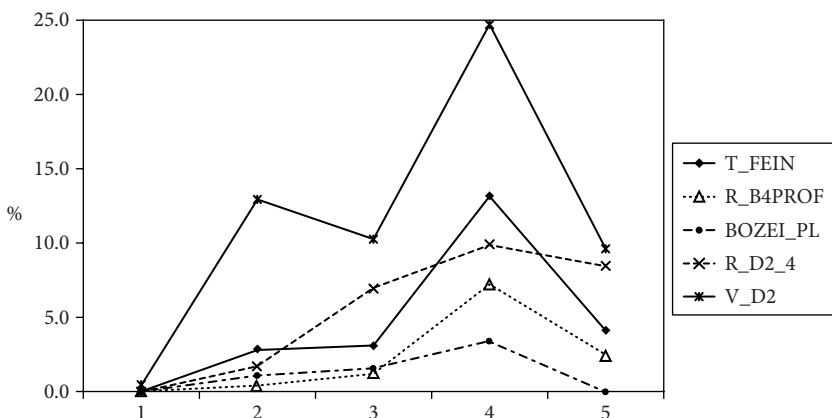


Diagram 47. Břeclav-Pohansko. The Forest Nursery. Changes in the average share of fine washed pottery, simple cylindrical or conical truncated lips with protruding lower and upper edge and central moulded band, moulded marks on the base, horizontal truncated lips with protruding outer or inner edge and decoration in the form of simple lines drawn with a single-pronged instrument in subsequent pottery-chronological groups.

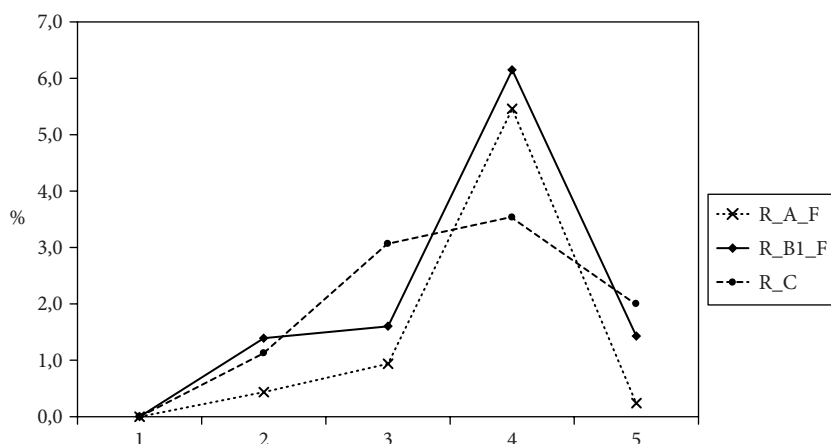


Diagram 48. Břeclav-Pohansko. The Forest Nursery. Changes in the average share of rounded and simple cylindrical or conical truncated lips made of fine material and funnel-shaped lips in subsequent pottery-chronological groups.

just as rounded lip made of fine fabric and cylindrical or conical truncated lip made of fine material (R_A_F, R_B1_F). This phase is also characterized by decoration in the form of simple lines made with a single-pronged instrument (V_D2) and a moulded mark on the bottom (BOZEI_PL). In group 4 we observe the greatest occurrence of several types of lips (Diagram 47–Diagram 48): cylindrical or conical truncated lip with protruding lower and upper edge and central moulded band (R_B4PROF), horizontal truncated lip with protruding outer or inner edge (R_D2_4) and various modifications of funnel-shaped lips (R_C).

It was not until the final phase of the development of early medieval pottery in the Forest Nursery at Pohansko (chronological group 5) that attributes heralding a new age (Diagram 49), such as fabric with an admixture of graphite (T_GRAPH), comb imprints (KAM_STI), notches (KERBE), simple pricks (STICH), plastic strips (LEISTE) and moulded rings on the neck and shoulder (WULSTE) came to the fore.

Overall, we can state that we succeeded in providing evidence of the dynamic development of pottery in the Forest Nursery, manifested by gradual changes in the average shares of the individual pottery attributes within the chronological phases. In this respect, the chronological groups, such as have been defined, can be considered valid and validated.

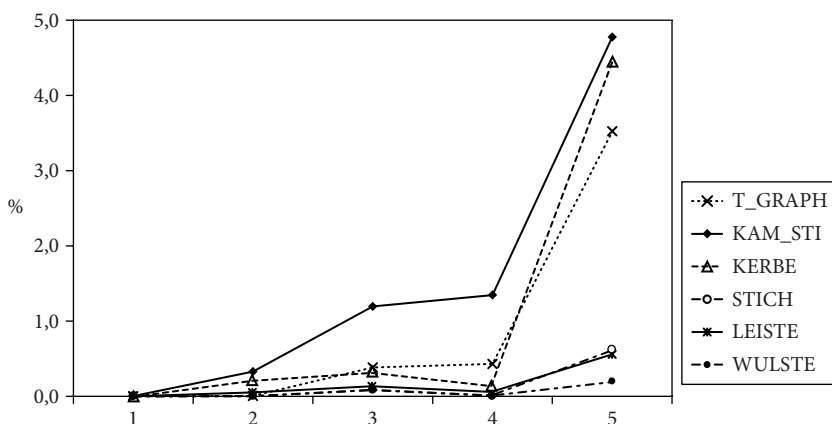


Diagram 49. Břeclav-Pohansko. The Forest Nursery. Changes in the average share of graphite pottery and fragments decorated with comb imprints, notches, pricks drawn with single-pronged instrument, plastic strips and moulded rings on the neck and shoulder in subsequent pottery-chronological groups.

4.2.1.5.1 Pottery groups and taphonomy

The validity of the chronological groups as defined above can be verified in yet another way. Earlier, we put forward the presupposition that the dating of the assemblages is related with the degree of fragmentation and the characteristics of pottery assemblages, exposed to the action of various depositional and post-depositional processes. We hold¹¹⁴ that the assemblages with pottery less affected by fragmentation were formed when the site was inhabited and are therefore, by an average, older than the features filled with tertiary refuse, coming from abandoned surface waste dumps. To verify this trend, we will compare the chronological groups specified above with the four clusters (1–4) into which, based on the Ward hierarchical method and within the taphonomic studies the pottery assemblages were divided based on the variables related with the depositional and post-depositional processes (see Chap. 4.2.1.2).

The table (Tab. 45) summarizes the expected (Expected Count) and the actually observed (Count) numbers of combinations between chronological groups (CHRO_GR) and taphonomic clusters (Ward Method). Their relationships are also visualized in a bar graph

¹¹⁴ e.g. Neustupný (1998b), p. 91.

Tab. 45. Břeclav-Pohansko. The Forest Nursery. Expected (Expected Count) and the actually observed (Count) numbers of combinations between chronological groups (CHRO_GR) and taphonomic clusters (Ward Method).

CHRO_GR		Ward Method				Total
		1	2	3	4	
1.00	Count	0	0	0	3	3
	Expected	1.4	1.4	0.1	0.1	3.0
	Count					
	% within CHRO_GR	0.0%	0.0%	0.0%	100.0%	100.0%
	% within Ward Method	0.0%	0.0%	0.0%	100.0%	3.3%
	% of Total	0.0%	0.0%	0.0%	3.3%	3.3%
2.00	Count	17	8	1	0	26
	Expected	12.1	11.8	1.2	0.9	26.0
	Count					
	% within CHRO_GR	65.4%	30.8%	3.8%	0.0%	100.0%
	% within Ward Method	40.5%	19.5%	25.0%	0.0%	28.9%
	% of Total	18.9%	8.9%	1.1%	0.0%	28.9%
3.00	Count	14	25	3	0	42
	Expected	19.6	19.1	1.9	1.4	42.0
	Count					
	% within CHRO_GR	33.3%	59.5%	7.1%	0.0%	100.0%
	% within Ward Method	33.3%	61.0%	75.0%	0.0%	46.7%
	% of Total	15.6%	27.8%	3.3%	0.0%	46.7%
4.00	Count	6	7	0	0	13
	Expected	6.1	5.9	0.6	0.4	13.0
	Count					
	% within CHRO_GR	46.2%	53.8%	0.0%	0.0%	100.0%
	% within Ward Method	14.3%	17.1%	0.0%	0.0%	14.4%
	% of Total	6.7%	7.8%	0.0%	0.0%	14.4%
5.00	Count	5	1	0	0	6
	Expected	2.8	2.7	0.3	0.2	6.0
	Count					

Tab. 45 (*cont.*)

CHRO_GR		Ward Method				Total
		1	2	3	4	
	% within CHRO_GR	83.3%	16.7%	0.0%	0.0%	100.0%
	% within Ward Method	11.9%	2.4%	0.0%	0.0%	6.7%
	% of Total	5.6%	1.1%	0.0%	0.0%	6.7%
Total	Count	42	41	4	3	90
	Expected	42.0	41.0	4.0	3.0	90.0
	Count					
	% within CHRO_GR	46.7%	45.6%	4.4%	3.3%	100.0%
	% within Ward Method	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	46.7%	45.6%	4.4%	3.3%	100.0%

(Diagram 50). The table and graph show that cluster 4, characterized by heavy base fragments can be, as expected, linked with Early Hillfort (pre-Great Moravian) features from the chronological group 1. The second specific cluster 3, consisting of features with very numerous pottery assemblages, falls in great part to the high Great Moravian period (chronological group 3). Clusters 1 and 2, which are the most important in terms of statistical testing, are evidently related to various degrees of fragmentation of Great Moravian pottery. It is obvious that the three most numerous chronological groups (2, 3, 4) are markedly different in terms of the ratio of objects from the two clusters. In order to be able to statistically test this conclusion, we generated another table (Tab. 46) and graph (Diagram 51), in which only the most numerous chronological groups and taphonomic clusters are represented. We can use them as the basis for performing the chi-squared test to verify whether the differences in the counts are statistically significant or not (Tab. 47).

The results of the chi-squared test indicate that the most important chronological groups are different from each other from a taphonomic point of view at a significance level of 5 percent. As expected in the older group 2 assemblages with pottery less affected by fragmentation prevail while in the younger group 3 it is the exact opposite. In group 4

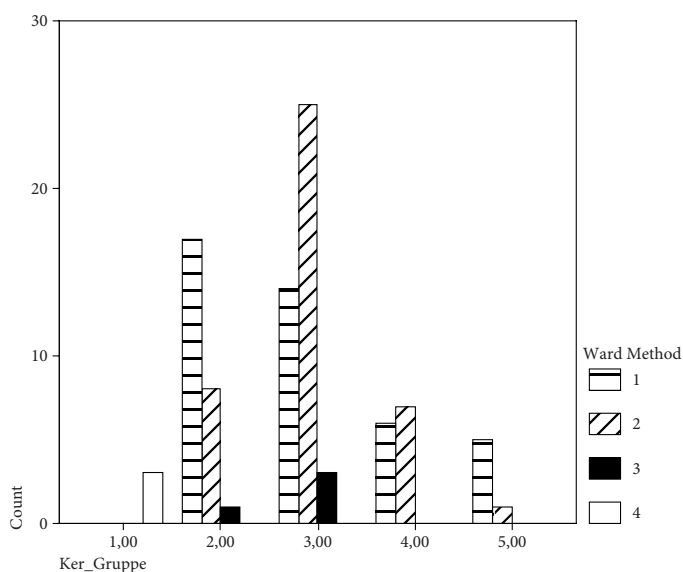


Diagram 50. Břeclav-Pohansko. The Forest Nursery. Number of pottery assemblages in the individual chronological groups. Classified by taphonomic clusters (Ward method).

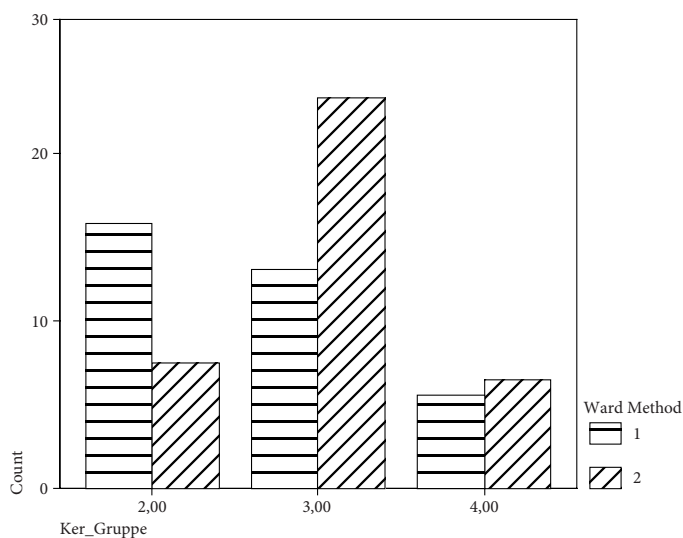


Diagram 51. Břeclav-Pohansko. The Forest Nursery. Number of pottery assemblages in chronological groups 2, 3, 4. Grouped by the first and second taphonomic cluster (Ward method).

Tab. 46. Břeclav-Pohansko. The Forest Nursery. Expected (Expected Count) and the actually observed (Count) numbers of combinations between chronological groups (CHRO_GR) and taphonomic clusters (Ward Method).

	CHRO_GR	Ward Method		Total
		1	2	
2.00	Count	17	8	25
	Expected	12.0	13.0	25.0
	Count			
	% within CHRO_GR	68.0%	32.0%	100.0%
	% within Ward Method	45.9%	20.0%	32.5%
	% of Total	22.1%	10.4%	32.5%
3.00	Count	14	25	39
	Expected	18.7	20.3	39.0
	Count			
	% within CHRO_GR	35.9%	64.1%	100.0%
	% within Ward Method	37.8%	62.5%	50.6%
	% of Total	18.2%	32.5%	50.6%
4.00	Count	6	7	13
	Expected	6.2	6.8	13.0
	Count			
	% within CHRO_GR	46.2%	53.8%	100.0%
	% within Ward Method	16.2%	17.5%	16.9%
	% of Total	7.8%	9.1%	16.9%
Total	Count	37	40	77
	Expected	37.0	40.0	77.0
	Count			
	% within CHRO_GR	48.1%	51.9%	100.0%
	% within Ward Method	100.0%	100.0%	100.0%
	% of Total	48.1%	51.9%	100.0%

Tab. 47. Břeclav-Pohansko. The Forest Nursery. Chronological groups and taphonomic clusters. Chi-Square Test.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.312	2	0.043
Likelihood Ratio	6.419	2	0.040
N of Valid Cases	77		

Chi-Square Tests

a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.25.

the ratio is equalized. Explanation is deserved by the high share of little fragmented pottery in the youngest chronological group 5, excluded from statistical testing due to the low number of features. In this case it is justifiable to think that the low fragmentation of pottery is not primarily related to taphonomic processes, but with the ceramic material properties (graphite, thick-walled and coarse pottery), appearing towards the end of the Great Moravian development.

The completed testing provides another argument to justifiably consider the defined chronological groups as valid.

The taphonomic differences between the individual chronological groups can be documented by a series of box plots, illustrating the descriptive statistic (range, median, extreme values) of the most important attributes related to pottery fragmentation (average weight of a pottery fragment in an assemblage—DR_GEW, percentage of rims with an upper part of the body in the total number of shards in an assemblage—RAN_B_P, ratio of related shards from individual vessels made up of three or more fragments to the total amount of shards from an assemblage expressed by their number—INDIVID_AN and weight—INDIVID_GE). The diagrams illustrate the differences between the 2nd and 3rd chronological group, a relatively wide range of the 4th chronological group and lower fragmentation of pottery in group 5 (Diagram 52–Diagram 55).

4.2.1.5.2 Pottery groups in space

Each pottery assemblage which was associated with a specific chronological group, based on the factor score, comes from a particular settlement feature. This enables us to create a series of site plans of the excavation in the Forest Nursery where the features are visualized in space.

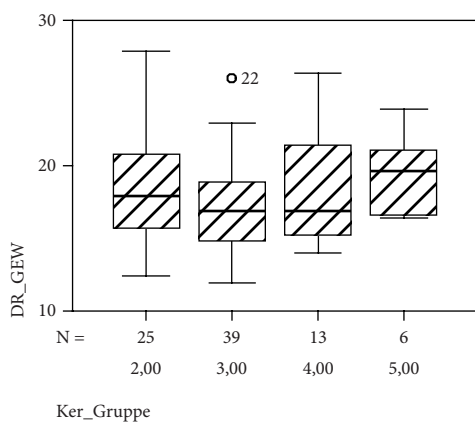


Diagram 52. Břeclav-Pohansko. The Forest Nursery. Average weight of a pottery fragment in an assemblage within the individual chronological groups.

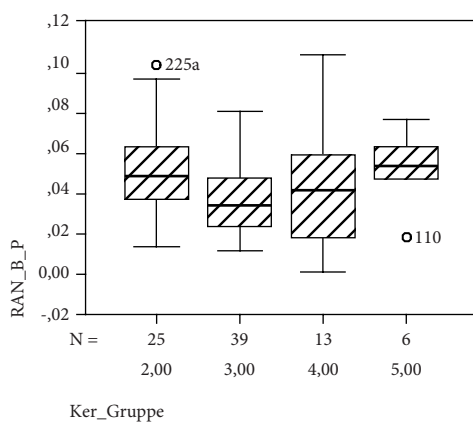


Diagram 53. Břeclav-Pohansko. The Forest Nursery. Average representation of rims with an upper part of the body in an assemblage within the individual chronological groups.

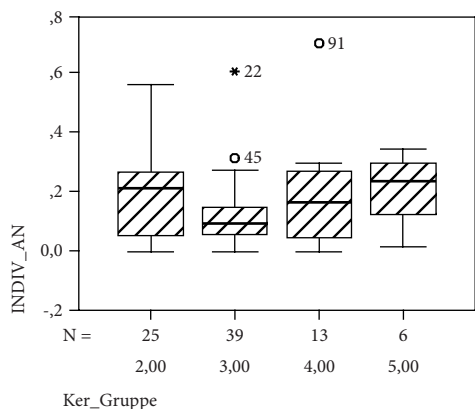


Diagram 54. Břeclav-Pohansko. The Forest Nursery. Ratio of related shards in an assemblage (by count) within the individual chronological groups.

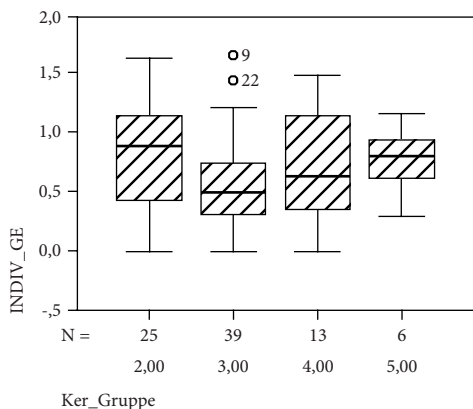


Diagram 55. Břeclav-Pohansko. The Forest Nursery. Ratio of related shards in an assemblage (by weight) within the individual chronological groups.

The site plan shows all the sunken-floored settlement features from the Forest Nursery, highlighting those that could be dated by pottery (Fig. 38). The next five plans (Fig. 39–Fig. 43) depict features belonging to the individual pottery groups (1–5). The last plan (Fig. 44) is a summary of all the groups attributed to the later phases of settlement in the Forest Nursery (group 3–5).

In terms of validation it is significant that the Early Hillfort features from the pre-Great Moravian period are oriented in the direction of the main compass points (N-S). In the early Great Moravian phase (group 2) this changed and, with two exceptions, all the settlement features have a NE-SW or NW-SE orientation. Another change happened in the late Great Moravian phase. In the southern part of the excavated area the settlement features are positioned in the N-S, E-W and in the northern part in the NE-SW or NW-SE direction. The transformations follow the changes in the urban-planning concept of the settlement in the Forest Nursery (see Chap. 4.5). They can be considered another proof of the validity of the structures extracted from the pottery assemblages.



Fig. 38. Břeclav-Pohansko. The Forest Nursery. Sunken-floored settlement features. In grey—features datable by pottery.

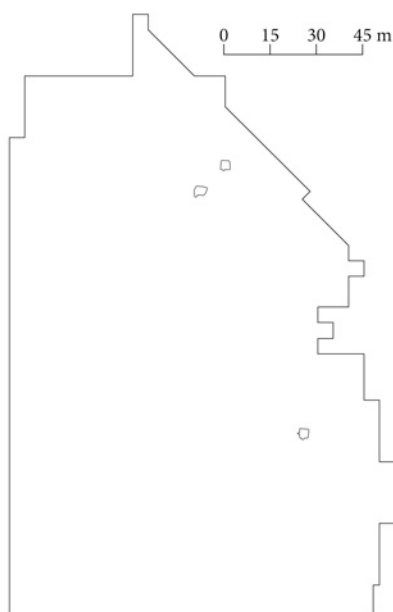


Fig. 39. Břeclav-Pohansko. The Forest Nursery. Settlement features assigned to pottery-chronological group 1.

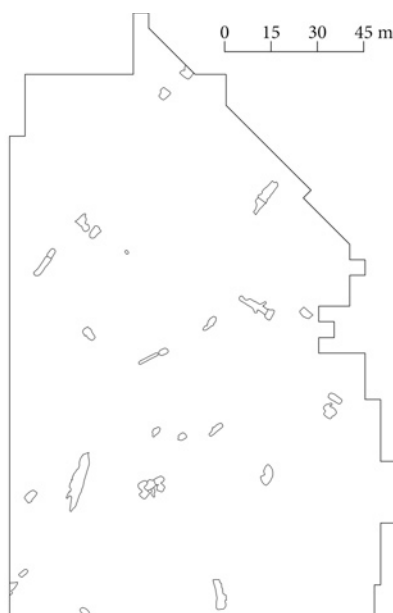


Fig. 40. Břeclav-Pohansko. The Forest Nursery. Settlement features assigned to pottery-chronological group 2.

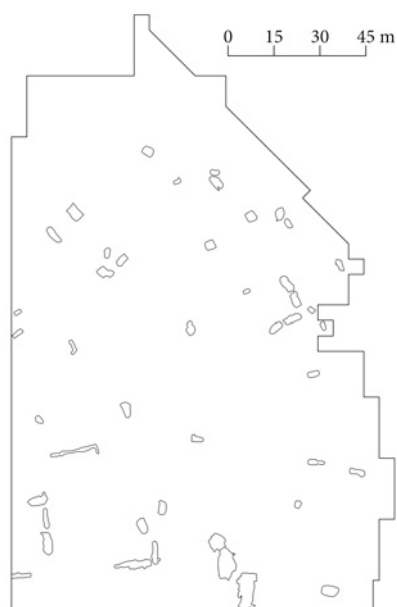


Fig. 41. Břeclav-Pohansko. The Forest Nursery. Settlement features assigned to pottery-chronological group 3.



Fig. 42. Břeclav-Pohansko. The Forest Nursery. Settlement features assigned to pottery-chronological group 4.

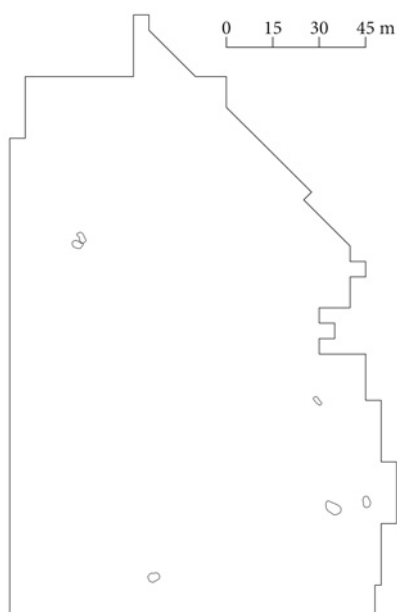


Fig. 43. Břeclav-Pohansko. The Forest Nursery. Settlement features assigned to pottery-chronological group 5.

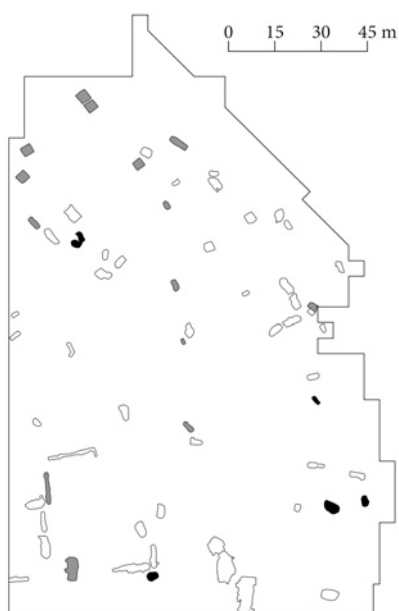


Fig. 44. Břeclav-Pohansko. The Forest Nursery. Summary of all the settlement features from the late phases of settlement. The individual pottery-chronological groups are distinguished by different graphics.

4.2.2 *Absolute chronology—dendrochronology*

One of the fundamental tasks of the archaeological investigation in the early medieval centre at Pohansko near Břeclav is the absolute dating of the excavated settlement features. Until now the problem has not been satisfactorily resolved. Due to a lack of other options it was unavoidable, as in many other cases, to resort to the application of indirect dating methods (e.g. the historical circumstances of the Christian church and the whole stronghold), or the dating was based on some *a priori* assumptions.¹¹⁵

However, the procedures mentioned above are currently being abandoned. On the hand, we have the radical criticism of mixed archaeological-historical argumentation,¹¹⁶ on the other hand, there is the ongoing revision of the existing chronological system of the Great Moravian artefacts.¹¹⁷ The narrow dating of the so-called Blatnica-Mikulčice horizon (especially its late stage with the production of mostly iron varieties of typical artefacts), previously considered important datable objects,¹¹⁸ has been proven unreliable in the light of the new finds.¹¹⁹ There has also been a significant shift in the discussion of the dating of the so-called Veligrad jewellery of the Byzantine or “Oriental” style.¹²⁰

Given the unreliability of the chronological ordering based exclusively on archaeological artefacts, the main focus in absolute dating of the early medieval period was moved to natural scientific methods, in particular dendrochronology.¹²¹

We now have dendrochronological dating available even at Pohansko near Břeclav, where, in July 2001, a re-excavation of well no. 203 from the Forest Nursery was carried out. Although the feature had already been investigated by B. Dostál in 1987, the wooden structure was left

¹¹⁵ E.g. the dating of the so-called Blatnica-Mikulčice horizon or the Veligrad-type jewellery; Dostál (1975), pp. 240–243; Dostál (1977–1978), pp. 129–131; Dostál (1993b), p. 50 etc.

¹¹⁶ E.g. Macháček (2004); Neustupný (2002); Třeštík (2001a).

¹¹⁷ More in Dostál (1977–1978), p. 130.

¹¹⁸ E.g. Bialeková (1979); Bialeková (1980a); Dostál (1977–1978); Dostál (1993c), p. 59.

¹¹⁹ E.g. the Italian monastery of San Vincenzo al Volturno; Mitchell (1994); Mitchell (1996).

¹²⁰ E.g. Dostál (1990b), pp. 39–40; Dostál (1991); Galuška (1996), p. 97; Chorvátová (2004); Pavličová (1995); Štefanovičová (1995); Štefanovičová (2004).

¹²¹ E.g. Dvorská, Poláček (2000); Poláček, Dvorská (1999).

in situ. The preserved remains of the well timbering include six boards and four posts from oak wood, which were extracted from the well within the re-excavation. Five boards and one post were analyzed by J. Dvorská in the dendrochronological laboratory of the Institute of Wood Studies of the Mendel University of Agriculture and Forestry in Brno.

The four ideally correlating curves of the annual rings (the trees grew over the same period) were averaged to form the mean “pohansko4” curve representing the whole well. The curve with 59 annual rings was compared against dated reference chronology from Mikulčice—the “mikst4” curve (Diagram 56).

The correlation results of the average curve from the well at Pohansko with the Mikulčice oak chronology are summed up in the following table (Tab. 48).

Tab. 48. The correlation results of the average curve from the well at Pohansko with the Mikulčice oak chronology. A = standard chronology; B = T.test 1 (according to Baillie & Pilcher); C = T.test 2 (according to Hollstein); D = curve concurrence in percent; E = sample overlapping with the reference chronology in years; F = dating.

A	B	C	D	E	F
mikst4	5.39	5.05	78.0	59	877

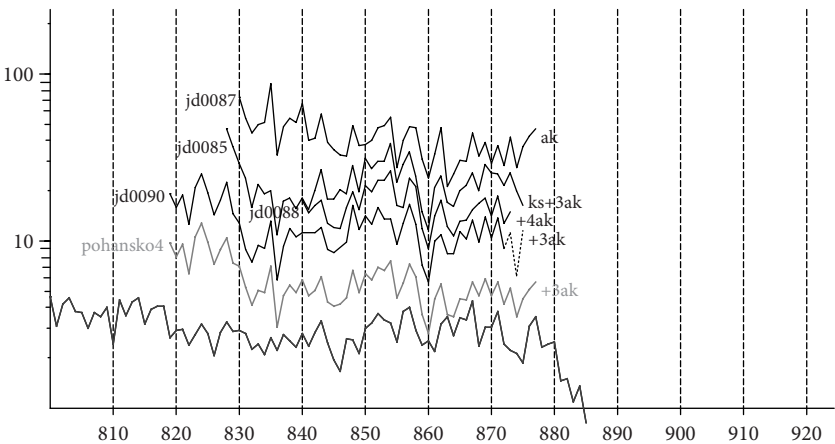


Diagram 56. Břeclav-Pohansko. The Forest Nursery. Synchronization of four dated samples of wood from well no. 203 (above) and their mean annual ring curves (Pohansko4) with the Mikulčice oak standard (below).

Of the six measured samples four were successfully dated (Diagram 56), two of which contained the sapwood (Tab. 49). This made it possible to date the whole well back to a period of shortly after 882.

The date obtained (882 AD) is the first absolute date available at Pohansko. It clearly confirms the fact that the settlement structures investigated in the Forest Nursery belong to the Great Moravian period. Unfortunately, it is an isolated date which does not allow us to specify with greater precision the absolute range of the early medieval settlement in the Forest Nursery.

There are also problems with the synchronization of the absolutely dated feature with the relative chronological phases established on the basis of the analysis and synthesis of the pottery assemblages. Although feature no. 203 was successfully associated, in contrast to the other wells from the Forest Nursery with a relative chronological group of pottery, the question remains whether the dates of the finds from the fill coincide with those of the boards or posts in the well. The cautionary tale in that respect is that of the well-known medieval well 1/80 from Most, the fill of which produced finds which are almost three quarters of a century older than the dendrochronologically dated boards in the well.¹²²

Tab. 49. Břeclav-Pohansko. The Forest Nursery. Well no. 203. Dendrochronological dating. **Ak**—the outer sapwood ring (ks), and the last ring under the bark (wk) not preserved in the sample, the sample cannot be precisely dated we can only place it before a specific date; **ks**—heartwood and outer sapwood ring, the wood can be dated with a tolerance of +/-10 years.

lab. code	sample no.	species	length	begin.	end	dating	fashioned
–	1	oak	–	–	–	not measured	board
jd0088	2	oak	34 + 4ak	839	873	after 882	board
jd0085	3	oak	48 ks + 3ak	827	875	Shortly after 880	board
jd0084, 89	4	oak	48 ks + 5ak	–	–	–	board
jd0086	5	oak	41 + 1ks	–	–	–	board
jd0090	6	oak	57 - 3ks + 3ak	818	875	shortly after 878	board
jd0087	7	oak	48 ak	829	877	after 882	post
–	8	oak	–	–	–	not measured	post
–	9	oak	–	–	–	not measured	post
–	10	oak	–	–	–	not measured	post

¹²² Klápště, Kyncl, Kyncl (2000).

Well no. 203 from the Forest Nursery at Pohansko is exceptional in respect to the relatively high density of finds (pottery, bones, daub), which were found inside. This sets the well apart from other features of the same type, for most wells from the Forest Nursery settlement contained hardly any refuse at all. This fact gives the impression that the wells, together with their immediate surroundings, were regularly cleaned (Diagram 57; DICH_KHK—combined density of pottery, daub and bones in the fill of a feature).

The exceptional status of well no. 203 is most probably the result of the archaeological context in which it was found. The well was dug in the middle of an above-ground feature with the floor irregularly battered (max. depth 10 cm), with large irregular, greyish stains, covering an area of roughly 8 × 8 m. The finds from its fill contained mainly small stones, pieces of daub and animal bones.¹²³ The original field documentation¹²⁴ describes as follows the relationship between the above-ground structure and the shaft of the well: “The layers of daub, small stones and animal bones were found on all sides, at a distance of 0.5–2 m from the dug-out part (the shaft of the well, note by Jiří Macháček). They may have been related to the walls of the

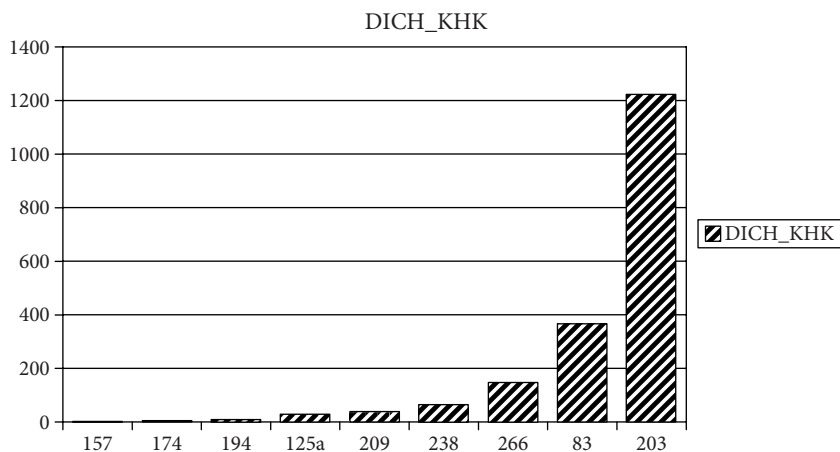


Diagram 57. Břeclav-Pohansko. The Forest Nursery. Density of pottery, daub and bones in the fill of wells.

¹²³ Dostál (1990c), p. 381.

¹²⁴ Břeclav-Pohansko, Lesní školka 1987, Polní nálezořová zpráva. Objekty. Vedoucí výzkumu: Doc. PhDr. Bořivoj Dostál, CSc.: Objekt 203.

above-ground structure, which incorporated the sunken-floored part, or whose ruins were interrupted by it. The latter cannot be ruled out given that the pieces of daub were in the fill of the pit, outside the timber siding. The fill of the feature, i.e. both shallow parts at the edges, and the central dug-out part yielded shards, bones, daub, iron slag, charcoals, and fragments of iron.”

The quoted description illustrates the opinion of the excavator (B. Dostál) according to which the later well superposed the abandoned, above-ground structure. Consequently, fragments from the older, above-ground structure found their way into the fill of the well, both during the well construction (finds between the walls of the dug-out well and the timbering siding inside), and probably even after its destruction, when layers of the surrounding ground containing older finds could have been removed due to a transformation into the abandoned well. The documentation also indicates that the artefacts originating from the adjoining shallow parts of the above-ground feature were associated with the well. The combination of the factors mentioned above explains the unusual quantity of settlement refuse found in well no. 203.

After the interlinking of the relative chronological phases with absolute dating the above-mentioned remarks are of crucial importance. It is obvious that the finds from the well or which were associated with the well during the find processing following the excavation are in fact older than its dendrochronologically dated timber siding. As the pottery assemblage from feature 203 (see Chap. 4.2.1.5) was fairly reliably associated with the chronological group 2 of pottery, it is reasonable to conclude that that group was in fact older than 882, the year in which the tree was cut from which the well siding was made. Unfortunately, the present conditions impossible any further refinement of such chronological remarks.

The relative chronological groups, from the 8th to the 10th century, their relationships and absolute dating can be schematically visualized in the table below. The conclusion one can draw from that table is that, in addition to the two main Great Moravian phases at Pohansko (chronological group 2 and 3), we managed to identify a pre-Great Moravian phase (chronological group 1) and a phase on the boundary between the Great Moravian and post-Great Moravian period (chronological group 5). Group 4 is not a chronological phase in the true sense of the word, however we can justifiably (see Chap. 4.2.1.4.3) suppose that it was contemporary with the late Great Moravian phases.

The problematic place in the development scheme is the beginning of the production of the Great Moravian pottery, and/or the emergence of the whole Great Moravian agglomeration at Pohansko. We have no absolute date available for this period, and the relative chronological relationships are also very complicated. A subject of many discussions is the issue of continuity or discontinuity between the Early (7–8th century AD) and the Middle (9th century AD) Hillfort periods. The main advocate of a continuous occupation of the site was B. Dostál,¹²⁵ who used pottery of archaic appearance from some of the features inside the Magnate Court as evidence of uninterrupted development. Among those was feature 117/VD, which is also included in the present multivariate statistical processing. The principal component analysis (see Chap. 4.2.1.5), based on the pottery assemblages, shows that the pottery from that feature is no exception from the general standard of the early Great Moravian phase (pottery group 2).

Conversely, there are indications of discontinuity. The Early Hillfort pottery assemblages are so different that they create a sharply separated group in the factor score diagram. A similar effect was not noted in every one of the subsequent Great Moravian chronological groups, between which it is impossible to draw a sharp line due to their seamless transition and the merging of the pottery assemblages. The Early Hillfort structures from the Forest Nursery also differ significantly from the Great Moravian features by their orientation and the fact that we find them in the Forest Nursery under the rampart construction. All of the above leads us to the conclusion that at Pohansko there was not continuous development between the Early and the Middle Hillfort periods. Establishing how long the hiatus lasted and when exactly the Great Moravian settlement at Pohansko started is presently beyond our capabilities.

At this point it seems appropriate to consider the importance of dating based on pottery assemblages as it will serve as the basis for our examination of the settlement structures in the Forest Nursery at Pohansko. There is no doubt, and the completed validations clearly prove it as well, that there are relative chronological differences between the defined pottery groups. The question is how such differences came about. To answer that we must start from the fact that all chronological groups from the Great Moravian period contain assemblages

¹²⁵ Dostál (1994c), p. 222.

with an almost complete set of pottery attributes (see Chap. 4.2.1.5), distinguished within the individual groups only by their quantitative ratios. This suggests that the settlement features from the various groups could have coincided in time. The decisive factor for the association of the pottery in an assemblage, and hence its relative dating, is establishing precisely when the feature was filled, in which the assemblage was found. Naturally, we cannot rule out the possibility that later pottery got into earlier features after they had been filled. However, such intrusive finds could not have influenced the ratios between the pottery attributes in the assemblage in the same way as the numerous residual pottery from tertiary refuse,¹²⁶ which must have been transported in great quantities to the later established features.¹²⁷ The conclusion that we can draw from the remarks above is that the individual chronological stages, as defined in the Forest Nursery at Pohansko, are distinguished mainly on the basis of their upper limits. We can recognize which original buildings (after being turned into sunken-floored features) were abandoned earlier than others, but it is impossible to precisely establish which settlement structures were founded earlier. Only at the hypothetical level we can presume that structures which became extinct earlier had also been built earlier.

ARCHAEOLOGICAL PHASE	CHRONOLOGICAL GROUPS					ABSOLUTE DATING
	1	2	3	4	5	
Late Hillfort Period (post-Great Moravian)		↓ ----- ?	 ----- 	 ----- 	 ----- - - - - - 	<u>10th century</u>
Middle Hillfort Period (Great Moravian)						882 DC
Early Hillfort Period (Pre-Great Moravian)						<u>9th century</u>
	----- 					<u>8th century</u>

¹²⁷ Macháček (2001c), p. 17; Nováček (2003).

4.3 ARTEFACTS OTHER THAN POTTERY FROM THE FOREST NURSERY—ANALYSIS AND SYNTHESIS OF THE FORMAL STRUCTURES

The specific purpose of the excavated area in the Forest Nursery at Pohansko has already been recognized by the site director and principal investigator B. Dostál.¹²⁸ He based his considerations on the shapes and the range of the settlement features and assemblages of artefacts. He drew particular attention to craftsmen's tools, utensils, semi-finished products, and production waste which, in his opinion, provide evidence of the production activities on the site. He took into consideration woodworking, metal casting, metal chasing and jewellery making, coopering, blacksmithing, weapon production and locksmithing, the processing of bones, antlers, textile, leather, bast and wicker. According to B. Dostál, the Forest Nursery was the location of a craftsmen's precinct, which provided most of the specialized production and services to the inhabitants of the stronghold, in particular members of the higher social stratum.

In the following chapter we will attempt to verify the assumed purpose of the whole precinct in the Forest Nursery and the individual features and, if possible, to specify it in greater detail and with more accuracy. Thanks to a considerable number of finds unearthed during the excavations at Pohansko we are able to use quantitative data, and the methods of the multivariate statistical analysis (principal component analysis—PCA) and statistical testing. Our examination will be based on the archaeological method of E. Neustupný,¹²⁹ which defines the different stages of the work of an archaeologist from the formulation of a preliminary model, analysis, synthesis and validation to modelling and interpretation.

4.3.1 *Analysis of artefacts other than pottery and a formalized descriptive system*

Based on the preliminary model, which for us is represented by the thoughts of B. Dostál, we will assume that the purpose of the settlement and the individual features can also be inferred from artefacts other than pottery found within. We will start from the hypothesis that the articles of everyday use, tools, raw materials and workshop

¹²⁸ Dostál (1993a); Dostál (1993b), pp. 46–48.

¹²⁹ Neustupný (1986).

products are relatively stable spacewise, i.e. at least part of them in the archaeological context in the place where the activity related with their production was performed, and therefore they can either be *de facto* refuse (not intentionally dumped) or primary refuse. Artefacts other than pottery are probably more stable in space than pottery or animal bones which make up the main body of secondary and tertiary refuse and which were intentionally moved while the settlement was still in existence. We cannot expect the spatial stability of the artefacts other than pottery to be absolute, as they must have been exposed to the impact of the post-depositional processes as well. Nevertheless, for the application of the multivariate statistics it will suffice if the finds exhibit at least a strong tendency towards stability in space. This hypothesis will be further verified, particularly during the validation of the results of statistical analysis.

The artefacts other than pottery, with which we will evaluate the qualities (variables) of the whole descriptive system, will be quantified by their absolute count, and/or their presence will be expressed by the dichotomized value of 0–1. The structuring entity (object) in the descriptive system will be an assemblage (more on the term in Chap. 2.1.1), i.e. a group of artefacts, which the excavator (B. Dostál), on the basis of field observations, related to a single, usually sunken-floored, archaeological feature, representing the basic stratigraphic unit of field documentation in the Forest Nursery at Pohansko.

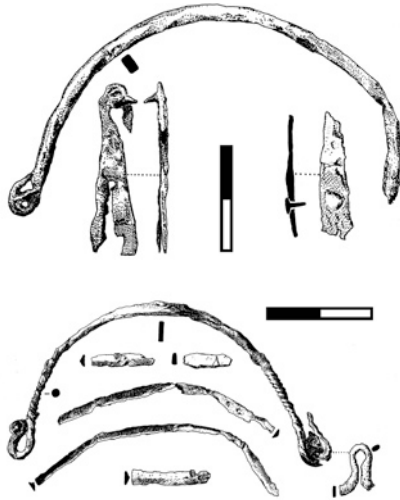
Given the considerable variety of the artefacts other than pottery originating from the Forest Nursery some of them must be grouped into broader categories, while others must remain independent due to their structuring significance. A few specialized artefacts not occurring in sufficiently representative numbers in multiple features were excluded from the principal component analysis (PCA). They include, for example, some bone and antler products (e.g. board game pieces, needle cases, needles, thin-walled decorating plates, handles, tubes, shrink rings or antler boxes), articles of personal hygiene (e.g. razors, scissors, combs), woodworking implements (e.g. axe, adze, drill, draw-knife, saw, chisel), leaden objects (e.g. ingots, bars), antiquity artefacts (stone axe, bronze arrowhead, ring or tutulus), clay balls and fragments of glass objects. On the other hand, the other categories of artefacts which were not taken into consideration for the statistical analysis are quite numerous. They occur in many features but do not form any consistent structures. Such is the case, for example, of iron

knives, iron bands, fragments of wire, nails and points or amorphous lumps of iron. The production of male dress accessories (bronze and iron strap-ends, shackles, buckles, etc.) and firesteels turned out to be relatively unstructuring and, therefore, unsuitable for the multivariate statistical analysis.

We can state in advance that some types of craft work or other activities performed on the site with less intensity or which left behind only a small amount of specialized tools, semi-finished work and waste cannot be identified through the processing of quantitative data. However, based on rare finds we can expect with high probability their existence on the site.¹³⁰ This concerns, for example, the above-mentioned production of the bone and antler industry, wood working or non-ferrous metal working.

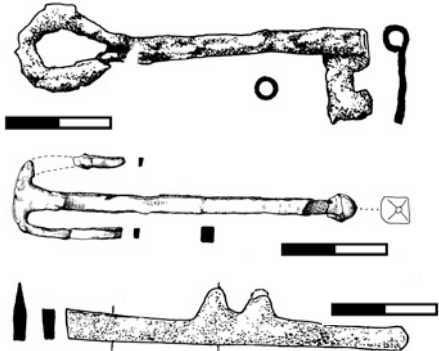
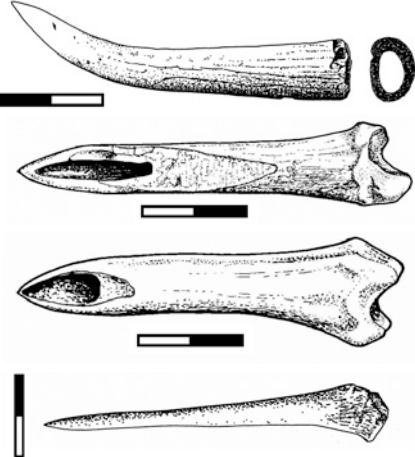
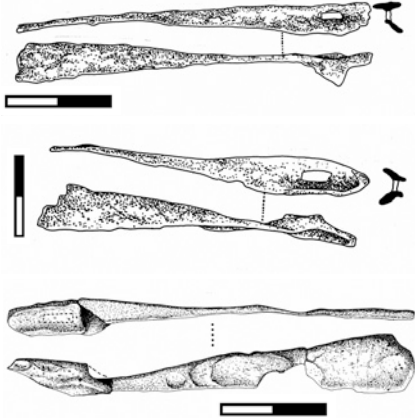
The total number of variables entering the principal component analysis (PCA) is 23. Their basic characteristics are summed up in the following table (Tab. 50).

Tab. 50. Břeclav-Pohansko. The Forest Nursery. The artefacts other than pottery.

Abbreviation	Name	Items	Illustration
EIMER	Bucket	iron handle mounts, handles and bucket loops	

¹³⁰ More in Dostál (1993a); Dostál (1993b).

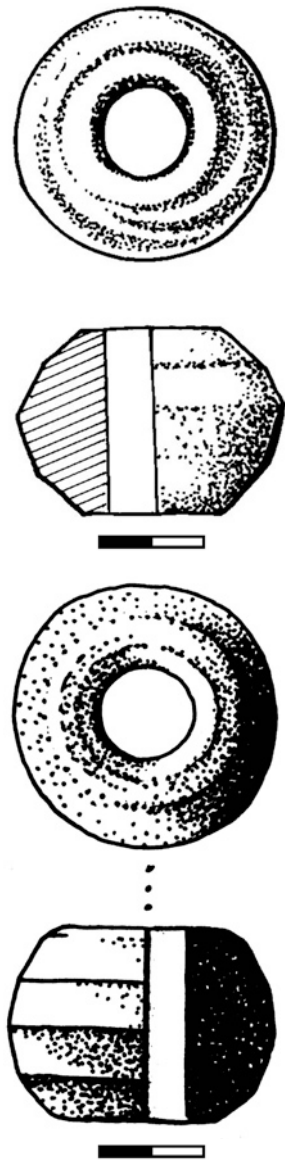
Tab. 50 (*cont.*)

Abbreviation	Name	Items	Illustration
SCHLOSS	Parts of locks	iron keys and bolts	
SPIT_KGI	Pointed bone tools	Antler point, bone sharpened tool, bone awl	
BARRE_FE	Iron ingots	axe-shaped iron ingot	

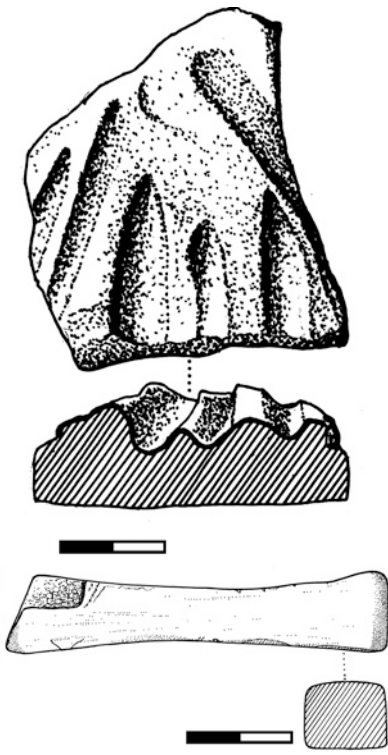
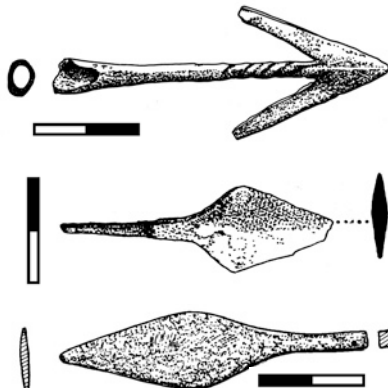
Tab. 50 (*cont.*)

Abbreviation	Name	Items	Illustration
GEWICHT	Clay weights	clay loomweights	

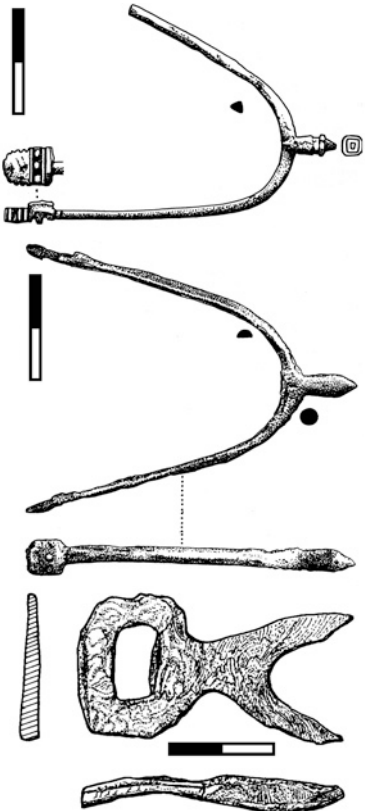
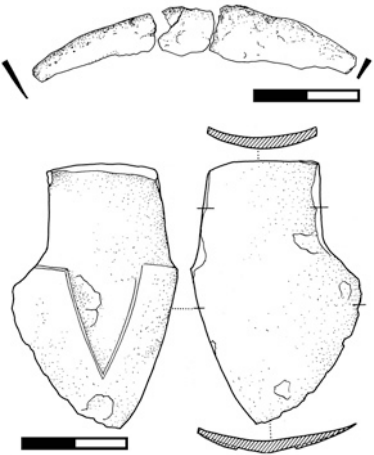
Tab. 50 (*cont.*)

Abbreviation	Name	Items	Illustration
SPINWIR	Whorls	ceramic or stone whorl	
MAHLSTEI	Quernstones	quernstone	no illustration

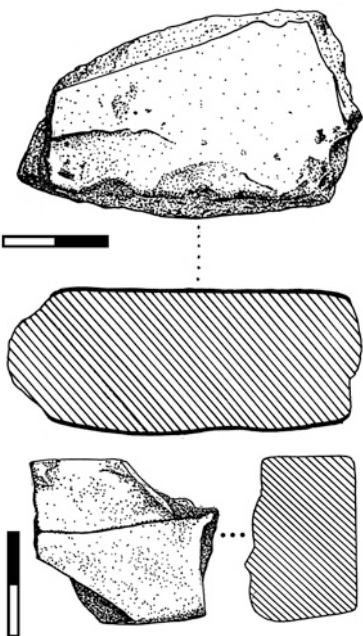
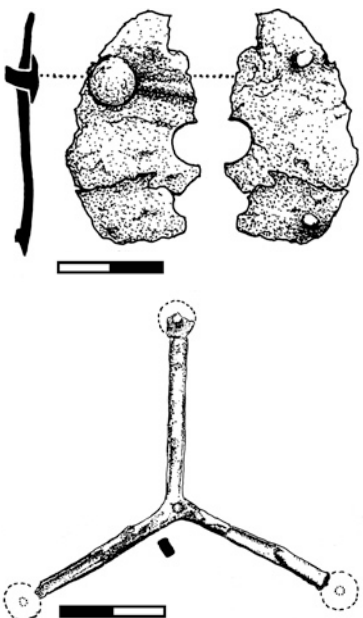
Tab. 50 (*cont.*)

Abbreviation	Name	Items	Illustration
SCHLEIFS	Whetstones	whetstone	
PFEILSPI	Arrowhead	iron arrowhead	

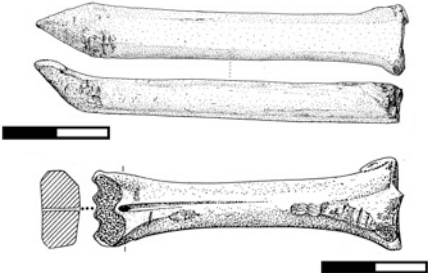
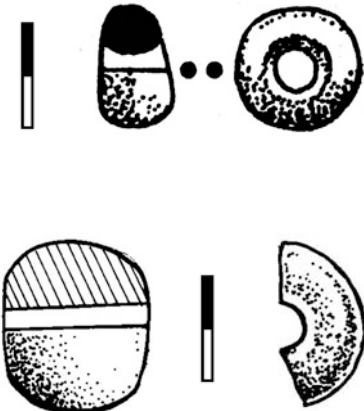
Tab. 50 (*cont.*)

Abbreviation	Name	Items	Illustration
AUSR_REI	Horse gear	iron spurs and parts of harness	 The illustration for AUSR_REI shows several items related to horse gear. At the top, there is a long, curved iron spur with a small circular detail at its end. Below it is another similar spur, but with a different terminal detail. To the left of these spurs are two small, rectangular metal components, likely parts of a harness. Below the spurs is a long, thin metal rod or pin. At the bottom of the illustration are two larger, more complex metal pieces: one is a rectangular plate with a central opening, and the other is a curved, hook-like piece. A small scale bar is visible between these two bottom pieces.
WZ_LANDW	Agricultural tools	iron sickle, scathe and ploughshare	 The illustration for WZ_LANDW shows three agricultural tools. At the top is a curved iron sickle with a serrated edge. Below it is a small, curved metal piece, likely a scathe. At the bottom are two large, rectangular iron ploughshares, one on the left and one on the right, both with a V-shaped notch at the top. A scale bar is located between the two ploughshares.

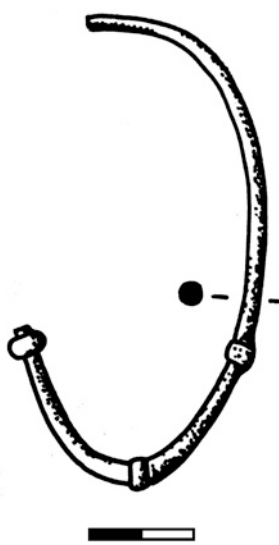
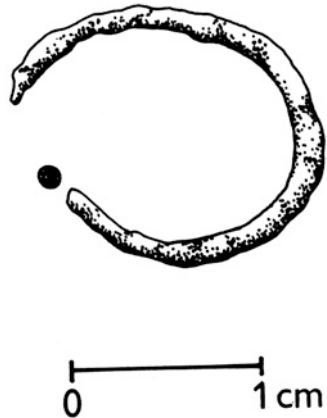
Tab. 50 (*cont.*)

Abbreviation	Name	Items	Illustration
ZIEGEL	Roman bricks	Roman brick	
BESCHLAG	Iron fittings	iron fittings	

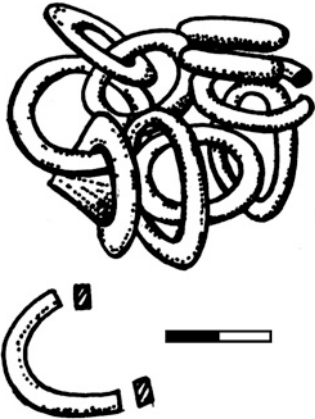
Tab. 50 (cont.)

Abbreviation	Name	Items	Illustration
SCHLITTS	Bone skates	the so-called bone skates	
WZ	Unspecified tools	unspecified iron tools	no illustration
BLECH_FE	Iron sheetmetal	iron sheetmetal	
BACKW_01	Rosting tray	clay roasting tray (dichotomized value)	no illustration
SCHMUCK	Jewellery	glass and ceramic bead, bronze earring and rounded button (gombik)	

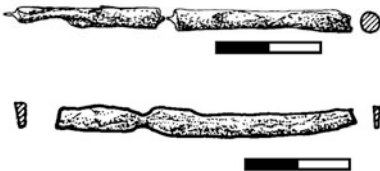
Tab. 50 (*cont.*)

Abbreviation	Name	Items	Illustration
			
			

Tab. 50 (*cont.*)

Abbreviation	Name	Items	Illustration
BRONZ	Bronze items	bronze wire, sheet, metal strip and raw materials	 
RING	Rings	iron ring from mail	

Tab. 50 (*cont.*)

Abbreviation	Name	Items	Illustration
KLAMMER	Iron cramp	iron cramp	
STABCHEN	Bars	iron bar	

4.3.2 *Synthesis of the formal structures from the assemblages with artefacts other than pottery*

The task of the synthesis is to search for the formal structures existing in a multidimensional space created by the variables (descriptors), which, as we expect based on an analysis, create the structure of the examined archaeological context.¹³¹ This is done by using a reliable method at the core of which is the principal component analysis (PCA) from the family of factor analyses.

The descriptive matrix defined during the analysis of the examined archaeological context in which we will search for the formal structures consists of 280 rows and 23 columns. The rows contain the assemblages from the individual settlement features investigated in the Forest Nursery at Pohansko (objects, observations) and the columns represent the categories of artefacts other than pottery quantified by their absolute count in the assemblages (variables). The only exception is the roasting tray, the presence of which, given its fragmentation, is expressed using the 0–1 value.

Before proceeding to the basic factor analysis, we must critically verify the quality of the data, on which our work is based. The fundamental problem possibly leading to the creation of undesirable formal structures is that excavations were carried out with different methodologies. Although the digging in the Forest Nursery extended over a relatively long period (17 campaigns), the procedures used did not change much, primarily because the same personnel was employed every year. The only significant deviation from standardized procedures was flotation, applied only to a portion of the settlement features.¹³² However, it is the deployment of this methodology which might have modified the range of finds usually acquired by excavation.

In the initial principal component analysis (PCA) we need to establish whether some of the formal structures contained in the matrix are related to flotation. This will be accomplished by adding the FLOTIER variable attaining a value of 0 or 1 to the matrix, denoting whether the particular settlement feature was subject to flotation or not. The total number of variables in the matrix will thus be increased to 24. The following tables (Tab. 51) present the basic descriptive statistics

¹³¹ Neustupný (1986), pp. 537–542; Neustupný (1993), pp. 113–153.

¹³² Čáp (1983).

Tab. 51. Descriptive Statistics.

	Mean	Std. Deviation	Analysis N
EIMER	0.1893	0.8098	280
WZ_SCHMI	5.357E-02	0.4242	280
SCHLOSS	2.500E-02	0.1564	280
SPIT_KGI	0.5536	1.2940	280
BARRE_FE	5.000E-02	0.2630	280
GEWICHT	0.1143	0.5563	280
SPINNWIR	0.2143	0.7311	280
MAHLSTEI	0.3107	1.4762	280
SCHLEIFS	0.2321	0.5802	280
STABCHEN	0.2679	1.0454	280
PFEILSPI	6.429E-02	0.2457	280
AUSR_REI	2.857E-02	0.1871	280
WZ_LANDW	3.214E-02	0.1767	280
ZIEGEL	2.143E-02	0.1680	280
BESCHLAG	0.1000	0.4199	280
SCHLITTS	3.214E-02	0.1959	280
WZ	1.429E-02	0.1189	280
BLECH_FE	0.2000	0.5767	280
BACKW_01	0.1000	0.3005	280
FLOTIER	7.50E-02	0.26	280
SCHMUCK	8.214E-02	0.5257	280
BRONZ	7.857E-02	0.3892	280
RING	0.4143	2.6437	280
KLAMMER	0.2107	1.0852	280

of the variables and the calculated eigenvalues of the individual factors visualized in a diagram.

In accordance with the established methodology¹³³ we will select five factors as the basis for the principal component analysis (PCA). The decisive criterion is the drop between the eigenvalues of the fifth and sixth factor (Tab. 52). The five extracted factors are rotated using the Varimax method to obtain a clear result. Factor loadings (or coefficients) with a value below 0.2 are not displayed, as in most of the solutions below, in order to unclutter the resulting table (Tab. 53).

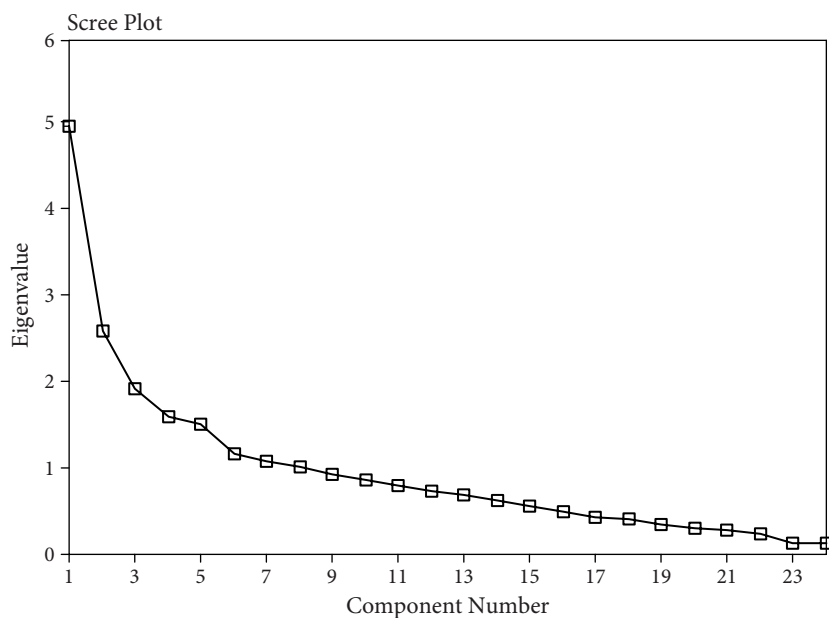
Of all five rotated factors, factor 1 is the most important for our purpose (Tab. 53). In addition to iron rings from mail (RING), there is a high correlation with this factor—expressed by a high factor loading—

¹³³ Macháček (2001c), pp. 29–30; Neustupný (1997b), pp. 237–258.

Tab. 52. Eigenvalues.

Initial Eigenvalues				Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.007	20.861	20.861	3.819	15.911	15.911
2	2.608	10.868	31.729	2.540	10.585	26.496
3	1.935	8.064	39.793	2.319	9.664	36.160
4	1.609	6.704	46.497	2.093	8.721	44.881
5	1.512	6.302	52.799	1.901	7.919	52.799
6	1.182	4.924	57.724			
7	1.093	4.556	62.280			
8	1.024	4.265	66.544			
9	0.946	3.940	70.484			
10	0.872	3.634	74.118			
11	0.799	3.330	77.448			
12	0.750	3.123	80.571			
13	0.705	2.937	83.508			
14	0.641	2.670	86.178			
15	0.564	2.348	88.526			
16	0.500	2.085	90.611			
17	0.438	1.823	92.434			
18	0.404	1.685	94.119			
19	0.344	1.433	95.552			
20	0.304	1.267	96.819			
21	0.275	1.146	97.965			
22	0.230	0.959	98.925			
23	0.137	0.571	99.496			
24	0.121	0.504	100.000			

Extraction Method: Principal Component Analysis. Total Variance Explained



Tab. 53. Rotated Component Matrix.

Component					
	1	2	3	4	5
RING	0.886				
BRONZ	0.885				
KLAMMER	0.795				
SCHMUCK	0.747				
FLOTIER	0.644				
BARRE_FE	0.523	0.226			
WZ_SCHMI		0.802			
BLECH_FE	0.245	0.681			
WZ		0.665			
STABCHEN	0.442	0.597	0.345		
WZ_LANDW		0.580			
SCHLOSS			0.747		
AUSR_REI			0.646		0.251
PFEILSPI			0.637		
BESCHLAG	0.224	0.267	0.603		
SPIT_KGI				0.830	
SCHLEIFS				0.676	
SPINNWIR				0.606	0.262
GEWICHT				0.483	

Tab. 53 (cont.)

	Component				
	1	2	3	4	5
SCHLITTS				0.392	
MAHLSTEI					0.819
ZIEGEL					0.712
EIMER			0.483		0.558
BACKW_01		0.320	0.288		0.321

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

in small bronze objects (BRONZ), cramps (KLAMMER), female jewelry (SCHMUCK), iron ingots (BARRE_FE) and, above all, the closely observed FLOTIER variable. Judging from the results of the principal component analysis, the common occurrence of these very small objects (except iron ingots) is mainly due to the excavation technique. The structure does not reflect the living past. To eliminate the problem, we need to drop for further analysis those variables whose occurrence is evidently influenced by flotation the fill from the features (RING, BRONZ, KLAMMER, and SCHMUCK).

To check whether our procedure is correct we will perform another principal component analysis without the affected attributes but leaving the FLOTIER control variable in place (Tab. 54).

From the drop of the eigenvalues between the fourth and fifth factor in the eigenvalue table and the diagram it is obvious that the next analysis should be based on four factors (Tab. 55). Compared to the previous solution the number of the rotated factors will be reduced by one.

The structure related to the removed attributes is completely missing in the rotated solution (Tab. 56). The FLOTIER control variable no longer holds a dominant position in any of the extracted factors and the values of its highest factor loadings are relatively low and in terms of the overall interpretation insignificant. We can state that the descriptive matrix, on which our next analyses will be based, has been cleared of attributes creating false structures, connected with the changes in the excavation technique.

In addition to removing the columns with variables which might create undesirable structures, we will also modify the number of rows that hold the archaeological entities—settlement features from the Forest Nursery in the descriptive matrix. To ensure that the coherence

Tab. 54. Descriptive Statistics.

	Mean	Std. Deviation	Analysis N
EIMER	0.1893	0.8098	280
WZ_SCHMI	5.357E-02	0.4242	280
SCHLOSS	2.500E-02	0.1564	280
SPIT_KGI	0.5536	1.2940	280
BARRE_FE	5.000E-02	0.2630	280
GEWICHT	0.1143	0.5563	280
SPINNWIR	0.2143	0.7311	280
MAHLSTEI	0.3107	1.4762	280
SCHLEIFS	0.2321	0.5802	280
STABCHEN	0.2679	1.0454	280
PFEILSPI	6.429E-02	0.2457	280
AUSR_REI	2.857E-02	0.1871	280
WZ_LANDW	3.214E-02	0.1767	280
ZIEGEL	2.143E-02	0.1680	280
BESCHLAG	0.1000	0.4199	280
SCHLITTS	3.214E-02	0.1959	280
WZ	1.429E-02	0.1189	280
BLECH_FE	0.2000	0.5767	280
BACKW_01	0.1000	0.3005	280
FLOTIER	7.50E-02	0.26	280

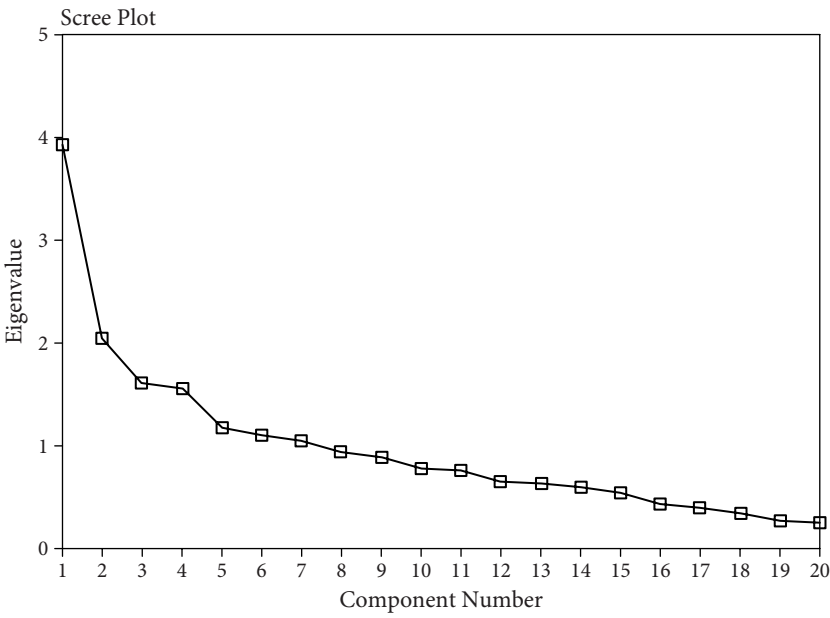
Tab. 55. Eigenvalues.

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.923	19.617	19.617	2.787	13.935	13.935
2	2.056	10.279	29.896	2.326	11.632	25.567
3	1.617	8.084	37.980	2.104	10.521	36.088
4	1.554	7.771	45.750	1.933	9.663	45.750
5	1.180	5.902	51.653			
6	1.111	5.557	57.209			
7	1.056	5.279	62.488			
8	0.944	4.720	67.208			
9	0.879	4.393	71.602			
10	0.776	3.881	75.483			
11	0.765	3.827	79.310			
12	0.651	3.254	82.564			
13	0.642	3.210	85.774			

Tab. 55 (cont.)

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
14	0.596	2.980	88.753			
15	0.547	2.736	91.490			
16	0.431	2.153	93.642			
17	0.406	2.029	95.672			
18	0.340	1.698	97.369			
19	0.272	1.358	98.728			
20	0.254	1.272	100.000			

Extraction Method: Principal Component Analysis. Total Variance Explained



Tab. 56. Rotated Component Matrix.

	Component			
	1	2	3	4
WZ_SCHMI	0.766			
BLECH_FE	0.720			
STABCHEN	0.687	0.375		
WZ	0.680			
WZ_LANDW	0.521			0.258
BARRE_FE	0.404		0.220	-0.243
FLOTIER	0.264	0.218		
SCHLOSS		0.731		
AUSR_REI		0.649		0.240
PFEILSPI		0.640		
BESCHLAG	0.334	0.621		
SPIT_KGI			0.809	
SCHLEIFS			0.681	
SPINNWIR			0.619	0.248
GEWICHT			0.474	
SCHLITTS			0.385	
MAHLSTEI				0.782
ZIEGEL				0.693
EIMER		0.471		0.576
BACKW_01	0.272	0.258		0.401

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

of the principal component analysis results is as high as possible, we will leave out, from the next analyses all pre-Great Moravian features where, given the agricultural nature of the early Slavic and the Early Hillfort settlement, we can expect a different function than in the features from the later Great Moravian central place. Also, we will no longer work with the finds from feature no. 6 from the Forest Nursery, which has been interpreted as the remains of an early medieval pottery clay pit,¹³⁴ and which because of its above-average dimensions contains a large quantity of non-homogenous archaeological material.

After the modifications of the descriptive matrix we can proceed with the basic factor analysis, in which we assess 262 objects based on 19 variables (Tab. 57).

¹³⁴ Macháček (2001c), pp. 221–222.

Tab. 57. Descriptive Statistics.

	Mean	Std. Deviation	Analysis N
EIMER	0.1947	0.8283	262
SPIT_KGI	0.5802	1.3215	262
WZ_SCHMI	5.725E-02	0.4383	262
AUSR_REI	2.672E-02	0.1838	262
WZ_LANDW	3.435E-02	0.1825	262
SCHLOSS	2.672E-02	0.1616	262
SCHLEIFS	0.2366	0.5915	262
SCHLITTS	3.435E-02	0.2024	262
BARRE_FE	5.344E-02	0.2716	262
WZ	1.527E-02	0.1228	262
BACKW_01	8.779E-02	0.2835	262
BLECH_FE	0.2023	0.5816	262
SPINNWIR	0.2061	0.7135	262
ZIEGEL	2.290E-02	0.1736	262
PFEILSPI	6.489E-02	0.2468	262
GEWICHT	0.1221	0.5743	262
MAHLSTEI	0.2748	1.2227	262
BESCHLAG	0.1069	0.4333	262
STABCHEN	0.2824	1.0776	262

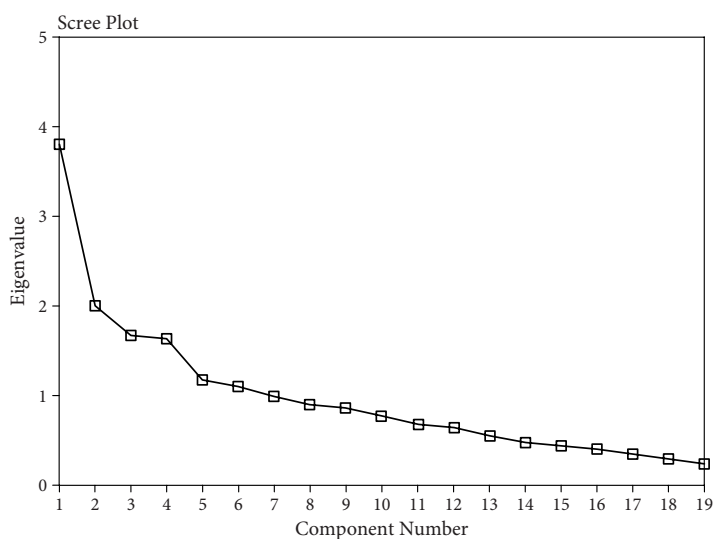
With regards to the last clearly visible drop of the eigenvalue between the fourth and fifth factor it is obvious that the four factors with the highest eigenvalues will be selected as the basis of the next analysis (Tab. 58). Together, the four factors cover 48.1 percent of the total variability contained in the correlation matrix which is generated as one of the by-products of the principal component analysis. The obtained cumulative variability is relatively high compared to the values established during the processing of the pottery assemblages (see Chap. 4.2.1.3—only 28.8 percent). This is probably related to the above-mentioned higher spatial stability of artefacts other than pottery, which are not so mixed up in the assemblages as pottery from the secondary and tertiary refuse, thus forming stronger formal structures. However, the possibility cannot be ruled out that the existing difference might be a consequence of a different pottery description method and a higher count of the variables in the descriptive system.

The four extracted factors are rotated using the Varimax method (Tab. 59).

Tab. 58. Eigenvalues.

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.812	20.065	20.065	2.767	14.563	14.563
2	2.008	10.568	30.633	2.389	12.572	27.135
3	1.682	8.851	39.484	2.093	11.017	38.152
4	1.639	8.625	48.109	1.892	9.957	48.109
5	1.184	6.230	54.338			
6	1.096	5.769	60.107			
7	0.984	5.180	65.287			
8	0.896	4.715	70.002			
9	0.873	4.594	74.596			
10	0.764	4.020	78.617			
11	0.672	3.537	82.154			
12	0.638	3.355	85.509			
13	0.554	2.915	88.424			
14	0.469	2.469	90.893			
15	0.440	2.314	93.207			
16	0.399	2.099	95.306			
17	0.347	1.827	97.133			
18	0.300	1.578	98.711			
19	0.245	1.289	100.000			

Extraction Method: Principal Component Analysis.



Tab. 59. Rotated Component Matrix.

	Component			
	1	2	3	4
WZ_SCHMI	0.773			
BLECH_FE	0.734			
STABCHEN	0.687	0.375		
WZ	0.677			
WZ_LANDW	0.514			0.246
BARRE_FE	0.408			-0.203
SCHLOSS		0.722		
AUSR_REI		0.704		
PFEILSPI		0.636		
BESCHLAG	0.328	0.607		
BACKW_01	0.309	0.330		0.318
SPIT_KGI			0.814	
SPINNWIR			0.658	
SCHLEIFS			0.651	
GEWICHT			0.479	
SCHLITTS			0.405	
MAHLSTEI				0.836
ZIEGEL				0.767
EIMER		0.482		0.570

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

The rotated solution of the principal component analysis (Tab. 58) can be described as follows:

Factor 1 is monopolar, just as all the other factors. An important position in it is held by metallurgical implements (WZ_SCHMI), iron sheetmetal (BLECH_FE), iron bars (STABCHEN), unspecified tools (WZ) and agricultural tools (WZ_LANDW), as well as iron ingots (BARRE_FE) and, to a lesser extent, iron mounts (BESCHLAG). Roasting trays (BACKW_01) have a similar (relatively low) factor loading in three factors and are not a typical component in any of the identified formal structures.

Factor 2 is marked by a high factor loading on variables representing parts of locks (SCHLOSS), horse gear (AUSR_REI), arrowheads (PFEILSPI) and iron mounts (BESCHLAG). Another variable important for this structure, bucket (EIMER), has a strong relationship with the fourth factor.

Factor 3 is represented by pointed bone tools (SPIT_KGI), spindle whorls (SPINNWIR), whetstones (SCHLEIFS), clay loom weights (GEWICHT) and the so-called bone skates (SCHLITTS).

The final factor, *Factor 4*, is marked by high loadings on three variables: quernstone (MAHLSTEI), Roman brick (ZIEGEL) and bucket mounts (EIMER). The other variables are of lesser importance for this factor.

To verify the stability of the performed principal component analysis described above, we will modify the parameters of the initial descriptive matrix and will observe whether this change will have an impact on the extracted structures. First of all, we will dichotomize the variables. This means that the quantitative data will be replaced by the values 0 or 1, which denote whether the particular artefact appeared in the assemblage or not. Another, although less significant, change consists in reducing the number of rows in the matrix where we will retain only features in which at least one artefact other than pottery occurred.

The new matrix will have 152 rows and 19 columns with the values 0 or 1 (Tab. 60).

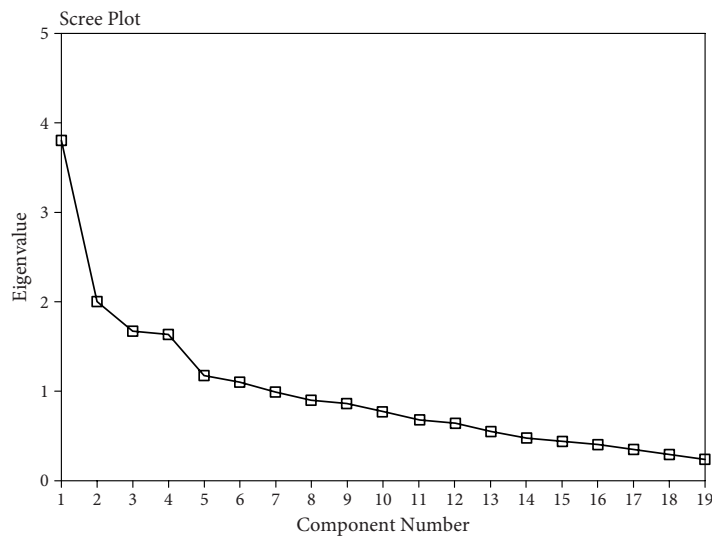
Tab. 60. Descriptive Statistics.

	Mean	Std. Deviation	Analysis N
EIMER	0.1645	0.3719	152
WZ_SCHMI	5.263E-02	0.2240	152
SCHLOSS	4.605E-02	0.2103	152
SPIT_KGI	0.4868	0.5015	152
BARRE_FE	7.237E-02	0.2600	152
GEWICHT	0.1250	0.3318	152
SPINNWIR	0.2434	0.4306	152
MAHLSTEI	0.1447	0.3530	152
SCHLEIFS	0.3026	0.4609	152
STABCHEN	0.2171	0.4136	152
PFEILSPI	0.1118	0.3162	152
AUSR_REI	3.947E-02	0.1954	152
WZ_LANDW	5.921E-02	0.2368	152
BESCHLAG	0.1250	0.3318	152
SCHLITTS	5.263E-02	0.2240	152
WZ	2.632E-02	0.1606	152
BLECH_FE	0.2566	0.4382	152
BACKW_01	0.1513	0.3595	152
ZIEGEL	3.289E-02	0.1790	152

Tab. 61. Eigenvalues.

Total Variance Explained						
Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.023	15.909	15.909	2.591	13.639	13.639
2	1.826	9.609	25.519	1.856	9.771	23.410
3	1.620	8.525	34.043	1.842	9.696	33.105
4	1.469	7.732	41.775	1.647	8.669	41.775
5	1.221	6.428	48.203			
6	1.153	6.067	54.270			
7	1.120	5.896	60.166			
8	0.913	4.807	64.974			
9	0.862	4.536	69.510			
10	0.832	4.381	73.891			
11	0.758	3.989	77.879			
12	0.691	3.638	81.518			
13	0.640	3.367	84.884			
14	0.596	3.138	88.022			
15	0.515	2.712	90.734			
16	0.497	2.617	93.351			
17	0.450	2.369	95.720			
18	0.430	2.262	97.982			
19	0.383	2.018	100.000			

Extraction Method: Principal Component Analysis.



Based on the eigenvalues it is possible to choose, as the basis of the next analysis, either four or seven factors (Tab. 61). In this case we will stick to the lower number to be able to better compare the obtained results with the previous principal component analysis.

We can see from the rotated result (Tab. 62) that the basic structures were retained, despite factors being re-shuffled. Factor 1 corresponds with factor 2 from the basic solution. In both solutions this structure is mainly related to parts of locks (SCHLOSS), arrowheads (PFEIL-SPI), bucket mounts (EIMER), horse gear (AUSR_REI) and iron mounts (BESCHLAG). A much stronger relationship with this factor compared to the basic solution is noted in iron bars (STABCHEN). The second factor of the control analysis consists of the same variables as factor 1 in the previous analysis, i.e. mostly various iron tools (WZ, WZ_SCHMI, WZ_LANDW), iron ingots (BARRE_FE), iron metal sheet (BLECH_FE) or iron mounts (BESCHLAG). In addition, we notice a slightly higher factor loading of whetstones (SCHLEIFS). The third factor is very similar to factor 4 from the basic solution. It is also dominated by two variables: quernstone (MAHLSTEI) and Roman brick (ZIEGEL). Surprisingly, bucket hardware has no particular affinity to it. On the contrary, higher factor loadings are observed there in agricultural tools (WZ_LANDW), bone skates (SCHLITTS) and roasting trays (BACKW_01). The last, fourth factor of the control analysis clearly correlates with factor 3 from the basic solution of the principal component analysis. Pointed bone tools (SPIT_KGI), clay weights (GEWICHT), whetstones (SCHLEIFS), spindle whorls (SPIN-NWIR) and bone skates (SCHLITTS) have as strong relationship with both factors, expressed by a higher factor loading.

Based on the results of the control principal component analysis we can state that the PCA solutions obtained are very stable and the basic structures remain even when we modify the descriptive matrix parameters. Their validity and purpose need to be verified and explained in the process of validation and interpretation.

4.3.3 *Validation of formal structures*

Validation is an important part of the archaeological method¹³⁵ carried out in order to confirm the validity of the structures identified in the

¹³⁵ Neustupný (1997b), p. 243.

Tab. 62. Rotated Component Matrix.

	Component			
	1	2	3	4
SCHLOSS	0.636			
PFEILSPI	0.633			
STABCHEN	0.607	0.231		0.204
EIMER	0.592			
AUSR_REI	0.591		0.223	
BESCHLAG	0.583	0.368		
WZ		0.684		
BARRE_FE		0.571	-0.248	
BLECH_FE		0.450		
WZ_SCHMI	0.397	0.424		
MAHLSTEI			0.721	
ZIEGEL			0.674	
WZ_LANDW		0.440	0.465	-0.255
SCHLITTS			0.458	0.212
BACKW_01	0.307	0.234	0.413	
SPIT_KGI		0.257		0.645
GEWICHT			0.227	0.595
SCHLEIFS		0.320		0.581
SPINNWIR				0.545

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 7 iterations.

synthesis phase. This step is extremely important especially in archaeology although it is often neglected. We should keep in mind that archaeological records are a result of the action of many processes. Without a properly conducted validation we cannot be sure whether the extracted structures were generated by chance or are a product of various transformations which act as an efficient filter between us and the living culture in the past. A correctly performed validation can also help us with the interpretation of the formal archaeological structures. We take advantage of the so-called external evidence, i.e. features and variables not included in the original descriptive matrix that the synthesis of the structures was based on. The validation starts from the fundamental premise, according to which the same structure cannot be obtained accidentally from different independent data.

4.3.3.1 Validation by slag

Data on the presence of slag in the settlement features provide important external evidence which was not included in the original

descriptive matrix. As opposed to the variables from the basic solution representing individual tools, products or articles of everyday use, slag is production waste. According to B. Dostál, slag finds provide convincing evidence of blacksmithing and other iron working activities, more so when it occurs in some features in higher concentrations.¹³⁶ His conclusion was based both on logical inference and the circumstances in other important early medieval manufacturing and commercial centres.¹³⁷

The presence of slag in the individual settlement features from the Forest Nursery is quantified in two ways. One of them takes into consideration the absolute weight of slag in a settlement feature (SCH), the other the number of large smithing slag cakes (SCHPK). The latter form in the ash at the bottom of the furnace and are a clear proof of iron smelting.¹³⁸

If any of the extracted factors of the basic analysis is related to iron metallurgy, then the variables defined above should maintain a dominant position in it. To verify this we will add both variables related to slag to the descriptive matrix of the basic analysis (Tab. 63) and perform a new principal component analysis.

Tab. 63. Descriptive Statistics.

	Mean	Std. Deviation	Analysis N
EIMER	0.1947	0.8283	262
SPIT_KGI	0.5802	1.3215	262
WZ_SCHMI	5.725E-02	0.4383	262
AUSR_REI	2.672E-02	0.1838	262
WZ_LANDW	3.435E-02	0.1825	262
SCHLOSS	2.672E-02	0.1616	262
SCHLEIFS	0.2366	0.5915	262
SCHLITTS	3.435E-02	0.2024	262
BARRE_FE	5.344E-02	0.2716	262
WZ	1.527E-02	0.1228	262
BACKW_01	8.779E-02	0.2835	262
BLECH_FE	0.2023	0.5816	262
SPINNWIR	0.2061	0.7135	262
ZIEGEL	2.290E-02	0.1736	262
PFEILSPI	6.489E-02	0.2468	262

¹³⁶ Dostál 1993a; 1993b, 47–48)

¹³⁷ E.g. Hedeby; Schietzel (1981).

¹³⁸ E.g. Klíma (1985), p. 444; Pleiner (1967), pp. 106–108; (2000), p. 255.

Tab. 63 (cont.)

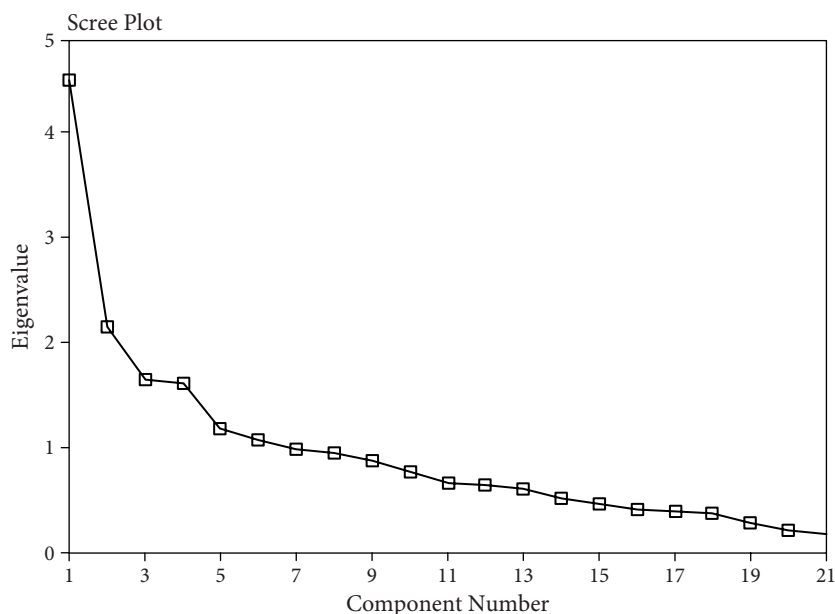
	Mean	Std. Deviation	Analysis N
STABCHEN	0.2824	1.0776	262
GEWICHT	0.1221	0.5743	262
MAHLSTEI	0.2748	1.2227	262
BESCHLAG	0.1069	0.4333	262
SCH	0.4997	1.6622	262
SCHPK	0.5649	2.4607	262

Extraction Method: Principal Component Analysis.

Tab. 64. Eigenvalues.

Initial Eigenvalues				Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.606	21.933	21.933	3.757	17.892	17.892
2	2.212	10.532	32.465	2.387	11.367	29.259
3	1.687	8.032	40.497	2.104	10.018	39.277
4	1.645	7.835	48.332	1.902	9.055	48.332
5	1.206	5.744	54.076			
6	1.099	5.235	59.311			
7	1.007	4.797	64.109			
8	0.969	4.616	68.725			
9	0.904	4.305	73.030			
10	0.795	3.785	76.815			
11	0.684	3.256	80.071			
12	0.653	3.109	83.180			
13	0.623	2.969	86.149			
14	0.538	2.563	88.712			
15	0.470	2.236	90.948			
16	0.414	1.973	92.922			
17	0.395	1.882	94.804			
18	0.379	1.804	96.608			
19	0.301	1.432	98.039			
20	0.223	1.063	99.102			
21	0.189	0.898	100.000			

Extraction Method: Principal Component Analysis. Total Variance Explained.



The four rotated factors (Tab. 64) remained virtually unchanged compared to the basic analysis. Both control variables took up a dominating position only in factor 1 (Tab. 65). The other factors have a lower loading as far as these variables are concerned. This confirmed the initial presumption of the validation and the existence of an archaeological structure which appeared as factor 1 can be considered confirmed. It is undoubtedly related to the work of the iron processing workshops in the Forest Nursery at Pohansko.

4.3.3.2 *Validation by sunken-floored settlement features*

One of the most important validation criteria is the relation between the formal structures generated on the basis of artefacts other than pottery and settlement feature types. We presume that the function of the individual buildings should be independently manifested both in the range of artefacts found inside each one of them and the specific shapes or interior furnishings and building details.¹³⁹

The comparison will be based on factor scores which indicate how typical the objects from the original descriptive system are for each

¹³⁹ More in Dostál (1993a); Dostál (1993b).

Tab. 65. Rotated Component Matrix.

	Component			
	1	2	3	4
SCH	0.80	0.19	0.16	−0.02
WZ_SCHMI	0.77	0.10	0.06	0.00
STABCHEN	0.75	0.34	0.13	0.00
SCHPK	0.70	0.11	−0.01	−0.05
BLECH_FE	0.67	0.16	0.14	0.10
WZ	0.59	−0.10	−0.03	0.04
WZ_LANDW	0.47	−0.03	−0.14	0.27
BARRE_FE	0.43	−0.04	0.19	−0.19
SCHLOSS	−0.02	0.72	0.02	−0.05
AUSR_REI	0.02	0.71	0.05	0.10
PFEILSPI	0.11	0.63	0.10	0.00
BESCHLAG	0.31	0.60	0.07	−0.02
SPIT_KGI	0.15	0.11	0.81	0.01
SPINNWIR	−0.05	0.08	0.66	0.10
SCHLEIFS	0.14	0.10	0.65	−0.10
GEWICHT	0.08	−0.09	0.47	0.05
SCHLITTS	−0.03	0.15	0.41	0.18
MAHLSTEI	0.02	−0.08	0.04	0.84
ZIEGEL	−0.05	−0.01	0.16	0.76
EIMER	0.07	0.48	0.04	0.57
BACKW_01	0.31	0.32	0.14	0.33

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

factor. The factor score is calculated from the matrix of Great Moravian assemblages/features, which, in addition to the basic variables, also contains slag data. The factor score values will subsequently be compared against the settlement feature type data (see Chap. 4.1.1).

In the following table (Tab. 66), each of the 262 Great Moravian features is described by its type, pertaining to a relative-chronological group of pottery, the number of artefacts other than pottery, and factor scores. The factor score values are also visualized in two scatter plots (Diagram 58–Diagram 59).

From the table presented above we can calculate the average value of each factor for all characteristic types of settlement features, defined in the Forest Nursery (B—wells, FS—isolated hearts and ovens, GEO—large sunken-floored features, GH—sunken-floored dwellings, R—trough-shaped features). The average values can be displayed in

Tab. 66. Břeclav-Pohansko. The Forest Nursery. Great Moravian features described by its type, the relative-chronological group of pottery, the number of artefacts other than pottery, and factor scores.

FEATURE	POTTERY- CHRONOLOGICAL GROUPS	FEATURE TYPE (OB_T_NEX)	NUMBER OF ITEMS	FAC1	FAC2	FAC3	FAC4
1	3	GH	7	-0.296	-0.261	0.427	-0.383
2			2	-0.242	-0.289	-0.454	0.186
3			5	-0.031	-0.054	0.374	0.010
4	4		6	0.013	-0.278	0.191	-0.196
5			1	-0.265	-0.206	-0.441	-0.188
7	2		3	-0.398	-0.005	-0.039	0.168
9	3		1	-0.265	-0.206	-0.441	-0.188
10			0	-0.265	-0.206	-0.441	-0.188
11			0	-0.265	-0.206	-0.441	-0.188
12	3		42	12.331	-1.083	-1.214	0.246
13	2	FS	3	0.026	-0.252	-0.117	-0.162
14			0	-0.265	-0.206	-0.441	-0.188
15			1	-0.279	-0.232	-0.133	-0.222
16			1	-0.282	-0.235	0.119	-0.349
17			4	-0.328	-0.478	-0.014	0.966
18	3		5	-0.274	-0.232	-0.132	-0.223
19			0	-0.265	-0.206	-0.441	-0.188
20			2	-0.372	-0.258	0.338	-0.198
21	3		6	1.135	-0.536	0.900	-0.806
22	3		15	1.662	-1.709	-0.013	2.195
23		FS	0	-0.265	-0.206	-0.441	-0.188
24			0	-0.265	-0.206	-0.441	-0.188
27			1	-0.084	0.105	-0.404	0.338
29			0	-0.265	-0.206	-0.441	-0.188
30			1	0.755	-0.605	-1.059	0.636
32			0	-0.265	-0.206	-0.441	-0.188
33			0	-0.265	-0.206	-0.441	-0.188
34	3		11	0.519	0.841	1.138	-0.549
35			0	-0.265	-0.206	-0.441	-0.188
36			1	-0.265	-0.206	-0.441	-0.188
37		FS	0	-0.265	-0.206	-0.441	-0.188
38	2		30	0.041	2.598	3.927	-0.733
39	3		13	0.523	-0.873	2.126	-1.249
41			0	-0.265	-0.206	-0.441	-0.188
42			3	-0.072	0.023	-0.419	0.714
43			1	-0.282	-0.235	0.119	-0.349
44	2		3	0.207	0.060	-0.081	0.365
45	3		3	-0.280	-0.236	0.119	-0.350
46			0	-0.265	-0.206	-0.441	-0.188
47			0	-0.265	-0.206	-0.441	-0.188
49	2	GH	4	-0.291	-0.288	0.654	-0.246
51			0	-0.265	-0.206	-0.441	-0.188
52			0	-0.265	-0.206	-0.441	-0.188
54			0	-0.265	-0.206	-0.441	-0.188
55	4		15	1.655	1.317	-0.618	0.671
56	4		1	-0.251	-0.207	-0.439	-0.191
57	4		23	0.041	5.094	-1.177	0.723
58	4		19	-0.871	7.770	-1.485	0.156
59			0	-0.265	-0.206	-0.441	-0.188

Tab. 66 (*cont.*)

FEATURE	POTTERY- CHRONOLOGICAL GROUPS	FEATURE TYPE (OB_T_NEX)	NUMBER OF ITEMS	FAC1	FAC2	FAC3	FAC4
60			5	-0.729	-0.337	1.912	-0.067
61			0	-0.265	-0.206	-0.441	-0.188
62			2	-0.358	-0.232	0.030	-0.164
64			0	-0.265	-0.206	-0.441	-0.188
65	4		0	-0.259	-0.206	-0.440	-0.189
67	3		5	-0.261	-0.346	1.609	-0.624
71			0	-0.265	-0.206	-0.441	-0.188
73			0	-0.265	-0.206	-0.441	-0.188
74			0	-0.265	-0.206	-0.441	-0.188
76			0	-0.265	-0.206	-0.441	-0.188
77			1	0.105	-0.229	-0.419	-0.138
78			0	-0.265	-0.206	-0.441	-0.188
79			0	-0.265	-0.206	-0.441	-0.188
80			2	0.225	-0.238	-0.489	-0.265
81			0	-0.265	-0.206	-0.441	-0.188
82	3		14	2.853	0.360	-1.262	2.615
83			5	0.675	-0.265	-0.511	-0.335
84	3		4	1.231	-1.224	0.533	-0.106
85			7	0.043	-0.442	0.136	0.827
87		GH	0	-0.265	-0.206	-0.441	-0.188
88	2		3	-0.299	-0.265	0.678	-0.510
89		FS	0	-0.265	-0.206	-0.441	-0.188
90			0	-0.265	-0.206	-0.441	-0.188
91	4	GH	8	0.914	-0.975	-0.558	2.069
92	3		1	0.040	-0.226	-0.425	-0.128
93	4	GEO	7	0.694	-0.226	1.272	-1.364
94			0	-0.265	-0.206	-0.441	-0.188
95			1	-0.130	-0.212	-0.428	-0.209
96			1	0.053	-0.227	-0.424	-0.130
97	3		0	-0.162	-0.211	-0.431	-0.204
98			2	-0.084	0.105	-0.404	0.338
99	4		6	0.213	-0.500	0.176	-0.637
100			0	-0.265	-0.206	-0.441	-0.188
101			1	-0.265	-0.206	-0.441	-0.188
103		GEO	0	-0.265	-0.206	-0.441	-0.188
104		GH	2	-0.270	-0.401	0.296	-0.209
105	3	GEO	12	0.601	-0.354	-0.178	-0.194
106	2	GEO	28	1.185	8.911	-1.076	-0.317
107	3	GEO	13	0.382	1.861	1.029	-0.849
108	2	GEO	11	-0.044	3.114	0.694	-0.022
109	5		71	4.692	-0.127	-0.338	-1.083
110	5		39	1.888	2.261	1.516	-1.046
111a			47	0.681	2.643	4.150	1.134
111b			2	-0.269	-0.314	-0.148	0.154
111c			1	-0.282	-0.235	0.119	-0.349
111d			0	-0.265	-0.206	-0.441	-0.188
112			24	-0.140	-0.242	0.132	-0.371
113	2		66	2.464	-0.083	0.693	-1.433
114			35	3.579	0.803	-0.181	-0.900
115			8	0.921	-0.613	-1.044	0.611

Tab. 66 (*cont.*)

FEATURE	POTTERY- CHRONOLOGICAL GROUPS	FEATURE TYPE (OB_T_NEX)	NUMBER OF ITEMS	FAC1	FAC2	FAC3	FAC4
116			0	-0.030	-0.223	-0.481	-0.226
117			2	-0.372	-0.258	0.338	-0.198
117a			0	-0.265	-0.206	-0.441	-0.188
118		FS	0	-0.265	-0.206	-0.441	-0.188
119			7	-0.072	0.105	-0.403	0.336
120		FS	2	-0.225	-0.261	0.181	-0.267
122		FS	1	-0.437	0.968	-0.474	-0.372
123			1	0.207	-0.264	-0.182	-0.298
124			0	-0.265	-0.206	-0.441	-0.188
125	2	GEO	14	-0.276	-0.575	2.911	-0.413
125a		B	0	-0.265	-0.206	-0.441	-0.188
126	3		16	0.023	-0.318	0.858	0.333
127			0	-0.265	-0.206	-0.441	-0.188
128			0	-0.248	-0.207	-0.439	-0.191
129			0	-0.265	-0.206	-0.441	-0.188
130	3		2	-0.273	-0.405	0.548	-0.336
131			0	-0.265	-0.206	-0.441	-0.188
132			2	-0.265	-0.206	-0.441	-0.188
133	2		25	0.606	-0.374	1.091	-0.271
134	3		8	-0.437	0.968	-0.474	-0.372
135	3		4	-0.282	-0.235	0.119	-0.349
136			0	-0.265	-0.206	-0.441	-0.188
137		FS	0	-0.265	-0.206	-0.441	-0.188
138			1	-0.263	-0.233	-0.131	-0.225
139			1	-0.265	-0.206	-0.441	-0.188
140		FS	0	-0.265	-0.206	-0.441	-0.188
141			0	-0.265	-0.206	-0.441	-0.188
142			0	-0.265	-0.206	-0.441	-0.188
143	3		8	-0.011	-0.059	0.628	-0.121
144	2		3	0.004	0.343	-0.030	-0.227
145	5		2	-0.265	-0.206	-0.441	-0.188
146		FS	0	-0.265	-0.206	-0.441	-0.188
147			0	-0.265	-0.206	-0.441	-0.188
148			0	-0.265	-0.206	-0.441	-0.188
149			0	-0.265	-0.206	-0.441	-0.188
150			0	-0.258	-0.206	-0.440	-0.190
151	3		3	-0.132	0.948	-0.458	-0.311
152		FS	0	-0.265	-0.206	-0.441	-0.188
153			2	0.360	0.079	-0.376	0.378
154			3	-0.074	0.023	-0.419	0.715
155			0	-0.256	-0.206	-0.440	-0.190
156	4		1	-0.358	-0.232	0.030	-0.164
157		B	0	-0.265	-0.206	-0.441	-0.188
158	2		4	0.253	-0.332	-0.197	-0.249
159	2	R	3	0.017	-0.282	0.443	-0.324
160		R	0	-0.265	-0.206	-0.441	-0.188
161			0	-0.265	-0.206	-0.441	-0.188
162		FS	0	-0.265	-0.206	-0.441	-0.188
163			0	-0.265	-0.206	-0.441	-0.188
164			0	-0.265	-0.206	-0.441	-0.188

Tab. 66 (*cont.*)

FEATURE	POTTERY- CHRONOLOGICAL GROUPS	FEATURE TYPE (OB_T_NEX)	NUMBER OF ITEMS	FAC1	FAC2	FAC3	FAC4
165		FS	0	-0.265	-0.206	-0.441	-0.188
166			0	-0.265	-0.206	-0.441	-0.188
168			5	-0.657	2.039	0.123	-0.889
169		FS	1	-0.358	-0.232	0.030	-0.164
170			1	-0.358	-0.232	0.030	-0.164
171			1	-0.265	-0.206	-0.441	-0.188
172	3	R	5	0.179	-0.213	0.435	-0.349
173			2	0.040	-0.226	-0.425	-0.128
174		B	0	-0.265	-0.206	-0.441	-0.188
175	3		4	1.314	-0.561	-1.043	0.658
176			0	-0.265	-0.206	-0.441	-0.188
177	3	R	27	0.573	0.134	1.038	3.947
178			0	-0.265	-0.206	-0.441	-0.188
179			0	-0.265	-0.206	-0.441	-0.188
180			0	-0.265	-0.206	-0.441	-0.188
181		FS	0	-0.265	-0.206	-0.441	-0.188
182			0	-0.265	-0.206	-0.441	-0.188
183			3	-0.110	1.581	-0.670	-0.558
184			0	-0.265	-0.206	-0.441	-0.188
185			0	-0.212	-0.208	-0.436	-0.197
186			0	-0.265	-0.206	-0.441	-0.188
187	2		3	-0.287	-0.258	0.176	-0.257
188	2		8	-0.271	1.295	0.496	0.176
189	3		7	-0.240	-0.397	-0.161	0.528
190			0	-0.265	-0.206	-0.441	-0.188
191	3	R	6	-0.337	-0.339	1.350	-0.485
192	4	R	9	-0.443	0.941	-0.166	-0.407
193		FS	0	-0.265	-0.206	-0.441	-0.188
194		B	3	-0.471	0.525	0.448	0.018
196	2	GEO	11	-0.614	1.680	1.188	0.019
197	2	FS	0	-0.246	-0.207	-0.439	-0.191
198		FS	1	-0.265	-0.206	-0.441	-0.188
199	3		5	-0.560	0.999	0.356	-0.002
200a		FS	0	-0.252	-0.207	-0.439	-0.190
200b			0	-0.265	-0.206	-0.441	-0.188
200c	2		17	0.039	-0.324	2.333	-0.681
200d		FS	2	-0.305	0.021	-0.509	0.144
200e			0	-0.265	-0.206	-0.441	-0.188
200f			0	-0.265	-0.206	-0.441	-0.188
200g			0	-0.265	-0.206	-0.441	-0.188
201	3		9	0.254	-0.022	-0.574	1.191
202		FS	0	-0.265	-0.206	-0.441	-0.188
203	2	B	23	-0.418	0.952	-0.863	9.431
204	4		7	-0.022	0.140	0.789	0.345
205	3		1	0.090	-0.007	-0.566	0.081
206			1	-0.345	-0.233	0.031	-0.166
207			0	-0.265	-0.206	-0.441	-0.188
208	2		3	0.036	-0.256	0.136	-0.290
208b			0	-0.265	-0.206	-0.441	-0.188
209		B	2	-0.238	0.018	-0.503	0.134

Tab. 66 (*cont.*)

FEATURE	POTTERY- CHRONOLOGICAL GROUPS	FEATURE TYPE (OB_T_NEX)	NUMBER OF ITEMS	FAC1	FAC2	FAC3	FAC4
210			45	3.405	1.666	3.181	-0.221
211			0	1.640	-0.368	-0.980	-0.495
212		FS	0	-0.123	-0.212	-0.428	-0.210
213		FS	0	-0.188	-0.209	-0.434	-0.200
215	3	GEO	27	-0.629	-0.966	6.171	-0.844
216	4	GEO	10	1.056	1.535	-1.172	1.196
217	3	FS	9	-0.257	0.282	0.885	-0.403
218	3	GEO	10	-0.671	-0.253	2.844	-0.043
219			0	-0.265	-0.206	-0.441	-0.188
220			1	-0.279	-0.232	-0.133	-0.222
221	3	GEO	10	0.644	-0.406	1.272	-0.531
222			0	-0.265	-0.206	-0.441	-0.188
223	2		1	-0.095	-0.138	-0.448	-0.215
224	3	R	11	0.918	-1.198	2.790	-0.313
225			3	-0.450	0.942	-0.166	-0.406
225a	2		3	-0.359	0.223	-0.270	0.442
226	2		2	-0.237	-0.207	-0.438	-0.193
227	5		15	-0.355	-1.274	1.089	3.607
228			0	-0.265	-0.206	-0.441	-0.188
229			0	-0.246	-0.207	-0.439	-0.191
230			0	-0.259	-0.206	-0.440	-0.189
231			0	-0.265	-0.206	-0.441	-0.188
232			0	-0.216	-0.208	-0.436	-0.196
233	2	GEO	7	0.462	-0.492	1.045	-0.875
234			5	-0.227	-0.709	0.387	0.591
235	3	GEO	12	0.474	-0.811	1.210	4.077
236	3		7	-0.857	2.224	-0.329	-0.322
237			0	-0.265	-0.206	-0.441	-0.188
238		B	0	-0.265	-0.206	-0.441	-0.188
239			3	-0.287	-0.431	0.855	-0.370
240			5	-0.078	-0.139	-0.446	-0.218
241	3	GEO	4	-0.014	0.076	-0.089	0.291
242			1	-0.279	-0.232	-0.133	-0.222
242a			0	-0.265	-0.206	-0.441	-0.188
243	2		1	-0.251	-0.207	-0.439	-0.191
244			3	-0.487	-0.241	0.955	0.150
245	3		12	-0.589	0.852	0.175	3.960
246			2	-0.305	0.021	-0.509	0.144
247		GEO	9	0.051	-0.651	1.781	-0.290
248	3		13	-0.332	-0.565	2.649	-0.671
249			1	-0.213	0.390	-0.517	-0.312
250			0	-0.265	-0.206	-0.441	-0.188
251	5		17	0.440	-0.543	3.515	-0.578
252			0	-0.265	-0.206	-0.441	-0.188
253		FS	2	-0.279	-0.232	-0.133	-0.222
254a			0	-0.265	-0.206	-0.441	-0.188
254b	5		7	-0.129	0.024	0.771	0.109
254c			8	-0.496	-1.556	0.364	7.107
255	3		10	0.846	-0.295	2.299	-0.157
256		R	6	1.257	-0.348	0.327	-0.460

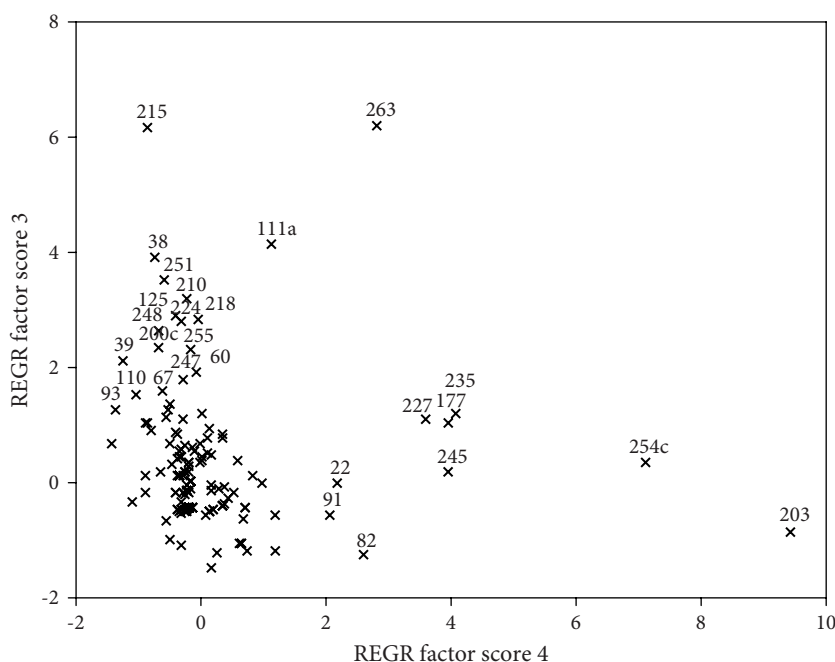


Diagram 59. Břeclav-Pohansko. The Forest Nursery. Factor analysis of assemblages/features with artefacts other than pottery.

a series of four bar graphs (Diagram 60–Diagram 63). The graphical depiction of the values clearly indicates the relations between the formal structures defined on the basis of artefacts other than pottery (including slag) and settlement feature types.

From the first graph it is obvious that there is no significant relationship between the characteristic settlement features and factor 1 (which had been validated earlier by slag and put in a relationship with blacksmithing). The situation with factor 2 was widely different as we recognize a particularly strong affinity with sunken-floored dwellings (GH). The opposite is noted with 3, which is closely related to large sunken-floored features (GEO) and trough-shaped features (R). The last, fourth, factor can be associated, based on the average value of the factor score, with wells (B).

Even this basic overview shows that there are non-random relationships between the settlement feature types and the tested formal structures. This proposition needs to be further verified.

One of the options in validating formal structures derived from artefacts other than pottery consists in extending the existing matrix with

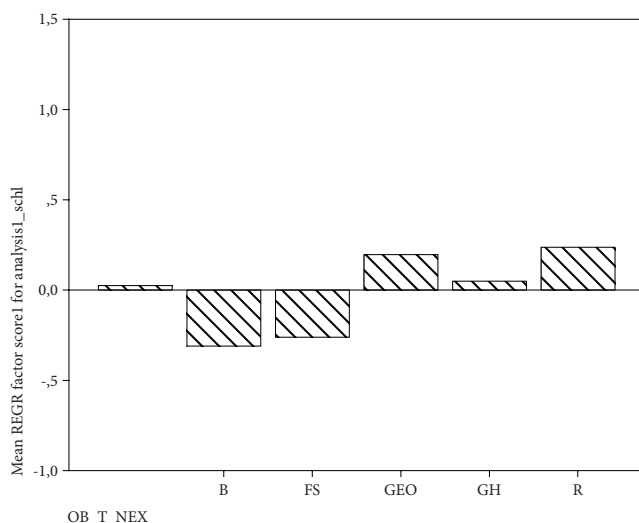


Diagram 60. Břeclav-Pohansko. The Forest Nursery. Average score of factor 1 calculated from assemblages with artefacts other than pottery for characteristic types of settlement features (B—wells, FS—isolated hearths and ovens, GEO—large sunken-floored features, GH—sunken-floored dwellings, R—trough-shaped features).

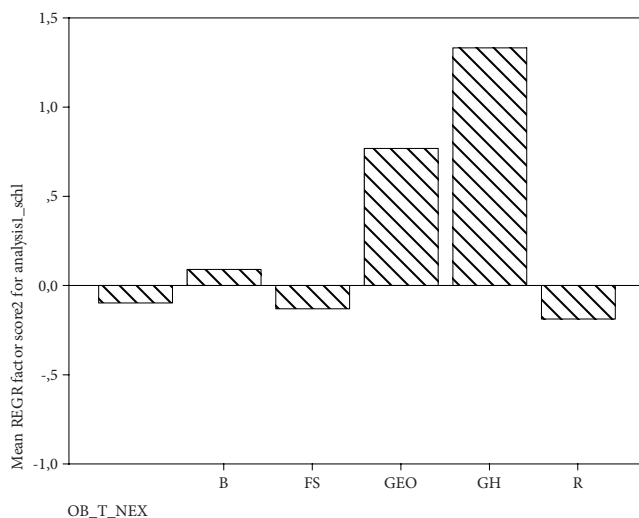


Diagram 61. Břeclav-Pohansko. The Forest Nursery. Average score of factor 2 calculated from assemblages with artefacts other than pottery for characteristic types of settlement features (B—wells, FS—isolated hearths and ovens, GEO—large sunken-floored features, GH—sunken-floored dwellings, R—trough-shaped features).

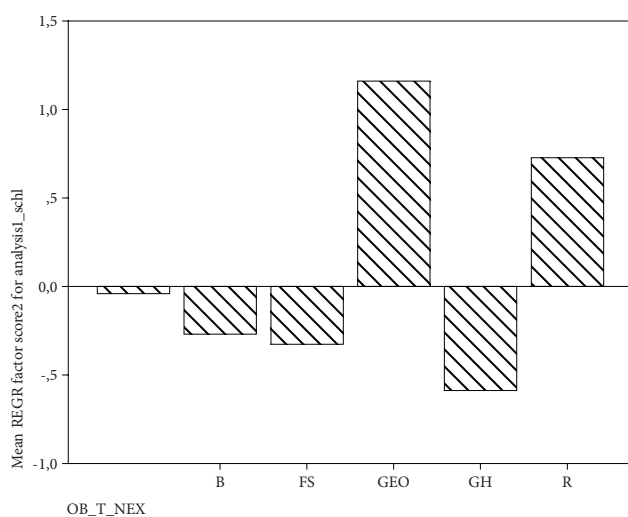


Diagram 62. Břeclav-Pohansko. The Forest Nursery. Average score of factor 3 calculated from assemblages with artefacts other than pottery for characteristic types of settlement features (B—wells, FS—isolated hearths and ovens, GEO—large sunken-floored features, GH—sunken-floored dwellings, R—trough-shaped features).

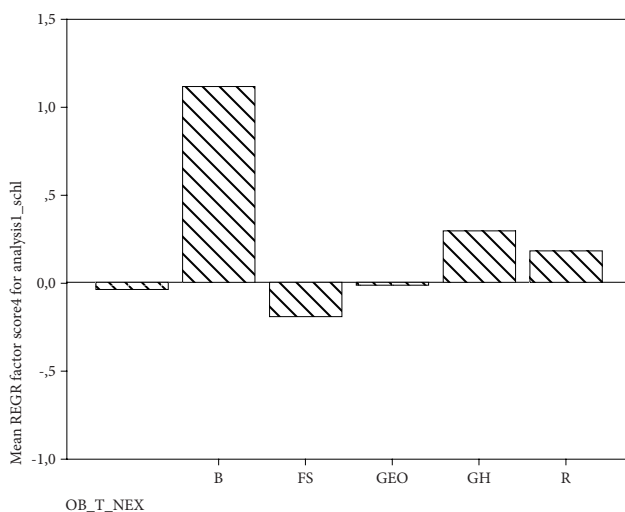


Diagram 63. Břeclav-Pohansko. The Forest Nursery. Average score of factor 4 calculated from assemblages with artefacts other than pottery for the characteristic types of settlement features (B—wells, FS—isolated hearths and ovens, GEO—large sunken-floored features, GH—sunken-floored dwellings, R—trough-shaped features).

variables of external evidence. Variables with values between 0 and 1 indicate to which specific type a particular settlement feature belongs. Given the limitations of the principal component analysis which is unable to work with the so-called “false zeros”,¹⁴⁰ we can include only one such variable in the descriptive matrix at a time. As a result we have to carry out a series of five principal component analyses in a row. Each of them will have a variable defining only one feature type at a time.

The first principal component analysis will be made with the added sunken-floored dwellings (GH) variable (Tab. 67).

Tab. 67. Rotated Component Matrix.

	Component			
	1	2	3	4
SCH	0.81	0.13	0.19	-0.02
WZ_SCHMI	0.78	0.05	0.07	0.00
STABCHEN	0.76	0.31	0.16	0.00
SCHPK	0.71	0.07	0.01	-0.04
BLECH_FE	0.66	0.20	0.10	0.10
WZ	0.58	-0.09	-0.05	0.05
WZ_LANDW	0.45	0.05	-0.20	0.27
BARRE_FE	0.43	-0.05	0.16	-0.19
BACKW_01	0.33	0.23	0.22	0.32
SCHLOSS	0.00	0.71	0.07	-0.06
BESCHLAG	0.31	0.65	0.06	-0.02
AUSR_REI	0.04	0.62	0.15	0.09
PFEILSPI	0.13	0.59	0.16	-0.01
GH2	-0.03	0.52	-0.27	0.07
SPIT_KGI	0.16	0.08	0.80	0.01
SPINNWIR	-0.04	0.06	0.65	0.10
SCHLEIFS	0.15	0.09	0.64	-0.10
SCHLITTS	-0.02	0.11	0.43	0.18
GEWICHT	0.07	-0.03	0.40	0.05
MAHLSTEI	0.01	-0.07	0.03	0.84
ZIEGEL	-0.05	-0.03	0.18	0.76
EIMER	0.07	0.49	0.05	0.56

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 5 iterations.

¹⁴⁰ Neustupný (1997b), p. 239.

The second principal component analysis will be extended by the large sunken-floored features GEO variable (Tab. 68).

Tab. 68. Rotated Component Matrix.

	Component			
	1	2	3	4
SCH	0.80	0.18	0.16	-0.03
WZ_SCHMI	0.77	0.09	0.07	-0.02
STABCHEN	0.76	0.33	0.12	0.00
SCHPK	0.70	0.11	-0.01	-0.06
BLECH_FE	0.68	0.15	0.11	0.10
WZ	0.59	-0.11	-0.05	0.05
WZ_LANDW	0.45	-0.01	-0.07	0.22
BARRE_FE	0.42	-0.04	0.21	-0.21
AUSR_REI	0.01	0.72	0.13	0.07
SCHLOSS	-0.01	0.72	0.03	-0.05
PFEILSPI	0.12	0.62	0.09	0.02
BESCHLAG	0.32	0.59	0.05	0.00
BACKW_01	0.30	0.33	0.22	0.29
SPIT_KGI	0.15	0.09	0.83	0.01
SCHLEIFS	0.15	0.07	0.63	-0.09
SPINNWIR	-0.03	0.05	0.59	0.14
GEO2	-0.01	0.26	0.52	-0.10
GEWICHT	0.09	-0.11	0.44	0.06
SCHLITTS	-0.04	0.14	0.43	0.16
MAHLSTEI	0.03	-0.08	0.03	0.84
ZIEGEL	-0.04	-0.01	0.17	0.76
EIMER	0.10	0.46	0.00	0.59

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

The third principal component analysis will be added to by the well B variable (Tab. 69).

Tab. 69. Rotated Component Matrix.

	Component			
	1	2	3	4
SCH	0.80	0.19	0.16	-0.04
WZ_SCHMI	0.77	0.10	0.05	-0.02
STABCHEN	0.75	0.34	0.13	-0.02

Tab. 69 (cont.)

	Component			
	1	2	3	4
SCHPK	0.70	0.12	-0.01	-0.06
BLECH_FE	0.67	0.16	0.14	0.07
WZ	0.59	-0.10	-0.02	0.02
WZ_LANDW	0.48	-0.03	-0.12	0.22
BARRE_FE	0.42	-0.04	0.18	-0.19
BACKW_01	0.32	0.31	0.15	0.30
SCHLOSS	-0.02	0.73	0.02	-0.05
AUSR_REI	0.02	0.71	0.05	0.09
PFEILSPI	0.11	0.63	0.11	-0.01
BESCHLAG	0.30	0.60	0.07	-0.01
SPIT_KGI	0.15	0.12	0.82	-0.02
SPINNWIR	-0.05	0.09	0.66	0.08
SCHLEIFS	0.13	0.11	0.65	-0.11
GEWICHT	0.08	-0.08	0.47	0.02
SCHLITTS	-0.03	0.14	0.39	0.24
MAHLSTEI	0.05	-0.09	0.07	0.80
ZIEGEL	-0.03	-0.02	0.19	0.72
EIMER	0.09	0.47	0.04	0.59
B	-0.05	0.01	-0.11	0.45

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

The fourth principal component analysis is based on a descriptive matrix with the hearth FS variable added (Tab. 70).

Tab. 70. Rotated Component Matrix.

	Component			
	1	2	3	4
SCH	0.80	0.19	0.17	-0.02
WZ_SCHMI	0.77	0.10	0.06	0.00
STABCHEN	0.75	0.34	0.14	0.00
SCHPK	0.70	0.11	0.00	-0.04
BLECH_FE	0.66	0.16	0.15	0.10
WZ	0.59	-0.10	-0.02	0.05
WZ_LANDW	0.47	-0.03	-0.13	0.28
BARRE_FE	0.43	-0.04	0.19	-0.19
SCHLOSS	-0.02	0.72	0.03	-0.05

Tab. 70 (*cont.*)

	Component			
	1	2	3	4
AUSR_REI	0.02	0.71	0.06	0.10
PFEILSPI	0.11	0.63	0.10	0.00
BESCHLAG	0.31	0.60	0.08	-0.02
SPIT_KGI	0.14	0.12	0.81	-0.01
SCHLEIFS	0.13	0.10	0.66	-0.11
SPINNWIR	-0.06	0.09	0.65	0.09
GEWICHT	0.08	-0.09	0.47	0.04
SCHLITTS	-0.04	0.15	0.41	0.17
FS2	-0.10	-0.02	-0.19	-0.11
MAHLSTEI	0.01	-0.08	0.05	0.84
ZIEGEL	-0.06	-0.01	0.17	0.75
EIMER	0.07	0.48	0.05	0.57
BACKW_01	0.31	0.32	0.16	0.33

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

The fifth principal component analysis was performed with the added trough-shaped features R variable (Tab. 71).

Tab. 71. Rotated Component Matrix.

	Component			
	1	2	3	4
SCH	0.80	0.18	0.16	-0.02
WZ_SCHMI	0.77	0.09	0.05	0.00
STABCHEN	0.75	0.33	0.13	0.01
SCHPK	0.70	0.10	0.00	-0.04
BLECH_FE	0.67	0.15	0.15	0.10
WZ	0.58	-0.10	-0.03	0.04
WZ_LANDW	0.47	-0.04	-0.14	0.27
BARRE_FE	0.43	-0.02	0.17	-0.20
SCHLOSS	-0.01	0.71	0.00	-0.04
AUSR_REI	0.03	0.71	0.02	0.10
PFEILSPI	0.12	0.62	0.09	0.01
BESCHLAG	0.31	0.60	0.05	-0.01
SPIT_KGI	0.14	0.15	0.80	0.00
SCHLEIFS	0.13	0.13	0.64	-0.11
SPINNWIR	-0.06	0.15	0.61	0.09

Tab. 71 (*cont.*)

	Component			
	1	2	3	4
GEWICHT	0.08	−0.11	0.54	0.05
SCHLITTS	−0.04	0.20	0.35	0.17
R2	0.05	−0.14	0.31	0.06
MAHLSTEI	0.02	−0.10	0.06	0.84
ZIEGEL	−0.06	0.01	0.14	0.76
EIMER	0.08	0.45	0.05	0.58
BACKW_01	0.32	0.31	0.14	0.33

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 5 iterations.

The following table (Tab. 72) presents a summary of the factor loadings of the control variables from all of the five principle component analyses performed. It is clear from the result that each of the typical features (except isolated furnaces and hearths—FS) has a dominant position, expressed by a high loading, to only one of the factors 2, 3 or 4. In factor 1 there were again no relationships with typical settlement features. On the contrary factor 3 had a dominant relationship with two variables: large sunken-floored features (GEO) and trough-shaped features (R). The result again points to the fact that the relationship between two independent phenomena—formal structures derived from artefacts other than pottery and settlement feature types—is not random.

The relation established between the tested formal structures and the settlement feature types can be verified by yet another special analysis. Based on our knowledge of the formal properties of the settlement features from the Forest Nursery (see Chap. 4.1.1.2) we can define descriptors which express in the best possible way the variability of the settlement features in the Forest Nursery. They include the total area of the feature at the subsoil level (FLACHE), maximum depth identified in the feature (TIEFE), ratio of the maximum length to the maximum width of the feature (LAN_BREI) and the presence of the hearth in the corner of the feature (FS_ECKE). We can enter those characteristic variables in the descriptive matrix with artefacts other than pottery, and conduct a new principal component analysis. If the new variables do not interfere with the existing formal structures and

Tab. 72. Břeclav-Pohansko. The Forest Nursery. Summary of the factor loadings of the control variables (typical features).

<i>TYP OBJEKTU</i>	<i>FAC 1</i>	<i>FAC 2</i>	<i>FAC 3</i>	<i>FAC 4</i>
<i>GH</i>	-0.03	<u>0.52</u>	-0.27	0.07
<i>GEO</i>	-0.01	0.26	<u>0.52</u>	-0.10
<i>B</i>	-0.05	0.01	-0.11	<u>0.45</u>
<i>FS</i>	-0.10	-0.02	-0.19	-0.11
<i>R</i>	0.05	-0.14	<u>0.31</u>	0.06

take up a dominant position in any of the existing factors we can justifiably presume that the same structure exists in two mutually independent groups of archaeological data.

The descriptive matrix that the present control factor solution will be based on will be composed of 24 columns (variables) and 238 rows, representing Great Moravian settlement features, from which we could acquire full and complete information. Variable BACKW_01 was omitted as it has already shown itself to be relatively unstructuring in the basic analysis.

The resulting rotated solution (Tab. 73) indicates that the existing formal structures remain virtually unchanged. The variables representing the area of the features (FLACHE), their depth (TIEFE) and the length-width index (LAN_BREI) maintain an important position in factor 2. It is evidently in connection with the strong relationship of this factor with large sunken-floored features (GEO) and trough-shaped features (R), identified earlier by previously performed control factor solutions. Both types of features are characterised by the high values of the attributes mentioned above (see Chap. 4.1.1.3). Variables defining a hearth in the corner of the feature (FS_ECKE) and a greater area of the feature (FLACHE) have an increased factor loading on factor 3. This can be put in connection with sunken-floored dwellings (GH) which also have a significant affinity with factor 3. Factor 4 is characterized by only one high loading of the control variable, i.e. the depth (TIEFE). This finding confirms the linking of factor 4 with well-like features.

The completed validation shows that the validity of all the formal structures defined based on artefacts other than pottery can be confirmed using independent external evidence—metallurgical waste or the variables characteristic of the settlement features. In the following

Tab. 73. Rotated Component Matrix.

	Component			
	1	2	3	4
SCH	0.810			
WZ_SCHMI	0.773			
STABCHEN	0.773		0.308	
SCHPK	0.713			
BLECH_FE	0.677			
WZ	0.579			
WZ_LANDW	0.451			0.261
BARRE_FE	0.438			
SPIT_KGI		0.809		
SCHLEIFS		0.658		
FLACHE		0.611	0.218	
SPINNWIR		0.528		
GEWICHT		0.516		
TIEFE		0.495		0.408
SCHLITTS		0.420		
LAN_BREI		0.316		
SCHLOSS			0.766	
AUSR_REI			0.698	
PFEILSPI			0.626	
BESCHLAG	0.339		0.592	
FS_ECKE			0.237	
MAHLSTEI				0.816
ZIEGEL				0.772
EIMER			0.508	0.537

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

tables (Tab. 74–Tab. 77) and diagrams (Diagram 64–Diagram 81) the findings can be checked by means of the absolute values, that express the average count of specific types of finds in the individual feature types. The calculation is based on a set of forty Great Moravian features, which could be assigned to some of the characteristic types of settlement features and which contained at least one artefact other than pottery. The graphs present the average count of objects of a given type in a single feature of a given type (Diagram 64–Diagram 81).

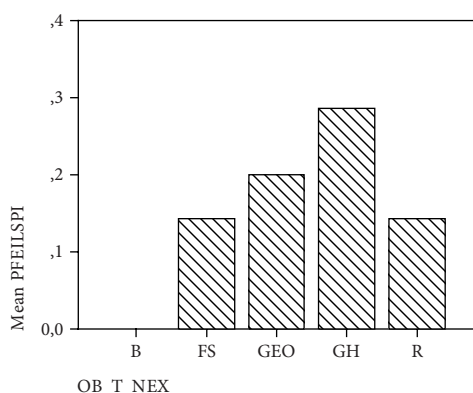


Diagram 64. Břeclav-Pohansko. The Forest Nursery. Average count of arrowheads in a single settlement feature of a particular type.

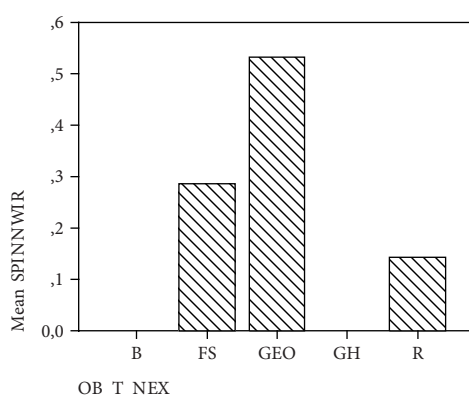


Diagram 65. Břeclav-Pohansko. The Forest Nursery. Average count of whorls in a single settlement feature of a particular type.

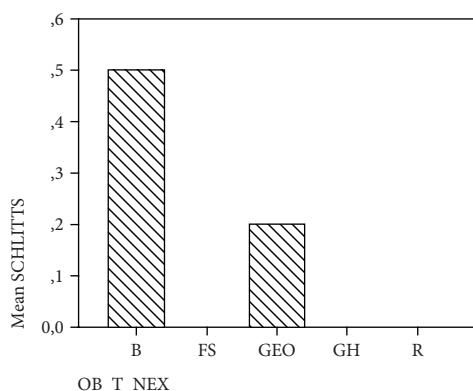


Diagram 66. Břeclav-Pohansko. The Forest Nursery. Average count of the so-called bone skates in a single settlement feature of a particular type.

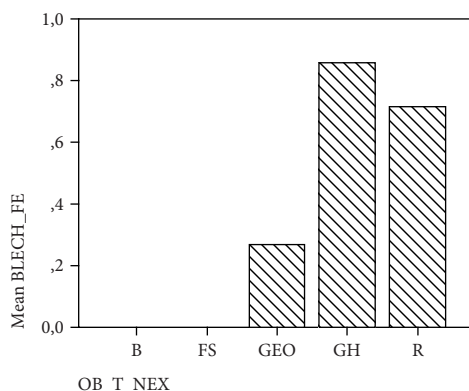


Diagram 67. Břeclav-Pohansko. The Forest Nursery. Average count of fragments of iron sheetmetal in a single settlement feature of a particular type.

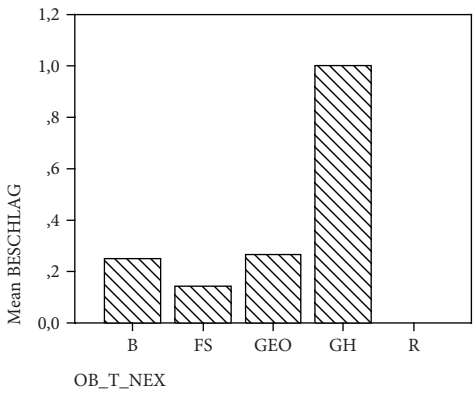


Diagram 68. Břeclav-Pohansko. The Forest Nursery. Average count of iron mounts in a single settlement feature of a particular type.

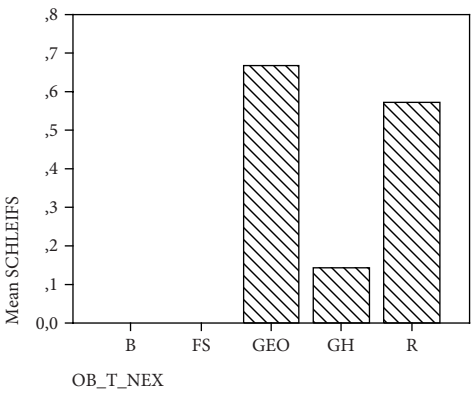


Diagram 69. Břeclav-Pohansko. The Forest Nursery. Average count of whetstones in a single settlement feature of a particular type.

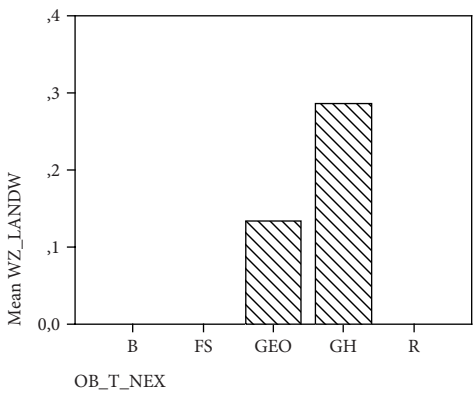


Diagram 70. Břeclav-Pohansko. The Forest Nursery. Average count of agricultural tools in a single settlement feature of a particular type.

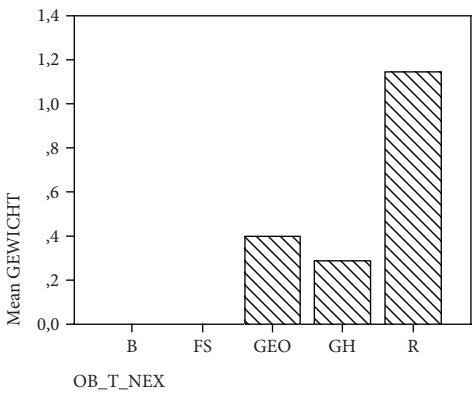


Diagram 71. Břeclav-Pohansko. The Forest Nursery. Average count of clay weights in a single settlement feature of a particular type.

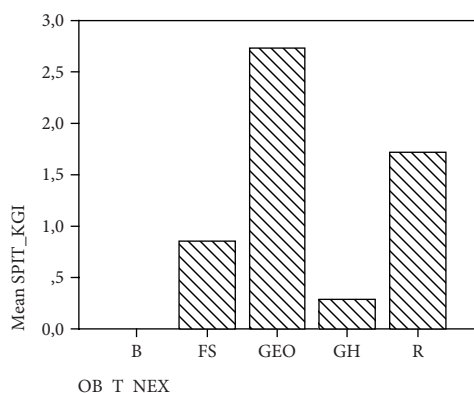


Diagram 72. Břeclav-Pohansko. The Forest Nursery. Average count of pointed bone tools in a single settlement feature of a particular type.

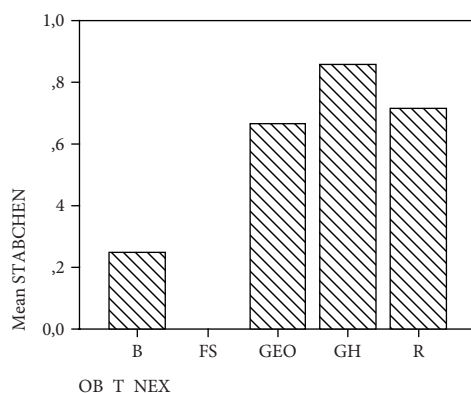


Diagram 73. Břeclav-Pohansko. The Forest Nursery. Average count of iron bars in a single settlement feature of a particular type.

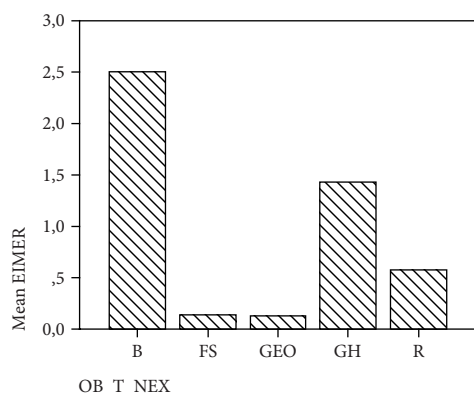


Diagram 74. Břeclav-Pohansko. The Forest Nursery. Average count of bucket components in a single settlement feature of a particular type.

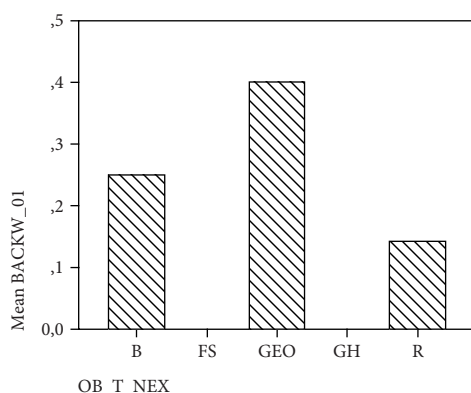


Diagram 75. Břeclav-Pohansko. The Forest Nursery. Average count of roasting trays in a single settlement feature of a particular type.

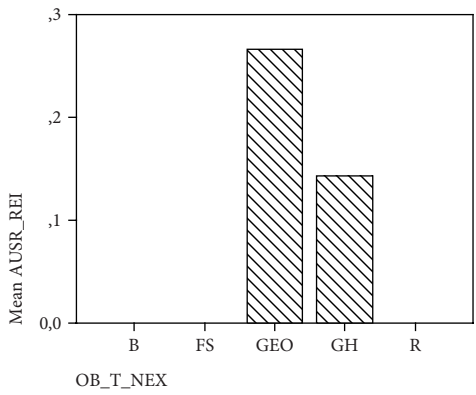


Diagram 76. Břecław-Pohansko. The Forest Nursery. Average count of horse gear components in a single settlement feature of a particular type.

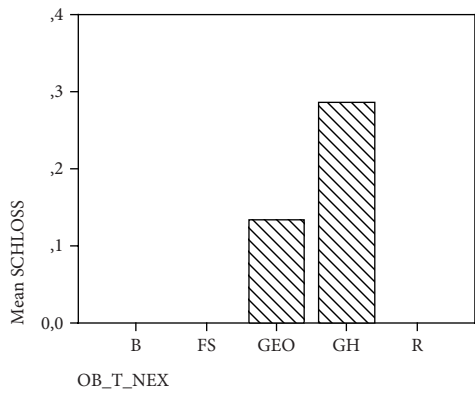


Diagram 77. Břecław-Pohansko. The Forest Nursery. Average count of parts of locks and keys in a single settlement feature of a particular type.

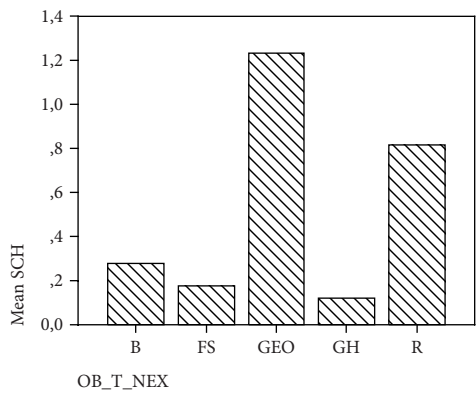


Diagram 78. Břecław-Pohansko. The Forest Nursery. Average weight (in kilograms) of slag in a single settlement feature of a particular type.

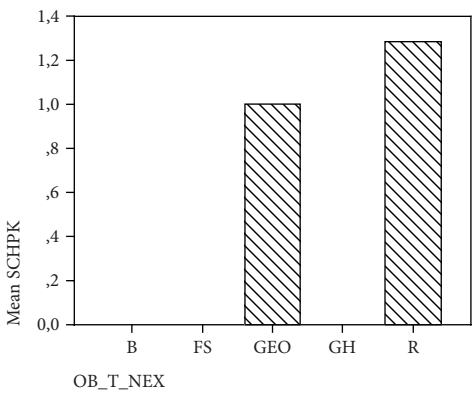


Diagram 79. Břecław-Pohansko. The Forest Nursery. Average count of large smithing slag cakes in a single settlement feature of a particular type.

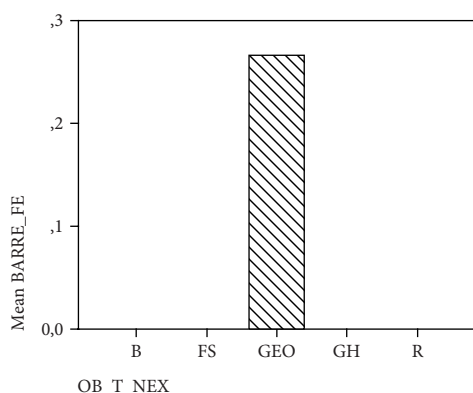


Diagram 80. Břeclav-Pohansko. The Forest Nursery. Average count of iron ingots in a single settlement feature of a particular type.

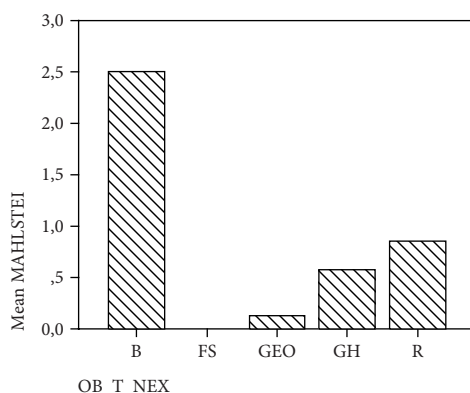


Diagram 81. Břeclav-Pohansko. The Forest Nursery. Average count of quernstones in a single settlement feature of a particular type.

Tab. 74. Břeclav-Pohansko. The Forest Nursery. Average count of specific types of finds in a single settlement feature of a particular type. Case Summaries.

OBJEKT TYP		PFEILSPI	BLECH_FE	BESCHLAG	WZ_LANDW	STABCHEN
B	N	4	4	4	4	4
	Mean	0	0	0.2500	0	0.2500
	% of Total Sum	0%	0%	7.7%	0%	4.5%
	Sum	0	0	1	0	1
FS	N	7	7	7	7	7
	Mean	0.1429	0	0.1429	0	0
	% of Total Sum	14.3%	0%	7.7%	0%	0%
	Sum	1	0	1	0	0
GEO	N	15	15	15	15	15
	Mean	0.2000	0.2667	0.2667	0.1333	0.6667
	% of Total Sum	42.9%	26.7%	30.8%	50.0%	45.5%
	Sum	3	4	4	2	10
GH	N	7	7	7	7	7
	Mean	0.2857	0.8571	10	0.2857	0.8571
	% of Total Sum	28.6%	40.0%	53.8%	50.0%	27.3%
	Sum	2	6	7	2	6
R	N	7	7	7	7	7
	Mean	0.1429	0.7143	0	0	0.7143
	% of Total Sum	14.3%	33.3%	0.0%	0.0%	22.7%
	Sum	1	5	0	0	5
Total	N	40	40	40	40	40
	Mean	0.1750	0.3750	0.3250	1.000E-01	0.5500
	% of Total Sum	100%	100%	100%	100%	100%
	Sum	7	15	13	4	22

Tab. 75. Břeclav-Pohansko. The Forest Nursery. Average count of specific types of finds in a single settlement feature of a particular type. Case Summaries.

OBJEKT TYP		AUSR_REI	SCHLOSS	EIMER	MAHLSTEI	ZIEGEL
B	N	4	4	4	4	4
	Mean	0	0	2.5000	2.5000	0.2500
	% of Total Sum	0%	0%	37.0%	45.5%	50.0%
	Sum	0	0	10	10	1
FS	N	7	7	7	7	7
	Mean	0	0	0.1429	0	0
	% of Total Sum	0%	0%	3.7%	0%	0%
	Sum	0	0	1	0	0
GEO	N	15	15	15	15	15
	Mean	0.2667	0.1333	0.1333	0.1333	6.667E-02
	% of Total Sum	80.0%	50.0%	7.4%	9.1%	50.0%
	Sum	4	2	2	2	1
GH	N	7	7	7	7	7
	Mean	0.1429	0.2857	1.4286	0.5714	0
	% of Total Sum	20.0%	50.0%	37.0%	18.2%	.0%
	Sum	1	2	10	4	0
R	N	7	7	7	7	7
	Mean	0	0	.5714	.8571	0
	% of Total Sum	0%	0%	14.8%	27.3%	0%
	Sum	0	0	4	6	0
Total	N	40	40	40	40	40
	Mean	0.1250	0.1000	0.6750	0.5500	5.000E-02
	% of Total Sum	100%	100%	100%	100%	100%
	Sum	5	4	27	22	2

Tab. 76. Břeclav-Pohansko. The Forest Nursery. Average count of specific types of finds in a single settlement feature of a particular type. Case Summaries.

OBJEKT TYP		SPINNWIR	SCHLITTS	SCHLEIFS	GEWICHT	SPIT_KGI
B	N	4	4	4	4	4
	Mean	0	0.5000	0	0	0
	% of Total Sum	0%	40.0%	0%	0%	0%
	Sum	0	2	0	0	0
FS	N	7	7	7	7	7
	Mean	0.2857	0	0	0	0.8571
	% of Total Sum	18.2%	0%	0%	0%	9.8%
	Sum	2	0	0	0	6

Tab. 76 (*cont.*)

OBJEKT TYP		SPINNWIR	SCHLITTS	SCHLEIFS	GEWICHT	SPIT_KGI
GEO	N	15	15	15	15	15
	Mean	0.5333	0.2000	0.6667	0.4000	2.7333
	% of Total Sum	72.7%	60.0%	66.7%	37.5%	67.2%
	Sum	8	3	10	6	41
GH	N	7	7	7	7	7
	Mean	0	0	0.1429	0.2857	0.2857
	% of Total Sum	0%	0%	6.7%	12.5%	3.3%
	Sum	0	0	1	2	2
R	N	7	7	7	7	7
	Mean	0.1429	0	0.5714	1.1429	1.7143
	% of Total Sum	9.1%	0%	26.7%	50.0%	19.7%
	Sum	1	0	4	8	12
Total	N	40	40	40	40	40
	Mean	0.2750	0.1250	0.3750	0.4000	1.5250
	% of Total Sum	100%	100%	100%	100%	100%
	Sum	11	5	15	16	61

Tab. 77. Břeclav-Pohansko. The Forest Nursery. Average count of specific types of finds in a single settlement feature of a particular type. Case Summaries.

OBJEKT TYP		BACKW_01	BARRE_FE	SCH	SCHPK
B	N	4	4	4	4
	Mean	0.2500	0	0.2775	0
	% of Total Sum	12.5%	0%	4.0%	0%
	Sum	1	0	1.11	0
FS	N	7	7	7	7
	Mean	0	0	.1743	0
	% of Total Sum	0%	0%	4.5%	0%
	Sum	0	0	1.22	0
GEO	N	15	15	15	15
	Mean	0.4000	0.2667	1.2353	10
	% of Total Sum	75.0%	100%	67.6%	62.5%
	Sum	6	4	18.53	15
GH	N	7	7	7	7
	Mean	0	0	0.1186	0
	% of Total Sum	0%	0%	3.0%	0%
	Sum	0	0	.83	0

Tab. 77 (*cont.*)

OBJEKT TYP		BACKW_01	BARRE_FE	SCH	SCHPK
R	N	7	7	7	7
	Mean	0.1429	0	0.8171	1.2857
	% of Total Sum	12.5%	0%	20.9%	37.5%
	Sum	1	0	5.72	9
Total	N	40	40	40	40
	Mean	0.2000	1.000E-01	0.6853	0.6000
	% of Total Sum	100%	100%	100%	100%
	Sum	8	4	27.41	24

To the already performed validations, we can now add yet another interesting test during which we will calculate the ideal volumes of the fill of all the features that are classified as being of a particular type and the ratios between them. From the established values we can make a qualified estimate of the number of artefacts that we could expect in the given type of soil from a particular type of feature provided that the objects were distributed completely randomly within the volume. The calculated result will be compared with the actually observed values (Tab. 78). The comparison will allow us to draw conclusions about the relations between some types of features and categories of finds. In the test we will use only the most numerous groups of finds, both those contained in the descriptive matrix (large smithing slag cakes—SCHPK, bucket components—EIMER, pointed bone tools—SPIT_KGI), and those outside it (knives—MESSER). Only in the most numerous category of finds (pointed bone tools—SPIT_KGI) is it possible, given the initial conditions to perform the chi-square test. Its result at the significance level of 1 percent indicates that there is significant difference between the observed and expected counts. Important differences, although they cannot be verified by a statistical test, can also be observed in large smithing slag cakes (SCHPK) and bucket components (EIMER). The buckets clearly dominate in wells and sunken-floored dwellings (GH), where there is an underrepresentation in the numbers of bone tools used in manufacturing. The large smithing slag cakes are linked with large sunken-floored and trough-shaped features.

The knives exhibit different characteristics than the variables discussed above. They are quite common finds evenly distributed among

Tab. 78. Břeclav-Pohansko. The Forest Nursery. Relations between some types of features and categories of finds based on the ideal volumes of the fill of all the features.

	<i>Volume</i>	<i>Ratio</i>	<i>Observed</i>	<i>SCHPK</i>	<i>EIMER</i>	<i>SPIT_KGI</i>	<i>MESSER</i>
<i>R</i>	54.65	11.39%	R	9	4	12	5
<i>FS</i>	31.98	6.67%	FS	0	1	6	2
<i>B</i>	52.62	10.97%	B	0	10	0	1
<i>GEO</i>	294.74	61.44%	GEO	15	2	41	23
<i>GH</i>	45.73	9.53%	GH	0	10	2	3
<i>Summe</i>	479.72		<i>Summe</i>	24	27	61	34
<i>Expected</i>							
			R	2.7	3.1	6.9	3.9
			FS	1.6	1.8	4.1	2.3
			B	2.6	3.0	6.7	3.7
			GEO	14.7	16.6	37.5	20.9
			GH	2.3	2.6	5.8	3.2
<i>Chitest</i>				–	–	0.0069	–

various feature types. This also confirms the rightness of the original decision to leave out this relatively unstructuring artefact category from the basic descriptive matrix.

From the completed test (Tab. 77) it is obvious that there are significant associations between some categories of structuring finds and some settlement feature types which were manifest even earlier during the validation of the formal structures extracted from the matrix of artefacts other than pottery.

The test will be extended with a series of diagrams (Diagram 82–Diagram 99) in which we can compare the proportion of individual types of finds in the characteristic features that could be expected according to the volume ratios of their fills (white striped columns), with the actually observed values (black columns). For greater clearance, everything is expressed in percentages by means of dividing the total count of artefacts of a particular category (e.g. all arrowheads from typical features) by their observed or expected count in a particular type of features (e.g. arrowheads in sunken-floored dwellings (GH)).

4.3.3.3 *Validation by pottery*

Another example of external evidence that will be used in the validation of the formal structures extracted from the matrix with artefacts

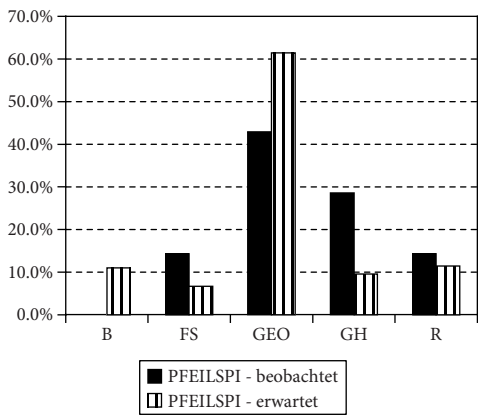


Diagram 82. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of arrowheads in characteristic features.

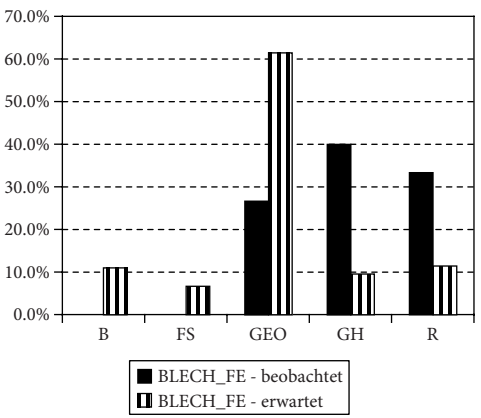


Diagram 83. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of iron metal sheet fragments in characteristic features.

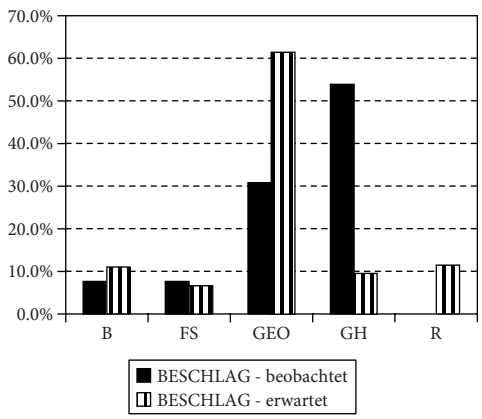


Diagram 84. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of iron mounts in characteristic features.

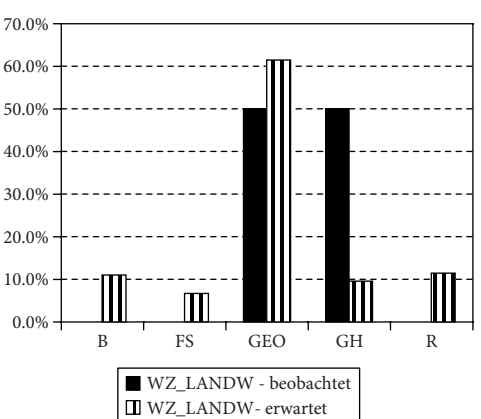


Diagram 85. Břeclav-Pohansko The Forest Nursery. Expected and observed percentages of agricultural tools in characteristic features.

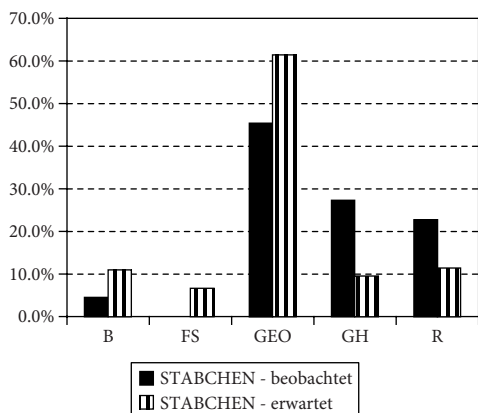


Diagram 86. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of iron bars in characteristic features.

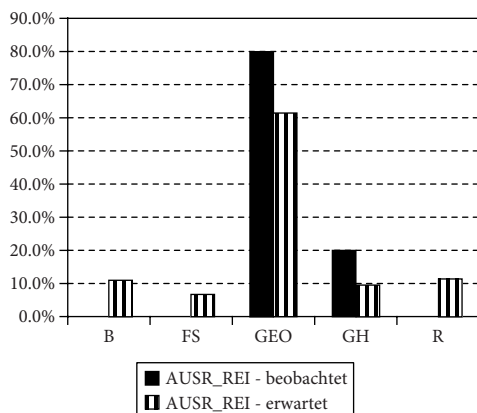


Diagram 87. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of horse gear components in characteristic features.

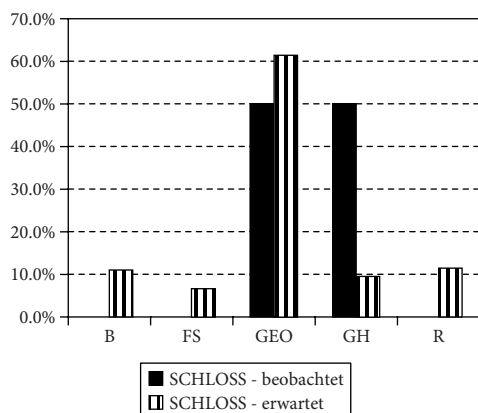


Diagram 88. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of parts of locks in characteristic features.

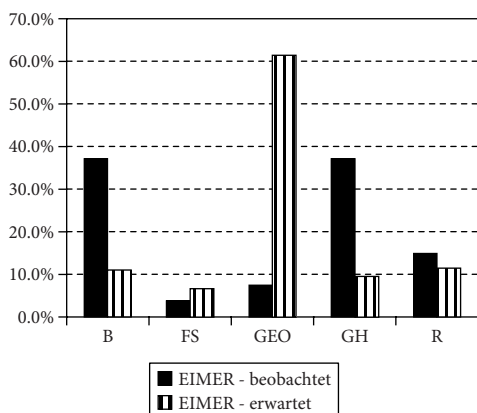


Diagram 89. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of bucket components in characteristic features.

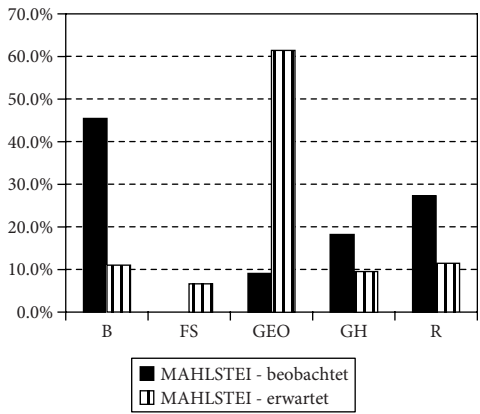


Diagram 90. Břeclav-Pohansko. The Forest Nursery Expected and observed percentages of quernstones in characteristic features.

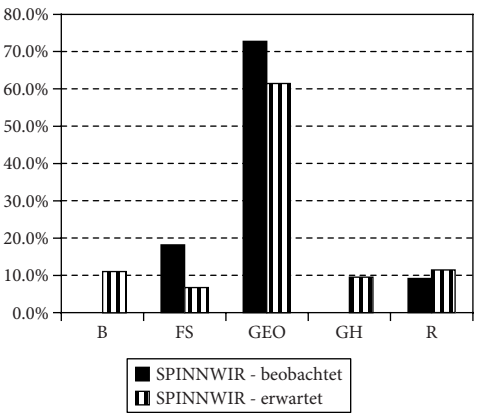


Diagram 91. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of spindle whorls in characteristic features.

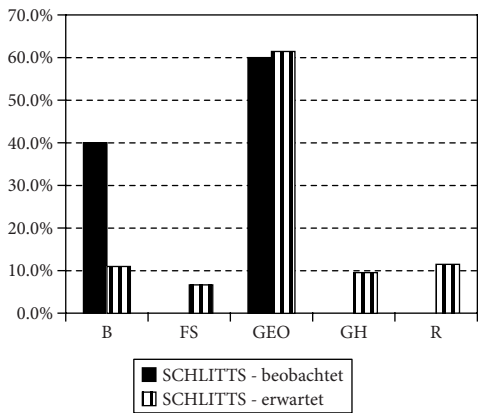


Diagram 92. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of the so-called bone skates in characteristic features.

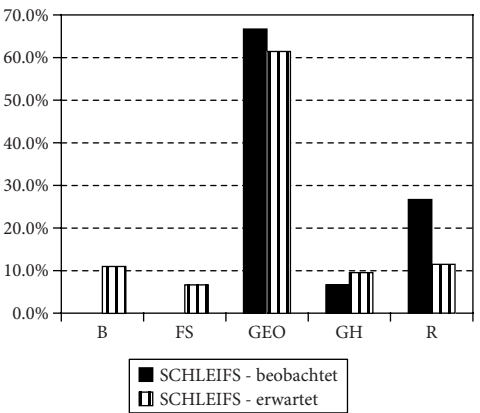


Diagram 93. Břeclav-Pohansko. The Forest Nursery. Expected and percentages of whetstones in characteristic features.

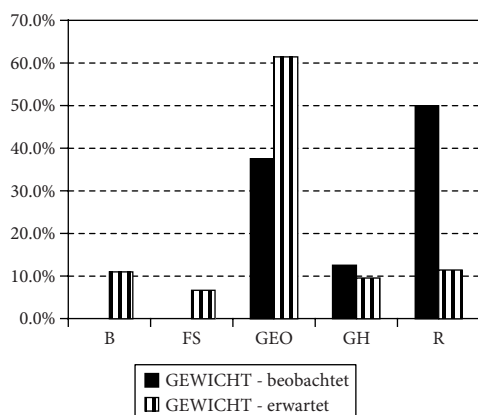


Diagram 94. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of clay weights in characteristic features.

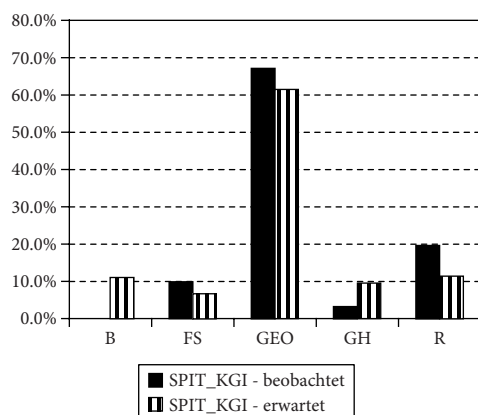


Diagram 95. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of pointed bone tools in characteristic features.

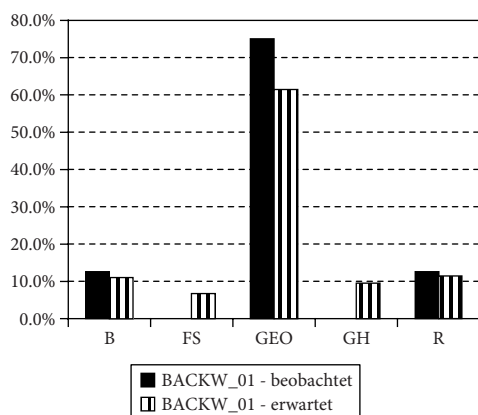


Diagram 96. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of roasting trays in characteristic features.

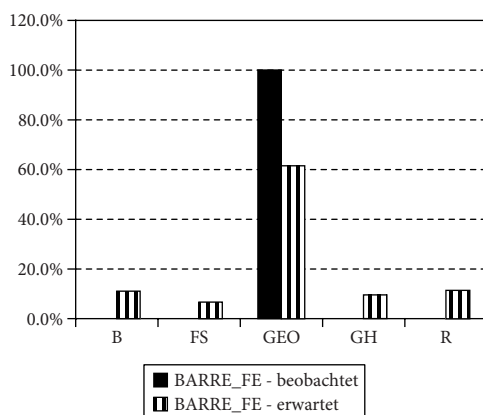


Diagram 97. Břeclav-Pohansko. The Forest Nursery. Expected and observed percentages of iron ingots in characteristic features.

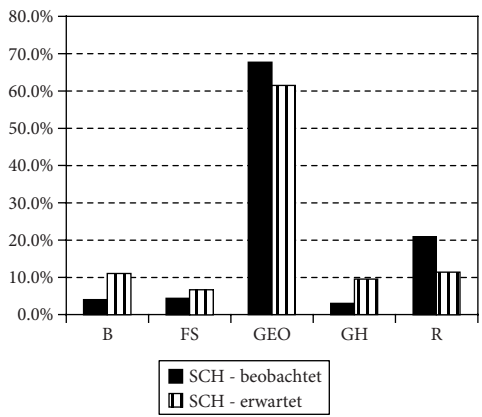


Diagram 98. Břeclov-Pohansko. The Forest Nursery. Expected and observed percentages of slag in characteristic features.

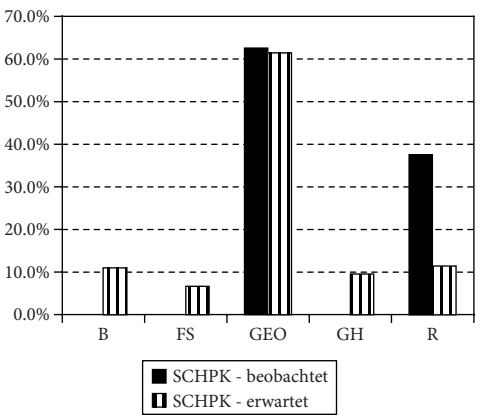


Diagram 99. Břeclov-Pohansko. The Forest Nursery. Expected and observed percentages of large smithing slag cakes in characteristic features.

other than pottery are pottery assemblages. We start from the premise that artefacts other than pottery, on one hand, and pottery, on the other hand, are two independent phenomena, even though were observed in the same features. If the tested formal structures significantly relate to the pottery assemblages, this could be considered a telling argument in the validation process.

During the validation we will start by comparing the tested formal structures with the relative chronological groups defined following the analysis and synthesis of pottery assemblages (see Chap. 4.2.1.5). The pottery groups will be compared with the factor scores calculated above (factor solution with artefacts other than pottery and slag).

The following calculations will be based on a set of 87 Great Moravian features from the Forest Nursery which could be associated with one of the relative chronological groups (Great Moravian groups 2–5) and, at the same time, contained at least one artefact other than pottery. In each of the pottery groups (Ker_Gruppe) we calculated the basic values of descriptive statistics for each of the factor scores (mean, median, minimum, maximum). The results of the calculations are clearly summed up in a table (Tab. 79) and visualized in a series of bar graphs (mean values) and box plots (median, range and extreme values) (Diagram 100–Diagram 107).

Tab. 79. Břeclav-Pohansko. The Forest Nursery. Average score of factors calculated from assemblages with artefacts other than pottery by pottery-chronological groups.

Ker. Gruppe		REGR factor score1	REGR factor score2	REGR factor score3	REGR factor score4
2	N	26	26	26	26
	Mean	0.05	0.56	0.46	0.11
	Median	-0.07	-0.21	0.16	-0.24
	Minimum	-0.61	-0.58	-1.08	-1.43
	Maximum	2.46	8.91	3.93	9.43
3	N	42	42	42	42
	Mean	0.44	-0.08	0.76	0.27
	Median	-0.01	-0.24	0.43	-0.20
	Minimum	-0.89	-1.71	-1.26	-1.25
	Maximum	12.33	2.22	6.20	4.08
4	N	13	13	13	13
	Mean	0.18	1.09	-0.28	0.15
	Median	0.01	-0.21	-0.44	-0.16
	Minimum	-0.87	-0.98	-1.49	-1.36
	Maximum	1.66	7.77	1.27	2.07
5	N	6	6	6	6
	Mean	1.05	0.02	1.02	0.14
	Median	0.16	-0.17	0.93	-0.38
	Minimum	-0.36	-1.27	-0.44	-1.08
	Maximum	4.69	2.26	3.52	3.61
Total	N	87	87	87	87
	Mean	0.33	0.29	0.53	0.20
	Median	-0.01	-0.21	0.18	-0.19
	Minimum	-0.89	-1.71	-1.49	-1.43
	Maximum	12.33	8.91	6.20	9.43

From the table and the diagram it is obvious that the mean values of the factor scores are widely different in the individual pottery groups. The highest mean of the score of factor 1 was found in pottery group 5. The second highest mean was encountered in factor 3 where the value is, nevertheless, strongly influenced by the extreme feature 12. By its mean values factor 2 has the greatest affinity with the fourth pottery group and just slightly less to group 2, which is, however, influenced by the extreme position of feature no. 106. The highest means of the factor score of factor 3 were noted in pottery group 3 and 5. The negative relationship of the fourth pottery group to this factor is remarkable. There is no other significant relation between the

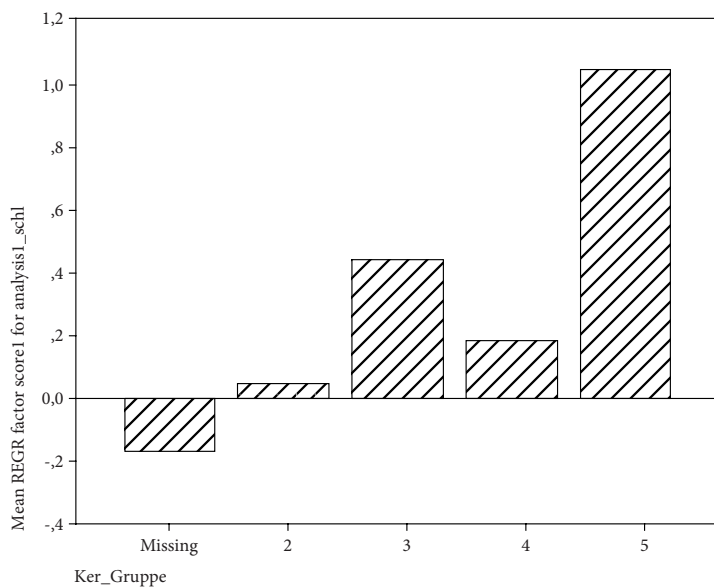


Diagram 100. Břeclav-Pohansko. The Forest Nursery. Average score of factor 1 calculated from assemblages with artefacts other than pottery by pottery-chronological groups.

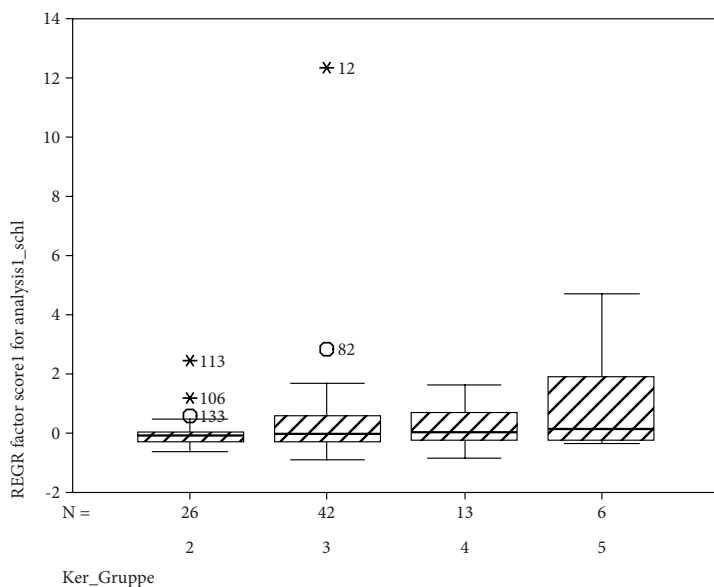


Diagram 101. Břeclav-Pohansko. The Forest Nursery. Box plot of the score of factor 1 calculated from assemblages with artefacts other than pottery. Divided by pottery-chronological groups.

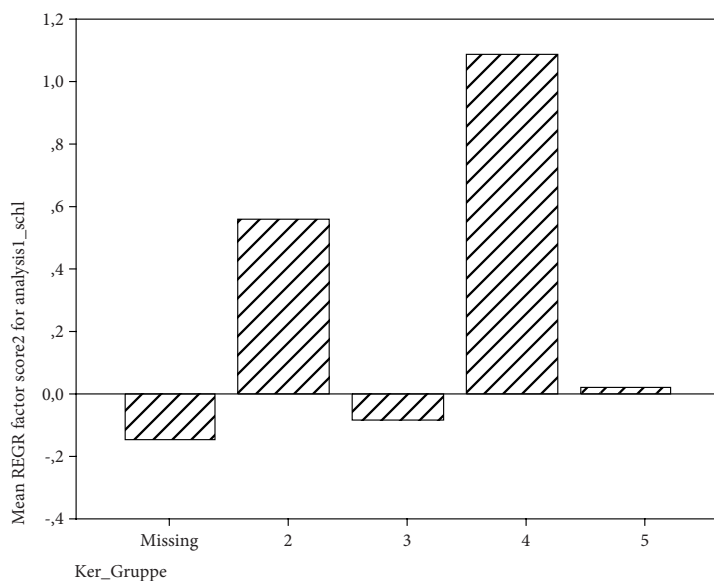


Diagram 102. Břeclav-Pohansko. The Forest Nursery. Average score of factor 2 calculated from assemblages with artefacts other than pottery by pottery-chronological groups.

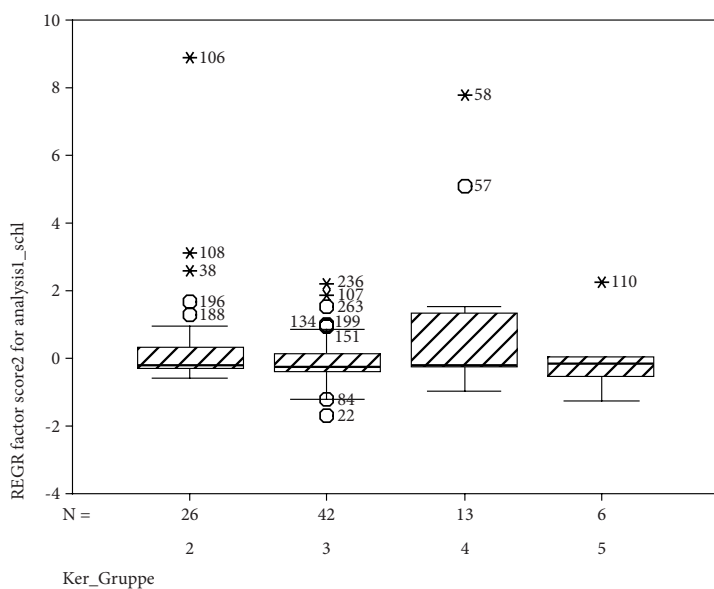


Diagram 103. Břeclav-Pohansko. The Forest Nursery. Box plot of the score of factor 2 calculated from assemblages with artefacts other than pottery. Divided by pottery-chronological groups.

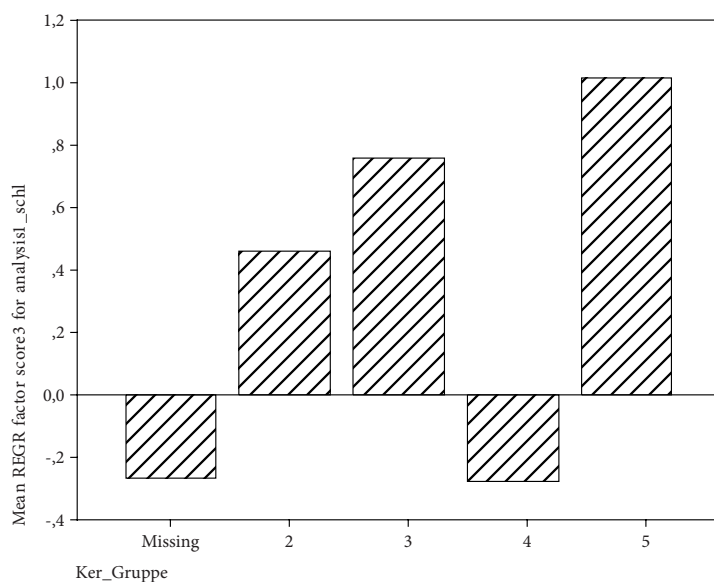


Diagram 104. Břeclav-Pohansko. The Forest Nursery. Average score of factor 3 calculated from assemblages with artefacts other than pottery by pottery-chronological groups.

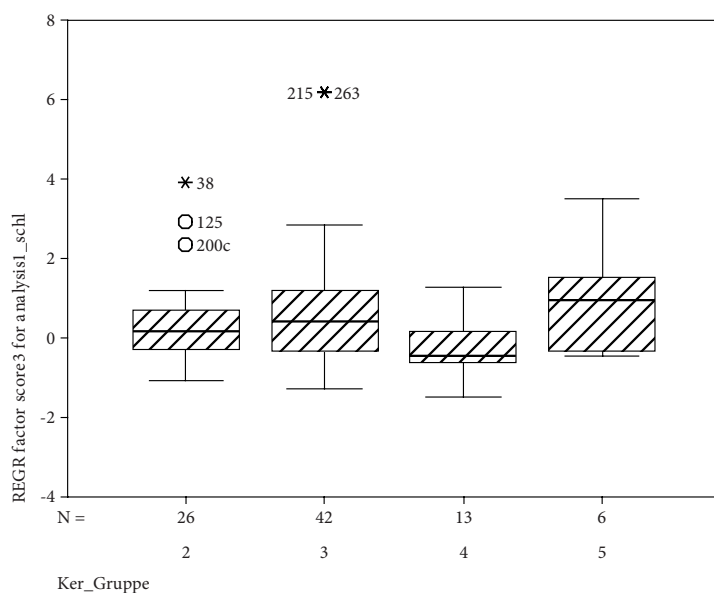


Diagram 105. Břeclav-Pohansko. The Forest Nursery. Box plot of the score of factor 3 calculated from assemblages with artefacts other than pottery. Divided by pottery-chronological groups.

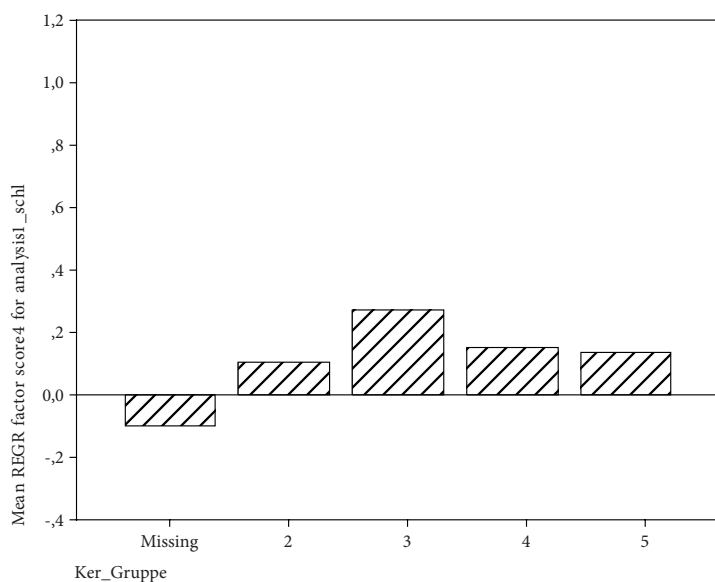


Diagram 106. Břeclav-Pohansko. The Forest Nursery. Average score of factor 4 calculated from assemblages with artefacts other than pottery by pottery-chronological groups.

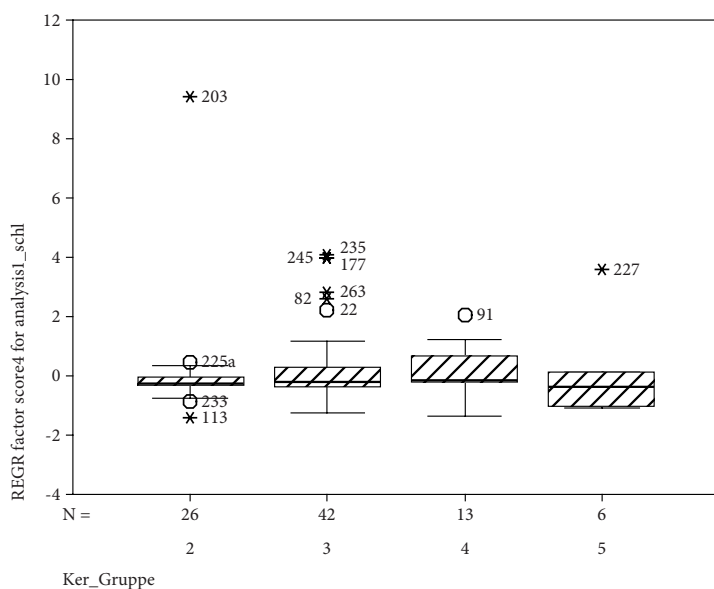


Diagram 107. Břeclav-Pohansko. The Forest Nursery. Box plot of the score of factor 4 calculated from assemblages with artefacts other than pottery. Divided by pottery-chronological groups.

pottery groups and factor 4, which is undoubtedly due to the familiar fact that the factor is partly connected with wells in which settlement waste (including pottery) was normally absent.

The facts described above will be verified by a series of principal component analyses which will be based on a descriptive matrix defined by settlement features and artefacts other than pottery (including slag), added to by a dichotomic variable (KER_2, KER_3, KER_4, KER_5) the value of which (0–1) will determine whether the settlement feature belongs to a particular Great Moravian pottery group or not. Only one such variable can be entered in each principal component analysis.¹⁴¹

The first principal component analysis will be added to by the KER_2 control variable (Tab. 80).

Tab. 80. Rotated Component Matrix.

	Component			
	1	2	3	4
SCH	0.80	0.18	0.16	–0.02
WZ_SCHMI	0.77	0.08	0.05	0.00
STABCHEN	0.75	0.34	0.13	0.00
SCHPK	0.70	0.10	–0.01	–0.05
BLECH_FE	0.67	0.16	0.14	0.10
WZ	0.59	–0.11	–0.03	0.05
WZ_LANDW	0.47	–0.05	–0.15	0.27
BARRE_FE	0.43	–0.03	0.19	–0.20
SCHLOSS	0.00	0.72	0.01	–0.06
AUSR_REI	0.03	0.72	0.05	0.09
PFEILSPI	0.13	0.61	0.08	0.01
BESCHLAG	0.33	0.57	0.04	–0.01
BACKW_01	0.31	0.33	0.15	0.32
KER_2	–0.04	0.32	0.25	0.00
SPIT_KGI	0.16	0.12	0.81	0.00
SCHLEIFS	0.14	0.12	0.66	–0.11
SPINNWIR	–0.04	0.09	0.65	0.11
GEWICHT	0.10	–0.11	0.45	0.06
SCHLITTS	–0.02	0.13	0.39	0.19
MAHLSTEI	0.01	–0.07	0.04	0.84
ZIEGEL	–0.05	–0.01	0.16	0.76
EIMER	0.08	0.48	0.03	0.56

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

¹⁴¹ The problem of the so-called false zeros; more in Neustupný (1997b), p. 239.

The second principal component analysis will be extended by the KER_03 variable (Tab. 81).

Tab. 81. Rotated Component Matrix.

	Component			
	1	2	3	4
SCH	0.79	0.20	0.15	-0.03
WZ_SCHMI	0.77	0.10	0.05	-0.01
STABCHEN	0.75	0.35	0.12	-0.01
SCHPK	0.70	0.11	0.00	-0.05
BLECH_FE	0.66	0.17	0.14	0.09
WZ	0.59	-0.12	0.02	0.05
WZ_LANDW	0.47	-0.05	-0.11	0.28
BARRE_FE	0.43	-0.03	0.18	-0.20
AUSR_REI	0.02	0.71	0.03	0.09
SCHLOSS	-0.01	0.69	0.04	-0.04
BESCHLAG	0.30	0.62	0.03	-0.03
PFEILSPI	0.11	0.62	0.11	0.01
BACKW_01	0.31	0.32	0.14	0.32
SPIT_KGI	0.14	0.13	0.83	0.00
SCHLEIFS	0.12	0.13	0.65	-0.12
SPINNWIR	-0.07	0.13	0.62	0.08
KER_3	0.22	-0.14	0.55	0.17
GEWICHT	0.07	-0.06	0.46	0.03
SCHLITTS	-0.05	0.20	0.36	0.16
MAHLSTEI	0.02	-0.08	0.05	0.84
ZIEGEL	-0.06	0.01	0.16	0.75
EIMER	0.07	0.47	0.04	0.57

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

The third principal component analysis with the KER_4 variable (Tab. 82).

Tab. 82. Rotated Component Matrix.

	Component			
	1	2	3	4
SCH	0.81	0.12	0.19	-0.01
WZ_SCHMI	0.78	0.03	0.08	0.01
STABCHEN	0.76	0.29	0.16	0.01
SCHPK	0.71	0.06	0.01	-0.04

Tab. 82 (*cont.*)

	Component			
	1	2	3	4
BLECH_FE	0.66	0.19	0.11	0.10
WZ	0.58	-0.10	-0.05	0.05
WZ_LANDW	0.45	0.07	-0.21	0.26
BARRE_FE	0.42	0.03	0.12	-0.20
SCHLOSS	0.00	0.69	0.08	-0.05
BESCHLAG	0.30	0.66	0.06	-0.02
PFEILSPI	0.12	0.63	0.13	0.00
AUSR_REI	0.05	0.60	0.15	0.11
KER_4	0.00	0.53	-0.21	0.02
SPIT_KGI	0.16	0.09	0.80	0.01
SPINNWIR	-0.04	0.07	0.65	0.10
SCHLEIFS	0.15	0.08	0.64	-0.10
SCHLITTS	-0.02	0.10	0.44	0.18
GEWICHT	0.08	-0.06	0.43	0.04
MAHLSTEI	0.01	-0.07	0.02	0.84
ZIEGEL	-0.06	-0.03	0.17	0.76
EIMER	0.07	0.49	0.05	0.57
BACKW_01	0.33	0.23	0.20	0.34

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 5 iterations.

The fifth principal component analysis with the KER_5 variable (Tab. 83).

Tab. 83. Rotated Component Matrix.

	Component			
	1	2	3	4
SCH	0.80	0.17	0.21	-0.02
WZ_SCHMI	0.76	0.13	0.02	-0.01
STABCHEN	0.76	0.31	0.19	0.00
SCHPK	0.71	0.07	0.06	-0.05
BLECH_FE	0.66	0.19	0.12	0.09
WZ	0.58	-0.08	-0.05	0.04
WZ_LANDW	0.47	-0.02	-0.16	0.26
BARRE_FE	0.42	-0.07	0.25	-0.19
AUSR_REI	0.03	0.72	0.01	0.09
SCHLOSS	0.00	0.71	0.00	-0.05
PFEILSPI	0.12	0.62	0.10	0.00

Tab. 83 (*cont.*)

	Component			
	1	2	3	4
BESCHLAG	0.32	0.57	0.09	-0.02
BACKW_01	0.31	0.34	0.11	0.32
SPIT_KGI	0.11	0.19	0.76	0.03
SCHLEIFS	0.11	0.15	0.64	-0.09
SPINNWIR	-0.08	0.14	0.62	0.12
GEWICHT	0.07	-0.12	0.56	0.07
KER_5	0.20	-0.13	0.37	0.04
SCHLITTS	-0.06	0.23	0.32	0.18
MAHLSTEI	0.03	-0.11	0.07	0.84
ZIEGEL	-0.06	0.01	0.12	0.76
EIMER	0.09	0.45	0.03	0.57

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

The factor loadings of the control variables calculated in the principal component analyses can be clearly summed up in a single table (Tab. 84). The table indicates that the individual pottery groups have a significant relationship with only a few factors. In principle, we see a repetition of the results known from the previous test. Variables KER_3 and KER_5 have a higher loading on factor 1, variable KER_2 and especially KER_4 on factor 2 and variables KER_2, KER_5 and in particular KER_3 on factor 3. In factor 4 it is again impossible to prove a significant relationship with any pottery group.

Tab. 84. Břeclav-Pohansko. The Forest Nursery. The factor loadings of the control variables (relative chronological pottery groups).

<i>KER. SKUPINA</i>	<i>FAK 1</i>	<i>FAK 2</i>	<i>FAK 3</i>	<i>FAK 4</i>
<i>KER_2</i>	-0.04	0.32	0.25	0.00
<i>KER_3</i>	0.22	-0.14	0.55	0.17
<i>KER_4</i>	0.00	0.53	-0.21	0.02
<i>KER_5</i>	0.20	-0.13	0.37	0.04

The last step of the validation by pottery will be a principal component analysis where we will add variables expressing the percentages of several important and structuring descriptors of the pottery assemblages. Two of the attributes evaluate the share of specific materials in

the total amount pottery in the feature (T_FEIN—washed, fine clay, T_GRAPH—admixture of graphite in the paste), two other attributes assess the characteristic shape of the lips (R_B4PROF—simple cylindrical or conical truncated lip with protruding lower and upper edge and central moulded band, R_E—grooved lip). During the control principal component analysis we will again observe whether the new variables do not disturb the existing formal structures and whether they will assume a dominant position in any of the existing factors. If it is so we can state that the tested structures are manifested in two independent groups of archaeological data, and therefore can be considered validated.

Tab. 85. Rotated Component Matrix.

	Component			
	1	2	3	4
SCHPK	0.826			
SCH	0.825			
STABCHEN	0.788	0.273		
WZ_SCHMI	0.772			
BLECH_FE	0.660			
WZ	0.531			
WZ_LANDW	0.449		-0.351	0.254
BARRE_FE	0.363			-0.278
T_GRAPH	0.264			
BESCHLAG	0.331	0.738		
PFEILSPI		0.631		
SCHLOSS		0.630		
AUSR_REI		0.569		
R_B4PROF		0.544	-0.438	
SPIT_KGI			0.696	
SCHLEIFS			0.579	
SPINNWIR			0.517	
T_FEIN		0.201	-0.460	
SCHLITTS			0.426	0.325
R_E			0.396	
GEWICHT				
MAHLSTEI				0.785
ZIEGEL				0.751
EIMER		0.424		0.556
BACKW_01	0.380		0.203	0.423

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 6 iterations.

By applying the Varimax rotation we extracted well-known structures from the correlation matrix where the positions of the original variables against the basic solution remained virtually unchanged (Tab. 84). The control variable parameters in the structures are interesting. Although the loading of variable T_GRAPH in factor 1 is not very high it is still important as the variable has no relationship whatsoever to the other factors. The characteristics of variable Lip B4PROF are quite different. It has a relatively high positive loading on factor 2 and a negative loading on factor 3. Fine material (T_FEIN) can be described in a similar way although its loading on factor 2 is not so strong. Variable R_E (grooved lip) has a higher loading on factor 3 only. None of the control variables has a significant relationship with factor 4.

Another very interesting output from this principal component analysis are two scatter plots of the factor scores (Diagram 108–Diagram 109). Special symbols mark the different characteristic settlement feature types defined earlier based on the excavation records (see Chap. 4.1.1). A simple dot represents settlement features not associated with any of the described types. The diagrams offer an interesting combination of three types of information. The multi-dimensional space from which the factor score values were calculated is distinguished by variables describing assemblages of artefacts other than pottery and pottery. This type of information merges in the diagrams with data on the feature types.

We can clearly see the link between sunken-floored dwellings (GH) and factor 2 as well as the relation of large sunken-floored (GEO) and trough-shaped (R) features to factor 3. The antagonist relationship between the two groups of settlement features (sunken-floored buildings—GH x large sunken-floored features—GEO and trough-shaped features—R), related both to artefacts other than pottery and pottery from the fill, is behind the strongly bipolar factor 3.

Factor 1 has no relationship with any of the defined settlement feature types while factor 4 is closely linked with well no. 203.

The completed tests suggest that with the assistance of pottery used as independent external evidence, we can validate three from four factors. A particularly strong affinity with pottery was confirmed in factors 2 and 3. The initial premises were fully confirmed in those structures and they can therefore be considered valid.

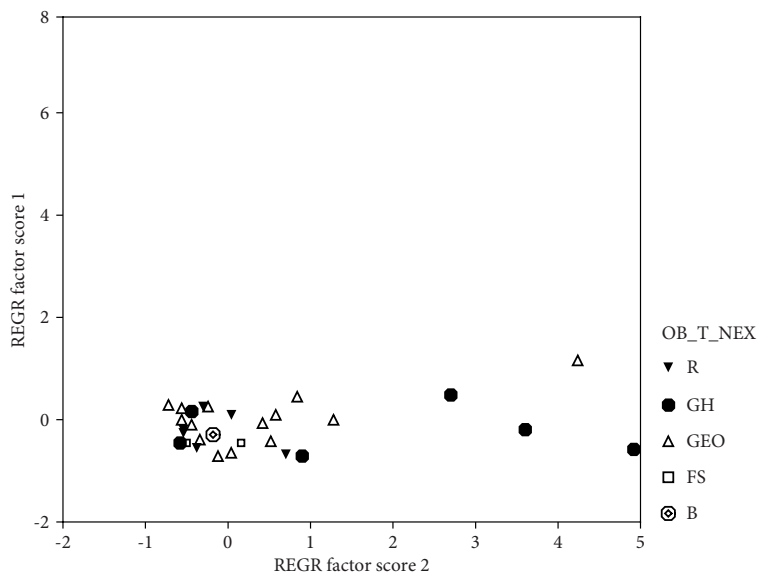


Diagram 108. Břeclav-Pohansko. The Forest Nursery. Scatter plot of factor scores with settlement feature types marked by different symbols.

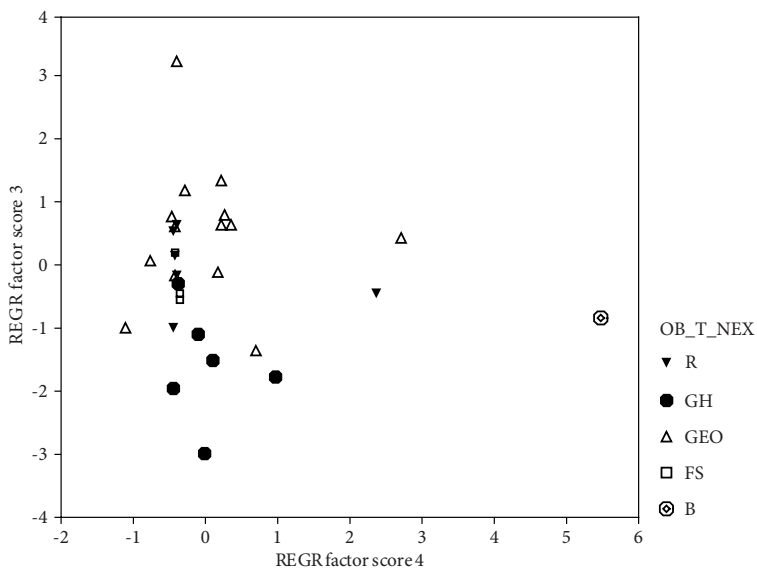


Diagram 109. Břeclav-Pohansko. The Forest Nursery. Scatter plot of factor scores with settlement feature types marked by different symbols.

Pottery is an artefact category most appropriate for chronological analysis (see Chap. 4.2.1). Thus, it is probable that some combinations of artefacts other than pottery in the assemblages are in a specific relationship with the dating of the features from which they originate. This may, however, be partly due to other causes, such as social aspects, by which we explain, for example, the fourth pottery group (see Chap. 4.2.1.4.3).

4.3.4 *Spatial arrangement of formal structures*

The individual objects (entities) of the original descriptive matrix, being the assemblages made up of artefacts other than pottery, can be characterized by the so-called factor score, estimating the actual value of individual objects (entities) for the extracted factors. Just as with the processing of pottery it is not easy to decide for which of the formal structures (factors) defined above is a particular object most typical. The values of objects typical for a particular factor are determined *ad hoc*, keeping in mind that there are no absolute and rigid categories.

Based on our previous experience we define the limit values of the factor scores. We start from the basic factor analysis expanded with variables describing the presence of slag:

- objects typical for the first factor have a score for this factor greater than 2
- objects typical for the second factor have a score for this factor greater than 1
- objects typical for the third factor have a score for this factor greater than 1
- objects typical for the fourth factor have a score for this factor greater than 2.5

Although we presumed that the spatial stability of artefacts other than pottery and their link with the settlement features, in which they existed in the living culture, is stronger than in pottery we should bear in mind that the artefacts often became part of secondary waste and as such were transported over greater distances within the settlement. In spite of that, during the validation we identified a trend (see Chap. 4.3.3.2), which clearly shows that there are non-random relationships between some types of settlement features with specific combinations of artefacts other than pottery. However, we cannot rule out that these

artefacts found their way into other settlement features as part of secondary and tertiary waste. It is probable with settlement features which are typical for more than one factor. The assemblages from those features may consist of waste transported from more distant locations or a combination of transported waste and artefacts remaining in the place of their use.

The following site plans of the settlement in the Forest Nursery depict all the features which may be considered typical for the individual factors based on the selected criteria (Fig. 45–Fig. 48). Features relating to a single factor only are distinguished graphically (features in black).

The other series of site plans (Fig. 49–Fig. 56) shows the features typical for the individual factors within a single settlement phase (early Great Moravian as opposed to late Great Moravian). They are exclusively settlement features which contained a sufficient amount of pottery which allows for dating. In this case, features typical for only a single factor within the given phase are graphically distinguished from those having relationships with multiple factors.

4.3.5 *Interpretation*

The performed validations described above confirmed the validity of all the formal structures extracted from the matrix with artefacts other than pottery. The question that remains is their function, significance and meaning. However, these cannot be observed from the archaeological record alone. It is therefore necessary to compare the archaeological structures with the categories of the living culture which make this collection of information possible. For archaeologists, the source for studying the living culture are disciplines which involve an inherently dynamic way to acquire information, such as history, ethnography and experimental archaeology. In the interpretation, we can also employ general models.¹⁴²

The first factor of the basic analysis consists of various metallurgical implements (punches, chisels, hammers, anvils, crucibles), iron metal sheet and bars (which could have just as well served as engraving tools, awls, or small punches), iron ingots, iron mounts and iron implements (including agricultural tools). During the validation this factor was

¹⁴² Neustupný (1986), pp. 542–548; (1993), pp. 163–168.



Fig. 45. Břeclav-Pohansko. The Forest Nursery. Features typical for factor 1 of the factor solution based on a matrix consisting of assemblages with artefacts other than pottery and slag. Black—features related to a single factor only.

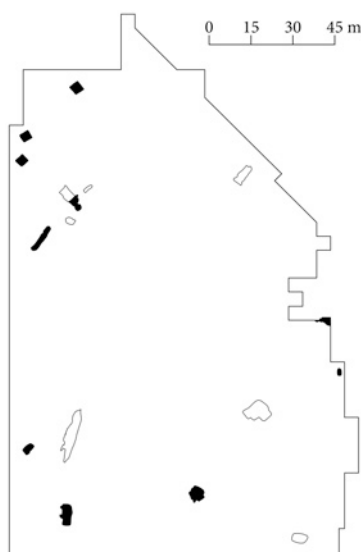


Fig. 46. Břeclav-Pohansko. The Forest Nursery. Features typical for factor 2 of the factor solution based on a matrix consisting of assemblages with artefacts other than pottery and slag. Black—features related to a single factor only.



Fig. 47. Břeclav-Pohansko. The Forest Nursery. Features typical for factor 3 of the factor solution based on a matrix consisting of assemblages with artefacts other than pottery and slag. Black—features related to a single factor only.

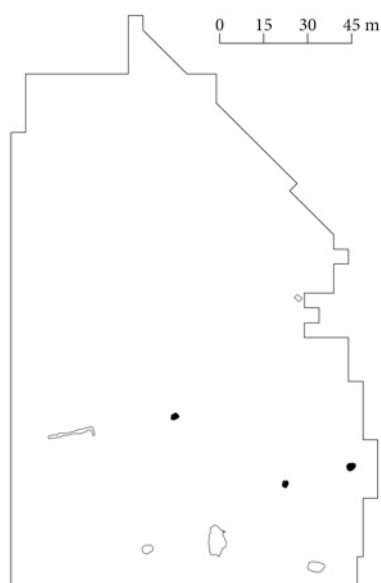


Fig. 48. Břeclav-Pohansko. The Forest Nursery. Features typical for factor 4 of the factor solution based on a matrix consisting of assemblages with artefacts other than pottery and slag. Black—features related to a single factor only.

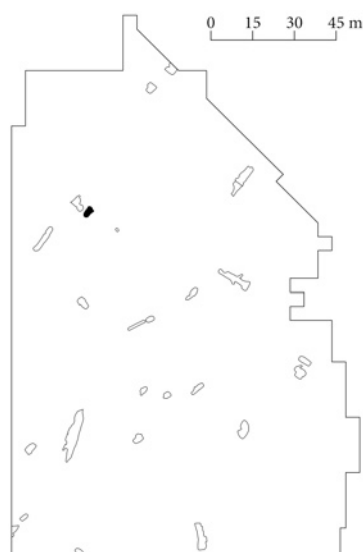


Fig. 49. Břeclav-Pohansko. The Forest Nursery. Early Great Moravian phase. Grey—features typical for factor 1 of the factor solution based on a matrix consisting of assemblages with artefacts other than pottery and slag. Black—features related to factor 1 only.



Fig. 50. Břeclav-Pohansko. The Forest Nursery. Early Great Moravian phase. Grey—features typical for factor 2 of the factor solution based on a matrix consisting of assemblages with artefacts other than pottery and slag. Black—features related to factor 2 only.



Fig. 51. Břeclav-Pohansko. The Forest Nursery. Early Great Moravian phase. Grey—features typical for factor 3 of the factor solution based on a matrix consisting of assemblages with artefacts other than pottery and slag. Black—features related to factor 3 only.



Fig. 52. Břeclav-Pohansko. The Forest Nursery. Early Great Moravian phase. Grey—features typical for factor 4 of the factor solution based on a matrix consisting of assemblages with artefacts other than pottery and slag. Black—features related to factor 4 only.

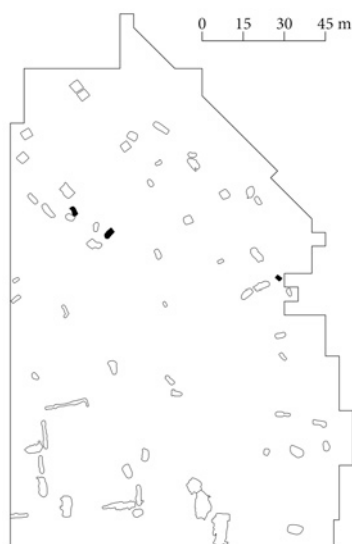


Fig. 53. Břeclav-Pohansko. The Forest Nursery. Late Great Moravian phase. Grey—features typical for factor 1 of the factor solution based on a matrix consisting of assemblages with artefacts other than pottery and slag. Black—features related to factor 1 only.



Fig. 54. Břeclav-Pohansko. The Forest Nursery. Late Great Moravian phase. Grey—features typical for factor 2 of the factor solution based on a matrix consisting of assemblages with artefacts other than pottery and slag. Black—features related to factor 2 only.



Fig. 55. Břeclav-Pohansko. The Forest Nursery. Late Great Moravian phase. Grey—features typical for factor 3 of the factor solution based on a matrix consisting of assemblages with artefacts other than pottery and slag. Black—features related to factor 3 only.



Fig. 56. Břeclav-Pohansko. The Forest Nursery. Late Great Moravian phase. Grey—features typical for factor 4 of the factor solution based on a matrix consisting of assemblages with artefacts other than pottery and slag. Black—features related to factor 4 only.

clearly associated with slag, including large smithing slag cakes. From what we know about blacksmithing in general, blacksmithing tools and waste on the basis of ethnographical, archaeological and metallographical data,¹⁴³ it appears that the structure which appeared as factor 1 is principally associated with metalworking.

Features that will be considered typical for factor 1 will be those with a score for this factor greater than 2. They include, first and foremost, a group of four features in the northwestern part of the Forest Nursery (no. 12, 109, 110 and 113), which can be interpreted as a metalworking area (given the specific finds this production area can also be associated with the nearby feature 21 with an iron ingot, feature 115 with rings and a ploughshare, feature 112 with rings and feature 111 with rings and a crucible—although those features have a slightly lower factor score). Feature 113 contained a destroyed, massive hearth, built on top of the natural clay bank. Those may well be the remains of a blacksmithing furnace. In terms of its characteristics, furnishing and dimensions, the feature fully matches the characteristics of the second type of Slavic smithies as defined by D. Bialeková.¹⁴⁴ The other pits with evidence of metalworking found in the complex in the immediate vicinity of the feature with the blacksmithing furnace confirm the existence of an extensive production district, which may further be compared with the smithy found in the Great Moravian stronghold in Mikulčice.¹⁴⁵ Given that the features are assigned on the basis of pottery to several chronological phases, we can assume a long-term and continual operation of the smithy. The production of the identified blacksmithing workshop evidently concentrated on armoury, or belt set making, as illustrated by frequent finds of mail rings, strap ends, fragment of a bronze shackle (with an elongated neck?), an arrowhead, etc. A little later it also turned to the production of agricultural tools (e.g. scythe, ploughshare). The find of a crucible in feature 111 provides evidence of the processing of non-ferrous metals.

Another feature (no. 82) with a high score to factor 1 was examined in 1976 in the eastern section of the Forest Nursery. Fragments of daub lining and a roasting tray may indicate a hearth which B. Dostál¹⁴⁶ later hypothetically reconstructed as a clay oven with a roasting tray

¹⁴³ E.g. Bialeková (1981), pp. 17–62; Hošek (2003); Pleiner (1962); Pleiner (1967).

¹⁴⁴ Bialeková (1981), p. 17.

¹⁴⁵ Klíma (1985).

¹⁴⁶ Dostál (1980b).

on top. This feature was undoubtedly used for the production or working of agricultural tools, as is confirmed by the find of a ploughshare with unfinished top part of the share. Apart from blacksmithing, the feature was also used for non-ferrous metalworking as illustrated by three lead ingots found inside. Two other lead ingots are known from feature 83 (which incorporated a well), located only 15 m away. That feature contained large quantities of iron slag, just as feature no. 82.¹⁴⁷ A remarkable find in another feature (no. 1) from the group consisted of a bronze strap end with an ornamental pattern most typical for the Carolingian art.¹⁴⁸ It is obvious that a production area existed here, specializing in ironworking and non-ferrous metallurgy.

Another location which can be associated with metallurgy is situated in the south-eastern section of the Forest Nursery. It is centred around feature 210 with a high score to factor 1. It was again the site of combined processing of iron and non-ferrous metals.¹⁴⁹ The advanced technology employed there is confirmed by finds of specialized tools—small hammers and jeweller anvils. The production of the workshop was intended for the upper social strata of warriors and horsemen, as proven by finds of bronze shackles with elongated neck, mail parts, iron buckles, an arrowhead, etc. The production area incorporates the small pits 211, 212 and 213 filled with great amounts of slag, which might be interpreted as blacksmithing furnaces. It is possible that the metal processing continued on the site over a long period. Evidence of this can be seen in the stratigraphic relationships of the later pits filled with iron slag dug into the fill of an earlier feature 210.¹⁵⁰

In all the three identified production areas we have evidence of iron and non-ferrous metal processing. The tendency towards the concentration of production equipment for the processing of iron and non-ferrous metals is also confirmed in other archaeological sites, such as Staré Město—U Víta, where smithies were found in close proximity (approx. 20–30 m) of to the jewellers' workshops. However, in contrast to the Forest Nursery, the two kinds of industrial activity (iron and non-ferrous metalworking) were performed in separate locations.¹⁵¹ The spectrum of finds originating from the metalworking workshops

¹⁴⁷ Ibidem.

¹⁴⁸ Dostál (1993b), pp. 64–65.

¹⁴⁹ Dostál (1993a); Dostál (1993b).

¹⁵⁰ Dostál (1993c), p. 62.

¹⁵¹ Galuška (1989).

at Pohansko suggests that it was primarily the site of the production of military weapons and equipment, partly complemented by the making of agricultural implements and other tools.

The existence of the three production complexes is underpinned by the evaluation of the spatial distribution of slag from all the settlement features in the Forest Nursery using the grid-oriented GIS software (GeoMedia Grid). The whole area of the Forest Nursery was divided into 50×50 cm cells. The centroids (centre points) carrying information on the absolute weight of slag in the feature were converted into a grid. By using the Local Scan statistical function we calculated, for the individual cells within the scanning window sized 25 m, the average weights of slag from the given area. From the result we extracted an area with the highest density of slag in the Forest Nursery (Fig. 57). The three identified concentrations are shown together with the features which are very typical for factor 1, and other features from the vicinity, with evidence of metallurgical production. The combination of both outputs illustrates even more clearly the existence of three

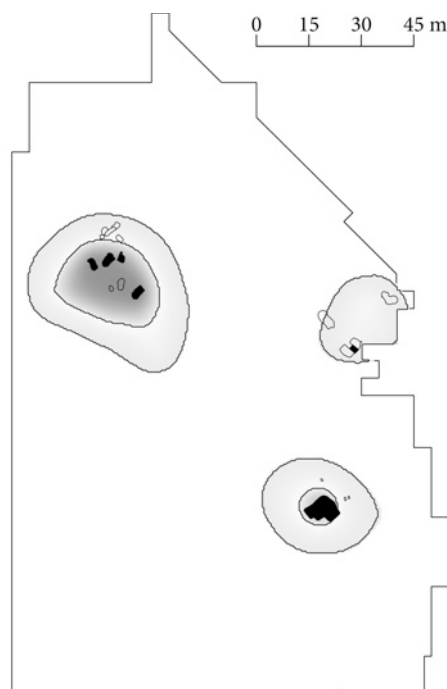


Fig. 57. Břeclav-Pohansko. The Forest Nursery. Spatial distribution of slag.

metallurgical complexes from where large amounts of slag were scattered in the surroundings.

The relationships between the weights of slag from the individual settlement features and their distribution in space can be depicted in yet another way (Fig. 58). We will create buffer zones around the centroids, the diameter of which is calculated based on the weight of the slag in the features. The greater the buffer zone around a centroid the more slag was found in the feature. The site plan makes it clear that the largest buffers are again concentrated around features interpreted as smithies.

The second factor of the basic analysis is typified by a combination of horse gear, arrowheads, lock components, iron mounts and bucket components. During the validation it was shown that the factor is associated mainly with sunken-floored dwellings and the fourth pottery group, which is not in essence primarily chronological as opposed to the other pottery groups (see Chap. 4.2.1.4.3).

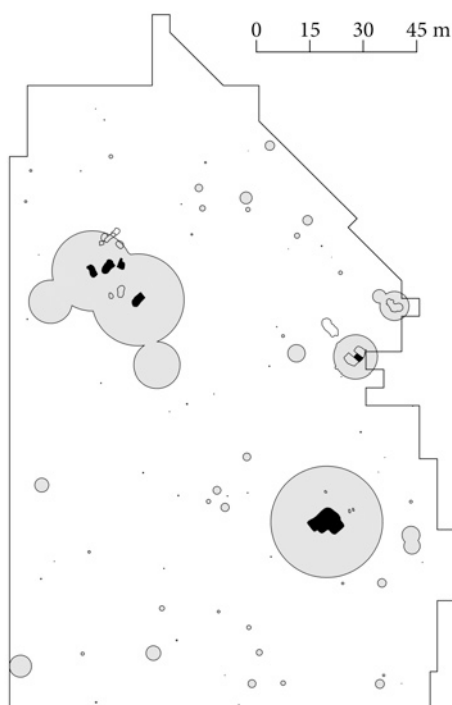


Fig. 58. Břeclav-Pohansko. The Forest Nursery. Spatial distribution of slag.

When trying to explain the second factor, we should start from it being linked with square sunken-floored buildings. In the Slavic world in general this type of settlement feature type is commonly interpreted as dwelling, primarily because of the presence, in one of the four corners, of a fireplace.¹⁵² The idea is further substantiated by ethnographic observation of recent societies¹⁵³ and by means of experimental archaeology.¹⁵⁴

In Pohansko near Břeclav the sunken-floored dwellings have a prominent position. They prevail in the Southern Suburb where they appear as sunken-floored dwellings with a square plan and stone ovens, as well as elongated structures with a clay oven carved into in the pit's wall or with a hearth on the floor. The two types together make up 23 percent of the total count of 436 examined settlement features.¹⁵⁵ The high percentage of sunken-floored dwellings in the Southern Suburb is in stark contrast to the situation in the Forest Nursery where the sunken-floored dwellings make up only 3.4 percent of all the sunken-floored Great Moravian structures.

Judging from the most characteristic component among the finds from the Southern Suburb—weapons and horse gear—those living in sunken-floored buildings were most likely warriors, perhaps members of the retinue of the Great Moravian ruler, who were settled together with their families in the vicinity of the strategic fortress. They were not involved in either craft production, or agriculture, for comparatively few craftsman or agricultural tools have been found in the Southern Suburb.¹⁵⁶ There are in fact 5.2 artefacts related to the horse gear for every 100 settlement features in the Southern Suburb, which is twice as much as in the Forest Nursery inside the stronghold, where 2.8 such artefacts were found per 100 settlement features. At the same time, considerably fewer implements or tools were found in the Southern Suburb than in the Forest Nursery settlement. For 100 settlement features in the Southern Suburb there are, for example, 7.7 spindle whorls and 22.5 bone awls.¹⁵⁷ As much as three times more whorls

¹⁵² E.g. Donat (1980), pp. 56–62; Šalkovský (2001), pp. 16–17.

¹⁵³ E.g. Frolec (1987), pp. 51–53; Frolec—Vařeka (1983), pp. 265–266.

¹⁵⁴ E.g. Pleinerová (1986).

¹⁵⁵ Vignatiová (1992), p. 11, pp. 16–27.

¹⁵⁶ Vignatiová (1992), pp. 91–99.

¹⁵⁷ Calculated and completed according to Švecová (2000) and unpubl. database of P. Vlasatíková.

and awls have been found in the craftsmen's quarter (21 whorls and 58 bone awls).

The idea that troops were lodged in the Southern Suburb is further substantiated by comparison with the situation in early medieval Meissen, which is otherwise well documented in both written and archaeological sources. The strategic castle of the German kings was founded in 929 as an advanced bastion inside the territory of the Slavic tribes. We are told that the *suburbium* of that castle was inhabited by the so-called *vethenici* together with their families (who are first mentioned in 1002). The *vethenici* were knights of a lower social status and together with craftsmen, merchants, and administrative officials made up the Slavic population of the castle. The examination of the pottery found in Meissen in the *suburbium* reveals that the people living there had close relationships with northwestern Bohemia, and most likely came from that region. The excavation of the *suburbium* showed that in the 10th and 11th century there were simple residential houses made of planks or wattle, which were built alongside roads. No evidence of craft production and large storage facilities has been found, while horseshoes were predominant among the small finds.¹⁵⁸

On the basis of the written sources, it is possible to reconstruct the function and the significance¹⁵⁹ of the *suburbium* in Meissen. This can help us understand the situation in Pohansko (where the only evidence available is archaeological) in terms of the living culture of an early medieval centre. The comparison of the material structure found in Meissen with the archaeological structure known from the Southern Suburb at Pohansko strongly suggests that the original interpretation of the Southern Suburb may be accepted as a fact.¹⁶⁰ We will further work with the theory that the Southern Suburb was inhabited by members of the Great Moravian garrison or retinue with their families, and their typical dwellings were simple residential structures—sunken-floored buildings.

By comparing the sunken-floored dwellings from the Southern Suburb and from the area in the Forest Nursery situated inside the stronghold which we connect with craft production, we arrive at some noteworthy conclusions. The association of the sunken-floored dwell-

¹⁵⁸ Lübke (2000); Schmid-Hecklau (2000).

¹⁵⁹ In the sense of Neustupný (1993).

¹⁶⁰ Vignatiová (1992), pp. 94–99.

ings with the non-industrial and non-agricultural (military?) component of society is observed in the Forest Nursery as well. This trend is expressed by factor 2. The sunken-floored dwellings only rarely contained tools, while various structural and furniture fittings, components of locks, buckets, and even belt mounts were quite frequent. *Militaria* also appear although more rarely.¹⁶¹ The exceptional position of the sunken-floored dwellings in the Forest Nursery area is also confirmed by the fact that one of them (feat no. 54) had a stone-and-mortar corner. Apart from religious buildings this construction technique appears in Great Moravia only in high-status buildings known from central locations.¹⁶² Stone-and-mortar masonry is connected with western influences, which found expression in settlement construction in the Great Moravian central places.¹⁶³ The sunken-floored buildings are also distinct from the other settlement features in the Forest Nursery by their arrangement in space. They are not arranged in plots or homesteads (see 4.5), but rather they form two irregular parallel lines (Fig. 82), just as in the so-called Settlement II in the Southern Suburb.¹⁶⁴

The special significance of the second factor is also a consequence of its link with the fourth pottery group. This is typified by specific pottery types, such as pottery made of fine clay¹⁶⁵ or vessels with a simple cylindrical or conical truncated lip with a protruding lower and upper edge and a central moulded band.¹⁶⁶ This pottery is one of the finest wares from Pohansko, which appears in much smaller quantities than the common pottery.¹⁶⁷ Vessels from typological group C may have been used as tableware.¹⁶⁸ However, statistical testing did not corroborate the opinion of B. Dostál,¹⁶⁹ according to which medium and small-sized vessels dominate in the sunken-floored dwellings compared to the other features in the Forest Nursery. This conclusion can also be documented by a box plot (Diagram 110), illustrating the basic statistical

¹⁶¹ Dostál (1987b), pp. 95–97.

¹⁶² E.g. Dostál (1987a), pp. 19–21; Poulík (1985); Ruttkay (2002a), pp. 141–143.

¹⁶³ E.g. Dostál (1987a), p. 27.

¹⁶⁴ Vignatiová (1992), p. 89.

¹⁶⁵ Principal attribute of typological group C, or the 5th group of B. Dostál; see Macháček (2001c), pp. 138–139.

¹⁶⁶ Principal attribute of typological group A/group 1a according to B. Dostál; see Macháček (2001c), pp. 137–138.

¹⁶⁷ Macháček (2001c), pp. 137–138, p. 143.

¹⁶⁸ Ibidem, pp. 236–237.

¹⁶⁹ Dostál (1987b), p. 95.

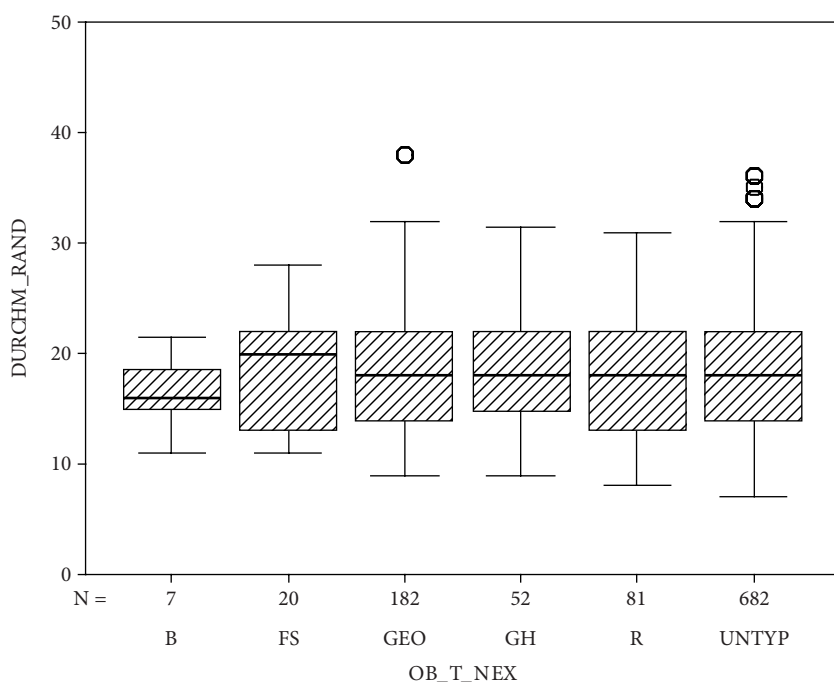


Diagram 110. Vessel mouth diameters from the different characteristic feature types (B—wells, FS—hearths, GEO—large sunken-floored features, GH—sunken-floored dwellings, R—trough-shaped features, UNTYP—untypical features). Box plot.

characteristics of the vessel mouth diameters, divided into groups by the feature type from which they originate (B—wells, FS—hearths, GEO—large sunken-floored features, GH—sunken-floored dwellings, R—trough-shaped features, UNTYP—untypical features). The dimensions of the pottery are virtually identical in all feature types. This means that the differences in the spectrum of the pottery from different features are not primarily connected with the different function of the vessels, which would be reflected by their size (e.g. storage vessels, tableware). The reasons behind such differences must therefore be sought elsewhere, perhaps in the demand and habits of the pottery consumers.

Given the facts described above, factor 2 can be associated with the specific group of inhabitants of the stronghold at Pohansko, who were not involved in crafts or agriculture in their dwellings and enjoyed a privileged position in society (see the stone-and-mortar corner of sunken-floored building no. 54 or the above-standard access to pot-

tery of the finest quality). In the Forest Nursery area they lived in sunken-floored dwellings, which distinguishes them from the dominant section of the population at Pohansko which was engaged in craft production, as the finds from the Forest Nursery confirm. On the other hand, the characteristic type of the house connects them with the inhabitants of the Southern Suburb who we think belonged to the military part of society and made up the wider retinue of the Great Moravian ruler. Why those people also lived inside the stronghold, outside the Magnate Court, alongside craftsmen and their production/residential homesteads/plots (see Chap. 4.5), remains unclear. They may have played some role in the control of production or perhaps fulfilled tasks related to the protection of the northern section of the vast fortification.

The third factor is made up of high loadings of variables which describe some production tools and aids. They include various pointed bone tools, spindle whorls, whetstones, clay weights for looms and the so-called bone skates. Based on our previous knowledge most objects may be associated with textile production. This is undoubtedly the case of the spindle whorls,¹⁷⁰ the function of which in the spinning of yarn is clearly confirmed by iconographic sources from the early Middle Ages¹⁷¹ and experimental archaeology.¹⁷² The same is true for clay weights which were used to tighten and fix the warp yarns on vertical looms.¹⁷³ The weights encountered in Slavic territories between the 6th and the 10th century have the shape of a flattened sphere with a vertical hole in the middle, alternatively described as disc-shaped or circular. However, their finds are rare compared to the Germanic environment.¹⁷⁴ The proposed application of clay weights in weaving was verified both by experimental archaeology and iconographic evidence and archaeological finds.¹⁷⁵ The opinion that these objects might have fulfilled a different function,¹⁷⁶ can thus be ruled out. The situation concerning the so-called bone skates is much more complicated.

¹⁷⁰ E.g. Marek—Kostelníková (1998), pp. 172–174.

¹⁷¹ Březinová (1997), fig. 27, fig. 28.

¹⁷² E.g. Freudenberg (1990), pp. 450–451.

¹⁷³ Březinová (1997), pp. 133–135, fig. 20–21.

¹⁷⁴ Pleinerová (1999), pp. 37–40.

¹⁷⁵ E.g. Zimmermann (1990), pp. 418–422; Schierer (1987), Abb. 108–111; Tidow (1990), pp. 422–423.

¹⁷⁶ E.g. weights of fishing nets; see Dostál (1975), p. 176.

Their interpretation allows for a number of possibilities. Based on provenance studies, the early medieval specimens can very likely be considered flattening tools or smoothers employed in the processing of textiles and leather.¹⁷⁷ The pointed bone artefacts are generally thought to be bone sharpened tools or awls used to punch leather and thicker cloths.¹⁷⁸ They may be related to finds of whetstones for sharpening.

As the validation of the factor solution shows the third factor is principally linked with the so-called large sunken-floored features. B. Dostál underlined their similarity with the production buildings from the *Pfalz* in Tilleda,¹⁷⁹ where they are interpreted as women's textile workshops, the so-called *gynaecaea*.¹⁸⁰ In a similar way to Pohansko and Tilleda they are elongated sunken-floored structures of huge dimensions but the textile workshops in Tilleda are on average slightly bigger (length 7.4–29.1 m) and their floor plan is more regular (rectangular). In the fortified bailey in Tilleda there were seven of those structures identified although only two yielded more clay weights and only five had long trough-shaped pits interpreted as the remains of horizontal looms.¹⁸¹ While their interpretation was never questioned¹⁸² we cannot rule out that some of the structures could have served other technical purposes.¹⁸³ The discernible differences between the textile workshops from Tilleda and analogous structures from Pohansko could be attributed to the fact that the focal point of the development of the Ottonian empire falls between the 10th and 11th century.¹⁸⁴

Based on written reports the *gynaecaea* are thought of as weaving manufactures as early as late antiquity¹⁸⁵ providing evidence of a higher organizational standard of craft production.¹⁸⁶ In early medieval written sources they appeared from the 7th century.¹⁸⁷ The work-

¹⁷⁷ Kavánová (1995), pp. 156–161 with references.

¹⁷⁸ Ibidem, pp. 161–171 with references.

¹⁷⁹ In this and all subsequent instances, *Pfalz* is used instead of either palace or palatium (or any such phrase) to indicate the combination of a palatial compound (hall, royal chapel, and other residential or representational buildings) and subservient suburbs, all of which may be fortified.

¹⁸⁰ Dostál (1986), pp. 132–134.

¹⁸¹ Grimm (1990), pp. 49–54.

¹⁸² E.g. Donat (1996a), p. 131; Gockel (2000), p. 553; Winkelmann (1977), p. 111.

¹⁸³ Gockel (2000), p. 580.

¹⁸⁴ The first document issued in Tilleda dates back to 974; see Gockel (2000), p. 556, p. 578, p. 583.

¹⁸⁵ Banck-Burgess (1998), p. 371.

¹⁸⁶ Donat (1996a), p. 131.

¹⁸⁷ Winkelmann (1977), p. 111.

shops employed women of lower social strata, as indicated by both written and iconographic sources.¹⁸⁸

A relatively high score to factor 3 was noted in the trough-shaped structures, very narrow and long pits more or less deep (0.3–1 m). This group of features also exhibited the highest average percentage of clay weights (Diagram 71, Diagram 94). It is very likely that some of the features functionally corresponded to the elongated pits we know from various sites where they provided higher humidity for the environment necessary for weaving cloths from plant materials.¹⁸⁹ According to another explanation the elongated pits were created when the weights on irregularly long warp threads (*Kettfäden*) touched the originally flat floor and the weaver was forced to dig underneath in order to allow them to hang loosely.¹⁹⁰ Similar grooves have been excavated in the floors of the weaving workshops in Tilleda,¹⁹¹ as well as in the long sunken-floored feature no. 38 in the Forest Nursery at Pohansko.¹⁹² The other trough-shaped features at Pohansko could have served other purposes, e.g. as driers.¹⁹³

The fourth and final factor is characterized by variables such as bucket mounts, quernstones, and Roman bricks. The most conspicuous affinity to the factor, based on the factor score values, is noted in feature no. 203 which can be clearly identified by its attributes (shape, depth, timbering) as a well.¹⁹⁴ Other features with a high factor score to factor 4 (feat. no. 245 and 254c) resembled features by some of their parameters, e.g. the ground plan (trapezoidal to rectangular), relatively greater depth (min. 75–80 cm) and smaller area. Although in the case of well 203 artefacts other than pottery could possibly have found their way to the fill together with settlement refuse from an earlier feature that the well penetrated (see Chap. 4.2.2), it is probable that the fourth factor is especially typical for wells. This is also because the finds that characterize it appear in other wells from the Forest Nursery, e.g. a bucket handle in well no. 209 or the bucket handle mount in well no. 194.¹⁹⁵

¹⁸⁸ Dostál (1986), pp. 132–137, with references; Banck-Burgess (1998), Abb. 420.

¹⁸⁹ Zimmermann (1982); Zimmermann (1990), p. 418.

¹⁹⁰ Schierer (1987), p. 74.

¹⁹¹ Grimm (1990), pp. 49–54.

¹⁹² Dostál (1986), p. 100, p. 131.

¹⁹³ Dostál (1993b), p. 43.

¹⁹⁴ Dostál (1990c).

¹⁹⁵ *Ibidem*.

It is the same in other wells from different locations within Pohansko, specifically, the walled well no. 358 from the Southern Suburb, the fill of which yielded frequent items of bucket mounts and parts of quernstones,¹⁹⁶ or well no. 30 with quernstones and no. 52 with a stone infill and bucket mounts from the so-called Forest Dune.¹⁹⁷

A half of the wells identified in the Forest Nursery contained no artefacts other than pottery at all. This might be ascribed to the fact that the wells and their surroundings were regularly cleared, as is confirmed by minimum percentages of settlement refuse in the fill of the wells (see Chap. 4.2.2). This makes the validation of the fourth factor quite difficult.

Explaining the significance of the extracted structure and the meaning of the relationship between the different variables and the wells is not a simple task in this case. There are no interpretation problems with the bucket mounts, the presence of which in the wells is hardly surprising. On various early medieval sites components of buckets used for drawing water appear in the wells quite frequently.¹⁹⁸ It is the other two variables making up the factor that are more difficult to interpret.

The finds of quernstones in the wells are not unusual at Pohansko. They were confirmed in at least three cases. They may have a meaning similar to that of stone infills, which are often found in wells at Pohansko.¹⁹⁹ The explanation of this phenomenon is not simple. The functionalist interpretation, according to which the stones originally created a stone rim on the surface, paved the access to the wells,²⁰⁰ or weighed down the well cover is no more than one among many possibilities. The stones, including the quernstones, are often found in the middle of the fill in the well, which by its homogenous nature and absence of settlement waste gives the impression that it was not created by gradual filling of the wells from the surrounding layers but rather by being backfilled at once. The backfilling of abandoned wells with pure soil is also confirmed in Merovingian settlements in south-

¹⁹⁶ Vignatiová (1982); Vignatiová (1992), pp. 41–43, p. 143, pp. 145–147.

¹⁹⁷ Unpublished excavation by J. Macháček, ÚAM FF MU 1999–2004.

¹⁹⁸ E.g. Schmidt (1975); Vendtová (1966).

¹⁹⁹ Wells no. 124A, 174, 194 and 266 from the Forest Nursery—see Dostál (1990c), p. 386; well 52 from the Forest Dune—unpublished excavation by ÚAM FF MU 1999–2004.

²⁰⁰ Dostál (1990c), p. 386.

ern Germany.²⁰¹ The case of well no. 358 from the Southern Suburb at Pohansko is particularly instructive. The infill (160 × 130 cm), consisting of large flat stones and flat-laid quernstones was unearthed at a depth of 115 cm from the sub-soil under a homogenous grey backfill with no finds. It was under this “capping” of the well shaft that the stone walling of the well started.²⁰² The quernstones may have had the same symbolic meaning as those found in the gates of fortifications, where they are deposited probably as a confirmation of the legal act of permanent abandoning of the settlement,²⁰³ or in the storage and silo pits into which they were thrown in connection with the rituals marking the abandoning of these features, as is suggested by finds from the early medieval settlements in Roztoky near Prague,²⁰⁴ Březno near Louny²⁰⁵ and Bajč²⁰⁶ and the hillfort in Klučov²⁰⁷ and Mužla.²⁰⁸ M. Kuna holds that such a great quantity of quernstones in storage pits cannot merely be the result of random losses or discarding damaged and unwanted pieces, but more likely the sign of a ritual deposition of objects on various occasions.²⁰⁹ This thesis is supported by finds from the early medieval settlement Bajč—Madzi kanálmi, where quernstones were found on the bottom of three storage pits. Although the excavator presumes they were used to seal the neck of the pit, another explanation seems more probable. A great number of other storage pits forming a separate district in Bajč contained skeletons of various animals (horses, dogs, pigs, goats, badger). Palaeontological analyses confirmed that many of them did not die of natural death but were intentionally killed. Their placement in storage pits was probably connected with specific cult practices.²¹⁰ The quernstones might have been thrown into the storage pits and wells for the same reason.

²⁰¹ Geisler (1996), p. 772.

²⁰² Vignatiová (1982), pp. 203–204, obr. 2.

²⁰³ E.g. the quernstone store in both gates of the Gars –Thunau stronghold, see Friesinger, H. (1992), p. 66; the quernstone in the gate of the high medieval castle in Obrány near Brno, see Konečný (1977), p. 233; the quernstones in the gates of Mikulčice, see e.g. Kouřil (2003), p. 114; Marek, Skopal (2003), p. 518.

²⁰⁴ Kuna, Profantová (2005).

²⁰⁵ Pleinerová (2000), 218.

²⁰⁶ Ruttkay (2002c), p. 265.

²⁰⁷ Kudrnáč (1970), p. 96; Kudrnáč and Pleinerová (2000) suppose the quernstones were used in the silo pits to seal the opening.

²⁰⁸ Hanuliak, Kuzma, Šalkovský (1993), pp. 95–99.

²⁰⁹ Kuna, Profantová (2005).

²¹⁰ Ruttkay (2002c), pp. 265–266.

The significance of quernstones in the cult of the old Slavs is supported by other finds, such as a pit with children's skulls covered with a quernstone at the foot of the rampart in the Petrova louka stronghold near Strachotín,²¹¹ the depot of quernstones and irons from the stronghold at Staré zámky near Líšeň²¹² or the discovery of two quernstones, covering a hoard of iron implements in the corner of the apse of church VIII in Mikulčice.²¹³

The digging of any deep pits, not just wells, was in prehistoric and probably even early medieval societies considered a highly symbolic act,²¹⁴ as was abandoning them. The intentional throwing of quernstones into the well during its backfilling or infilling with stones might have confirmed the irreversibility of the whole process within the transitional ritual. The same meaning could have probably been associated with the whole or broken quernstones in the backfill and lining of some graves both at Pohansko,²¹⁵ as well as on other early medieval Moravian and Bohemian sites²¹⁶ or elsewhere.²¹⁷ In Mikulčice alone quernstones were uncovered in twenty graves, where they were found in the fill, stone lining, but also behind the head and at the feet of the skeleton.²¹⁸ In the graves they might have served, in some cases, as part of more complex protection against vampires.

The Roman bricks may also have had a non-utilitarian meaning. However, such bricks are very rare in Pohansko and their relation to wells cannot be clearly confirmed. Interestingly, Roman bricks were used to line the bottom of the well-known well in the "Nad haltýřem" settlement in the Great Moravian central place in Staré Město. The bricks in question were in fact four specimens of the *tegula mammata* type with stamps of the XIVth legion and a private manufacturer from Carnuntum.²¹⁹ This find could be explained simply as the recycling of bricks, the form and size of which was ideal for lining the wall bottom. On the other hand, we should note that Roman bricks were

²¹¹ Oral account by Z. Měřínský.

²¹² Staňa (1961).

²¹³ Marek, Skopal (2003), p. 518, Taf. 6–7.

²¹⁴ Neustupný (1997a), pp. 315–317.

²¹⁵ Grave 41 from the North-eastern Bailey and grave 320 from the church cemetery.

²¹⁶ Staré Město "Na Valách" and "Na Čertově kútě", Syrovín near Bzenec, Stará Kouřim, Prachovské skály, Lahovice.

²¹⁷ E.g. central Germany; see Dostál (1982a), p. 179.

²¹⁸ Marek, Skopal (2003), pp. 518–519, Taf. 8–10.

²¹⁹ Hrubý (1965), pp. 158–163.

transported to Moravia from a considerable distance (most probably an extinct Roman building in southwestern Slovakia) and were used mainly in the construction of churches where they are found either complete built into the walls or crushed as an admixture in mortar.²²⁰ They also appeared in graves,²²¹ where, just as with many other antiquities originating in Roman provinces, they fulfilled the magical-ritual function of protective amulets.²²² For the same reason Roman bricks could have found their way into the wells which, according to ethnographic observations are associated with various traditions supposed to ensure the protection and cleanness of water.²²³

In the Forest Nursery the rituals need not have been linked with the wells only but to the other deeper features formally resembling them as well (feat. no. 245 and 254c—see above). While their original function is unclear (storage pits ?), they contain stone infills with quernstones and Roman bricks, which suggests the taking place of similar rituals as in the wells.

The archaeological structures identified on the basis of artefacts other than pottery from the Forest Nursery at Pohansko were interpreted, using models derived from the living culture, in terms of their function, significance and meaning.²²⁴ The function, which expresses the practical point of view and the way in which the facts of the living culture are usually employed, is contained in the first, third and partly in the fourth factor. It is a reflection of the most notable craftsmen's activities taking place in the Forest Nursery area, i.e. metal processing and textile production, and the using of wells to draw water. The significance which is given by the social milieu and reflects the relations of people to other people, is linked with the second factor and a specific group of people settled in the Forest Nursery. The fourth factor is mainly bound with the symbolic meaning of the archaeological structures and reflects the spiritual life of early medieval society.²²⁵ This was manifested in the settlement context of the Forest Nursery by the relationship of the inhabitants to wells and other deep pits.

²²⁰ Musil (1997), pp. 315–324.

²²¹ E.g. grave 5/51 from the Na valách cemetery in Staré Město, see Hrubý (1955), p. 494.

²²² E.g. Kolník, Rejholcová (1986), pp. 343–347.

²²³ E.g. Frolec, Vařeka (1983), p. 216.

²²⁴ Neustupný (1986), p. 543; (1993), p. 160.

²²⁵ More in Neustupný (1997a), pp. 317–319.

Our sources, originally static, formal, material, and silent are now filled with functions, significances and meanings derived from the categories of the living culture. The result was made possible by a consistent application of the archaeological method²²⁶ to the archaeological context from the Forest Nursery at Pohansko.

4.4 GRAVES FROM THE FOREST NURSERY

In addition to the church cemetery with 407 graves, another 456 graves were excavated at Pohansko near Břeclav, of which 210 were in the Southern and 50 in the Northeastern Suburb. The graves are scattered, either individually or in small clusters, among the settlement features and do not form any compact cemeteries. Graves situated within the stronghold, in an area delineated by the fortification, are often in simply dug pits and without any grave goods or only a few grave goods. On the other hand, pottery appears quite often in those graves, in sharp contrast to the situation in the church cemetery. B. Dostál thought that the graves scattered among settlement features were of commoners and that those who buried them were still following pagan burial customs.²²⁷ Eighty-one such graves were also uncovered during the excavation of the Forest Nursery settlement. Apart from pottery they only produced a knife, a firesteel, simple bronze earrings, a bead, a buckle, etc. Following B. Dostál, we may presume that those were the graves of people of the lowest social stratum, perhaps even slaves employed in the workshops.²²⁸

In evaluating the graves we will mainly concentrate on the question of whether it is possible to reconstruct the social status of the people buried in the Forest Nursery and/or whether we can shed any light on their spiritual life. If we succeed we will gain a more comprehensive idea of the function, significance and meaning of this settlement. As far as addressing the questions outlined above is concerned, it is generally thought that the burial grounds are an important source of information so that we can optimistically expect that their processing will considerably expand our knowledge in this field.

²²⁶ Neustupný (1986); Neustupný (1993).

²²⁷ Dostál (1982a).

²²⁸ Dostál (1993a); Dostál (1993b), p. 45.

4.4.1 *Analysis of graves and the formalized descriptive system*

In creating a descriptive system, we will consider each individual grave as the structuring entity. However, as part of the analysis we must also define their qualities (variables). We need to choose variables that will be sufficiently structuring in terms of the questions asked.

The first group of descriptors is related to artefacts placed in the graves as grave goods. Their importance for the discussion of the social stratification of the dead and the religious ideas of the people who placed the grave goods into the graves is beyond any doubt, even though the graves from the Forest Nursery are rather poor. Only two groups of grave goods are so numerous as to be singled out as independent descriptors: knives (MESSER) and pottery (KER). The other grave goods (strap ends, buckle, antler box, iron or bronze ring, bone sharpened tool, firesteel, bucket, bronze point, worked bone) had to be gathered under a single descriptor—other artefacts (ANDERE_F). Dress accessories, such as earrings and beads, appeared only in a few graves and are not sufficiently structuring. Their data was not included in the descriptive matrix. The presence of grave goods in the grave is expressed by the dichotomized value 0–1.

Another descriptor is related to the grave pits. As was stated above the graves in the Forest Nursery are simply arranged and can be characterized solely by their dimensions. The selected structurizing attribute expresses, in absolute units, the area of the grave pit at the subsoil level (AREA). The grave depth is not included in the descriptive matrix as most of the graves in the Forest Nursery dug into the subsoil were quite shallow (the grave depth only exceptionally exceeds 30 cm) and for many of them this attribute had not been recorded in the field documentation at all.

The last group of descriptors describes the skeleton—its orientation, condition and position. The W-E grave orientation, which is very common in most 9th- to 12th-century burial grounds in the region,²²⁹ appears only occasionally in Pohansko, both with graves scattered among the settlement features²³⁰ and in the church cemetery.²³¹ We can expect it had a special significance. The fact that a grave is oriented in the W-E direction will be denoted by the value 1 by descriptor

²²⁹ Hanuliak (1984), p. 109.

²³⁰ Dostál (1982a), p. 181.

²³¹ Rajchl (2001), pp. 129–131.

W_O. In addition to graves strictly following the direction this group will include cases with a slight deflection in the WNW-EES and WWS-EEN direction. Graves marked in this descriptor with 0 are oriented in any other direction. With skeletons, we also took into consideration the state of preservation. Descriptor ERHALGUT expresses by the values 0 and 1 whether the uncovered skeleton was in a good or bad condition. The position of the limbs is recorded by means of two descriptors. For the position of the arms the structuring and, at the same time, prevailing attribute²³² is the folding of at least one forearm, which is often placed across the pelvis (EHAND_BO). The bending of the knees (BEINE_BO) is considered a significant deviation from the common rite, and not just with skeletons found in crouched or flexed position.²³³

4.4.2 *Synthesis of the formal structures of the graves*

The principal component analysis which is at the core of the archaeological method will be carried out based on the descriptive matrix consisting of 8 columns (see above) and 50 lines (Tab. 86). The reduced number of entities/objects (graves) in the matrix compared to all the recorded graves from the Forest Nursery (81) is due to the fact that in many graves one of the attributes was unavailable, such as the dimensions of the grave pit (in case the grave extended beyond the edge of the trial trench or the original position of the limbs (when the grave was secondarily dislocated). The precondition of a properly conducted principal component analysis is a complete descriptive matrix with none of the missing pieces of data. As a result the affected entities (or qualities) must be exempt from the analysis.²³⁴

The next principal component analysis will be based on four factors. We decided on this number following the finding that the eigenvalue of the first four factors is greater than one and, at the same time, we note a significant drop of the eigenvalue between the fourth and fifth factor. The extracted factors express 72.5 percent of the total variability of the matrix (Tab. 87).

²³² Dostál (1982a), p. 182.

²³³ Ibidem.

²³⁴ Neustupný (1997b), p. 239.

Tab. 86. Descriptive Statistics.

	Mean	Std. Deviation	Analysis N
MESSER	0.1600	0.3703	50
KER	8.000E-02	0.2740	50
ANDERE_F	0.1000	0.3030	50
AREA	12532.7480	8111.1927	50
W_O	0.5400	0.5035	50
ERHALGUT	0.8200	0.3881	50
EHAND_BO	0.3200	0.4712	50
BEINE_BO	0.1600	0.3703	50

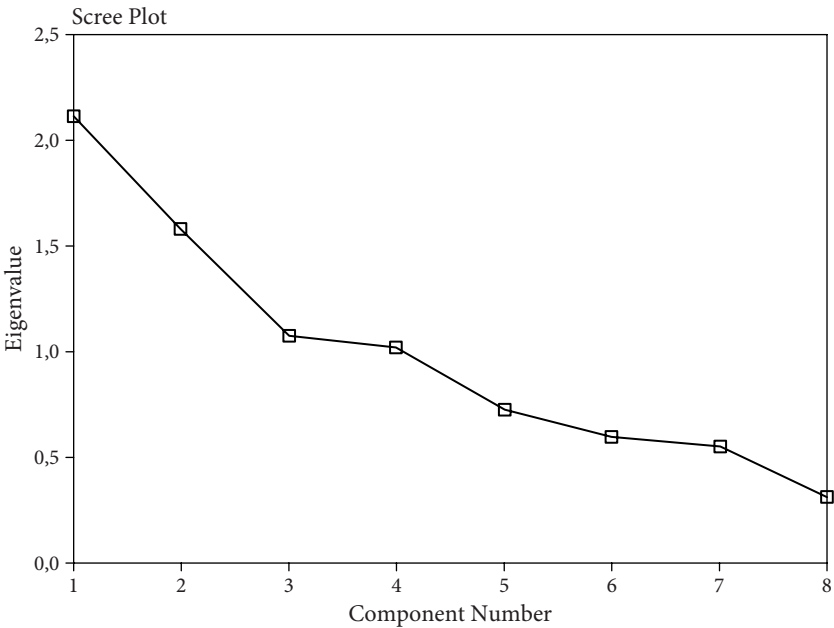
Tab. 87. Eigenvalues.

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.113	26.410	26.410	2.045	25.562	25.562
2	1.585	19.813	46.223	1.334	16.677	42.239
3	1.077	13.464	59.687	1.282	16.026	58.265
4	1.025	12.809	72.496	1.138	14.231	72.496
5	0.730	9.124	81.620			
6	0.600	7.495	89.115			
7	0.554	6.926	96.041			
8	0.317	3.959	100.000			

Extraction Method: Principal Component Analysis. Total Variance Explained

The rotated factors are summed up in the following table (Tab. 88). For greater clarity the table displays only factor loadings with values greater than 0.2 and the descriptors are ordered by their typicality for the given factor.

The first factor is made up of three notable descriptors on the positive pole: other grave goods (ANDERE_F), knife (MESSER) and vessel (KER). In opposition to them is the grave orientation in the W-E direction (W_O). This variable took up a position on the negative pole of factor 1. The second factor is also strongly bipolar. On its positive pole we find two variables with high loadings—well preserved skeleton (ERHALGUT) and grave area (AREA). On the negative pole we



Tab. 88. Rotated Component Matrix.

	Component			
	1	2	3	4
ANDERE_F	0.850			
MESSER	0.816			
KER	0.552	-0.540		
ERHALGUT		0.813	0.223	
AREA		0.588	-0.357	0.467
EHAND_BO			0.855	
W_O	-0.487		0.566	0.394
BEINE_BO				-0.854

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 9 iterations.

encounter pottery in the grave (KER). The third factor can be principally characterized by two variables with high positive loadings: folded forearm (EHAND_BO) and W-E grave orientation (W_O). The variable characterizing a well preserved skeleton (ERHALGUT) with a positive loading and the grave area (AREA) with a negative loading are only a little less important for the third factor. The last fourth

factor is again clearly bipolar. On the negative pole we note, with a high loading, the variable for bent lower limbs (BEINE_BO), and it is opposed on the positive pole of the factor by attributes such as grave area (AREA) and W-E orientation (W_O).

4.4.3 *Validation of formal structures*

In terms of the validation of the formal structures related to graves and grave goods it is thought that the suitable independent external evidence is the anthropological determination of the age and sex of the dead.²³⁵ This piece of information will also be used in the validation of the factors described above. We will again use, as the initial data, the factor scores which express, by their value, the relationship between the individual objects (in this case graves) of the original descriptive matrix and the various factors. The higher the positive value of the score of these objects the more typical they are for the positive pole of the factor. The lower their negative value, the more typical they are for the negative pole of the factor. Objects with the factor score around zero are insignificant for the given factor.

For the purposes of the validation the graves (only anthropologically determined graves) and their factor scores are divided into three groups by sex, and/or age (GESCHL: women—Frau, men—Mann, children—Kind). The three sets are compared among one another in the following series of two types of diagrams (Diagram 111–Diagram 118). The bar graph indicates the average value of the score of each factor in the selected groups of graves, the box plot shows their statistical characteristics, such as the median, upper and lower quartiles, range and extreme values.

The diagrams provide us with some important findings. In the first factor there is an affinity with male graves, although exceptional female and children's graves can also attain very high scores in this factor. With regards to the second factor there is no doubt that the negative pole is typical for children's graves. Only three female graves are within values characteristic for children's graves. On the other hand, the positive pole of the factor is more related to male graves.

²³⁵ Ibidem, p. 243, pp. 254–255.

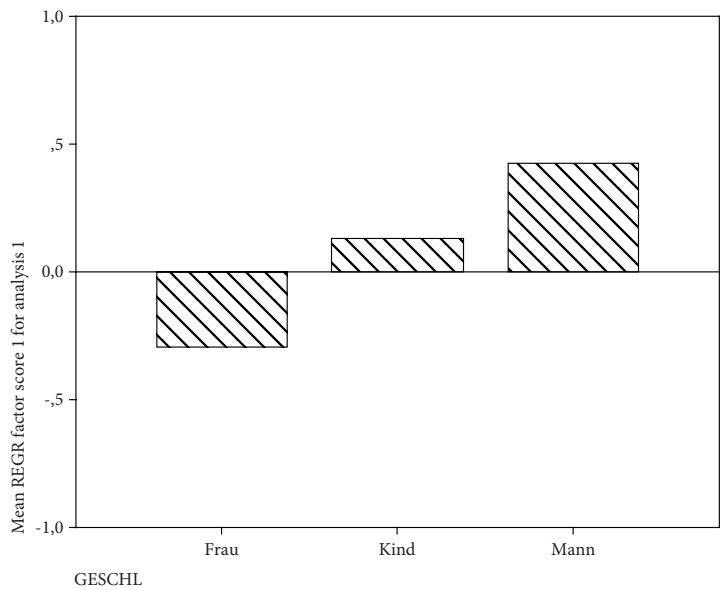


Diagram 111. Břeclav-Pohansko. The Forest Nursery. Average score of factor 1 calculated from grave finds. Divided by sex and age (GESCHL: women—Frau, men—Mann, children—Kind).

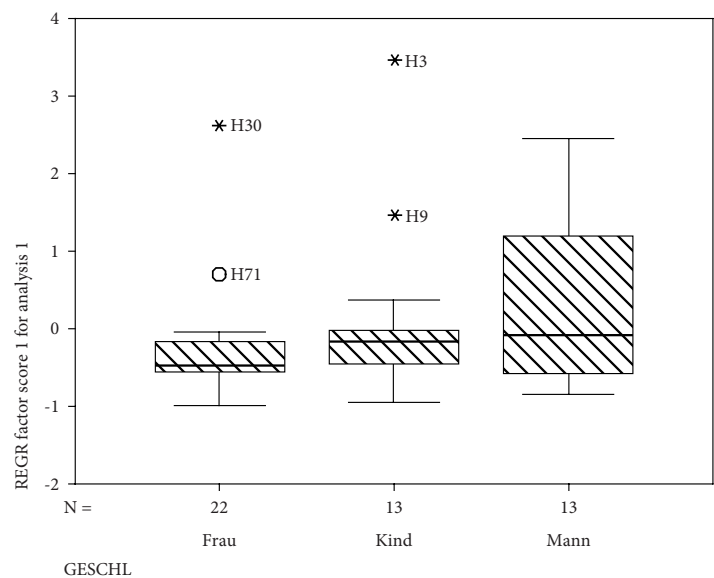


Diagram 112. Břeclav-Pohansko. The Forest Nursery. Box plot of the score of factor 1 calculated from grave finds. Divided by sex and age (GESCHL: women—Frau, men—Mann, children—Kind).

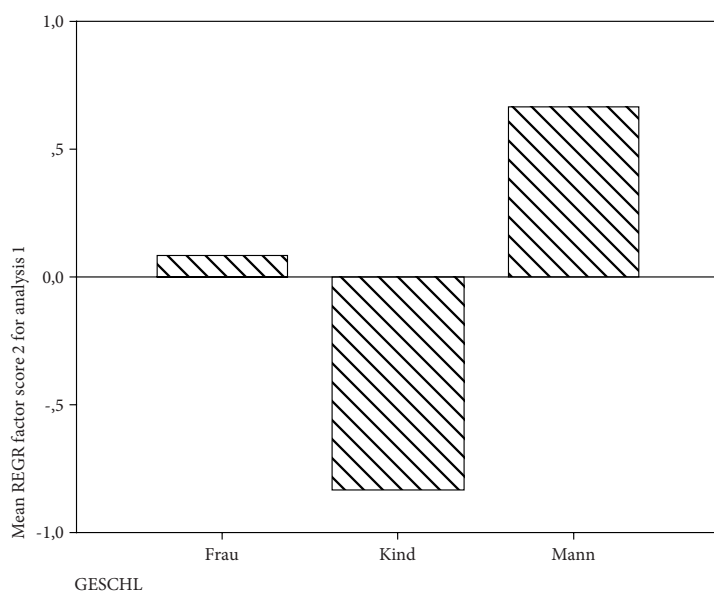


Diagram 113. Břeclav-Pohansko. The Forest Nursery. Average score of factor 2 calculated from grave finds. Divided by sex and age (GESCHL: women—Frau, men—Mann, children—Kind).

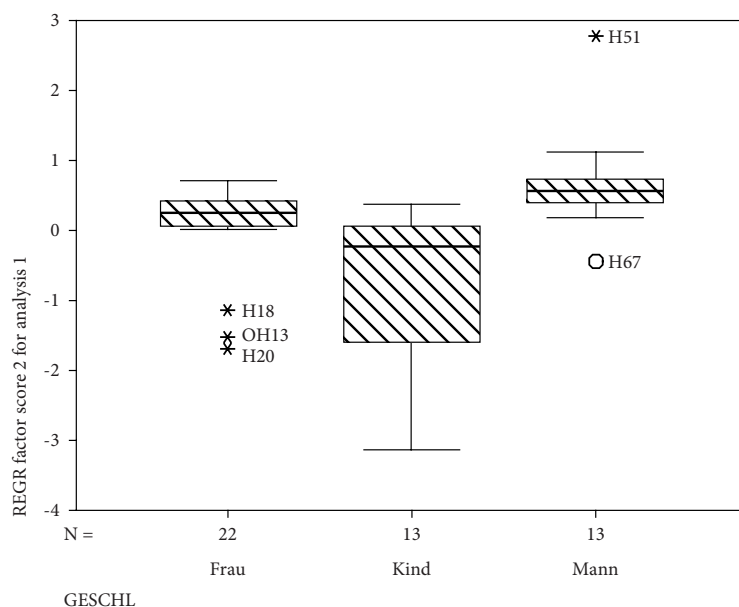


Diagram 114. Břeclav-Pohansko. The Forest Nursery. Box plot of the score of factor 2 calculated from grave finds. Divided by sex and age (GESCHL: women—Frau, men—Mann, children—Kind).

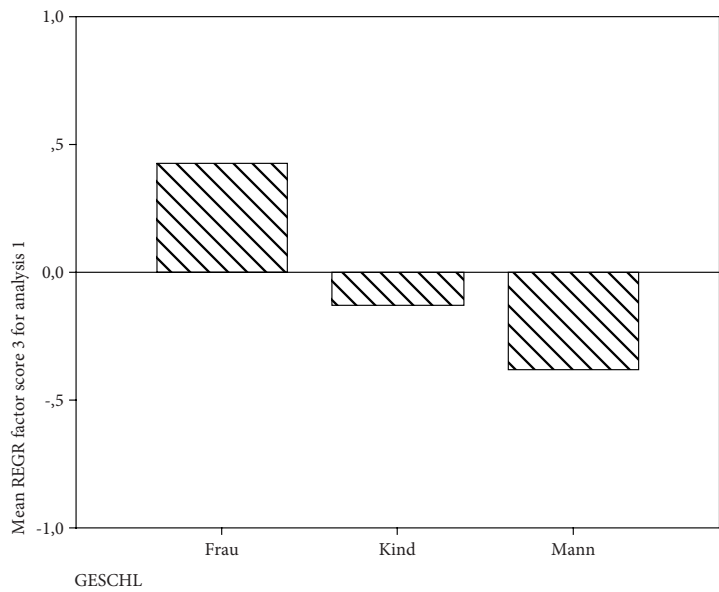


Diagram 115. Břeclav-Pohansko. The Forest Nursery. Average score of factor 3 calculated from grave finds. Divided by sex and age (GESCHL: women—Frau, men—Mann, children—Kind).

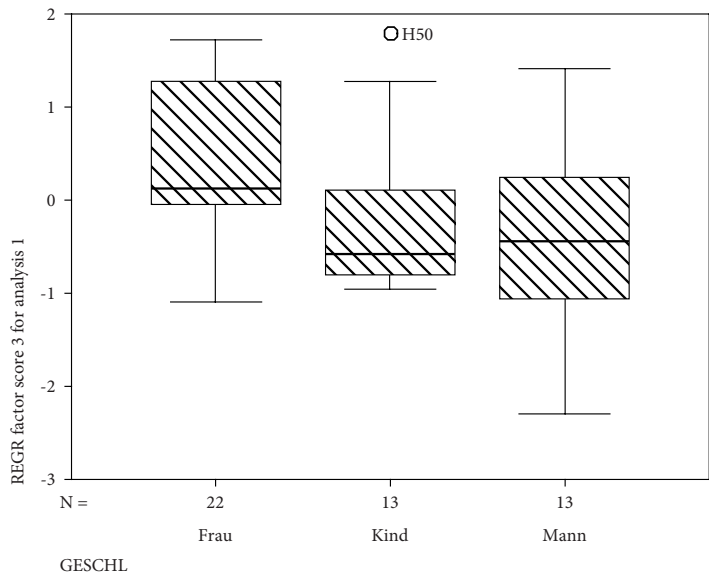


Diagram 116. Břeclav-Pohansko. The Forest Nursery. Box plot of the score of factor 3 calculated from grave finds. Divided by sex and age (GESCHL: women—Frau, men—Mann, children—Kind).

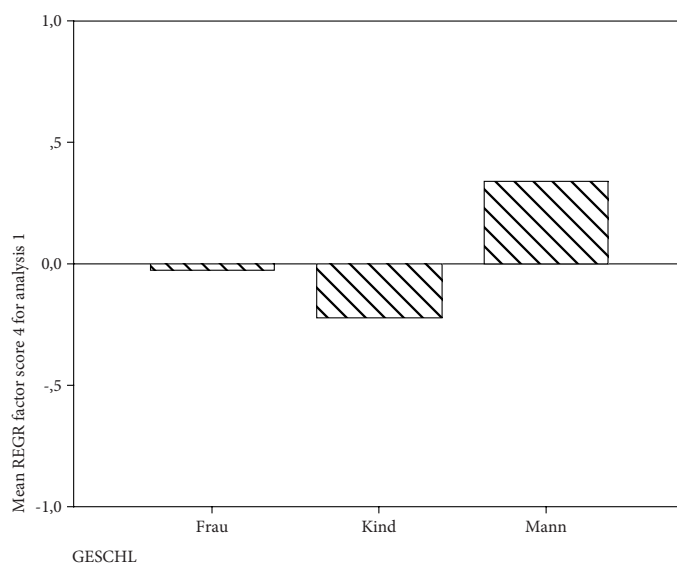


Diagram 117. Břeclav-Pohansko. The Forest Nursery. Average score of factor 4 calculated from grave finds. Divided by sex and age (GESCHL: women—Frau, men—Mann, children—Kind).

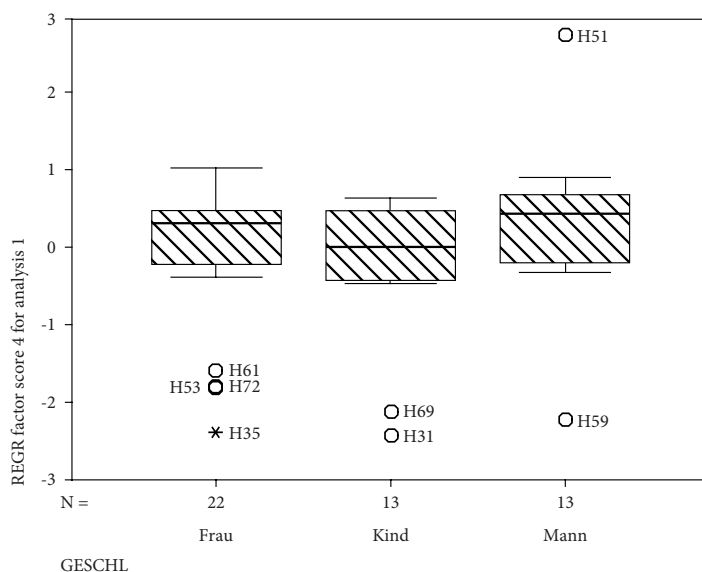


Diagram 118. Břeclav-Pohansko. The Forest Nursery. Box plot of the score of factor 4 calculated from grave finds. Divided by sex and age (GESCHL: women—Frau, men—Mann, children—Kind).

The third factor, or its positive pole, belongs to female graves. This is highlighted even more clearly on comparison with children's and male graves, which have medians and average factor scores within negative values. In the last, fourth, factor there is no apparent link with the sex or the age of the dead.

The number of graves which could have been included in the principal component analysis is limited, mainly because of the missing pieces of data in the combination of all the variables and unfortunately is not large enough to be used as a basis for statistical tests confirming or refuting the validity of the extracted formal structures. As a result in the following tests we will use variables which showed themselves to be sufficiently structuring in the principal component analysis and which can be individually surveyed and recorded in a much greater number of graves.

The tested variables will be compared against external evidence (age and sex) and we will test for any relationship between them or for the possibility of rejecting the null hypothesis of no relationship. To do this we will employ contingency tables/crosstabulation, with quantification of the relationships between the nominal data, and the chi-square test. In the test we will compare the so-called experimental or observed counts (in the table as Count), which were actually observed, and the so-called expected counts (in the table as Expected Count), obtained from a particular model. In this case it will be a 50/50 hypothesis, which is based on a supposition that none of the groups created from the combination of the tested variables with external evidence (age, sex) significantly outnumber the other groups. At a given significance level (mostly $p=0.05$) we will then observe where there is a relationship between the experimental and expected counts or not. An application of the chi-square test requires that some preconditions are met. Over 20 percent of all the expected counts should not be lower than 5 and none lower than 1. If they are sorted into two groups only, then none of the expected counts should be lower than 5.²³⁶ The resulting table of the chi-square test shows the test criterion value, number of degrees of freedom and, most importantly, the minimum significance

²³⁶ Reisenauer (1970), pp. 94–96.

level (Asymp. Sig.), from which we reject the so-called null hypothesis. If this value is lower than 0.05, we can state that, at the given level of statistical significance, there may be some relationship between the expected and the observed count.

Each of the following tests is accompanied with a contingency table (crosstabulation) showing the observed and expected values, and a bar graph or a box plot (Diagram 119–Diagram 124).

The first relationship which can be statistically tested concerns the age and/or sex of the dead (GESCHLECH: Frau, Mann, Kind) and the grave orientation (Diagram 119). For the purposes of this (and the following) tests we will create three broad groups of graves based on their orientation:

group A: N-S, S-N, SSE-NNW, NNW-SSE orientation

group B: NW-SE, SW-NE, NE-SW orientation

group C: W-E, WNW-EES, WWS-EEN orientation

The calculation (Tab. 89) was made on the basis of 73 graves for which the required data was available (e.g. in some graves we have no anthropological determination of the sex of the adults available).

Tab. 89. Břeclav-Pohansko. The Forest Nursery. Relationship between the age and/or sex of the dead (GESCHLECH) and the grave orientation (ORIENT2). Crosstabulation.

GESCHLECH		ORIENT2			Total
		A	B	C	
Women	Count	0	5	18	23
	Expected Count	4.1	6.9	12.0	23.0
Children	Count	9	12	11	32
	Expected Count	5.7	9.6	16.7	32.0
Men	Count	4	5	9	18
	Expected Count	3.2	5.4	9.4	18.0
Total	Count	13	22	38	73
	Expected Count	13.0	22.0	38.0	73.0

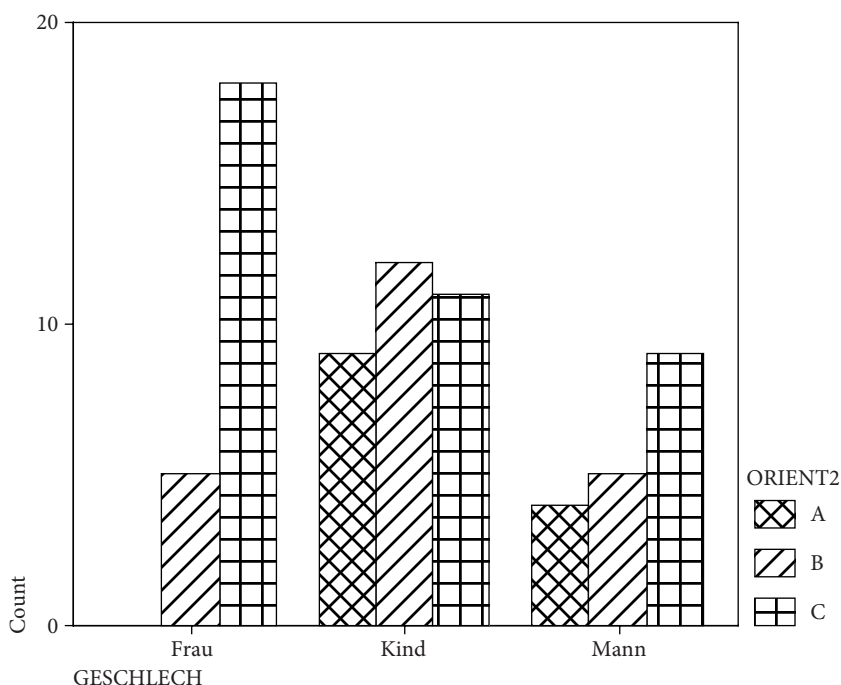


Diagram 119. Břeclav-Pohansko. The Forest Nursery. Bar graph showing the relationship between the age, and/or sex of the dead (GESCHL: women—Frau, men—Mann, children—Kind) and the grave orientation (groups A, B, C).

The completed test (Tab. 90) does not, unfortunately, comply with one of the preconditions required for the application of the chi-square test. The percentage of expected counts with a value below 5 reaches 22.2 percent, which is beyond the limit of 20 percent, even if not far from it. At the same time, one of the two counts which do not reach a value of 5, can be considered relatively high (4.1). Given those circumstances we believe that the result of the completed test has some value and we can continue working with it, albeit bearing in mind that the rigid statistical preconditions were not completely satisfied.

The result of the chi-square test indicates that a relationship exists between the grave orientation and the sex of the dead buried in them. The contingency table and the bar graph confirm that it is mainly female graves that are different, having a prevalent orientation of group C (W-E, with deflections) and no orientation of group A (N-S, S-N, with deflections). In children's graves all three groups have a

Tab. 90. Břeclav-Pohansko. The Forest Nursery. Relationship between the age and/or sex of the dead and the grave orientation. Chi-Square Test.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.323	4	0.015
Likelihood Ratio	15.987	4	0.003
N of Valid Cases	73		

a 2 cells (22.2%) have expected count less than 5. The minimum expected count is 3.21.

roughly equal distribution, even though the N-S and S-N orientation in particular (group A) is somewhat higher when compared to the expected values. Male graves are divided between the individual groups as expected, i.e. with the prevalent W-E orientation, which is not so markedly dominant as in women's graves.

The result can be complemented by another type of comparison. The anthropological data also inform us of the age of the dead (ALT_BIS). It is a continuous quantitative value expressed by the number of years. From this value we can calculate the main features of descriptive statistics (Tab. 91; mean, median, variance, standard deviation, minimum, maximum and range) related to the three groups of graves that we created on the basis of their orientation (A, B, C). The age of the deceased was identified in 69 graves. The established statistical characteristics are presented in a table and displayed in the form of a box plot (Diagram 120).

Tab. 91. Břeclav-Pohansko. The Forest Nursery. Relationship between the age of the dead (in years) and the grave orientation (group A, B, C). Descriptive statistics.

ORIENT	ALT_BIS	Statistic
A	Mean	14.85
	Median	7.00
	Variance	291.81
	Std. Deviation	17.08
	Minimum	2.00
	Maximum	55.00
	Range	53.00
B	Mean	20.45
	Median	16.00
	Variance	305.71

Tab. 91 (cont.)

ORIENT	ALT_BIS	Statistic
C	Std. Deviation	17.48
	Minimum	0.00
	Maximum	55.00
	Range	55.00
	Mean	32.76
	Median	37.50
	Variance	446.85
	Std. Deviation	21.14
	Minimum	1.00
	Maximum	79.00
	Range	78.00

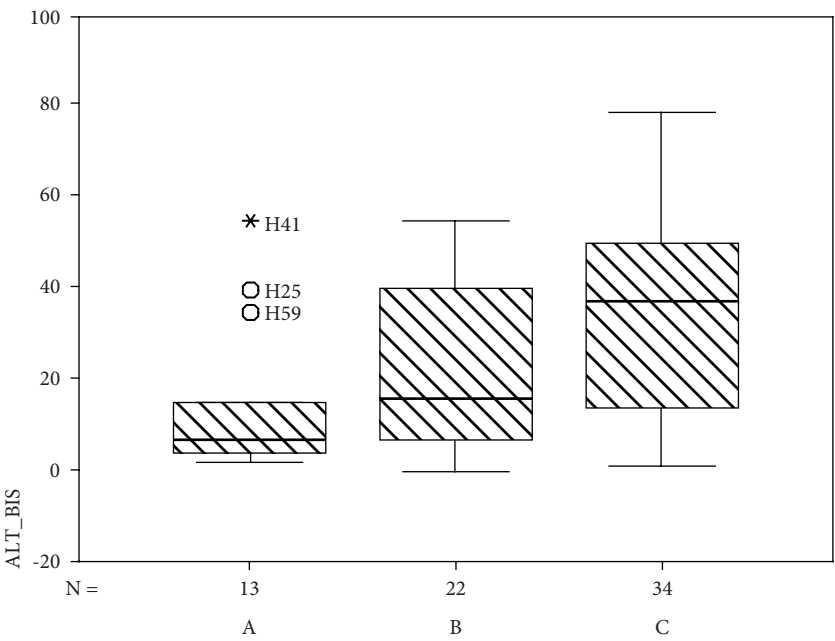


Diagram 120. Břeclav-Pohansko. The Forest Nursery. Box plot. Relationship between the age of the dead (in years) and the grave orientation (group A, B, C).

The diagram and the descriptive statistic (Tab. 91) clearly show that young individuals, or children, prevail in group A (grave orientation N-S, S-N, with deflections). It is quite the opposite in group C (grave orientation W-E, with deflections) where the average age of the dead is almost 33 years.

Another relationship that will be statistically tested is the one between the sex and/or the age of the dead (GESCHL) and the grave goods (FUNDE). We will try to establish whether the grave goods are randomly or non-randomly distributed in male, female and children's graves. The presence of any grave good in the grave is recorded by the dichotomic variable 0–1. The test will be performed on a set of 75 graves (Tab. 92–Tab. 93; Diagram 121).

Tab. 92. Břeclav-Pohansko. The Forest Nursery. Relationship between the sex and/or the age of the dead (GESCHL) and the grave goods (FUNDE). Crosstabulation.

GESCHL		FUNDE		Total
		0	1	
Women	Count	19	5	24
	Expected Count	16.0	8.0	24.0
Children	Count	19	14	33
	Expected Count	22.0	11.0	33.0
Men	Count	12	6	18
	Expected Count	12.0	6.0	18.0
Total	Count	50	25	75
	Expected Count	50.0	25.0	75.0

Tab. 93. Břeclav-Pohansko. The Forest Nursery. Relationship between the sex and/or the age of the dead (GESCHL) and the grave goods (FUNDE). Chi-Square Test.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.915	2	0.233
Likelihood Ratio	3.012	2	0.222
N of Valid Cases	75		

a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.0.

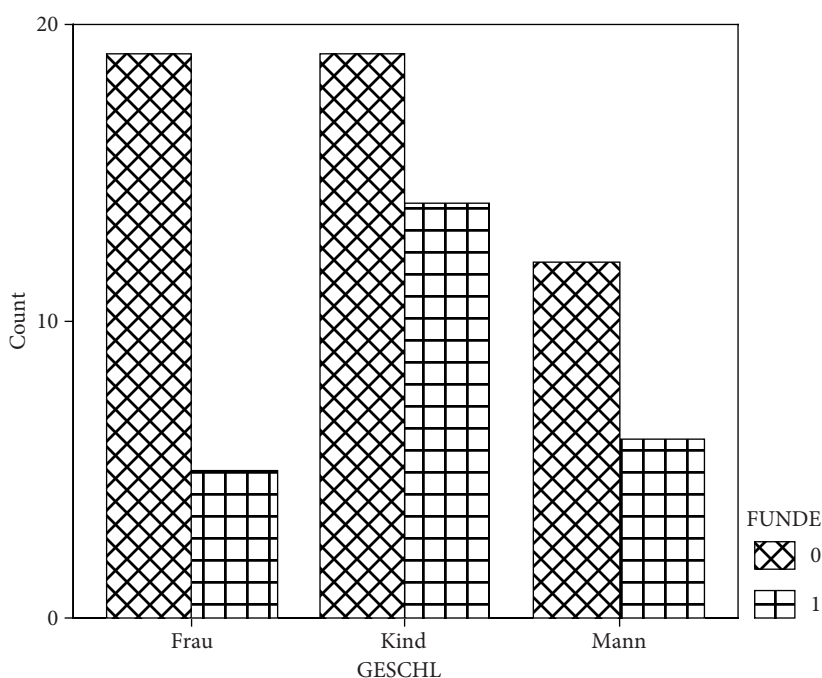


Diagram 121. Břecław-Pohansko. The Forest Nursery. Relationship between the sex, and/or the age of the dead (GESCHL: women—Frau, men—Mann, children—Kind) and the grave goods (FUNDE).

Although the contingency table (Tab. 92) and the bar graph indicate that the absolutely highest occurrence of grave goods is linked with children's graves and the lowest to women's graves, the difference cannot be confirmed by the statistical chi-square test (Tab. 93). Furthermore, we have to consider that there is no significant relationship between the sex and/or age of the dead and the grave goods.

The next test requires that the input data is slightly modified. The presence of grave goods in the grave (FUNDE) will be compared with only two categories related to the age of the dead (adult—ERWACHS, child—KIND). The given values were recorded in 76 cases (Diagram 122). The contingency table (Tab. 94) consists of only four boxes (2×2 table type). Apart from the chi-square test this also allows us to apply, for example, Fisher's Exact Test (Tab. 95).

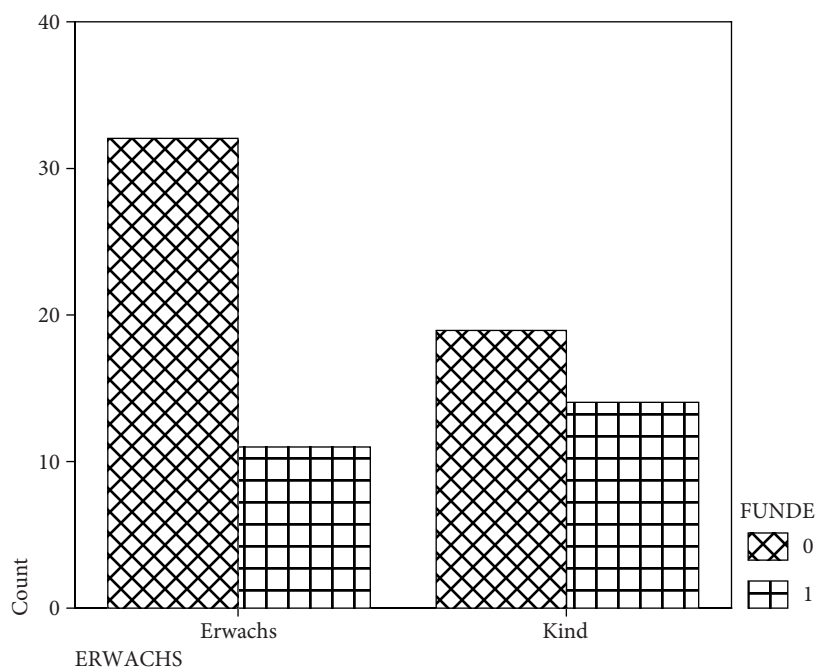


Diagram 122. Břeclav-Pohansko. The Forest Nursery. Relationship between the age of the dead (ERWACHS: adult—ERWACHS, child—KIND) and the grave goods (FUNDE).

Tab. 94. Břeclav-Pohansko. The Forest Nursery. Relationship between the age of the dead (ERWACHS) and the presence of grave goods in the grave (FUNDE). Crosstabulation.

ERWACHS		FUNDE		Total
		0.00	1.00	
Adult	Count	32	11	43
	Expected Count	28.9	14.1	43.0
Child	Count	19	14	33
	Expected Count	22.1	10.9	33.0
Total	Count	51	25	76
	Expected Count	51.0	25.0	76.0

Tab. 95. Břeclav-Pohansko. The Forest Nursery. Relationship between the age of the dead and the presence of grave goods in the grave. Chi-Square Test.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson	2.399	1	0.121		
Chi-Square					
Continuity	1.697	1	0.193		
Correction					
Likelihood Ratio	2.392	1	0.122		
Fisher's Exact Test				0.145	0.097
N of Valid Cases	76				

a Computed only for a 2×2 table
b 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.86.

The result shows that even in this case we cannot confirm a significant relationship between the dependence of the occurrence of grave goods in the grave and the age of the dead based on the statistical tests.

In the next test we will concentrate on a single category of finds, pottery (KER). Judgingg from the previous factor analysis, pottery appears to be structuring and, at the same time, in sufficient quantity to allow for its use as a basis for statistical testing. The presence of pottery in the grave is recorded by the dichotomized value 0–1. The occurrence of pottery will again be compared with two categories related to the age of the dead (adult—ERWACHS, child—KIND). The contingency table (Tab. 96) is again made up of four boxes. In addition to the chi-square test we can use Fisher's Exact Test (Tab. 97). The calculation is made on a set of 76 graves (Diagram 123).

Tab. 96. Břeclav-Pohansko. The Forest Nursery. Relationship between the age of the dead (ERWACHS: adult—ERWACHS, child—KIND) and the occurrence of pottery in the grave (KER). Crosstabulation.

ERWACHS		KER		Total
		0.00	1.00	
Adult	Count	41	2	43
	Expected Count	35.6	7.4	43.0
Child	Count	22	11	33
	Expected Count	27.4	5.6	33.0
Total	Count	63	13	76
	Expected Count	63.0	13.0	76.0

Tab. 97. Břeclav-Pohansko. The Forest Nursery. Relationship between the age of the dead (ERWACHS: adult—ERWACHS, child—KIND) and the occurrence of pottery in the grave (KER). Chi-Square Test.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson	10.833	1	0.001		
Chi-Square					
Continuity	8.904	1	0.003		
Correction					
Likelihood	11.360	1	0.001		
Ratio					
Fisher's				0.001	0.001
Exact Test					
N of Valid	76				
Cases					

a Computed only for a 2×2 table

b 0 cells (,0%) have expected count less than 5. The minimum expected count is 5,64.

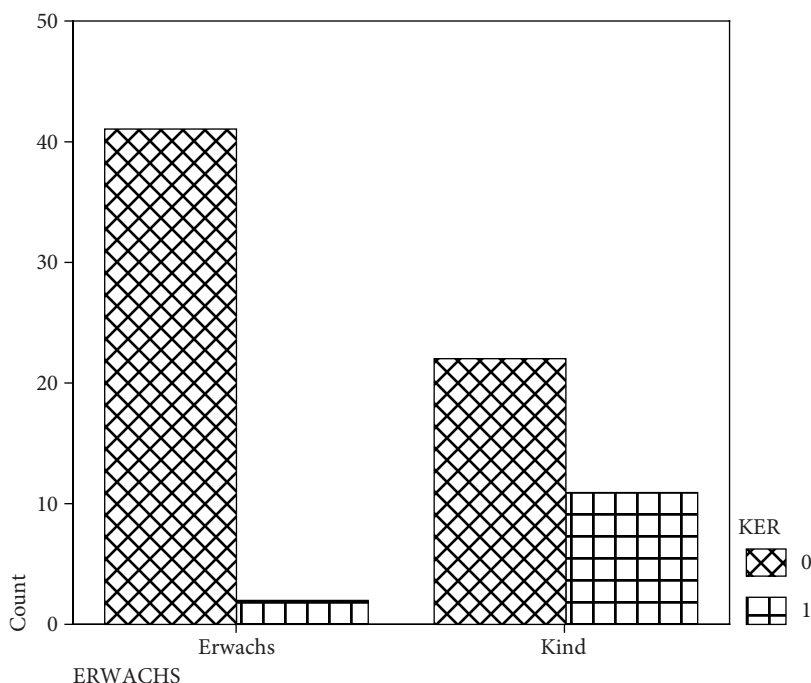


Diagram 123. Břeclav-Pohansko. The Forest Nursery. The relationship between the age of the dead (ERWACHS: adult—ERWACHS, child—KIND) and the occurrence of pottery in the grave (KER).

It is obvious from this statistical test that there is a significant relationship between pottery in the graves and the age of the dead. The contingency table and bar graph clearly show that there appears much more pottery in children's graves than in adults' graves.

Within the statistical testing of the graves from the Forest Nursery we can carry out yet another complementary test (Tab. 98–Tab. 99). In a set of 78 graves we will examine whether there is a significant relationship between the grave orientation (ORIENT) and the occurrence of the grave goods (FUNDE). The orientation will again be defined by three groups (A, B, C—see above) and the presence of grave goods by values 0 and 1 (Diagram 124).

The test (Tab. 99) clearly points out that there exists a relationship between orientation and grave goods. In the graves from group C (graves with the W-E orientation, with deflections) there are fewer grave goods than could be expected, while in the graves with different

Tab. 98. Břeclav-Pohansko. The Forest Nursery. Relationship between the grave orientation (group A–C) and the grave goods (FUNDE). Crosstabulation.

ORIENT		FUNDE		Total
		0	1	
A	Count	7	7	14
	Expected Count	9.5	4.5	14.0
B	Count	14	11	25
	Expected Count	17.0	8.0	25.0
C	Count	32	7	39
	Expected Count	26.5	12.5	39.0
Total	Count	53	25	78
	Expected Count	53.0	25.0	78.0

Tab. 99. Břeclav-Pohansko. The Forest Nursery. Relationship between the grave orientation (group A–C) and the grave goods (FUNDE). Chi-Square Test.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.271	2	0.026
Likelihood Ratio	7.439	2	0.024
N of Valid Cases	78		

a 1 cells (16.7%) have expected count less than 5. The minimum expected count is 4.49.

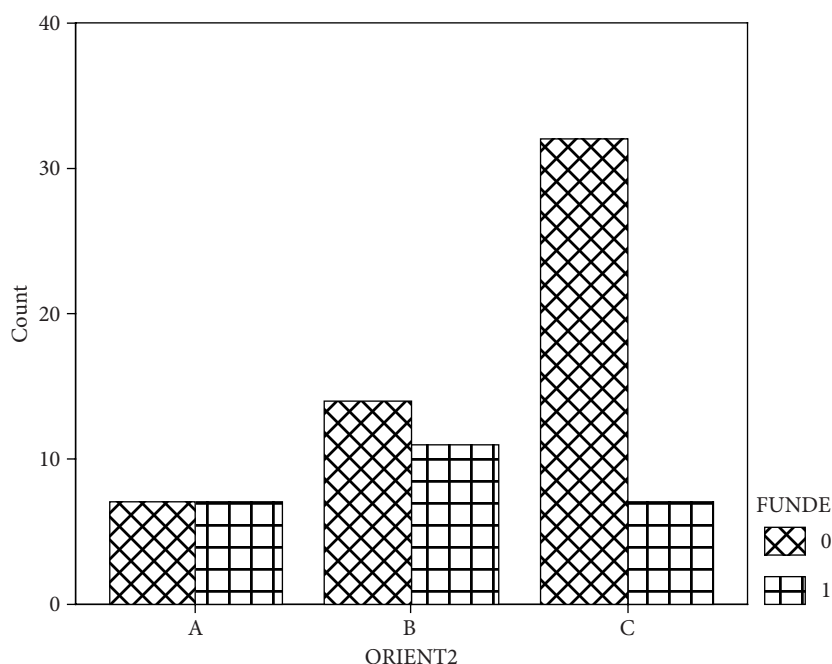


Diagram 124. Břeclav-Pohansko. The Forest Nursery. Relationship between the grave orientation (group A–C) and the grave goods (FUNDE).

orientations (group A and group B) the number of graves with grave goods is unexpectedly high.

The factor analysis based on the matrix the entities of which were graves from the Forest Nursery at Pohansko was, in its great part, successfully validated by comparing the extracted formal structures, or the important and structuring variables, with independent data on the age and sex of the dead. The process was clearcut in factor 2, where the negative pole, with the dominant KER (pottery) variable, is linked with children. On the contrary, the positive pole of factor 3 and the negative pole of factor 1, or the W-E orientation of the grave, is related to women. Some dependency, which could not have been subject to statistical testing, was confirmed even between the positive pole of factor 1 and male graves. Validation of the fourth factor unfortunately failed as there were no significant relationships with the sex or age of the dead identified.

4.4.4 *Spatial distribution of the graves*

The spatial organization of the archaeological record is a very important topic²³⁷ which must be studied in detail. This also applies to the graves from the Forest Nursery at Pohansko. Even the first look at their distribution over the area of the excavation makes it clear that they are not arranged there randomly (Fig. 59). The different clusters that the graves form in space are especially distinctive. In order to be able to define them we used the tools from the raster-oriented GIS software (GeoMedia Grid). The Forest Nursery area was divided up into a grid of cells with a side of 50 cm. Each of the graves was located by its central point (centroid). By running the Local Scan function we identified zones with the greatest concentration of grave centroids. Their boundaries were then vectorized. In this way we defined eight groups, of which two stand out as especially rich in graves (Fig. 60).



Fig. 59. Břeclav-Pohansko. The Forest Nursery. Grave burials.

²³⁷ Neustupný (1996b); Neustupný (1997b), p. 237.

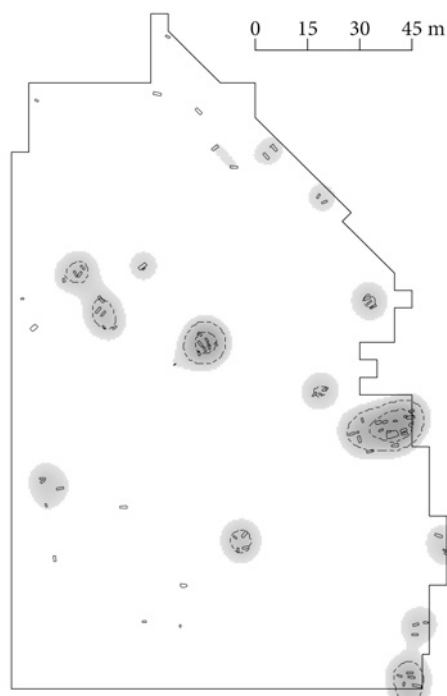


Fig. 60. Břeclav-Pohansko. The Forest Nursery. Spatial clusters of graves.

Another aspect that was under observation was the distribution of graves with different orientation in the Forest Nursery area. The graves were divided by their orientation into three groups. The graves in the first group are oriented in the SW-NE, NW-SE and NE-SW direction and are concentrated in the northern half of the excavation (Fig. 61). The burials in the second group with the W-E, N-S and S-N orientation are mainly situated in the southern sector under investigation (Fig. 62). In the area between the two groups we often find graves from the third group oriented in the WNW-EES, WWS-EEN, SSE-NNW and NNW-SSE direction (Fig. 63). There are no sharp divisions between the individual groups, they actually overlap and some graves stand completely out from the given standard. But regardless of that a trend towards the spatial distribution of the graves by their orientation is evident. It is probably connected with the urban-planning concept of the settlement in the Forest Nursery as it was defined for the posthole and sunken-floored structures (see Chap. 4.2.1.5.2 and Chap. 4.1.2.2). In terms of chronology, this division is associated with the

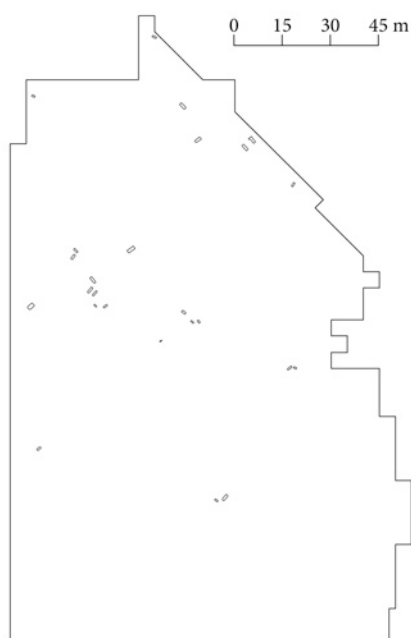


Fig. 61. Břeclav-Pohansko. The Forest Nursery. Graves oriented in the SW-NE, NW-SE and NE-SW direction.

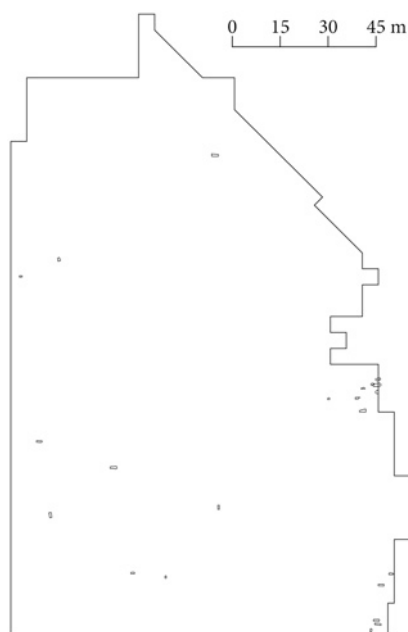


Fig. 62. Břeclav-Pohansko. The Forest Nursery. Graves oriented in the W-E, N-S and S-N direction.

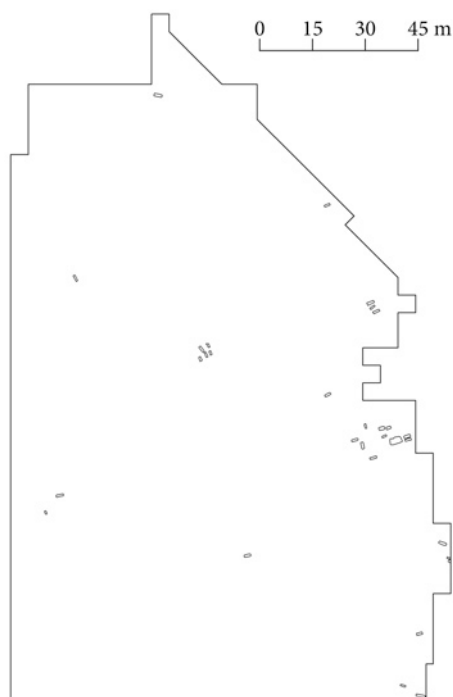


Fig. 63. Břeclav-Pohansko. The Forest Nursery. Graves oriented in the WNW-EES, WWS-EEN, SSE-NNW or NNW-SSE direction.

late Great Moravian phase. Judging from the observed superpositions, most graves may be assigned to that phase.²³⁸

It is also possible to visualize, in space, graves classified by their properties which were recognized within the principal component analysis and the subsequent validation as especially important. The first site plan displays burials considered relatively “rich” in the context of the Forest Nursery. This means that they yielded a knife or an artefact other than pottery. Graves containing jewellery (earrings, bead) are distinguished by different graphics. This attribute was not included in the factor solution. The site plan makes it obvious that the “richer” graves are concentrated mainly inside the zones of the highest densities of graves in accordance with the classification above (Fig. 64).

²³⁸ Dostál (1993b), p. 48.

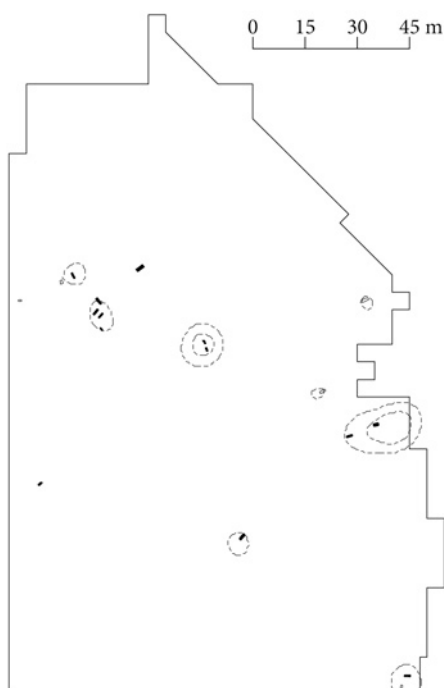


Fig. 64. Břeclav-Pohansko. The Forest Nursery. Graves with grave goods other than pottery (white—graves with jewellery, long dash line—grave clusters).

Another type of graves is represented by children's graves with vessels. Their distribution in space is different. Most of them are concentrated in a single group, although some are found outside the defined group or on its edge (Fig. 65).

Female burials with the W-E orientation (including small deflections) which have at least one bent forearm placed over the pelvis, are isolated outside the zone of the highest concentrations of graves, or on its edges. An exception is a group of graves in the south-eastern part of the excavated area, where three such graves appear next to each another (Fig. 66).

Graves of crouched or flexed individuals with bent legs were often located on the edge of clusters of graves, or completely isolated (Fig. 67).

In the end we can sum up that the distribution of the graves in the Forest Nursery is not random. Their locations differ depending on their orientation. They are concentrated into clusters and are also distinguished by the spatial distribution of the individual typical attributes. The causes that gave rise to these spatial structures must be addressed within interpretation.

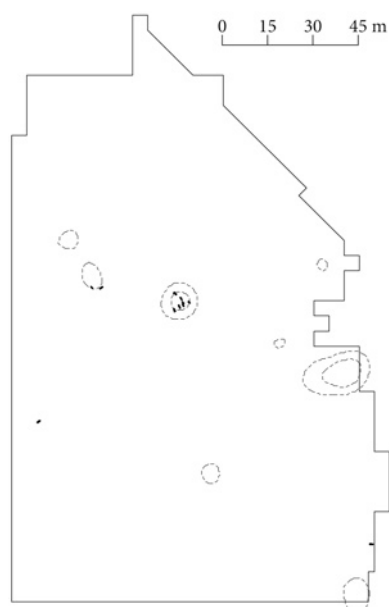


Fig. 65. Břeclav-Pohansko. The Forest Nursery. Children's graves with pottery (hashed—grave clusters).

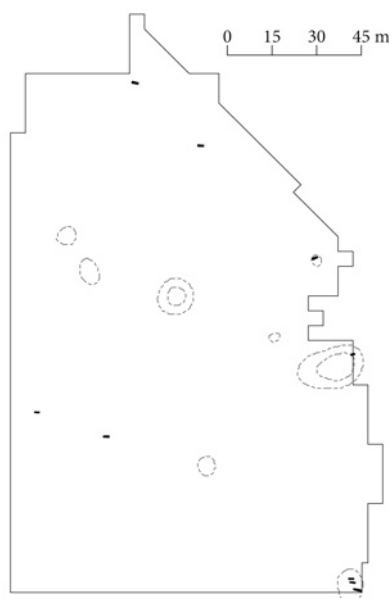


Fig. 66. Břeclav-Pohansko. The Forest Nursery. Women's burials roughly oriented in the W-E direction (hashed—grave clusters).

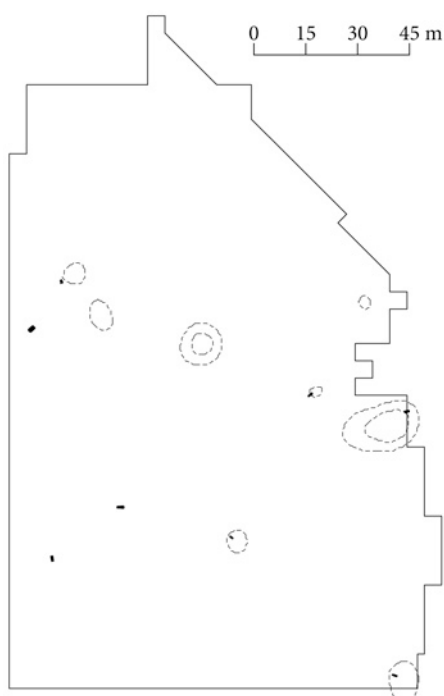


Fig. 67. Břeclav-Pohansko. The Forest Nursery. Graves of crouched individuals with bent legs (hashed—grave clusters).

4.4.5 Interpretation

In the interpretation of the archaeological structures identified on the basis of the analysis and synthesis of the graves from the Forest Nursery at Pohansko we must start from the archaeological model. This is created on the basis of categories of the living culture or is generally formulated by developing abstract categories of the living culture towards concrete results, the reflection of which we find in the archaeological context.²³⁹

The very fact that in the Forest Nursery the graves were dug within the settlement area and are scattered individually or in clusters among the settlement features is remarkable. We encounter here a spatial overlapping of the residential, production and funerary component within a single settlement area.²⁴⁰ This phenomenon is not unknown

²³⁹ Neustupný (1986), pp. 544–548; (1993), pp. 159–178.

²⁴⁰ Regarding the terminology see Neustupný (1993), see 24–29.

in the Great Moravian period. In Slovakia where the phenomenon has been studied in detail, there are no less than 187 such graves known so far from 33 sites.²⁴¹ In Moravia, sites with graves within the settlement include, in addition to Pohansko near Břeclav, the St. Hippolytus stronghold near Znojmo, Staré Město, Mikulčice and the settlement in Břeclav—Poštorná.²⁴² It was noted that they are mainly shallow grave pits dispersed irregularly throughout the area. They are usually at a relatively great distance from each other and have various orientation. Burials of children prevail. The graves of adults display signs of practices meant to ward off vampires and are mostly without grave goods. *Militaria* and jewellery are exceptional. It appears that the number of graves within settlements increases from the early to the late phase of the Great Moravian period, and again decreases during the post-Great Moravian phase.²⁴³

In order to appreciate the reasons for burials within Great Moravian settlements we must first examine the previous situation. During the 6th and 8th century the Slavs in the region buried their dead exclusively in separate burial grounds.²⁴⁴ This is no exception to the general rule applying to other periods as well. Spatial separation of the funerary component from the residential component is taken to be the most frequent method of organization of the settlement areas.²⁴⁵ However, the distances between the two components are generally not too long. We can take as an example early Slavic cremation cemeteries, which would be 300–500 metres away from the settlement,²⁴⁶ as well as the burial grounds of other peoples.²⁴⁷ The habit of separating the residential and funerary component survived in the Great Moravian period (and long afterwards until the beginning of the 13th century), when people were most often buried on separate burial grounds outside the settlements.²⁴⁸ It is expected that the traditional separation of the two components is typical of rural sites while in the central places, strongholds and their suburbs we find both cemeteries situated around the newly built churches and graves distributed among the settlement

²⁴¹ Hanuliak (2002), p. 83.

²⁴² Dostál (1966), p. 13; Unger (2004).

²⁴³ Hanuliak (2002), pp. 83–85.

²⁴⁴ E.g. Fusek (1994), pp. 128–143; Hanuliak (2002), p. 88.

²⁴⁵ Neustupný (1993), p. 27.

²⁴⁶ E.g. Dostál (1982b), p. 5; Fusek (1994), p. 139.

²⁴⁷ E.g. the Franks; see Lorren (1996), p. 748.

²⁴⁸ Hanuliak (2002), p. 83; Unger (2002), p. 40.

features.²⁴⁹ According to common opinion, the people buried within the settlements outside church cemeteries might have been individuals of inferior status in the community, maybe even slaves, or people forced by circumstances to leave their homeland, with no relatives within the local community, which could in turn explain their burial outside the local cemetery.²⁵⁰

The question still remains of what could have caused such a burial pattern, against the rule of spatial separation between funerary and residential components, which is known from many other cultures and was in some cases even codified.²⁵¹ It is thought that the main impulse for these changes came with the adoption of Christianity, the unmistakable manifestation of which in Great Moravian centres are religious buildings with church graveyards. Christianity eroded the original religious and social structures to such an extent that graves in the vicinity of houses became tolerable for the local inhabitants although the fear of the “living dead” did not disappear but rather intensified as is indicated by various practices against vampirism.²⁵²

A model example of this process is the evolution of the burial customs among the Alemanni and Bavarians at the turn of the 7th and 8th century. It was a period of gradual Christianization of the whole society as is also confirmed by numerous written sources.²⁵³ The large grave row cemeteries of the Merovingian age were slowly abandoned and most of the population started to bury their dead following the Christian rite without grave goods around churches. However, the two great moments in the development of the early medieval funeral customs were separated by a period in which some of the dead were buried in separate cemeteries, often directly in settlements. We notice small clusters of graves (most often four to eight burials) and isolated graves situated inside the individual farmsteads or in their immediate vicinity. The graves follow the orientation of the roads running through the settlement or that of the farmsteads to which they belonged. While the prevalent direction is W-E, other orientations also appear (e.g. N-S in Lauchheim), as a result of the link between graves and the over-

²⁴⁹ Dostál (1966), p. 13; Unger (2004).

²⁵⁰ Dostál (1993b), p. 48; Hanuliak (2002), pp. 84–85.

²⁵¹ E.g. by the Romans in the law code of the East-Roman emperor Theodosius II, see Unger (2004).

²⁵² Unger (2002), p. 40; Unger (2004).

²⁵³ E.g. Mayr (1988); Lorenz (1998).

all settlement layout. The dead were given amulets, the occurrence of which might be connected with dramatic changes in burial customs and in the ideology of the entire society. Those are mostly graves without grave goods or with poor goods, although there are some exceptions, such as the rich graves from the settlement in Lauchheim (the Mittelhofen site) or a grave from Aschheim—Keplerstr.²⁵⁴ The occurrence of isolated graves or their groupings among residential houses is recorded in the early Middle Ages in other regions as well.²⁵⁵

From the finds and the terrain configurations identified in Lauchheim and elsewhere it is obvious that most graves from the settlements may be dated between 680 to 720 AD. Very rare are graves, which could be securely dated to the last three quarters of the 8th century. The rich goods that are exceptionally found in the settlement graves are very conservative and defy the trend of the time, for by then grave goods were gradually not buried with the deceased.²⁵⁶ The perennial open question is whether the graves with no grave goods prevalent in the other settlements (e.g. Mengen, Kirchheim) are an expression of the Catholic faith of the dead or the social status of the poor inhabitants who were in a dependent position and belonged to the individual farmsteads.²⁵⁷ There are no doubts in cases where we find, in addition to graves, remains of a church, often still a wooden building, in the farmstead.²⁵⁸

There are many parallels we can find between the social situation in southern Germany at the turn of the 7th and 8th century and the situation in Moravia during the 9th century. The most important aspect is the disintegration of the existing social order and the profound changes in ideology related to the process of Christianization initially tied to the upper echelons of society and gradually moving to the middle and lower strata of the local population. The archaeological correlates of such changes are the presence of burials around churches and within settlements. This also applies to the graves from the Forest

²⁵⁴ Böhme (1996), pp. 500–501; Eule (1998), p. 28; Stork (1998); Wintergerst (1999), p. 140; Zeller (1988), pp. 235–236.

²⁵⁵ E.g. in northern Gaul, see Lorren (1996), p. 748; in Bavaria, see Geisler (1997), pp. 462–463.

²⁵⁶ Stork (1998), p. 306.

²⁵⁷ Bückner, Hoepfer (2000), pp. 227–228.

²⁵⁸ E.g. Barbing—Kruezhof, Herrsching near Ammersee; see Bückner, Hoepfer (2000), pp. 225–227; Codreanu-Windauer (2001), pp. 176–177.

Nursery that we study. The identified structures should therefore be interpreted from this perspective. On the one hand we must expect some outward expressions of Christianity which, in the milieu of an early medieval centre, could have spread among all population strata, but on the other hand we have evidence of the pagan rite with measures protecting the living against the dead. The interpretation of the structures related to the spiritual world and the cult of people from the early Middle Ages is very complicated. It becomes even more so, given the small number of graves forming individual structures. Therefore in our considerations we cannot move beyond the level of hypothesis and conclusions must be viewed as anything more than tentative. Such conclusions need further verification and more precision within the iterative archaeological method.²⁵⁹

The only identified formal structure which can be put in connection with the Christian rite in the Forest Nursery is the positive pole of factor 3 where we find attributes such as the W-E orientation and bent forearms, often laid over the pelvis. This group is in a significant relationship mainly with adult women. The graves with the W-E orientation are also characterized by the absence of grave goods.

Orientation in the W-E direction is typical for burials throughout the Middle Ages. In the high phase it was also due to the fact that the dead were mainly laid in the graves that were oriented in accordance with the church axis. However, this orientation was becoming more and more regular even earlier in the Late Hillfort Period (11th–12th century), when grave goods and other objects were slowly disappearing from the graves. With a few exceptions there are no more objects to be found in the graves from the high Middle Ages.²⁶⁰ Grave goods gradually disappeared from the graves during the 9th–12th century and their absence is usually considered to be one of the substantial consequences of the changes in human thinking and the advancing Christianization.²⁶¹ The folding of the arms on the belly or chest is a typical attribute of Christian burials in the high Middle Ages (13th–16th century), when the burial customs of the whole population of Europe were controlled by the church and the dead were buried exclusively in parish churchyards, within a clearly marked and sanctified

²⁵⁹ Neustupný (1986), p. 548; Neustupný (1993), pp. 178–180.

²⁶⁰ Unger (2002), pp. 42–49.

²⁶¹ Hanuliak (1990), pp. 178–179.

area. The position of the arm, or arms, pointing to the pelvis area often appears in the graves from the church cemetery at Pohansko.²⁶² This attribute was also recorded in other Great Moravian church graveyards.²⁶³ In Staré Město on the „Na valách“ site, V. Hrubý²⁶⁴ noticed that arms folded on the lap occur mostly in later graves without grave goods, although we can find an arm placed over the pelvis in rural burial grounds as well.²⁶⁵

In earlier Alemannic, Bavarian, Frankish, Langobardian and Thuringian burial grounds from the Merovingian period most of the dead are laid in supine position (i.e. stretched position, on the back) whereby the arms are placed close to the body. Deviations appear only occasionally, as can be confirmed, for example, in the case of one of the greatest Merovingian grave row cemeteries, namely Altenerding in Bavaria (1360 graves). Burials with one or both arms pointing to the lap are rather rare on this site.²⁶⁶ On the contrary, this phenomenon is noted quite frequently in 8th- and 9th-century Anglo-Saxon cemeteries, for example in Hamwic.²⁶⁷

One or both arms folded, across the lap, is a body position often recorded in late antique, Roman provincial cemeteries, dated after Christianity was declared the only religion in the Empire in the late fourth century. It can be clearly illustrated with an example from the large cemetery excavated in Linz (Lentia), where none of the deceased had the arms laid on both sides of the body.²⁶⁸ That this particular body position was typical for provincial burial rites results from a quick comparison with contemporary cemeteries outside the Empire, in which the position with arms laid on either side of the body was predominant.²⁶⁹ An excavation of two cemeteries in Lauriacum (Ziegelfeld, Espelmayrfeld) provided convincing evidence of the Christian religion of the dead who were laid in the grave with their forearms crossed on the belly. Three of those graves yielded rings decorated with chrisms.²⁷⁰ The custom of burying the in supine position arms folded in various

²⁶² Kalousek (1971).

²⁶³ E.g. in 11 graves from Uherské Hradiště—Sady; see Galuška (1996), pp. 134–140.

²⁶⁴ Hrubý (1955), p. 79.

²⁶⁵ Měřinský (1985), pp. 132–135.

²⁶⁶ Losert, Pleterski (2003), pp. 41–42.

²⁶⁷ Morton (1992), p. 132.

²⁶⁸ Ruprechtsberger (1999), pp. 22–24.

²⁶⁹ Tejral (1982), p. 70.

²⁷⁰ Kloiber (1957), pp. 169–171; Kloiber (1962), p. 86.

position survived well into the early Middle Ages, as suggested, among others, by finds from a small cemetery excavated in Vrajk near Gorenji Mokronog (Slovenia). A total of 20 graves were excavated near a post-hole structure which might be connected with the wooden church of the first Christians remembered in the local oral tradition. Of the skeletons which were not damaged or dislocated, seven had both forearms folded onto the lap, five with only one forearm and only two with arms laid on either side of the body.²⁷¹ However, during the next development phase the custom of laying the body in supine position with extended arms was generalized. This type of burial is dominant in late early medieval graves from the Puščava cemetery, where we can follow the evolution of the funeral rite from the end of the 4th to the 10th century.²⁷²

The commonest body position in different parts of the early medieval Slavic world including Great Moravia is the supine position with arms alongside the body and legs extended.²⁷³ This position is not associated with expressions of Christianization. On the contrary, hands folded onto the lap are generally regarded, even in the early Middle Ages, as evidence of Christianity,²⁷⁴ which might have its roots in the late antiquity period (see above). The answer to the question why the position of the arms is not unified even in evidently Christian burials, which appear in the Great Moravian church cemeteries may be due to the fact that in the Roman-Catholic Church of that period there were no strict regulations in place stipulating the position of the arms of the dead. It could have been different with the Eastern Orthodox Church as some of the later written sources suggest. They mention the directives of the Byzantine Church prohibiting the burial of the dead with forearms extended alongside the body.²⁷⁵ In this way the different positions of the arms may reflect both the contradictions of Christianity and paganism, on the one hand, and the differences between the various Christian movements and sects, on the other hand.²⁷⁶

The graves of the dead from the Forest Nursery at Pohansko with attributes which could be associated with the process of Christianiza-

²⁷¹ Bavec (2003), pp. 325–330.

²⁷² Pleterski, Belak (2002), pp. 233–300.

²⁷³ Dostál (1966), p. 27.

²⁷⁴ Krumphanzlová (1971), p. 420.

²⁷⁵ Hanuliak (1990), p. 156; Zoll–Adamikowa (1991), p. 130.

²⁷⁶ Cf. Pleterski, Belak (2002), p. 267.

tion (W-E orientation, folded forearms, absence of grave goods) are often found in locations of lesser importance in what concerns the spatial arrangement: isolated, on the edges of grave clusters, or in a specially delimited area of the cemetery. It is therefore questionable whether they can truly be connected with Christianity, which was a matter of prestige at that time, linked as it were to the most prominent members of the Moravian society.²⁷⁷ Therefore we cannot rule out the possibility that the nature of the graves, containing mainly female burials, was related to other aspects, such as the social position of the dead. At present no analogy in the living culture is known for this interpretation. As a result, the most acceptable hypothesis could be based on a combination of both aspects. The positive pole of factor 3 may be in connection with the gradual penetration of Christianity (or its variants) to the lowest layers of Great Moravian society where the old and the new cult co-existed.²⁷⁸ This interpretation could be supported by the fact that after the fall of the structures of power in Great Moravia at the beginning of the 10th century Pohansko experienced a restoration of paganism,²⁷⁹ which must have been ingrained in the population even at the peak of Great Moravia.²⁸⁰ Among the inhabitants of the stronghold who rejected Christianity (or its local variant), the Christians (or adherents to a different Christian movement) from the same social milieu, could invite opposition. "Anyone who during the baptism defied the 'devil' and his works', that is pagan gods, ... willingly became an outcast".²⁸¹ Although the graves of those people could have had some Christian attributes, they were not buried in the church surroundings reserved from the members of the top social class,²⁸² or warriors,²⁸³ but in an area designated for the burial of members of lower social classes.²⁸⁴ However, their graves are spatially separated from the majority population.

²⁷⁷ E.g. Třeštík (2001b), pp. 128, 206.

²⁷⁸ Třeštík (2001b), p. 130.

²⁷⁹ Macháček, Pleterski (2000).

²⁸⁰ Klanica (1985a), pp. 130–134; Klanica (1985b).

²⁸¹ Třeštík (2001b), p. 128.

²⁸² See the frequent finds of jewellery of Byzantine-“Oriental” nature, weapons and riding equipment from the church cemetery, which are completely missing in the graves from the Forest Nursery; Kalousek (1971).

²⁸³ Compare the abnormally high masculinity index in the church cemetery; see Drozdová (2001), p. 115.

²⁸⁴ See the very high prevalence of women's graves in the Forest Nursery, see Drozdová (2001), p. 115.

The very opposite of the positive pole of factor 3, which we attempted to interpret above, is the positive pole of factor 1. The graves that make up this structure are among the “richer” in the Forest Nursery context and contain various grave goods. They are usually not oriented in the W-E direction and are typically men’s burials, although this might have been due to the fact that the factor solution did not include jewellery, which exceptionally appeared even in the graves from the Forest Nursery. Graves with non-ceramic grave goods (including jewellery) were most often situated inside the clusters of graves. It seems that, within the community which buried its dead within the settlement in the Forest Nursery, the people buried in those graves enjoyed an above-standard social status and formed the core of the community.

People buried in graves related to the negative pole of factor 4 were excluded from the majority of society even after their death. Their typical attribute is crouched legs, or a flexed or crouched position. Such graves appear in peripheral zones. In early medieval cemeteries such deviations from the ritual position represent an insignificant portion of the total number of graves (around 2 percent).²⁸⁵ Just as in the Forest Nursery, the dead are usually found on the edges of the burial clusters away from other individuals.²⁸⁶ The dead which are laid on the side or with folded limbs often appear among abnormal burials in the settlement features.²⁸⁷ This unusual form of burials has been interpreted as evidence of measures against vampirism.²⁸⁸ As this protective procedure does not survive in folk tradition, the possibility cannot be ruled out that the unusual position is simply an illness of the deceased or burial in rigor mortis.²⁸⁹ Some of the burials were weighed down by stones which hints at their belonging to the circle of the “feared dead”—probably individuals who were regarded as possessing witchcraft or magic powers.²⁹⁰ The increased fear of the dead may be connected with the new habit of burial within the settlement in the immediate vicinity of the existing dwellings.

The last notable structure, which we managed to extract from the matrix consisting of the graves from the Forest Nursery, is factor 2, or

²⁸⁵ Hanuliak (1990), p. 156.

²⁸⁶ E.g. Dostál (1966), p. 27; Hanuliak (1990), pp. 156–157.

²⁸⁷ Hanuliak (1997), pp. 168–170.

²⁸⁸ Hanuliak (1997), p. 173; Krumphanzlová (1964), pp. 193–199.

²⁸⁹ Krumphanzlová (1964), p. 198.

²⁹⁰ *Ibidem*, p. 194.

its negative pole. With regards to the completed validation it is doubtlessly made up of children's graves furnished with vessels.

In the Great Moravian period pottery appears mainly on rural graveyards where vessels occur in more than 40 percent of the graves. It is quite the opposite in church cemeteries.²⁹¹ In the church cemetery at Pohansko pottery was present only in 14 graves (3.4 percent). In the small burial grounds and dispersed graves at Pohansko, processed by B. Dostál,²⁹² vessels appear in 12.4 percent of all graves. The majority are children's graves, while female graves are less frequent. The dominance of children and females in graves with pottery was also established in a representative collection of 2,830 early medieval graves in Slovakia.²⁹³ The occurrence of vessels in graves provides evidence of placing food in the graves.²⁹⁴ This is an obviously pagan custom. The fact that in the Forest Nursery (and elsewhere) this custom is principally linked to children's graves could be explained by the fact that they were given special attention after death and the customs relating to children's burials exhibited more conservative attributes than adult funerals.

4.5 SPATIAL STRUCTURE OF THE SETTLEMENT IN THE FOREST NURSERY AND THE DYNAMICS OF ITS DEVELOPMENT IN THE CONTEXT OF THE SETTLEMENT-PLANNING CONCEPT OF THE EARLY MEDIEVAL CENTRE AT POHANSKO

The archaeological record has two main attributes, formal and spatial.²⁹⁵ Although the methods employed for their investigation may be different, the goal is the same—to identify, in the archaeological data into which the archaeological records are transformed, the structures or patterns, which could be further interpreted in a meaningful way. As opposed to the archaeological structures in the formal (social) space which have already been relatively well investigated, the spatial structures in the geographical space have not even been systematically described.²⁹⁶ They are mainly used for the validation of the formal

²⁹¹ Dostál (1994b), p. 7.

²⁹² Dostál (1982a), p. 184.

²⁹³ Hanuliak (1990), p. 164.

²⁹⁴ *Ibidem*.

²⁹⁵ Neustupný (1993), pp. 68–69, Neustupný (1997b), p. 237.

²⁹⁶ Neustupný (1997b), pp. 237, 244.

structures. Archaeologists usually approach them from the traditional, intuitive point of view. If today we manage to objectivize the process of searching for the structures in geographic space with the assistance of computer technologies, we mostly find only relatively simple variants of spatial structures, such as clusters.²⁹⁷ The situation becomes more complicated when we expect complex spatial structures beyond the level of simple clusters. Unfortunately, the currently available methods do not yet allow us to formalize completely the process of identifying the spatial structures. We are therefore still dependent on our own empirical judgement. This increases the importance of the validation during which we must critically verify the anticipated structures and confirm or refute their objective existence.

The fundamental tool for working with spatial data is currently the GIS (Geographic Information System). GIS enables the automatic search for simpler structures and provides a more efficient administration, sorting and visualization of spatial data, and thus significantly simplifies the empirical work with spatial data.

The basic representation of archaeological facts in a two-dimensional space (e.g. computer screen, or printed charts) where the three-dimensional objects of the real world are simplified for the purposes of the archaeological method, is by means of the polygon. They are divided into two basic classes.²⁹⁸ The first class includes delimiting polygons representing specific archaeological entities, e.g. sunken-floored features or artefacts; the second class involves enclosing polygons defined only by their relationship to archaeological entities (e.g. arbitrarily chosen squares or a raster superimposed upon a cultural layer of a site).

In evaluating the spatial structures from Pohansko we apply both types of polygons. Delimiting polygons, representing settlement features, graves, postholes or trenches will be employed in the search for and visualization of spatial structures, the use of enclosing polygons will be substantiated in the validation phase. Our working tool will be the GIS software GeoMedia with additional specialized tools (e.g. GeoMedia Grid).

²⁹⁷ Macháček (2001c), pp. 33–35 with references and case studies.

²⁹⁸ Neustupný (1996b), pp. 113–114.

4.5.1 *Spatial structures in the Forest Nursery at Pohansko*

The spatial point of view was taken into consideration mainly during the validation of the formal structures in this work. The individual categories of archaeological entities (including information on their position in space) were processed separately. The principal aim was not a complex analysis of the space, but a confirmation of the results of the multivariate statistics. If we want to identify and appreciate the spatial structures in the Forest Nursery, we must start by integrating all the relevant data. However, if we add all the polygons representing the main categories of archaeological entities (i.e. sunken-floored settlement features, above-ground structures, graves, trenches) together, we will obtain a chaotic and unclear picture (Fig. 68). It is obvious that the spatial data must be further subdivided in order to receive simpler and more easily interpretable structures. This is especially important at the moment in which we turn to intuition and empirical experience, because we currently have no technologies available to enable an



Fig. 68. Břeclav-Pohansko. The Forest Nursery. Complete spatial structure.

automatic and formalized search for more complicated spatial structures. The main criterion in the analysis will be the data on the chronological development. We will attempt to divide the settlement in the Forest Nursery into the individual phases based on the assumption that, within a single settlement horizon, the spatial structures will stand out so clearly that they will be identifiable by mere empirical and logical judgement.

The input data for the chronological-spatial analysis are principally based on the results of the processing of the pottery assemblages from the individual sunken-floored features (see Chap. 4.2.1). We identified three main relative-chronological phases. The first belongs to the pre-Great Moravian (early Slavic, or Early Hillfort, 6–8th century AD) period (chronological group 1). It is followed by a period referred to as the early Great Moravian phase (chronological group 2). The development sequence is closed by the late Great Moravian phase, which encompasses three partially contemporary pottery groups (chronological group 3, 4, 5).

The assigning of various sunken-floored settlement features to their respective chronological phases is not completely clear. The very nature of the data (i.e. various levels of mixing of the settlement pottery assemblages) which carries the relative-chronological information, is the ultimate source of inaccuracies and mismatches (see 4.2.1.2). While, on the basis of pottery, we can usually recognize which features became extinct before others, we cannot reliably determine whether or not they had been founded earlier. This is just our hypothetical assumption. As a result, some features assigned to different pottery-chronological groups could have existed concurrently for some time. This means that the division of the settlement into phases by means of pottery is not absolute. It is more an expression of the evolutionary trends which influenced the arrangement of the settlement in the Forest Nursery.

Another problem related to the chronological-spatial analysis based on pottery is the fact that some sunken-floored features could not be dated either because they did not contain sufficiently large pottery assemblages or because the pottery assemblages originating from the homogenized pit fills became heterogeneous as a consequence of the depositional and post-depositional processes that the affected features could not be clearly assigned to the individual chronological phases. As without some of the features the resulting picture of the development of the settlement in the Forest Nursery would be incomplete,

they were selectively included in the final site plans, provided that they fit into the given spatial structures. Nevertheless, they are always clearly marked so as to avoid their being mistaken for features dated by means of pottery. A specific group is made up of settlement features of pre-Great Moravian age, which could not be dated by quantitative data, although by the range of the finds they very likely belong to that particular period.²⁹⁹

In comparison with sunken-floored settlement features dated by the finds from their fill, assigning above-ground structures, of which often only the postholes survive, to individual phases is much more difficult. On the basis of the previous evaluation (see Chap. 4.1.2.2) we can distinguish pre-Great Moravian above-ground structures, situated in the immediate vicinity of equally old sunken-floored features, which furthermore have an identical orientation, different from that of later structures. By the higher concentration of postholes and overlapping of posthole structures of two different orientations in the south-western quadrant of the excavated area we can assume, that even the above-ground structures from the Great Moravian period can be subdivided into two phases. However, the situation is clearer in the southern half of the excavated area only. Earlier it was found (see Chap. 4.2.1.5.2) that the sunken-floored features from the late Great Moravian phase have a N-S, E-W orientation, while during the early Great Moravian phase the NE-SW or NW-SE orientation prevails through the whole area of excavation (with two exceptions). As the above-ground post-hole structures appear to follow this pattern, they can be associated with a particular phase on the basis of their orientation. In the northern part of the investigated area all of the Great Moravian above-ground structures have identical orientation and the problem of their belonging to one of the two phases can be resolved only arbitrarily. We are forced to examine the associations of some above-ground structures with datable sunken-floored features and the overall layout of the settlement. The level of objectivity of this procedure is understandably rather low.

The dating of the graves from the Forest Nursery which are dispersed among the settlement features is even more difficult. So far we have not discussed this issue in great depth. Given the poor grave goods the problem is extremely complicated. We can use, as a starting

²⁹⁹ Dostál (1982b).

point, the infrequent superpositions and the thesis according to which the number of graves in settlement contexts in general culminated in the late phase of the Great Moravian period.³⁰⁰ The stratigraphic observations made in the Forest Nursery support this conclusion. In all nine cases of superpositions the grave cuts through the back-fill of a settlement feature, which means that the grave is later. Judging from such observations, we can tentatively ascribe all graves from the Forest Nursery to the late Great Moravian phase, which probably best reflects the overall evolutionary trend. However, we cannot rule out that some of the dead were buried there earlier or that funeral activities might have taken place even at a time when the site in the Forest Nursery no longer served its residential and production purposes.

The output of the chronological-spatial analyses are the site plans visualizing the situation during the individual settlement phases in the Forest Nursery.

The first plan (Fig. 69) shows a cluster of sunken-floored and above-ground structures from the pre-Great Moravian (early Slavic and Early Hillfort) period in the northwestern quadrant of the excavated area (the only exception is the sunken-floored building No. 214 from the Early Hillfort period). It is a part of the settlement extending further east under the rampart and on the edge of the northern suburb.³⁰¹ Both the above ground structures and the sunken-floored features (particularly the sunken-floored dwellings) have a predominantly N-S orientation. They do not form a particularly complex spatial pattern in the Forest Nursery area.

In the early Great Moravian period the situation dramatically changed (Fig. 70). Settlement features now covered the whole excavation area and were arranged in irregular rows running from NE to SW or from NW to SE. The settlement features followed that orientation. The exceptions include two sunken-floored features (features 233 and 243) in the southern part of the area, which have a N-S orientation (Fig. 71). It is those two cases that lend themselves to the discussion of the limits of dating based on settlement pottery and consider the possibility of their belonging to the next phase.

The most complicated spatial pattern was observed in the late Great Moravian phase, with which we associate the greatest number of

³⁰⁰ Hanuliak (2002), pp. 83–85.

³⁰¹ Dostál (1982b); Dostál (1985).

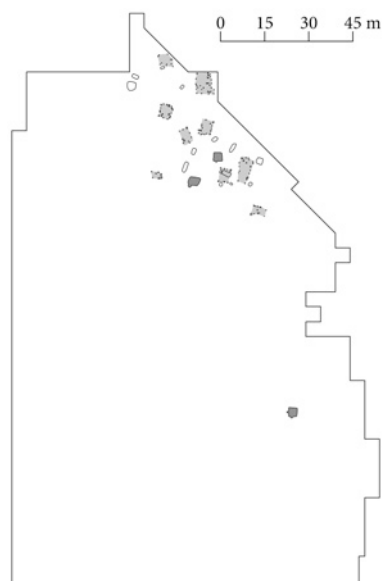


Fig. 69. Břeclav-Pohansko. The Forest Nursery. Sunken-floored and above-ground features from the pre-Great Moravian (early Slavic and Early Hillfort) period (grey with black outlines—sunken-floored settlement features dated by pottery).



Fig. 70. Břeclav-Pohansko. The Forest Nursery. Sunken-floored and above-ground features from the early Great Moravian period (grey with black outlines—sunken-floored settlement features dated by pottery).

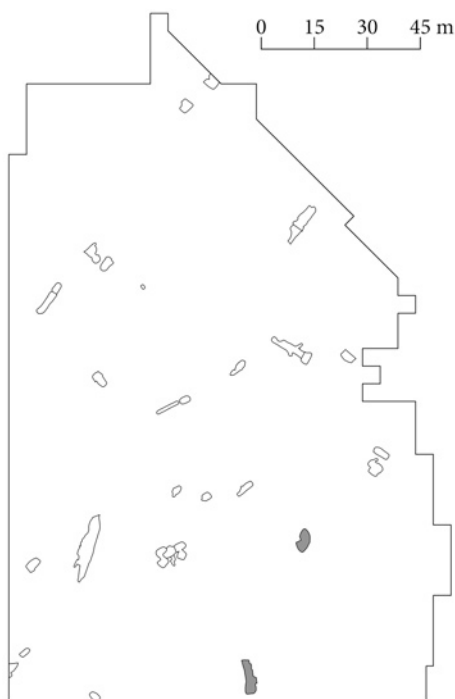


Fig. 71. Břeclav-Pohansko. The Forest Nursery. Sunken-floored features from the late Great Moravian period (grey—feature 233 and 243).

sunken-floored and above-ground structures, all the graves, as well as trenches (Fig. 72). The bipolar contrast between the northern and the southern part of the investigated area, mentioned above, is particularly striking. It stands out even more if we compare two site plans where the sunken-floored features from the late Great Moravian phase, all the Great Moravian above-ground structures and graves (only graves clearly oriented in the SW-NE, NW-SE, NE-SW, W-E, N-S and S-N direction) are divided by their orientation (Fig. 73–Fig. 74). It is obvious that the buildings and graves oriented in the NW-SE and NE-SW direction are concentrated in the northern part of the Forest Nursery (Fig. 74), while the N-S, E-W orientation (with minor deflections) dominates in the southern half (Fig. 73). It is remarkable that a significant part of the infrequent sunken-floored features, which do not conform to this pattern, belong to the fifth (and the last) pottery-chronological group (feat. 109, 110, 145 and 251). At that time there probably occurred the loosening of the fairly strict rules, typical for the

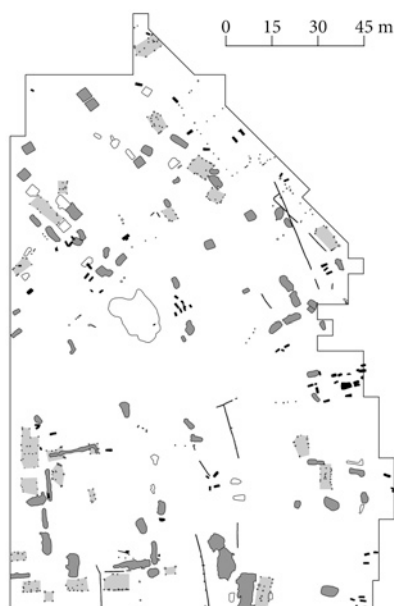


Fig. 72. Břeclav-Pohansko. The Forest Nursery. Complete spatial structure from the late Great Moravian period (grey with black outlines—sunken-floored settlement features dated by pottery).

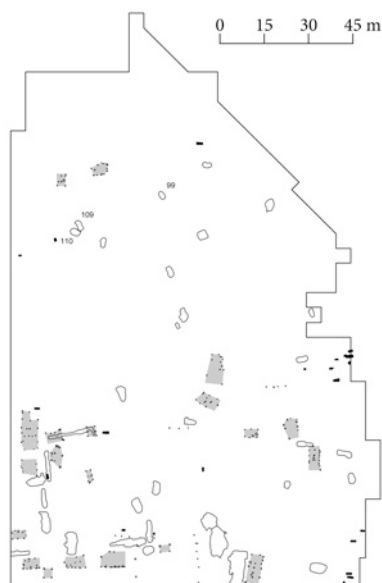


Fig. 73. Břeclav-Pohansko. The Forest Nursery. Buildings and graves from the late Great Moravian period with a N-S or E-W orientation.

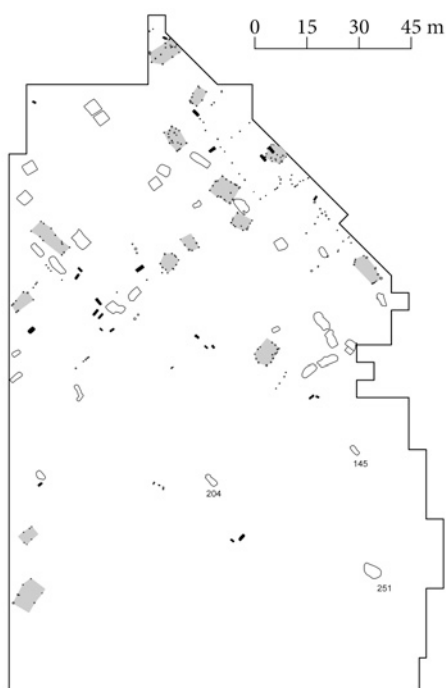


Fig. 74. Břeclav-Pohansko. The Forest Nursery. Buildings and graves from the late Great Moravian period with a NW-SE and NE-SW orientation.

late phase of the Great Moravian settlement in the Forest Nursery. The above-ground posthole structures which do not conform may have been built in one of the earlier phases (see Chap. 4.1.2.2).

Another remarkable spatial phenomenon identifiable in the late Great Moravian period in the Forest Nursery are the rectangular structures, delineated by sunken-floored features, posthole structures and, possibly, trenches and graves (Fig. 75). This pattern is clearly noticeable in the south-western quadrant of the excavation. A similar spatial structure to the north was investigated only partially as its second half extended into the unexcavated ground. Those spatial units are a little less obvious in the eastern half of the area. Their orientation corresponds to the division of the sunken-floored and above-ground structures and graves discussed above.

In the discussion of the layout of the built-up area in the late Great Moravian period we cannot leave aside the interesting belt stretching from the northwestern corner of the excavated area roughly to its centre, which is devoid of any structures. The belt abruptly changes direction and runs directly westwards (Fig. 75).

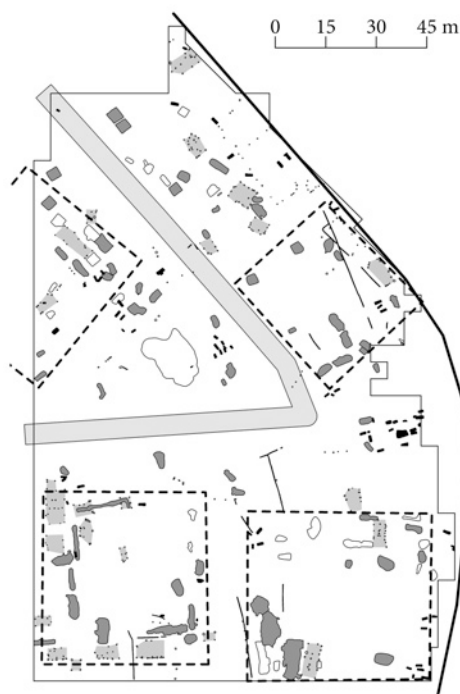


Fig. 75. Břeclav-Pohansko. The Forest Nursery. Rectangular spatial structures from the late Great Moravian period (grey with black outlines—sunken-floored settlement features dated by pottery).

4.5.2 *Validation of the spatial structures*

The problem of validating structures in the geographical space has not yet been satisfactorily resolved. The general assumption is that if formal structures are validated by spatial structures, it should also be possible to do it the other way round.³⁰² However, by following this procedure we would be exposed to the danger of circular argument, more so if there is only a limited number of the identified structures available to us. An alternative approach is offered by a method which could be termed hierarchical-structural. This validation method is based on the supposition that the validated spatial structure does not exist in isolation, but is an integral part of a hierarchically arranged geographical space. In verifying the validity of the identified structure we must prove that it is a meaningful component of a spatial structure of a

³⁰² Neustupný (1997b), p. 244.

higher order and vice versa, that itself it is composed of functionally interlinked structures of a lower order. An example from the modern world could be a single street, which in itself is a part of a higher level unit—a modern town—and, at the same time, it consists of structures of a lower order such as the individual houses. If we wanted to confirm the possible existence of this street we would have to prove it is surrounded by other streets which together form a town quarter, and that it is justifiable in terms of the urban communication concept. On the other hand, it should be obvious that the street itself is composed of street lamps, water supply and sewer systems and houses, the main entrances of which open onto the street pavements. The more complex the validated structure, the greater the probability that it can be successfully divided up into functionally interconnected components of a lower order, and/or that itself it will be a component of a hierarchically superior structure. On the contrary, in very simple spatial structures the method loses its potency. A supporting argument in the objectivization of spatial structures may be their separation from structures of a different period or a different function existing within the same area.

An example of a very simple but clearly observable spatial structure are the settlement features of pre-Great Moravian age in the north-eastern section of the Forest Nursery. They form a plain, sharply delimited cluster, outside of which, for an unknown reason, we find only sunken-floored building 214.³⁰³ The whole structure under discussion is not isolated, rather it is a part of a more extensive unit—the so-called settlement II—extending both within the Forest Nursery area and the adjoining part of the North-Eastern Suburb and under the body of the later rampart, by which it is distinguished from the later features of Great Moravian age.³⁰⁴ This hamlet belongs to the wider early Slav settlement at Pohansko consisting mainly of two nearby locations with remains of settlement activities (so-called settlement I and II) and a cremation cemetery, situated about 350 m to the south.³⁰⁵ Compared to the later Great Moravian structures from the northern part of the Forest Nursery, most of the early Slav features (especially the sunken-floored dwellings) have a N-S orientation, which is in line with what

³⁰³ Macháček (1992).

³⁰⁴ Dostál (1982b), p. 6.

³⁰⁵ Dostál (1982b), pp. 5–8.

was customary at that time.³⁰⁶ The existence of a simple spatial structure made up of a cluster of early Slavic settlement features in the Forest Nursery is quite obvious. It is validated, above all, by its links to the wider early Slavic settlement at Pohansko.

The early Great Moravian phase is also characterized by a relatively simple spatial structure. It consists of irregular rows of sunken-floored and above-ground features with a predominantly NE-SW and NW-SE orientation. That this structure could have existed can be supported by its delineation within the configuration of the geographic space in the early, and/or late, period and its incorporation into the contemporary structure of a higher order.

In comparison to the pre-Great Moravian settlement, the early Great Moravian structures from the Forest Nursery do not appear only within a spatially delimited area, but throughout the whole investigated area. They are also distinguished from the early Slavic settlement by their orientation which is no longer dominated by the W-E or N-S direction.

We can differentiate the early and late Great Moravian structures by their orientation. The spatial conflict between them is discernible in the southern half of the Forest Nursery, with an overlapping of early Great Moravian structures with a NE-SW or NW-SE orientation, and late Great Moravian structures with a N-S and E-W orientation. It is perfectly evident in the case of the superposition uncovered in the south-western corner of the excavation, where the later feature no 224 with a W-E grave orientation, cuts into earlier features 223 and 225a, with a NE-SW grave orientation.

With regards to deciding whether the spatial structure dated back to the early Great Moravian period is valid, it is crucial to establish the orientation of the buildings (Fig. 76). An important step in the validation process is the finding whether the directions of their longer axes are identical with the orientation of the Magnate Court or, more precisely, one of its oldest parts, the "cult" enclosure.³⁰⁷ In recognizing the cult function of the enclosure which has rightly been interpreted as a part of a pre-Christian shrine,³⁰⁸ the orientation in a particular direction

³⁰⁶ The most frequent orientation of the early Slavic sunken-floored dwellings is W-E or N-S; see Macháček (1992), p. 110.

³⁰⁷ Dostál (1975), 243–247.

³⁰⁸ E.g. Richter (1965); Dostál (1975), pp. 103–104.



Fig. 76. Břeclav-Pohansko. The Forest Nursery and the Magnate Court. Comparison of spatial structures from the early Great Moravian phase.

is decisive.³⁰⁹ From the palaeoastronomical research it appears that the enclosure was directed with great precision by its longer side to the sunrise at the summer solstice.³¹⁰ It could thus have played an important role in the agrarian cult of the sun and fertility. According to some theories the cult enclosure is the oldest part of the whole complex of the Magnate Court³¹¹ and all the other elements are adapted to it. This certainly applies to the later Christian church which was additionally built in the enclosure.³¹² The church has an orientation unusual for a Christian building, for it follows the original orientation of the enclosure, most likely of pagan character. The majority of the graves situated around the church also have a NE-SW orientation.³¹³

³⁰⁹ Macháček, Pleterski (2000).

³¹⁰ Rajchl (2001).

³¹¹ E.g. Konečný (1980), p. 131.

³¹² Dostál (1975), p. 104.

³¹³ Rajchl (2001).

The shape and orientation of the cult enclosure define a specific module, to which all the other important elements in the whole early medieval agglomeration are adopted. The module exhibits an almost ideal rectangular shape, a fixed ratio between the shorter and longer side, and the orientation of the longer side to the sunrise on the summer solstice and the shorter side to the southernmost rise of the full moon in the year. The module was initially used in constructing the early phase of the Magnate Court, at the centre of which was the inner bailey, most certainly suitable for assembling of people on important occasions, which corresponds by its shape and the side ratio to a magnified cult enclosure. The orientation of the longer axis of the bailey is identical, disregarding a minute deflection, with the ideal direction towards the summer solstice (Fig. 77). The module was employed for the second time in the building of the fortification in the northern portion of the stronghold. The rampart consists of two straight sections

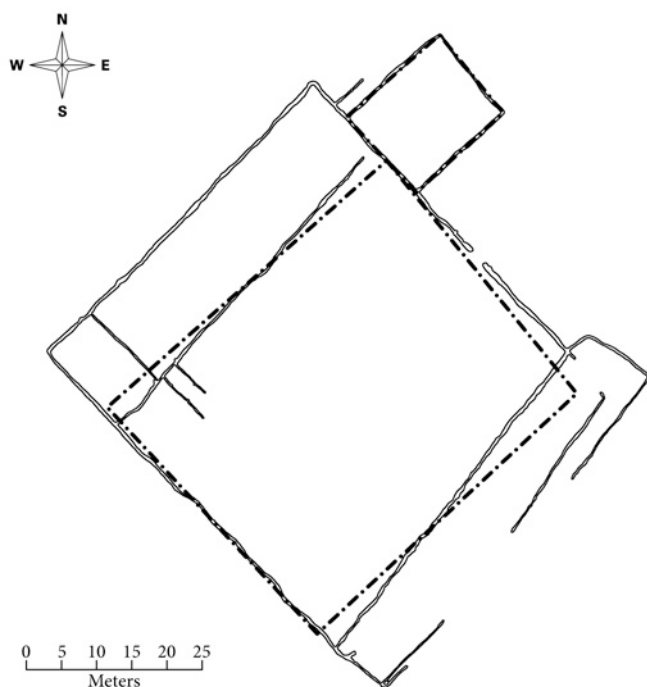


Fig. 77. Břeclav-Pohansko. The Magnate Court. Early phase of the palisade with the cult enclosure. Module derived from the cult enclosure (dot-and-dash line).

joined at a sharp angle. The orientation and the ratio of the two sections of the rampart matches the northern half of the cult enclosure after a multiple magnification (Fig. 78). The module whose inherent symbolic meaning is beyond any doubt, was also used in the planning of the inner area of the stronghold.³¹⁴

The synchronization based on pottery³¹⁵ (see Chap. 4.2.1.5) shows that the early Great Moravian phase in the Forest Nursery is contemporary with the oldest Great Moravian features from the Magnate Court area, the relative-chronological position being affirmed in greater detail by stratigraphic observation (feature 116 is below the later palisade of the Magnate Court). In some features from the group we cannot rule

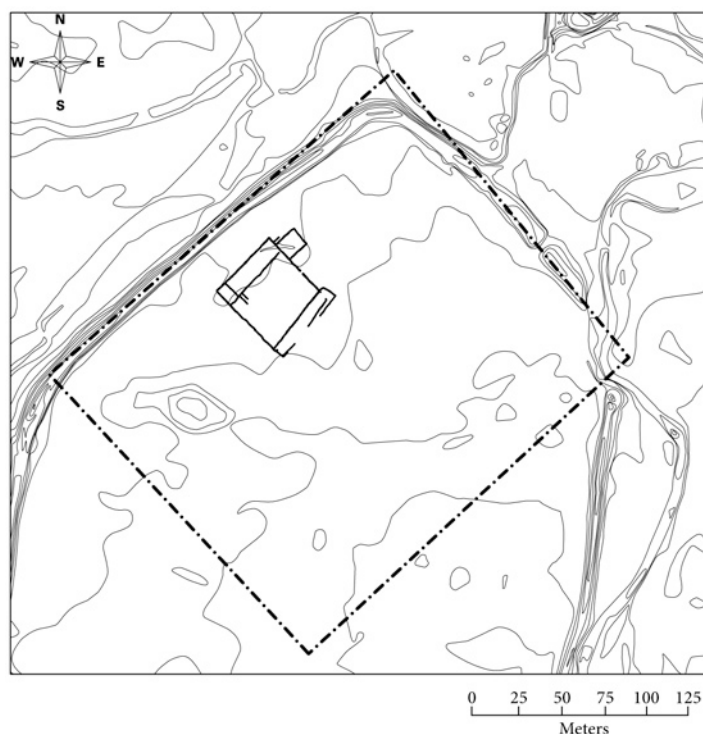


Fig. 78. Břeclav-Pohansko. Early phase of the palisade within the Magnate Court and the northern portion of the rampart. Module derived from the cult enclosure (dot-and-dash line).

³¹⁴ Macháček, Pleterski (2000).

³¹⁵ Using as a basis the pottery assemblage from feature 116 from the Magnate Court, included in the control factor solution; see also Macháček (2001c), p. 189.

out that they might have even preceded the first construction stage of the Magnate Court properly speaking.³¹⁶ They might have therefore been contemporary with only the cult enclosure with its sacred orientation. It is not surprising that the latter later determined the orientation of all the other buildings and structures within the Magnate Court, and the earliest Great Moravian built environment in the other locations of the emerging agglomeration. The spatial structure of the early phase of the Great Moravian settlement in the Forest Nursery, which was characterized by a radical change in the orientation with regards to the points of the compass, can in this regard be considered meaningful and valid. It is an integral part of a geographical space of a higher order, which was newly laid out most probably with regards to the disposition of the central pagan shrine. This phenomenon is by no means unusual. It is also observed, for example, in the towns of the high Middle Ages, the layout of which reveals the effort of the founders to orient the towns by the compass points. The starting point was the churches which mostly determined the orientation of the square and thus the gates and the whole town.³¹⁷

The validated spatial structures differ from both the earlier structures, which conform to what was customary within the early Slav or Early Hillfort traditions, and the later structures, where the pre-Christian symbolism no longer played an important role.

The most complicated spatial structure in the Forest Nursery emerges in the late Great Moravian phase. It was determined by three principal attributes: different orientation of the layout in the northern and southern half of the excavated area, the existence of several rectangular structures and an empty belt without buildings. In the process of validation we must confirm that it is interlinked with structures of a higher and a lower order and define the functional and spatial relationships that are bound to exist between them.

In the first phase of the validation we need to establish whether the bipolarity of the Forest Nursery area in the late Great Moravian phase is real. If it is not a fiction or a random occurrence, this distinctive phenomenon must find expression in the geographic space in some other element as well.

³¹⁶ Dostál (1975), pp. 243–244.

³¹⁷ Hoffmann (1992), p. 104.

One of the main elements that defined the layout at that time was the fortification. It marks the boundary of the settlement relative to the outside world, determines its area and shape. In terms of logistics it is an extremely demanding project which must have been built according to well thought-out plans and concepts. The construction was significantly influenced by cult aspects.³¹⁸ The remains of the fortification with a stone facing wall, which has survived at Pohansko as a visible embankment, are over 2 km in length. The rampart is composed of long straight sections joined at angles. Only in the southern part, unfortunately partly damaged by the building of the Liechtenstein mansion, the rampart follows a curve. The massive fortification was of cardinal importance for the existence of the vast centre. It provided protection both against the enemy and the natural elements. This is suggested by the digital elevation model (DEM), which shows that the SE section of the stronghold laid extremely low relative to the surrounding terrain (Fig. 79). In the floodplain this spelled acute

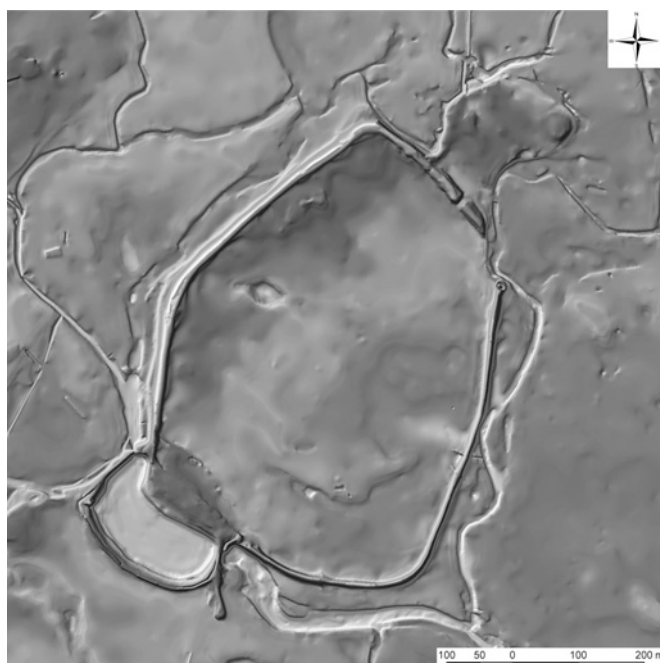


Fig. 79. Břeclav-Pohansko. Digital elevation model (DEM: computing by P. Dresler).

³¹⁸ Macháček, Pleterski (2000).

danger during floods. However, archaeological excavations provided evidence of intensive occupation even in this area. The rampart must have served as an efficient barrier against floods. Without it the early medieval Pohansko could not have stood up to the elements or military intrusions and its existence would have been unthinkable. It is very likely that the fortification also played one of the leading parts in structuring the geographical space.

If we compare the course of the rampart with the layout of the late Great Moravian buildings in the Forest Nursery, it is striking how tightly knit is the area (Fig. 80). The sunken-floored and above-ground features, trenches and graves are oriented, by their longer axis, either along the rampart or at a right angle to it. The bipolarity of the northern and southern part of the investigated area is determined by the fact that at the place where the orientation of the features and the graves changes the rampart sharply turns changing its direction from NW-SE to N-S. It is discernible although the actual angled section of the



Fig. 80. Břeclav-Pohansko. The Forest Nursery. The course of the rampart and the layout of the late Great Moravian buildings, including graves.

rampart has been eroded away by a dead branch of the Dyje. However, its course can be easily reconstructed. The empty belt with no buildings, possibly serving as communication space, also runs in parallel with the rampart, or perpendicular to it (Fig. 81). The hypothesis is further supported by the arrangement of the sunken-floored dwellings which, in the northern section of the Forest Nursery, form two rows along each side of the empty strip (Fig. 82). The fact that it is not a random coincidence is borne out by a comparison with the terrain configuration in the Southern Suburb in the so-called settlement II (Fig. 83), where the sunken-floored dwellings in the central part of the excavated area are equally arranged in two parallel rows.

The late Great Moravian buildings, graves, roads and fortification are spatially and functionally interconnected and evidently contemporary. The bipolarity identified between the northern and southern part of the investigated area is not a random phenomenon but a realistic expression of a spatial structure of a higher order. Its existence is thus validated.



Fig. 81. Břeclav-Pohansko. The Forest Nursery. The late Great Moravian phase. Communication corridor (grey).

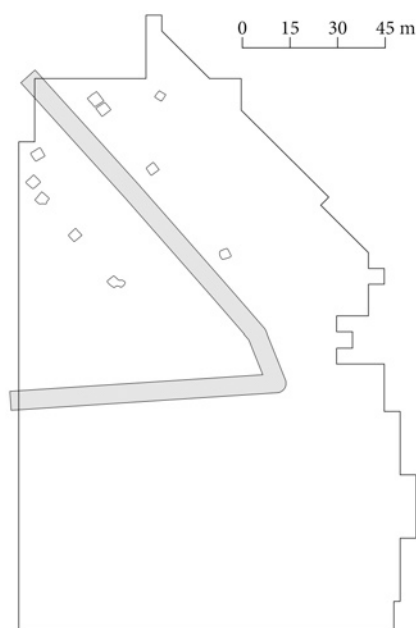


Fig. 82. Břeclav-Pohansko. The Forest Nursery. Arrangement of the Great Moravian sunken-floored dwellings along the communication corridor.

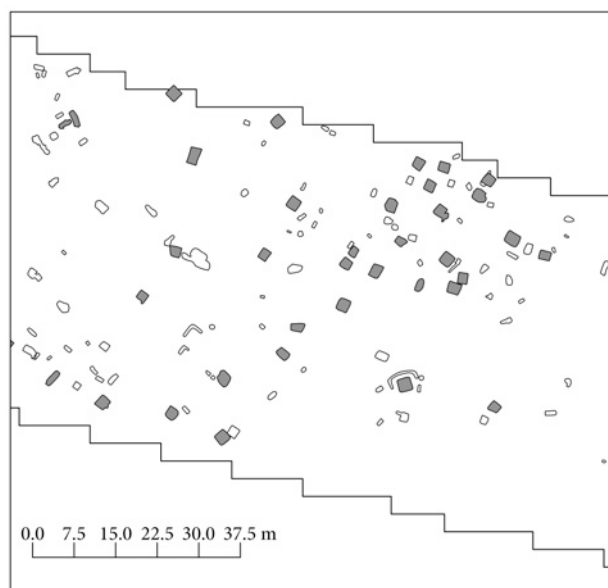


Fig. 83. Břeclav-Pohansko. The Southern Suburb. Distribution of the sunken-floored dwellings in the so-called settlement II (according to *Vignatiová 1992*).

Another distinctive spatial structure identified in the Forest Nursery is the rectangular clusters of sunken-floored features, posthole structures, trenches and graves. In its validation we need to prove that it is not an isolated or random phenomenon, and that similar structures appear in other parts of the agglomeration and are incorporated into a spatial structure of a higher order. In order to be able to fulfil this task, we needed to assemble the most comprehensive data on the layout of the settlement at Pohansko. The knowledge we had acquired from field excavation was therefore complemented by outputs of geophysical prospecting (Fig. 84), carried out, using a caesium magnetometer Smartmag SM-4g (Scintrex, Canada), between 2000–2003.³¹⁹

The measurement covered the complete accessible area within the fortification amounting to approx. 9 ha (Fig. 85). Apart from a few

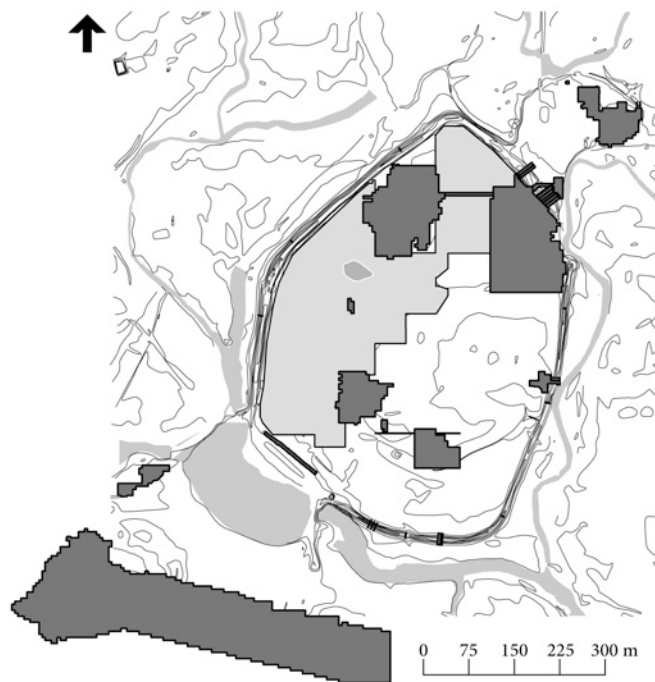


Fig. 84. Břeclav-Pohansko. Areas investigated by field excavations (dark grey areas) and geophysical measurement (light grey areas).

³¹⁹ Measurements and evaluation by RNDr. R. Křivánek: Závěrečná zpráva o geofyzikálním průzkumu, Archeologický ústav AV ČR č.j. 8461/00, 8884/01 and 7486/02.



Fig. 85. Břeclav-Pohansko. Geophysical measurements between 2000–2003.

recent terrain interventions (power cable, road, rubble from the construction of the Liechtenstein mansion), there were identified at least 1017 anomalies of different size and shape throughout the area, which can be considered evidence of relevant archaeological features (Fig. 86). However, the resulting picture is cluttered just as in the case of the undifferentiated settlement structure uncovered by the excavation (see Fig. 68). For the purposes of the validation the whole structure must be simplified and clarified. As a result of this we will select only anomalies with an extensive area, and/or anomalies where thanks to their shape we can clearly define the direction of their orientation (Fig. 87). Although it is a subjective sample to a certain extent, its validity can be confirmed by statistical tests (two-sample Kolmogorov—Smirnov test; Tab. 100). This clearly shows that the selected anomalies (inside plots) in terms of their area are different from the anomalies excluded from the sample (outside plots). The difference is obvious in a box plot as well (Diagram 125).



Fig. 86. Břeclav-Pohansko. Geophysical anomalies.



Fig. 87. Břeclav-Pohansko. Selected structuring geophysical anomalies (grey) and rectangular settlement structures identified by field excavations (black).

Tab. 100. Břeclav-Pohansko. Comparison of the areas of the geophysical anomalies included in the sample (inside plots), with anomalies excluded from the sample (outside plots). Two-Sample Kolmogorov-Smirnov Test.

	Anomalies	N
Area	Outside plots	731
	Inside plots	286
	Total	1017
		Area
Most Extreme Differences	Absolute	0.405
	Positive	0.405
	Negative	-0.001
Kolmogorov-Smirnov Z		5.805
Asymp. Sig. (2-tailed)		0.000

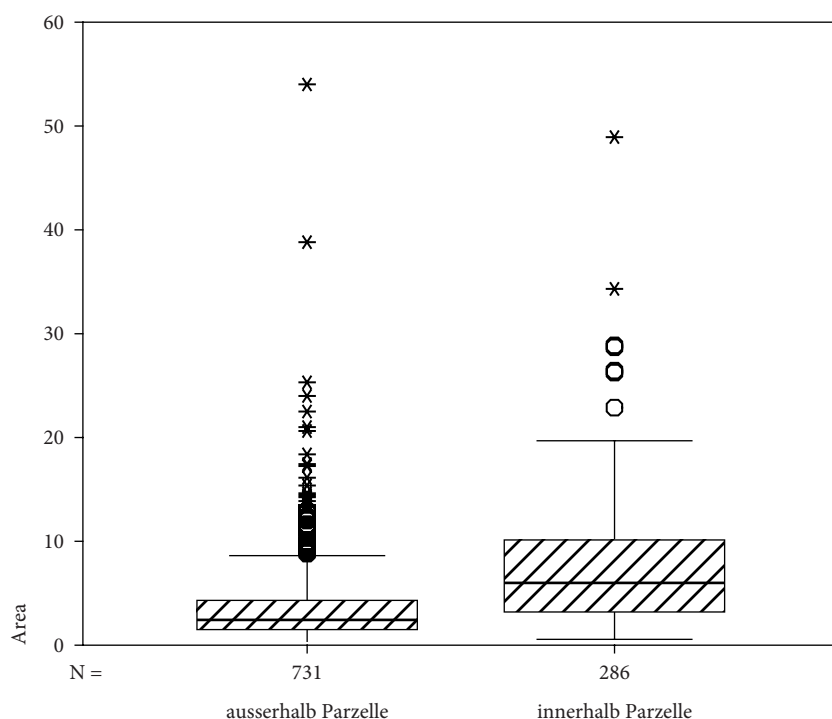


Diagram 125. Břeclav-Pohansko. Box plot. Comparison of the areas of the geophysical anomalies included in the sample (inside plots—innerhalb Parzelle), with anomalies excluded from the sample (outside plots—ausserhalb Parzelle).

Taking advantage of the GIS software capabilities of merging spatial data from different sources we can combine, within a single site plan, selected geophysical anomalies with the results of excavations from different locations inside the stronghold (Fig. 87). The discussed rectangular structures were identified both during the investigation in the Forest Nursery area, and the other excavated areas at Pohansko (the so-called Cremation Cemetery and Forest Dune). It is obvious from the resulting site plan which includes, for improved clarity, only those uncovered sunken-floored features that form the rectangular structures under discussion. With regards to compatibility with the outputs of the geophysical measurement the settlement features are not chronologically classified. The chart also depicts the palisades and the church in the Magnate Court (Fig. 88).

The final combination of geophysical prospecting and field excavations makes it absolutely clear that the rectangular spatial structures that we are trying to validate are not restricted to the Forest Nursery only but systematically cover the whole area delimited by the rampart.



Fig. 88. Břeclav-Pohansko. Rectangular settlement structures identified by geophysical measurement (grey) and during field excavations (black).

Their shape and orientation agree with the disposition of the Magnate Court, and/or are determined by the course of the fortification (this can be easily seen in the southern part of the Forest Nursery and the Forest Dune).

We identified a total of 26 similar structures, 7 during field excavations (Fig. 89) and 19 with the assistance of geophysical measurement. Their average area was 1401.3 square metres (median 1373.5 square metres), whereby the rectangular structures uncovered by excavation were, on an average, larger (1691.7 square metres) than those known to us thanks to geophysics (1294.3 square metres). The smallest known structure of the monitored type was 835.6 m², and the largest was 2726.7 m² in area. Their descriptive statistics (mean, median, standard deviation, variance, range, minimum and maximum) are presented in a table (Tab. 101). It is complemented by a histogram of the whole set (Diagram 126).

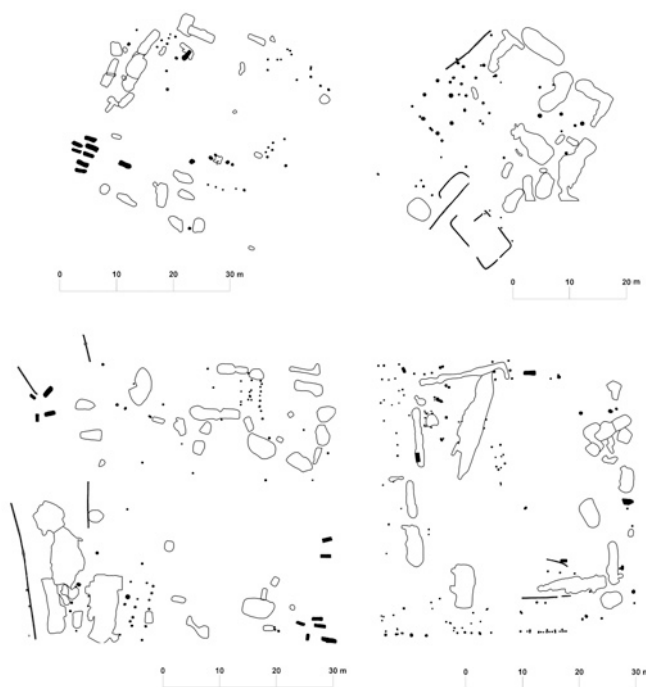


Fig. 89. Břeclav-Pohansko. The Forest Nursery, Former Cremation Cemetery and Forest Dune. Examples of a rectangular settlement structures identified by field excavations (white—sunken-floored settlement features, black—graves, postholes, trenches).

Tab. 101. Břeclav-Pohansko. The area of rectangular settlement structures identified by geophysical measurement and field excavations. Descriptive statistics.

SOURCE	N	Mean	Median	Std. Deviation	Variance	Range	Minimum	Maximum
Excavation	7	1691.7143	1553.4000	568.1669	322813.675	1602.10	1124.60	2726.70
Geophysics	19	1294.2579	1328.1000	298.5678	89142.756	1126.40	835.60	1962.00
Total	26	1401.2654	1373.5000	417.1109	173981.482	1891.10	835.60	2726.70

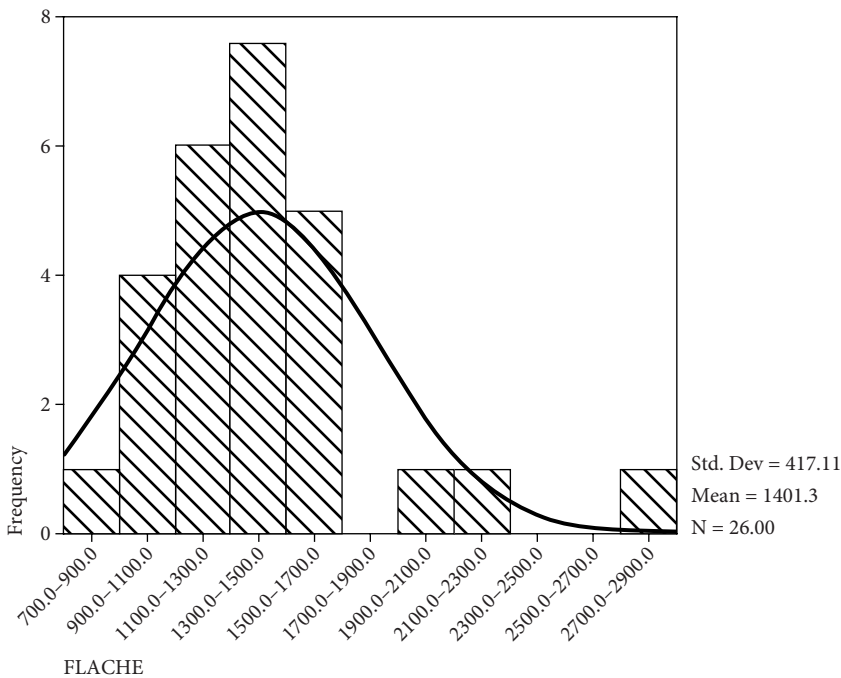


Diagram 126. Břeclav-Pohansko. Histogram. The area of rectangular settlement structures identified by geophysical measurement and field excavations.

The rectangular settlement structures identified in the Forest Nursery are certainly not a random or isolated phenomenon, but rather a component of a very complex structure of a higher order, The conclusion is very important for the validation of the spatial structures from the Forest Nursery.

The plausibility of the existence of the rectangular spatial structures, made up of sunken-floored and above-ground features, palisades and graves, can also be confirmed by a detailed spatial analysis performed

on a larger scale site plan. This is because one of the important arguments in the validation process is the finding that a similar structure is expressed completely independently within the space at various levels. A suitable external spatial structure which lends itself to the purpose is the distribution of settlement refuse at the original ground level,³²⁰ the surviving remnants of which include vessel shards, animal bones or daub from destroyed buildings. During the validation we will observe whether the distribution of settlement refuse is compatible with the rectangular settlement structures and whether the two independent structures are spatially and functionally interlinked. A similar procedure was used in the investigation of the communication patterns of high medieval castles, where it was revealed that in the space with the heaviest traffic waste (e.g. in the form of pottery fragments) had no chance of being preserved. It was subjected to being trampled on, driven over, erosion or clearance.³²¹

The solution to this problem was the task of a dedicated field excavation, carried out between 1999–2003 in the Forest Dune location in the south-eastern sector of the inner area of the stronghold (Fig. 90). The investigation yielded one of the rectangular structures consisting of sunken-floored features, graves, above-ground structures and rows of postholes and a trench. The space chosen for the excavation was not substantially interrupted by recent agricultural or construction activities with the sole exception of a few sand pits from the 19th century. This relatively recent intervention luckily damaged only a small part of the studied area (Fig. 91). Most of the investigated area was topped by an intact 40–70 cm thick layer, within which we found a surviving surface from the early Middle Ages, with a characteristic accumulation of artefacts and ecofacts at the same elevation level. However, in terms of the soil colour and specifications the soil seemed homogenous and, visually, was impossible to divide.

For the needs of the spatial analysis the whole investigated area was divided up by a metre grid, based on which we defined the so-called “enclosing” square polygons sized 1 × 1 m (Fig. 92). During the excavation the individual categories of finds (mainly pottery, bones, and daub) from the top layer (i.e. the original surface and the topmost parts of the sunken-floored features) were recorded by the polygons.

³²⁰ E.g. Geisler (1996), p. 772; Neustupný (1996), pp. 498–500.

³²¹ Durdík (1998), pp. 210–211.

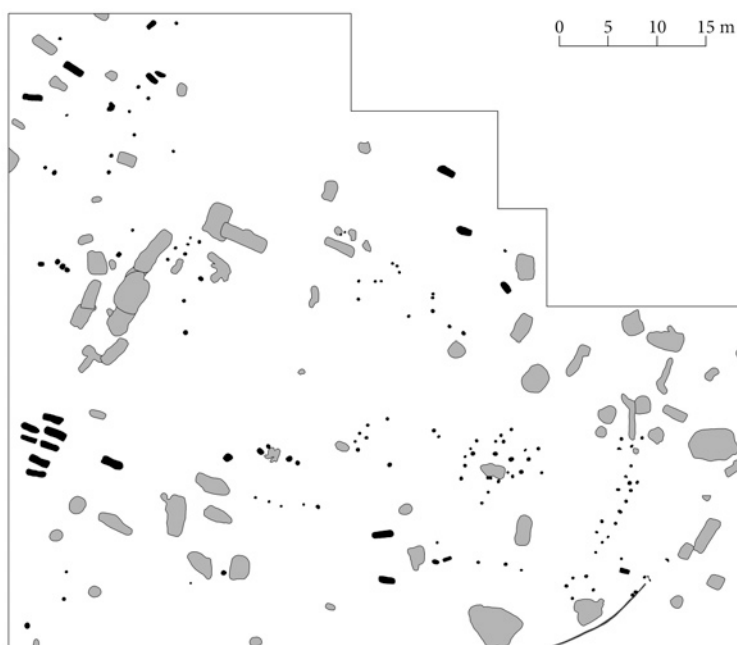


Fig. 90. Břeclav-Pohansko. Site plan of Forest Dune. Pits (grey), graves (black rectangle), postholes (black dots) and palisade (black line).

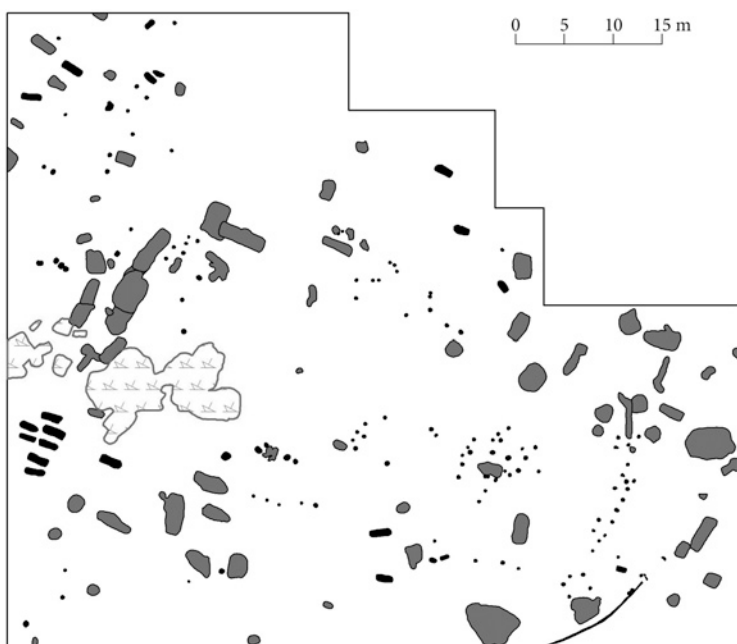


Fig. 91. Břeclav-Pohansko. Forest Dune. Recent interventions.

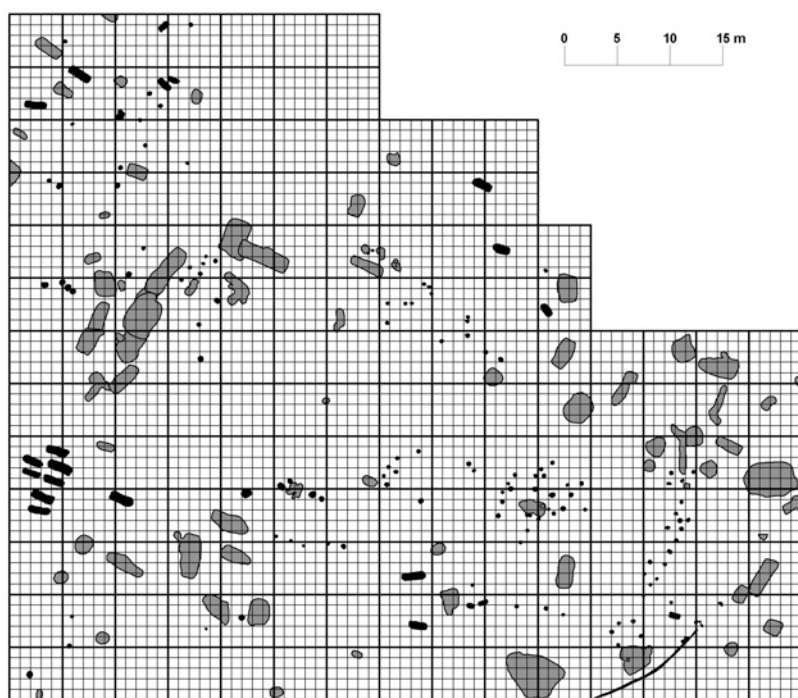


Fig. 92. Břeclav-Pohansko. Forest Dune. The so-called enclosing square polygons sized 1×1 m.

The result of the analysis is a database containing 4 025 entities (the individual polygons/squares 1×1 m), characterized by the number and weight of the fragments of pottery, animal bones, and daub uncovered in them. During the further processing the weight seemed to be the most suitable for the quantification of the finds. This piece of information eliminates, to a certain extent, the effect of fragmentation which is especially profound in the top layers. The data on the weight of the finds were linked, in the GeoMedia software, to the graphic representation of the individual polygons and thus located in space. In the GeoMedia Grid program the obtained values were interpolated using the Local Scan statistical function during which we calculated the average weight of the individual types of finds in a moving window with a diameter of 3 m. The result of the interpolation is a distribution map in which the density of animal bones (Fig. 93), daub (Fig. 94), and pottery (Fig. 95) is denoted by a different gradients of grey. The densities of the individual zones were vectorized and are delimited by

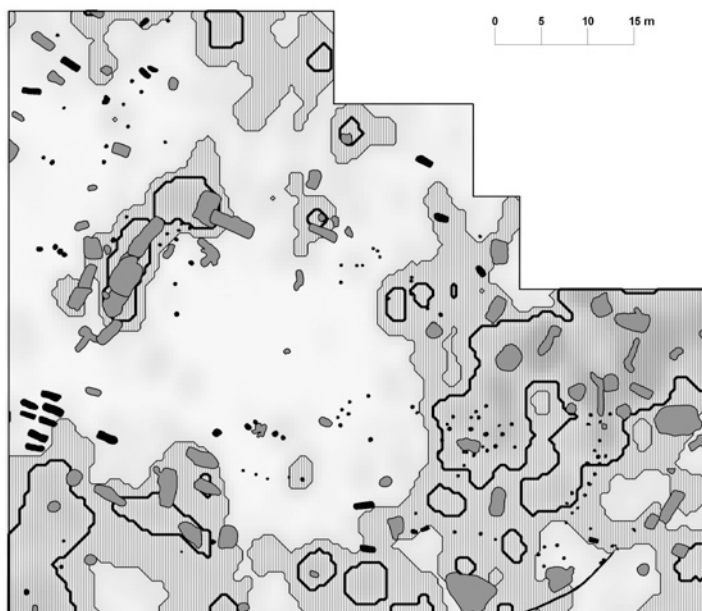


Fig. 93. Břeclav-Pohansko. Forest Dune. Distribution of animal bones on the original early medieval surface.

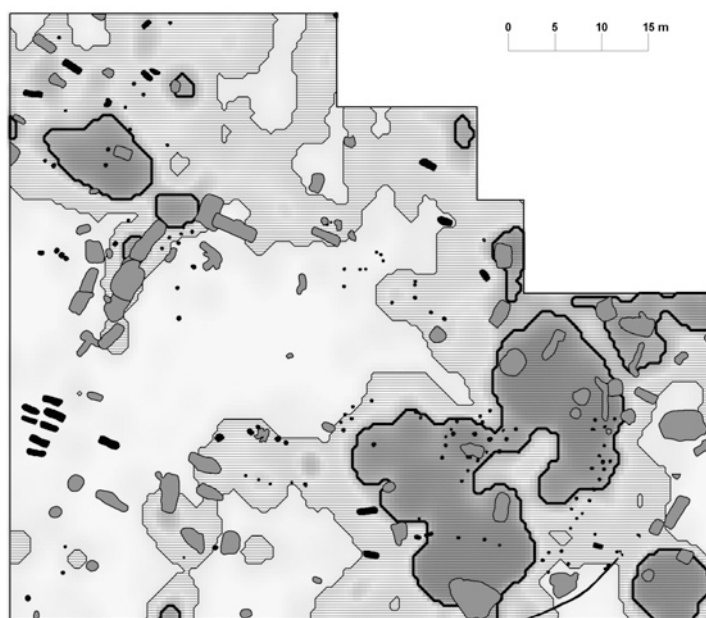


Fig. 94. Břeclav-Pohansko. Forest Dune. Distribution of daub on the early medieval surface.

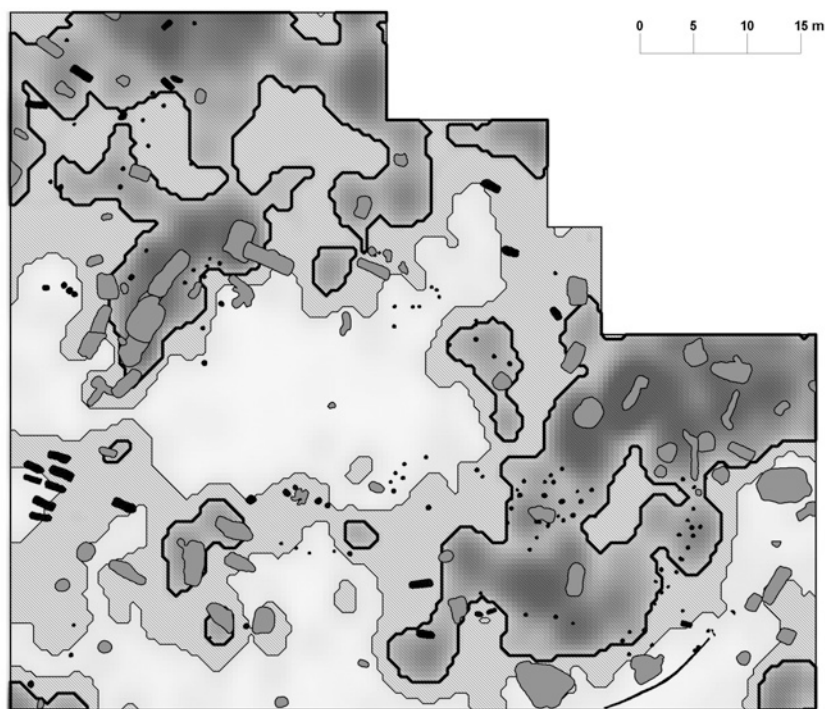


Fig. 95. Břeclav-Pohansko. Forest Dune. Distribution of pottery on the early medieval surface.

a line in all the maps. Apart from the density of finds the maps visualize sunken-floored settlement features (grey), graves (black), postholes and a trench (as the so-called delimiting polygons).

From the comparison of the three distribution maps we arrive at the following finding. The accumulations of refuse are tied to the sunken-floored (bones, pottery) and above-ground (daub) settlement features. Refuse logically appeared nearby places with a concentration of various residential, construction and production activities. It was thrown out in the immediate vicinity of the houses or workshops,³²² from where part of it was transported back into their fill due to the formation processes. What is rather surprising is the fact that the concentrations of pottery shards and animal bones also arise in places where there are no settlement features or postholes. There, we must presume the existence of the so-called surface refuse areas as proposed by

³²² Neustupný (1996a), p. 497.

E. Neustupný.³²³ It is a place (or places) where the waste was dumped on what was then the surface for a certain period of time within the settlement area. Over time their position could have changed and it is not impossible that they gradually covered most of the residential area. A similar method of disposing of refuse is expected at the Frankish rural settlements from the early Middle Ages, where rubbish pits are completely missing.³²⁴

On the Forest Dune location at Pohansko where we do not expect long-term occupation we identify the refuse areas as concentrations of finds. It is an important finding that artefacts of various types form clusters at different places. In the northern part of the investigated area we note a distinct concentration of pottery, while animal bones increasingly occur in the south-west corner of the excavation. This functional spatial structurization testifies to the sorting of waste during its deposition on secondary refuse areas.³²⁵ Daub is bound exclusively to postholes or shallow trenches and is related to the destruction of the above-ground structures.

Regardless of the differences between the various types of waste we can identify a common trend in their distribution. This particularly stands out when we merge the accumulations of pottery, bones and daub into a single whole (Fig. 96). The resulting distribution map shows the occurrence of any undifferentiated refuse within the excavated area in the Forest Dune. The most striking phenomenon that can be identified based on the map, is the empty space inside the rectangular spatial structure that we are trying to validate. It is free of any settlement refuse, sunken-floored and above-ground buildings, constructions or graves. The settlement refuse is concentrated either in the surroundings of the buildings or in the refuse areas outside the rectangular structure. The empty space with no finds has a roughly rectangular shape corresponding to the overall shape of the structure. We also notice two conspicuous protrusions, jutting out from it towards the west and the north-east. The space without early medieval finds in the western direction might be related to the recent sand mining taking place on the spot in the 19th century. A different explanation should be provided for the north-eastern protrusion, passing through

³²³ Ibidem, pp. 498–500.

³²⁴ Geisler (1996), p. 772.

³²⁵ Neustupný (1996a), p. 501.

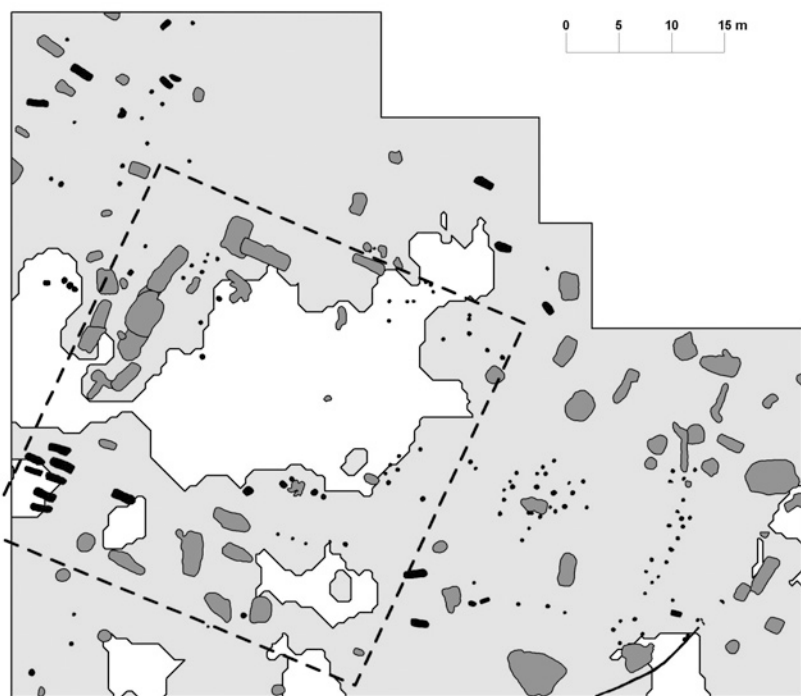


Fig. 96. Břeclav-Pohansko. Forest Dune. Distribution of undifferentiated settlement refuse on the early medieval surface.

a special posthole structure (Fig. 97), without any related greater concentration of daub, which sets it apart from the common standard. We cannot rule out that it is the entrance to the inside of the rectangular settlement structure and the corridor without finds is related to the communication running through it.

The whole structure is in essence very similar to the Magnate Court at Pohansko where it is also possible to map out the distribution of refuse in the top layers, although within a rougher grid compared to the Forest Dune. The basic entity is the so-called enclosing square polygon sized 5×5 m (Fig. 98), within the framework of which we recorded finds from the top layers.³²⁶ Pottery shards and animal bones are quantified by their absolute number in the square. Using the acquired data we were able to perform, in the GeoMedia Grid program with the

³²⁶ Dostál (1975), p. 15, plán 4.

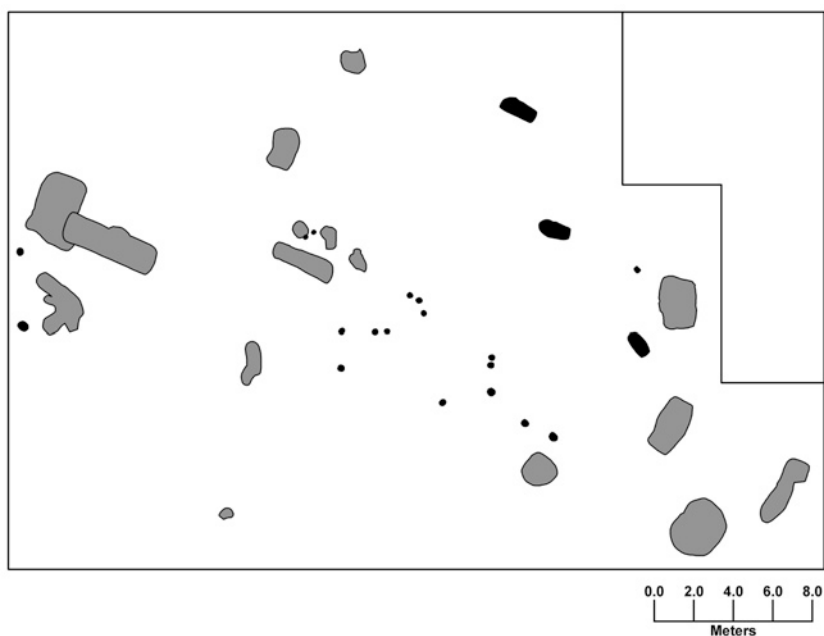


Fig. 97. Břeclav-Pohansko. Forest Dune. Posthole structure of the entrance.

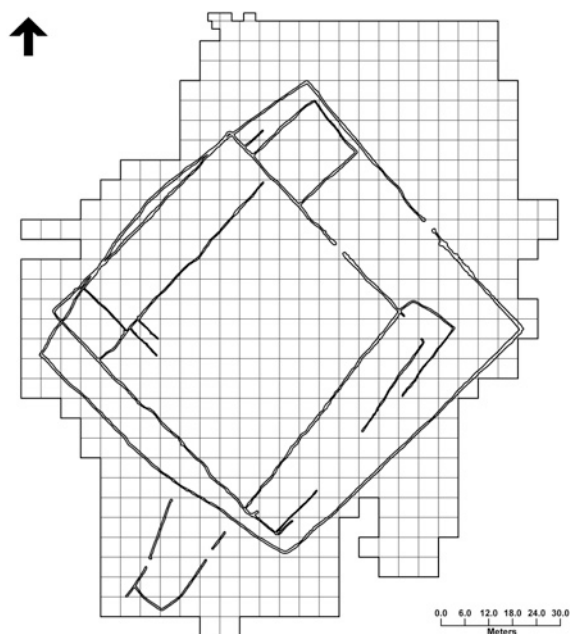


Fig. 98. Břeclav-Pohansko. The Magnate Court. Palisade trenches and enclosing square polygons sized 5 × 5 m.

assistance of the Local Scan statistical function, an interpolation which was based on the average number of fragments of both types of finds in a moving window with a diameter of 20 m. In the resulting distribution maps the greatest densities of finds are marked with dark tones and smaller densities with light tones. The white areas mark out the space with a minimum representation of waste. In addition to the distribution of waste the pictures show the course of the palisade of the Magnate Court (Fig. 99–Fig. 100).

The resulting maps clearly show that in the middle of the Magnate Court there was also an empty space free of any remains of buildings or settlement refuse. The central part is almost empty. The finds in the cultural layer are concentrated above the residential buildings and on the perimeter of the Magnate Court. A significant saturation of the layer with finds is recorded in the northern and southern part, outside the palisade. In the southern part the refuse is found inside the fence

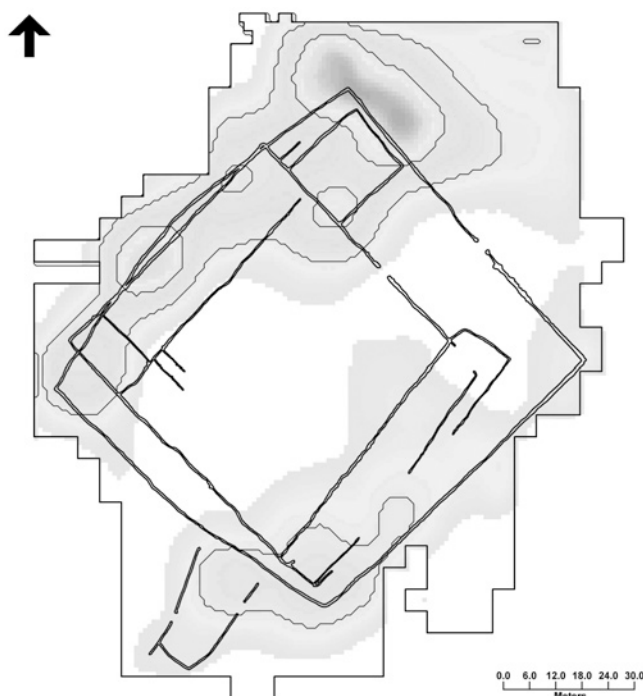


Fig. 99. Břeclav-Pohansko. The Magnate Court. Distribution of animal bones on the original early medieval surface.

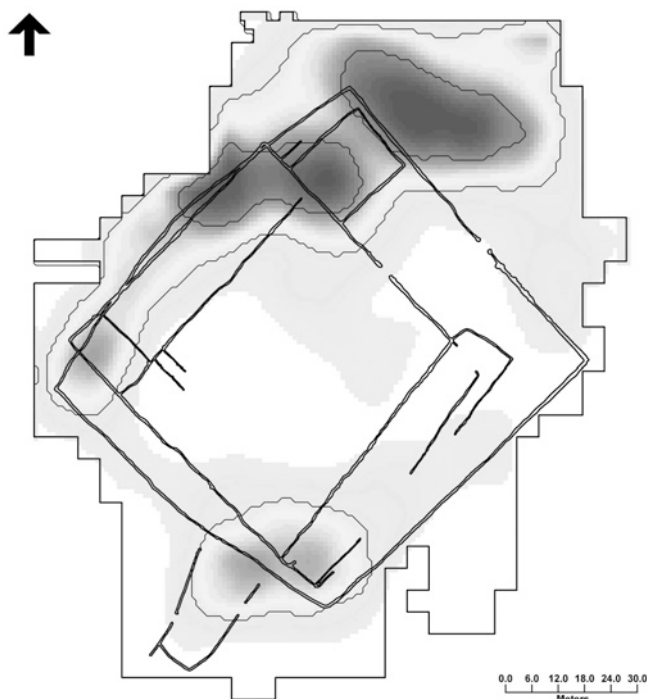


Fig. 100. Břeclav-Pohansko. The Magnate Court. Distribution of pottery on the original early medieval surface.

designated as feature 126.³²⁷ Although B. Dostál thinks it could have been a fence around a small homestead,³²⁸ given the absence of any obvious settlement features (excepting two posthole structures and two accumulations of small stones)³²⁹ we cannot rule out the possibility that it was a special enclosed area with an ancillary function, where the refuse from the Magnate Court was transported. Enclosed refuse areas in prehistoric settlements are expected even by E. Neustupný,³³⁰ e.g. in the Knovíz culture.

The distribution of refuse identified during the excavation in the Forest Dune area is fully compatible and spatially and functionally interlinked with the rectangular settlement structure which belongs,

³²⁷ Ibidem, pp. 120–122, obr. 3, příloha 4.

³²⁸ Ibidem, p. 32.

³²⁹ Ibidem, pp. 331–332, tab. 27.

³³⁰ Neustupný (1996a), p. 501.

together with the others (including the rectangular structures from the Forest Nursery) to a complex structure of a higher order. A similar distribution of refuse was also recognized in the top layers (on the original surface) of the Magnate Court, a fact which virtually rules out any idea that it was a work of chance. These findings are another serious argument in favour of the validation of the spatial structures from the late Great Moravian period.

To sum up, the process of the validation of the spatial structures identified in the Forest Nursery at Pohansko was successful. We managed to provide evidence that they were an integral part of a hierarchically arranged early medieval layout which was dynamically changing over time. The individual structures were not isolated, but, on the contrary, they were interconnected by a number of spatial and functional links. They are not a random phenomenon. Their actual existence was confirmed by means of a hierarchical-structural validation method.

4.5.3 *Interpretation*

In the previous chapters we described and validated the spatial structures existing both in the Forest Nursery and elsewhere at Pohansko in the area delineated by the rampart. During the interpretation we must fill the structures with content, attempt to explain their function, significance and meaning in the system of living culture.

The oldest early medieval structure which we managed to identify and validate in the Forest Nursery is a simple cluster of sunken-floored and/or above-ground features of pre-Great Moravian age. As was stated above it constitutes part of what is referred to as the early Slav settlement II, described in a monograph by B. Dostál.³³¹ According to him, settlement II is made up of two semicircular groups, consisting of dwellings, grain pits and other pits (Fig. 101). B. Dostál supposes that it is a self-contained farmstead of two generations of a single group of people.³³² However, other researchers do not share his opinions and underline the hypothetical nature of the conclusions. They point out that the actual ancillary structures such as sheds and barns are missing, as is an enclosure, which is very important for the definition of

³³¹ Dostál (1982b).

³³² Ibidem, pp. 54–56.

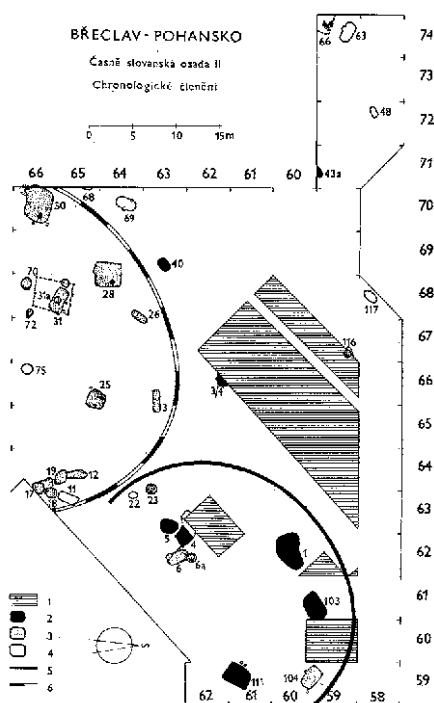


Fig. 101. Břeclav-Pohansko. Early Slav and Early Hillfort settlement II (according to *Dostál 1982b*).

self-contained farmsteads.³³³ They favour the approach of P. Donat,³³⁴ who maintains that in the west Slav world there is no evidence of such farmsteads in the agricultural environment until the 12th century. This is especially highlighted on comparison with the Germanic territories where in the early Middle Ages self-contained farmsteads represented a typical settlement structure.³³⁵ Their marking out (see below), or fencing proves the existence of clearly defined private ownership.³³⁶ Until the 12th century these structure are missing in the Slav agricultural settlements,³³⁷ probably due to the low socio-economic differentiation of their inhabitants.³³⁸ It can be well illustrated by an example of the

³³³ E.g. Ruttkay M. (2002a), p. 277.

³³⁴ Donat (1980), pp. 125–131.

³³⁵ Ibidem, pp. 92–106.

³³⁶ Ibidem, p. 126.

³³⁷ Ruttkay M. (2002a), p. 278.

³³⁸ E.g. Henning (2002), p. 140.

Slav agricultural settlement in Mstěnice in SW Moravia, where archaeological excavation provided evidence of continual development from the 8th/9th century to the high Middle Ages. In the early phases the settlement does not, principally, differ by its inner structure from the early Slav settlement at Pohansko. The sunken-floored dwellings, silo pits and other ancillary structures were arranged in a crescent or a semicircular shape. We do not record any traces of an internal subdivision of the settlement (Fig. 102). An important change took place in the second half of the 11th century when self-contained farmsteads started to appear in Mstěnice consisting of a single-space dwelling, sheds, barns and silo pits.

Another important example of an early medieval village is Březno near Louny. There, we have evidence of a settlement from the end of the 6th till the end of the 9th century. The oldest settlement with pottery of the Prague type appeared as a typical semicircle with six houses. In the second, Early Hillfort phase there arise groupings of

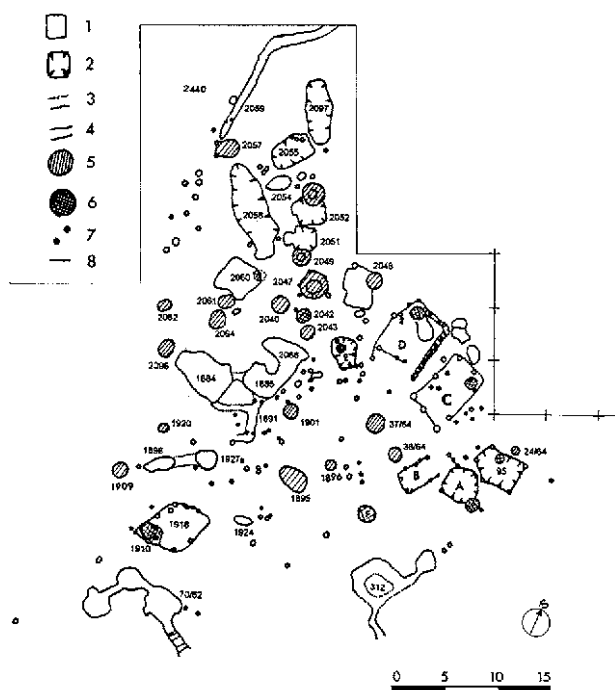


Fig. 102. Mstěnice. Layout of an early medieval settlement from the 10th to the first half of the 11th century (according to *Nekuda 2000*).

features which might point to the existence of some household units. In the third stage from the 9th century there were three independent (non-contemporary?) settlements in Březno, with a different arrangement of the layout—irregular, in rows, in a semicircle. In the western part of the site we can identify, based on the semi-circular arrangement and the orientation of a building, something resembling a village square with a well in the middle, apparently serving all the inhabitants of the village. The grain pits for seed, being other structurizing settlement elements, were irregularly distributed in all the three stages at the houses, between them or in isolation.³³⁹ Just as in the Slovak settlement in Bajč from the 6th–11th century,³⁴⁰ nothing suggests the existence of privately owned land or farmsteads, which is confirmed by archaeological and written sources in the early Middle Ages, for example, in the Alemannic and Bavarian regions (e.g. Lauchheim, Kirchheim, see below).

The low differentiation of the early medieval Slavs in terms of social status and property ownership was reflected in the uniform size and types of dwellings³⁴¹ that we also notice in the early Slav period at Pohansko.

To sum up, early medieval Slav settlements from the region of Central Europe are either dispersed or concentrated. They create clusters of a nest type, villages of a semicircular or circular shape, and/or rows.³⁴² It is expected that in the early Slav period they were built by the local clan, with surviving big family and patronymic elements,³⁴³ where the principal task was agricultural production.³⁴⁴ Agriculture was also the economic base of the early Slavic settlement at Pohansko,³⁴⁵ which is confirmed, among other things, by the occurrence of grain pits for storing cereals that are virtually missing in the Great Moravian period at Pohansko.³⁴⁶

The earliest spatial structure in the Forest Nursery is interpreted in the categories of living culture in terms of its function and significance as a settlement of a cluster type lived in by members of a socially and

³³⁹ Pleinerová (2000), p. 221, p. 223, pp. 224–227.

³⁴⁰ Ruttkay M. (2002c), pp. 298–299.

³⁴¹ Donat (1980), p. 151.

³⁴² Dostál (1987), p. 10; Ruttkay M. (2002b), pp. 73–74.

³⁴³ Dostál (1987a), p. 10 with references.

³⁴⁴ Ruttkay M. (2002a), p. 279; Ruttkay M. (2002b), p. 77.

³⁴⁵ Dostál (1982b), pp. 47–54.

³⁴⁶ Dostál (1993b), p. 44; Macháček (2001b), pp. 43–44.

economically little stratified early Slav society, engaged mainly in agricultural production.

The early Great Moravian layout is made up of irregular lines of sunken-floored and above-ground settlement features. As was pointed out in the process of validation it is in a relationship with the cult enclosure of the Magnate Court, which determined the orientation of the settlement features and the whole social geographic space in that period.

The characteristics of the identified settlement structure are nothing unusual in the west Slav world. Rows of elongated oval pits appear, for example, in the territory of the Elbe River valley Slavs (Fig. 103–Fig. 104). We know them from the baileys of the strongholds (e.g. Leu

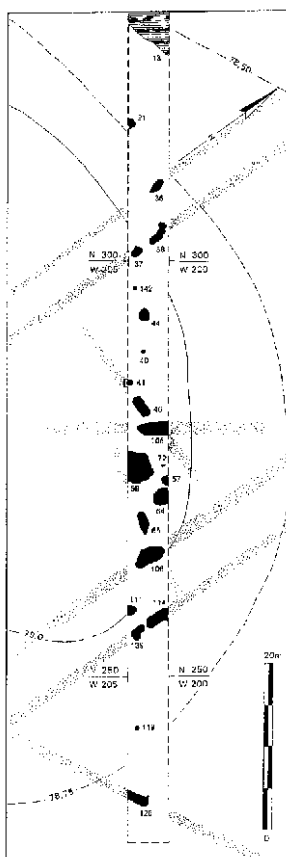


Fig. 103. Leuthen–Wintdorf. The bailey (according to *Biermann 2000*).

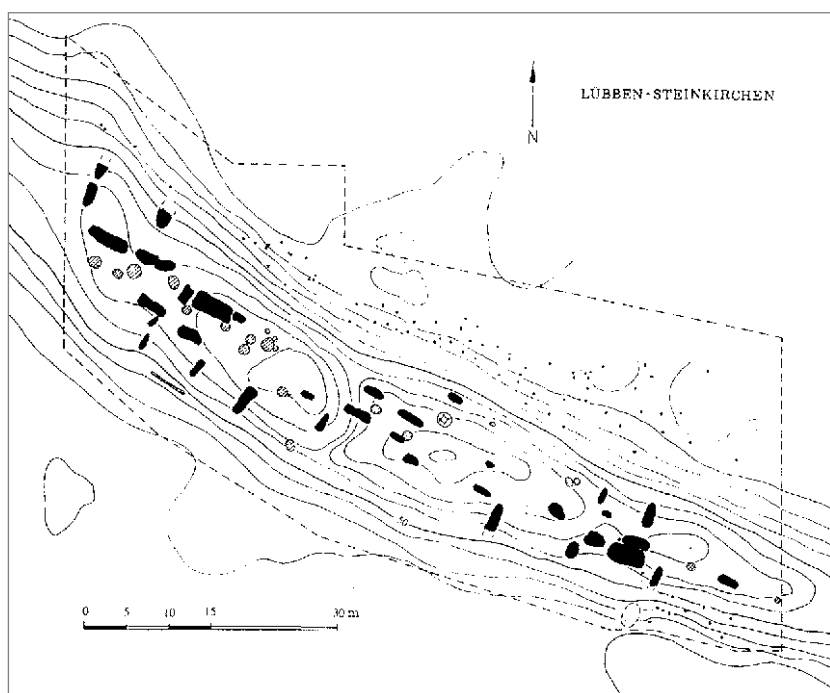


Fig. 104. Early medieval settlement in Lüben—Steinkirchen (according to Henning 2002).

then—Wintdorf, Presenchen, Tornow),³⁴⁷ and agricultural settlements (Lüben—Steinkirchen).³⁴⁸ As they are usually dated back to the 9th to 10th century based on pottery and more precisely by dendrochronology,³⁴⁹ they are contemporary with the Great Moravian settlement at Pohansko.

German archaeologists consider the elongated oval pits to be the lower parts of above-ground timber dwellings, and/or hearths.³⁵⁰ The rows they form in the settlements have usually an orientation following the terrain configuration (Lüben—Steinkirchen)³⁵¹ or the points of the compass (Leuthen—Wintdorf, Presenchen). Some simply point towards the centre of the stronghold (Radusch, Tornow). We cannot

³⁴⁷ Biermann (2000), pp. 151–161 with references.

³⁴⁸ Henning (2002), Abb. 8, p. 140.

³⁴⁹ Biermann (2000), p. 152; Henning (1998), p. 396.

³⁵⁰ Biermann (2000), pp. 158–159 with references.

³⁵¹ Henning (2002), Abb. 8.

rule out that there were roads running between them. Although there are many features that defy the typical layout, the described structure can be interpreted as the result of an effort towards a clear subdivision of the inhabited area. Its function and significance in the environment of the Elbe valley Slavs remains more or less unknown. We can, however, refute the conclusion that there were individual farmsteads or plots on those sites, as had occasionally been thought,³⁵² with all the related consequences.³⁵³

As far as the Forest Nursery at Pohansko is concerned the early Great Moravian settlement structure is also unable to provide a clear explanation in the categories of living culture. Obviously, it is the result of a new organization of the space, related to the new ideological concept. This was demonstrated in the first place by the construction of the cult enclosure, and/or the early phase of the Magnate Court, which determined the orientation of the rest of the contemporary settlement at Pohansko. However, it may have been at that time that craft production had already been going on in the Forest Nursery as is confirmed by the high factor scores of some features from pottery-chronological group 2, calculated from the shares of artefacts other than pottery (tools, half-finished and finished products, production waste, etc.; see Chap. 4.3).

The late Great Moravian phase provides a much greater potential for interpretation. There is sufficient and convincing evidence that the inner area at Pohansko, at that time very likely to be delimited by the rampart, was systematically built up by rectangular settlement structures, which comply with the other important elements of the whole agglomeration (the Magnate Court, fortification) and together they form a complex structure of a higher order. Inside the rectangular structures there were combined residential and economic activities, as is shown by the distribution of waste which is fully compatible with them, and the nature of archaeological finds and features. At some of them there were uncovered remains of fencing and small burial grounds. The groups of features with remains of trenches from fences at Pohansko were brought to light by B. Dostál.³⁵⁴ He preliminarily considered them to be self-contained household units—"with

³⁵² Compare, for example, the problem of the bailey of the Tornow stronghold; more in Biermann (2000), p. 152, p. 161.

³⁵³ E.g. non-existence of private landed property; more in Biermann (2000), p. 283.

³⁵⁴ Dostál (1980a); Dostál (1993a); Dostál (1993b), pp. 49–50.

craft-production characteristics"³⁵⁵ or "small homesteads", which existed at Pohansko next to the "Magnate Court".³⁵⁶

In the interpretation of these structures we can start from analogies identified during investigations of sites in various regions and from different periods, historical and ethnographic sources.

An important attribute of the rectangular structures from Pohansko is their delimitation with respect to the surrounding space. It could have been realized either by actual enclosure which left behind fragments of palisade trenches or rows of postholes, or by the arrangement of the sunken-floored and above-ground features situated along the perimeter of the rectangular structures. Contrary to the Magnate Court, where archaeologists found a functional fortification in the form of a massive palisade,³⁵⁷ their fencing does not have a defensive but only a symbolic nature.

From the general point of view we can state that they are enclosed settlement units with a mixed residential-production function, which are part of a larger residential area. They belong to the category of the so-called local enclosures, which served small groups of persons.³⁵⁸ In the region of Central Europe (e.g. southern Bavaria) they started to autonomously develop at the end of the Urn Field period, and/or at the beginning of the Hallstatt period (e.g. Landshut—Hascherkeller, Munich—Unterhaching). They were further transformed into separate farmsteads of the Hallstatt period. They would be enclosed by fences or palisades, which is understood as a demonstration of ownership. They contained posthole structures, pits of various functions, sunken-floored buildings and hearths. It seems that this settlement form is not bound with any particular social stratum. Rather, it reflects the normative idea of that period of a marked off settlement unit. By size they can be classified into two groups: small (around 600 m²) and large (on average 3000–4000 m², the so-called *Herrenhof*). No later than the Hallstatt period the farmsteads (Fig. 105) begin to merge (e.g. Nördlingen—Baldingen).³⁵⁹ The inner areas of large settlements are divided by fences and shallow ditches (e.g. phase IVc at Heuneburg). Inside the parcels there appear larger residential and smaller ancillary structures.

³⁵⁵ Dostál (1988d), p. 317, p. 320.

³⁵⁶ Dostál (1980a), p. 84.

³⁵⁷ Dostál (1969); (1975), pp. 23–38.

³⁵⁸ Venclová (2000), pp. 459–461.

³⁵⁹ Fries (2002).



Fig. 105. Late Hallstatt farmsteads from Nördlingen—Baldingen (according to Fries 2002).

It is expected that they are individual household units, which together form a settlement of a higher order. This proposed development reached its peak in the Celtic oppida (Fig. 106–Fig. 107), where the farmsteads lose their economic independence.³⁶⁰ According to N. Venclová we can only apply the term homesteads or “manors” to enclosed units which are, by its location, size, layout, and/or production or richer inventory different from the other households in the given residential area. If it is simply an organizational-spatial unit, and/or a cell equal to the other similar units in the settlement we should preferably speak of a household unit or, in general, an “economic unit”.³⁶¹

In the Celtic oppida the enclosed homesteads were built gradually along the main road. However, the fences marking the boundaries of the settlement units cannot always be archaeologically identified. In

³⁶⁰ Kaß, Schußmann (1998), pp. 93–98, p. 106; Rieckhoff, Biel (2001), pp. 101–108.

³⁶¹ Venclová (2000), p. 460.



Fig. 106. La Tène homestead from the oppidum at Hrazany (according to *Drda—Rybová 1998*).

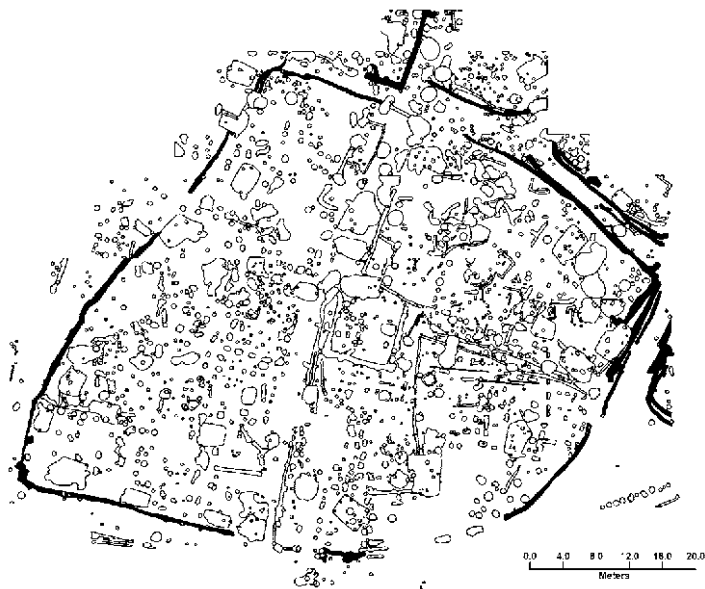


Fig. 107. La Tène homestead from the oppidum at Staré Hradisko (according to *Danielisová 2003*).

this case the homestead can be recognized based on the concentration and arrangement of the buildings, which are regularly distributed according to the given settlement layout (e.g. Manching).³⁶² As they are fully subordinated to the parcelation and the terrain configuration, they need not strictly conform to the rectangular shape, although the initial effort to observe regular parcelation remains visible (e.g. the homestead in the oppidum of Staré Hradisko). The homesteads in the oppida were separated from one another by smaller tracks (e.g. Hrazany).³⁶³ Inside we find residential houses, smaller ancillary structures and workshop facilities. Sometimes it is assumed that these enclosed units were lived in by families belonging to the wealthy upper class, of maybe rich traders and craftsmen, or even aristocracy. In addition to the regular spatial structures there is another development in the oppida—often free-standing houses, mainly in fairly small irregular areas. Their inhabitants were different from the social stratum in the enclosed homesteads, probably craftsmen with a lower social status. The homesteads in the Celtic oppida are on average larger than the rectangular settlement structures found at Pohansko. The length of their sides varies between 40 to 60 meters.³⁶⁴ Although their dimensions may differ even within a single site, the established differences do not reach the values encountered at Pohansko between the Magistrate Court on the one hand and the other settlement units on the other hand.

With the Germanic people the farmsteads also took a long time to develop. Their continual evolution can be best observed in the region between the Rhine and the Elbe and particularly in the seaside areas, where close to the coast artificial mounds called wurts were topped by farmsteads consisting of stable houses and granaries. In the period from the 5th to the 2nd century there were no rigidly defined settlement structures. The fences that appear from time to time seem to merely mark the individual roads, and change with each phase. The Germanic settlements of that period consisted of simple household units, clustered in groups of various sizes, which did not form complicated spatial structures. Some changes took place around the turn of the millennium (1st century BC–2nd century AD), when the first

³⁶² Sievers (2003), pp. 49–54.

³⁶³ Drda—Rybová (1998), p. 146

³⁶⁴ Danielisová (2003), pp. 20–21, pp. 54–55, pp. 174–179 with references.

enclosed farmsteads started to emerge (Fig. 108). Familiar even in modern Denmark, they are mostly small irregular farmsteads (300 m²–500 m²) of an oval shape, where the fence hugs the buildings and there is virtually no free space for economic use (e.g. Grønbjerg Skole). A significant change is noted from the beginning of the 3rd century AD when a vast rectangular farmstead enclosed within a fence with a longhouse with a byre, granary and sunken-floored buildings (weaving workshops) became the dominant settlement structure for a long period of time. From the region of the Netherlands and northwestern Germany we know more than 40 farmsteads like that. Their average area varies between 1,000 m² and 2,000 square metres but the differences between them are not so great to make us consider economic differences within the group of the farmstead owners. Their genesis must have been influenced by a number of factors (e.g. the impact of the Roman provinces), although the decisive factor was probably the internal development of the Germanic society and, above all, the changes in the availability of landed property which ceased to be in the

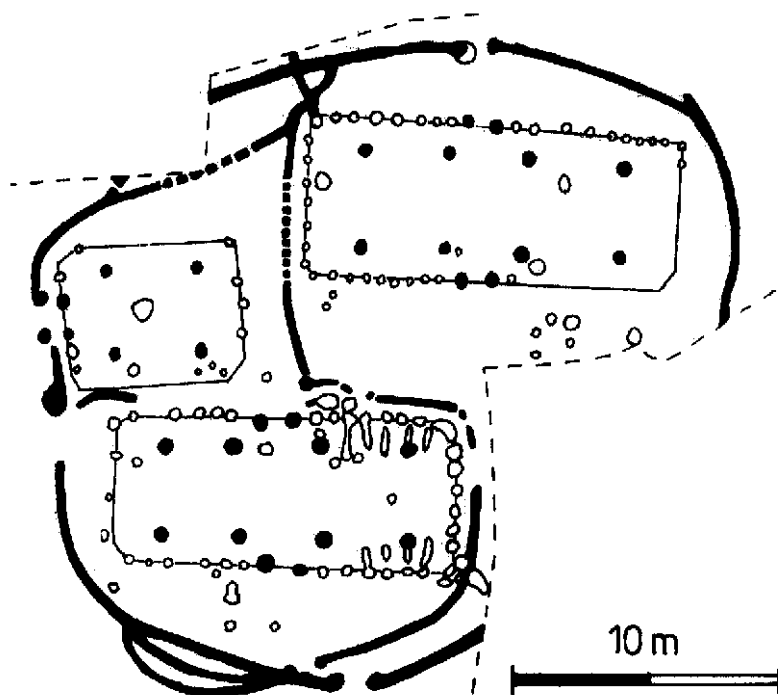


Fig. 108. Germanic farmstead from Grønbjerg Skole (according to Donat 1991).

possession of the clan. The enclosed farmsteads consisting of several parts, which appear in Germanic areas from the late Roman period can be put in connection with the new social phenomenon—private ownership of land.³⁶⁵

It is questionable whether the development outlined above can be generalized and applied to the whole territory populated by the Germanic people. In the eastern parts of that territory the regular enclosed farmsteads and longhouses with a byre do not occur throughout the Roman period.³⁶⁶ Yet, we can agree with P. Donat that the Germanic farmstead from the late Roman period established itself as a progressive settlement form and became the foundation of the further development in the early Middle Ages,³⁶⁷ which is well documented in the regions of southern and central Germany.³⁶⁸

With the Alemanni the farmsteads enclosed by a palisade (Fig. 109) may have appeared as early as the 3rd–4th century (e.g. Sontheim).³⁶⁹ However, we do not have more detailed data available on an Alemannic village of late Merovingian and early Carolingian period until the extensive excavations in Lauchheim in Baden-Württemberg. The explorations here included a complete excavation of a vast burial ground from the 6th–7th century together with the associated settlement about 200 m away from the burial ground. The village existed on the site from the 6th to the 12th century, i.e. significantly longer than the row grave cemeteries. The excavated part of the settlement (5.5 ha) revealed at least 60 above-ground structures and 45 sunken-floored buildings. The settlement area was divided into individual farmsteads, as is indicated by remains of fences and roads that separated them (Fig. 110). Based on the number of the dead in the burial ground it is estimated, that in the early Middle Ages there were eight to twelve farmsteads on the site at the same time. The farmsteads enclosed by a fence consisted of longhouses, sunken-floored structures, granaries and smaller byres. Inside some (not all) farmsteads there appeared small clusters of graves from the time when the row grave cemeteries were being abandoned (around 700 AD). However, most of the

³⁶⁵ Donat (1980), pp. 111–119; Donat (1985), pp. 147–153; Donat (1991), pp. 150–172; Kaldal Mikkelsen (2000), pp. 46–59.

³⁶⁶ More in Leube ed. (1998).

³⁶⁷ Donat (1980), p. 119.

³⁶⁸ Donat (1991), pp. 162–171.

³⁶⁹ See Fingerlin (1998), pp. 127–128; according to other opinions this farmstead dates back to the 6th century; see Bücker, Hoepfer (2000), p. 218.

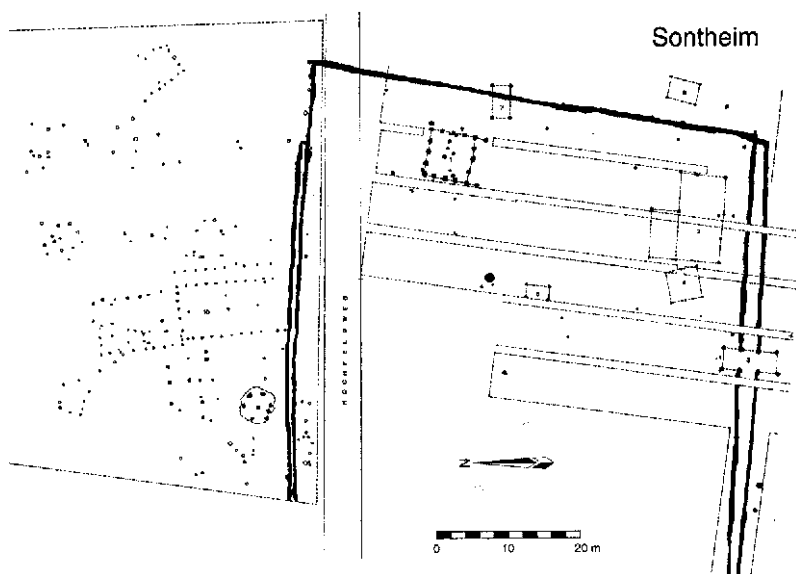


Fig. 109. Alemannic farmstead from Sontheim (according to *Bücker-Hoeper 2000*).



Fig. 110. Part of an early medieval settlement in Lauchheim. Graves are highlighted (according to *Stork 1998*).

inhabitants are buried in the church cemetery. One of the farmsteads excavated in Lauchheim is markedly distinguished from the remaining settlement units (Fig. 111). It stands alone on the eastern edge of the settlement and takes up the largest area (in the late phase 3,000 square metres, previously a half of that). Its inner layout is characterised by the absence of sunken-floored structures, which were commonly used for household production, and above average presence of large granaries capable of storing so much grain that its volume must have exceeded the consumption needs of the farmstead inhabitants. The graves uncovered inside this “chiefly” farmstead (*Herrenhof*) had extremely rich grave goods (weapons, silver belt mounts, glass vessels, crosses made using gold leaf, gold cross brooch with precious stones, enamel and glass inlays, brocade, etc.). A luxurious carved beechwood bed, unearthed in one of the graves, can be dated by means of dendrochronology back to 704 AD. People who lived in this “chiefly” farmstead (*Herrenhof*) and were buried there belonged to an important



Fig. 111. “Chiefly” farmstead (*Herrenhof*) from Lauchheim. Graves are highlighted (according to *Stork 1998*).

Alemannic aristocratic family which had converted to Christianity (see the Christian symbols on the graves), but for unknown (political?) reasons did not wish to be buried at the church.³⁷⁰

Apart from Lauchheim we know other Merovingian settlements from the Alemannic environment (e.g. Renningen, Mengen), which often existed without interruption until the end of the 12th century. From the arrangement and characteristics of the settlement layout it is expected that they always consisted of several farmsteads, which could have been adjoined (Lauchheim) or relatively wide apart (Mengen). Remains of light fences forming the boundaries of the farmsteads are preserved in Lauchheim only. On the other sites they were not revealed by the excavation although their existence is presumed. The size of the farmsteads was mostly between 1000 and 2000 m².³⁷¹

Geographically and culturally Great Moravia is closest to Bavaria. This can be confirmed both by written sources and historical events,³⁷² and with the assistance of archaeological finds. A good example is pottery built by coiling and shaped on a turntable with an admixture of gold-glimmer mica decorated with combed waves (*Goldglimmerkeramik*, type TT GG), which appears in the Danube valley in Bavaria (e.g. Kelheim, Barbing), Upper Palatinate, Upper Austria and Bohemia. However, the closest parallels are found in Moravia in the pre-Great Moravian and Great Moravian period. With the Bavarians it occurred a little earlier, from the beginning of the 7th century at the latest. Farther to the west (e.g. with the neighbouring Alemanni) it is virtually absent.³⁷³

The largest investigated early medieval settlements in Bavaria include Barbing-Kreuzhof, Kelheim and, most importantly, Kirchheim near Munich. The large area that was excavated revealed a Bavarian village from the 7th–8th century. (Fig. 112). A centrally running street marked on one side by a shallow ditch appeared as an empty corridor with no archaeological finds. Along both sides of the street twelve to fifteen farmsteads were identified. While surviving remains of their fencing are rare, the individual farmsteads had to be identified by other criteria, such as small clusters of graves and wells which proved

³⁷⁰ Stork (1998), pp. 290–310.

³⁷¹ Bückler, Hoeper, Höneisen, Schmaedecke (1998), pp. 311–322.

³⁷² Sometime after 817 the Moravians established contacts with the empire and probably in 831 were baptized by the Passau bishop Reginhard; see Třeštík (2001b), pp. 107–126.

³⁷³ Geisler (1993), p. CIV 2, p. DII 3.

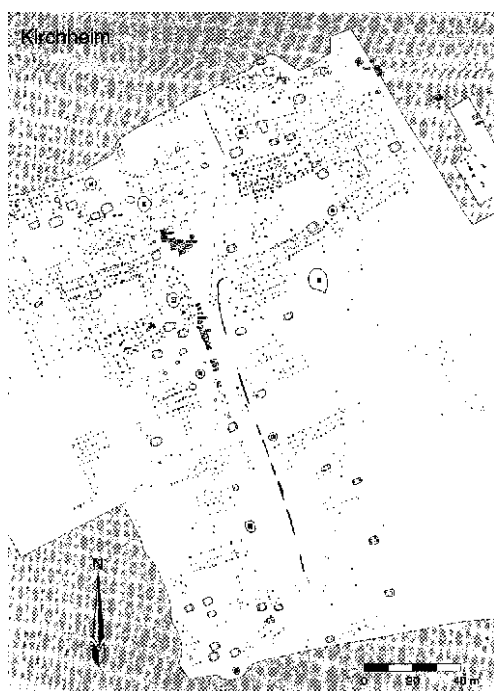


Fig. 112. Early medieval settlement in Kirchheim (according to *Bücker-Hoeper 2000*).

to be the most important indicator (Fig. 113). One farmstead was associated with one well which is also apparent in other settlements from that period (e.g. Barbing-Kreuzhof, Eching, Engelschalking, Pilsting). Each farmstead yielded evidence of household craft production (blacksmithing, textile production). Specific production activities (e.g. iron metallurgy) were carried out on the edge of the inhabited area (Kelheim). Most of the farmsteads in Kirchheim took up an area of about 1000 m². The only exceptions from this standard were two farmsteads referred to as “chiefly” (*Herrenhof*) with an area of around 4000 m². A Bavarian farmstead consisted of the main residential long-house, smaller posthole structures, which can be interpreted as barns or sheds, several sunken-floored structures, wells and, at the turn of the 7th and 8th century, a small burial ground.³⁷⁴

³⁷⁴ Bücker, Hoeper, Höneisen, Schmaedecke (1998), p. 317; Geisler (1993); Geisler (1997), pp. 461–483.

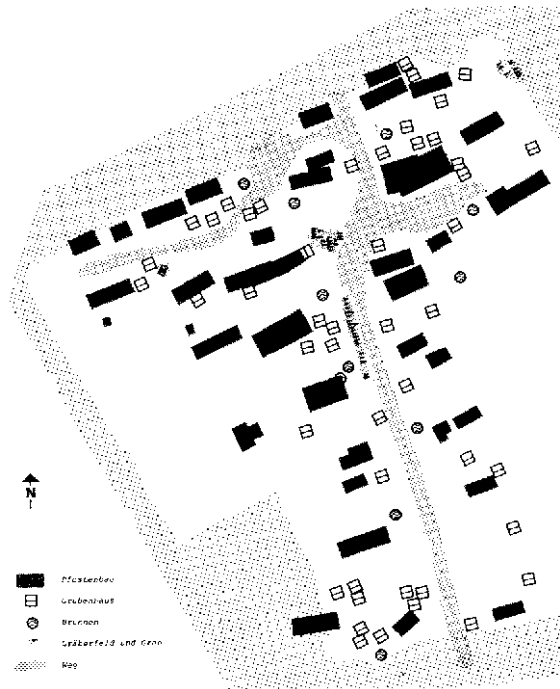


Fig. 113. Early medieval settlement in Kirchheim. Interpretation (according to Geisler 1997).

The farmsteads were independent residential and production units. While the old Frankish legal code *Lex Salica* (507–511) mentions exclusively farmsteads of free Franks, who managed them helped by their serfs or slaves, in the late Merovingian and, mainly, the Carolingian period there appeared farmsteads, which were incorporated into the organizational and legal structure of the early medieval great estate, the so-called *manorial system*.³⁷⁵ The great estate became one of the most important organizational forms of the economic and social life of the Middle Ages. The term “*manor*” can be understood both as the actual land ownership, and the legal and economic power over people who held the land of the lord in exchange for payments both in kind and in money, and for services. By leasing the land the peasant and his lord entered into a legal agreement, within the framework

³⁷⁵ Schulze (2004a), p. 109; Schulze (2004b), p. 56.

of which the tenant vowed to pay dues and provide services to the land owner. He was obliged to his lord with loyalty and obedience. In return the villein acquired a title for the house, farmstead and land which he could use over an extended period often until his death. If he fulfilled his duties, he was legally protected and his farm could not be removed from him. The lord also had to protect his villeins against violence and in times of extremity, caused by various factors.³⁷⁶ The layer of the villeins emerged gradually as a result of the free farmers falling into dependence and by releasing the unfree who were furnished with a holding integrated into the manor. Personally, they were free or half-free as opposed to the serfs.³⁷⁷

The early medieval village of the late Merovingian and Carolingian period were made up of a mix of free, unfree, and half-free peasants on one side and the land owners (king, clergy, aristocracy, low military gentry) on the other side. Within the process of feudalization the share of free peasants, completely independent of the great estate was constantly dropping.³⁷⁸ This has to be borne in mind during the interpretation of the spatial structures identified by the archaeological excavation of the early medieval sites in the Alemannic and Bavarian milieu. Evidently, there were the “chiefly” farmsteads (*Herrenhof*), which were the centres of extensive landed property and the collecting places for the dues paid, as is suggested by the huge granaries. The above-average size of these farmsteads, extending the needs of an ordinary peasant family, made it possible to accommodate a large number of serfs, who could have participated in the management of the great estate. The other farmsteads with standard furnishing and size could be property of both free peasants and tenants who paid back part of the produce and services to the great estate owner. The early medieval village of the Carolingian empire saw the emergence of a dynamically changing mixture of free, unfree, and half-free peasants who were interlinked by the same production activity. The existence of the spatial structures uncovered by excavations is at any rate a reflection of the more clearly defined economic, social, proprietary and legal structures of the early medieval society. This finding is in stark contrast to the situation in the Slavic villages where until the 11th/12th

³⁷⁶ Schulze (2000a), pp. 95–97.

³⁷⁷ Schulze (1998), pp. 248–250.

³⁷⁸ Ibidem, pp. 249–250.

century there is no archaeological evidence of the existence of private ownership of land and individual farming (e.g. Mstěnice, Březno, Bajč, see above).

Another important source, which helps us to give a name to archaeologically known early medieval settlement structures and to appreciate them in the categories of living culture, are the barbarian legal codes (*Volksrechte*, *leges*), which emerged with the Franks, the Alemanni, and the Bavarians between the 6th and 8th century.³⁷⁹ They are collections of legal provisions, an important part of which is devoted to solving events of a criminal nature related to everyday life, including events taking place around the farmstead and house. According to these codes, in the early Middle Ages the basic settlement unit is the farm, referred to as *curtis* or *villa*. The two terms embrace a wide spectrum from peasant farmsteads to royal manor houses.

A farmstead consisted in each case of a number of individual buildings of various functions, enclosed by a fence. The fencing had an essential normative significance. According to the Frankish law, codified in the *Lex Salica collection*, it was protected, just as a residential house or granary, and its burning was fined with 15 *solidi*.³⁸⁰ The fence was a demonstration of the ownership and right of disposal. From the practical point of view it protected the dwellings from free running cattle and wild animals. The farmstead and its fencing is associated with a special right of house freedom,³⁸¹ which is at the core of the early medieval legal texts and to this day is protected by criminal law (e.g. Section 238 of the Criminal Code of the Czech Republic). According to the barbarian codes (*leges*) the fence (*sepes*) should have been constructed from posts or poles sunk into the ground. Its height should have reached up to the chin or breast of an adult man. However, archaeologically they cannot be always clearly confirmed (see above). Another listed part of the farmstead is the residential house (*casa*, *domus*, *sala*), which should have been the most prominent building. It need not have been necessarily the largest structure. The codes further mention ancillary buildings such as stables (*scuria*, *sutes*), larder (*spicarium*), granaries (*fenile*, *granaria*, *horreum*), shelters (*scuria*) and cellar (*cellaria*). A special function was fulfilled by

³⁷⁹ *Lex Salica*, *Lex Alamannorum*, *Lex Baiuvariorum*—e.g. Hartmann (1988), pp. 266–272; Schmidt-Wiegand (1998), pp. 269–274.

³⁸⁰ *Lex Salica*, Chapter 21, Section 2; Eckhardt (1953), p. 139.

³⁸¹ Hausfriedens; Schulze (2004b), pp. 51–54.

the *gynaeceum*, which is usually considered a workshop for women. A synonym expression, which appears, for example, in Saxon legal texts, is *screona*, which was earlier described by the roman historian Tacitus as a hut half-sunken into the ground. They were most probably sunken-floored buildings, serving as spinning and weaving workshops. Additional facilities also appeared, such as the sauna, bathrooms, bakeries, etc. (*coquina, pistoria, balnearius, stuba*), which involved the use of fire.³⁸²

The subject of the farmsteads and their fencing also crops up in later written sources, which fall into the Carolingian period. It is, above all, the *Capitulare de villis*, which informs us about the organization and administration of the royal great estates of Charlemagne. They are the emperor's orders on how to effectively administrate the king's private domain. Another important source is the *Brevium exempla ad res ecclesiasticas et fiscales describendas*, which is a list of royal and church property.³⁸³ In this documentary evidence the farm is termed *curtes*. It consisted of stables, kitchens, bakeries, cellars, granaries, as well as the collections of buildings, which are referred to as *gynaeceum*. There lived and worked unfree women, engaged mainly in textile production. Both *gynaecea*, and the whole farmsteads should have been enclosed by fences. The *Brevium exempla* mentions two types of enclosures: *tunimus*, a massive palisade which could have served as protection against attacks, and *sepis*, which was a standard fence. The term *porta lignea* denotes the entrance/exit in the enclosure. Fences were also used to enclose fields. The construction and renovation of fences was an important duty of the peasants who belonged to the *curtes*. Even in this period the fences fulfilled both practical functions and were important legal symbols. Their construction required some organization and control on the part of the great estate owners.³⁸⁴

In Bohemia and Moravia clearly divided, enclosed and regularly shaped farmsteads in the early medieval agricultural settlements are missing although even here, there appear, from the early Slav period, some clusters of sunken-floored dwellings, silo pits and larger ancillary

³⁸² Bückner, Hoeper, Höneisen, Schmaedecke (1998), p. 314; Geisler (1996), pp. 769–773.

³⁸³ Schulze (2004), p. 129.

³⁸⁴ Dette (1996), pp. 46–56.

buildings.³⁸⁵ In Moravia, individual farmsteads, consisting of a single-space dwelling, cowsheds, barns and grain pits appeared from the second half of the 11th century at the earliest, as can be confirmed on the case of Mstěnice with individual household units, which can be considered villages of a cluster type. There are surviving remains of fencing around some of them. The area of the farmstead varied around 200 m². During the 12th century the local community started to differentiate in terms of property ownership. One of the farmsteads exceeded the others by its size (340 m²) (Fig. 114–Fig. 115). A profound change in the social and economic relationships did not happen until the 13th century when a small stone castle of a lower aristocrat was built in Mstěnice. It was only then that the traditional rural society, with roots in the early Middle Ages, began to substantially transform. There appeared a new type of a three-part stone house and a planned layout of the village, with rigidly delimited parcels and communication areas. A manor with high medieval characteristics emerged. This essential change was probably linked to the emergence of an ownership right to land and the development of aristocratic landed property,

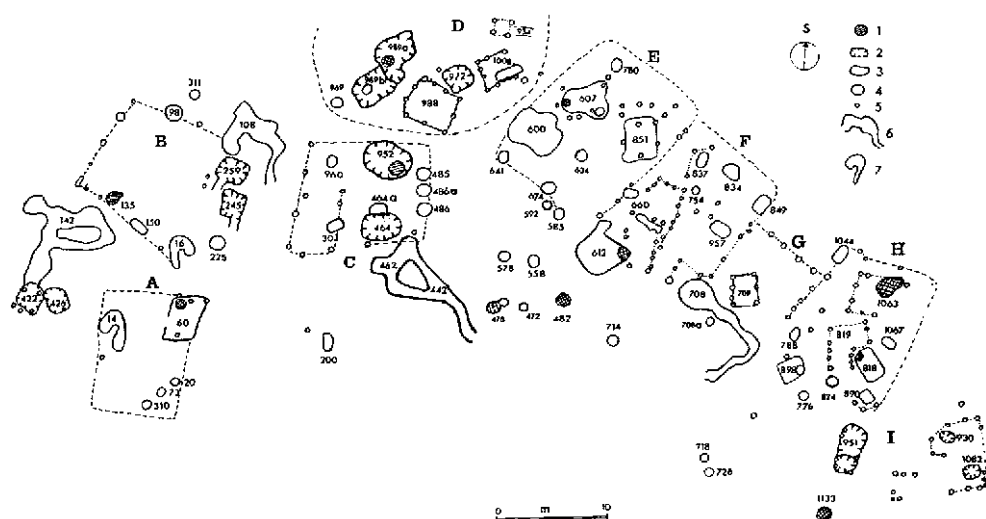


Fig. 114. Mstěnice. Layout of an early medieval settlement from the second half of the 11th to the first half of the 12th century (according to Nekuda 2000).

³⁸⁵ Compare e.g. Březno near Louny, Pleinerová (2000) or Mstěnice, Nekuda (2000); see above.

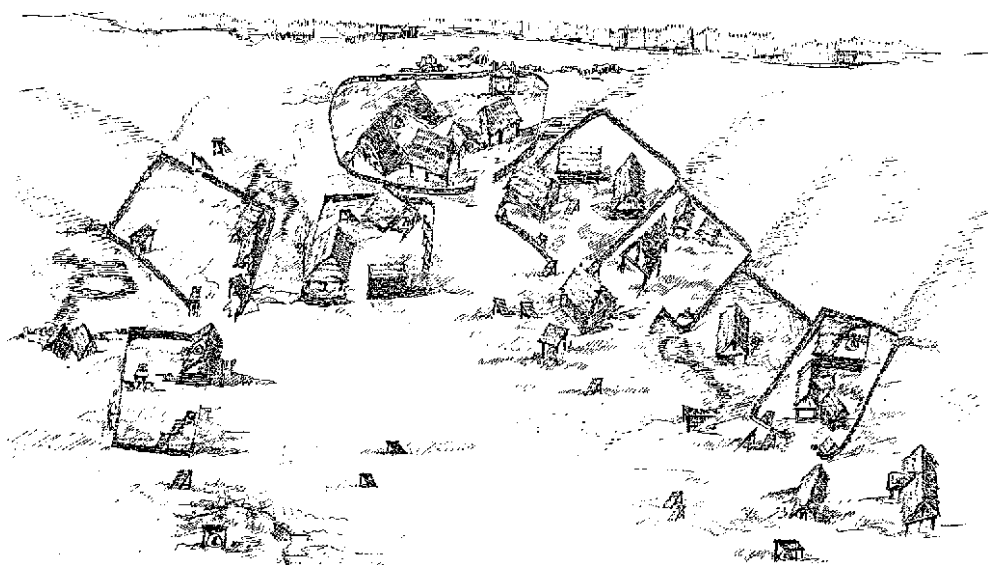


Fig. 115. Mstěnice. Reconstruction of a medieval settlement from the second half of the 11th to the first half of the 12th century (according to *Nekuda 2000*, drawing by G. Šik).

which started to establish itself in Moravia from the 12th century at the latest.³⁸⁶

The early medieval rural settlements and the western great estates were primarily engaged in agricultural production.³⁸⁷ This is not in line with the dominant production activity identified at Pohansko which was mainly related to craft production³⁸⁸ (see Chap. 4.3.5). It was concentrated in the discussed settlement units which appear as enclosed rectangular structures. Significant parallels are found in the prominent emporia in western and northern Europe. Those wiks did not serve, during the high phase of their existence, just for the periodic exchange of goods, rather they were settlements permanently inhabited by merchants and craftsmen of various trades. The most important ones were Quentovic, Dorestad, Hedeby, Birka, as well as Bremen, Hamburg or the Slav Reric, Norwegian Kaupang, Swedish Lillö, etc.

³⁸⁶ Dostál (1987a), p. 12; Nekuda (2000), pp. 128–136; Nekuda (2002), p. 90; Ruttkay M. (2002a), p. 278; Válka (1991), p. 61; Vařeka (2004), p. 238.

³⁸⁷ Schulze (1998), pp. 234–242, p. 249.

³⁸⁸ Dostál (1988a), pp. 286–287; Dostál (1993); Macháček (2001d).

They evolved mainly between the end of the 7th and the first decades of the 9th century, when their importance peaked.³⁸⁹ They were built to a uniform urbanization concept. It can be recognized by the streets, laid out to a planned grid, which overlays the previous cluster-like settlement structure. Such a complex organization of space at that time could have only been put forward by a higher authority—the ruler or his deputy. The sites arose suddenly thanks to their huge investments, which enabled them to gain control over the local production and distribution. They are clearly permanently populated settlements of an urban type. An example is the Danish Hedeby, Anglo-Saxon Hamwic or Frisian Dorestad. It seems that the layout in the emporia allocates too much space and takes up an unusually large area, especially compared with the later medieval standards. Sites of this type (e.g. Hamwic/Southampton—area 45 ha; Fig. 116) can be, just as Pohansko, 40

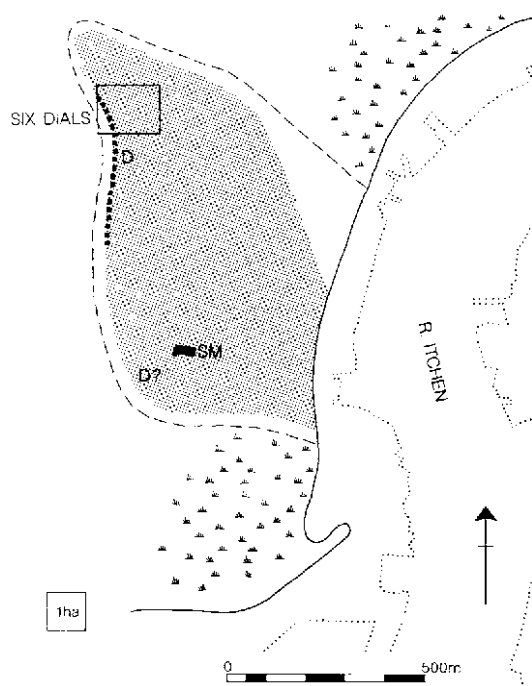


Fig. 116. Hamwic. Extent of the agglomeration and the excavation sites in Six Dials. D—ditch, SM—St Mary's Church (according to *Andrews 1997*).

³⁸⁹ Schulze (1998), pp. 257–259.

to 50 times greater than the other contemporary sites in the settlement hierarchy.³⁹⁰

Hamwic³⁹¹ is thought to be the first English town.³⁹² A combination of all means of dating indicates that the site existed in the 8th and 9th century. The fundamental settlement structure in Hamwic is based on a network of streets. Most of the houses in Hamwic stand on areas marked out by an enclosure or rows of large pits (Fig. 117). The

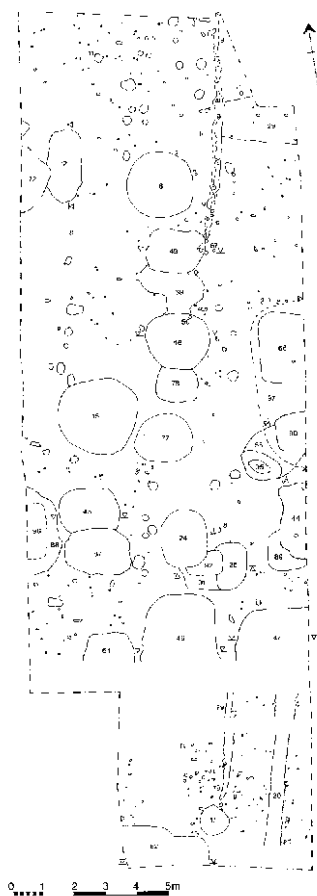


Fig. 117. Hamwic (SOU 11). Long rows of pits and palisades marking the boundaries of parcels (according to *Morton 1992*).

³⁹⁰ Astill (1994), p. 45; Clarke, Ambrosiani (1991), pp. 128–172; Hodges (1982); Hodges (1988); Hodges (2000).

³⁹¹ E.g. Andrews (1997); Brisbane (1988); Morton (1992).

³⁹² Astill (1994), p. 37.

boundaries are fairly regular and relatively stable. They delimit something like parcels or plots of land, occasionally with a smaller courtyard inside (Fig. 118). The pits situated in rows at the boundaries of the plots, are mostly rubbish pits; wells and storage pits were generally located inside the parcels and were used by a single household only. Later parcels are especially well identifiable. Their width was about 12 m and length about 25–30 m. An average parcel took up an area of around 300 m² but the largest parcels measured up to 600 square metres. The plots did not have an identical shape, nor size, which is partly due to their location in different portions of the settlement. In spite of the evidence of a relative stability of the plot boundaries excavations in the Six Dials location revealed some dynamics in the settlement—parcels were merged, some houses were no longer used, some parcels were completely abandoned.

Most of the plots were connected with streets running from the east to the west. Access to parcels which did not face the main street was provided by passages between houses or plots. The parcel boundaries

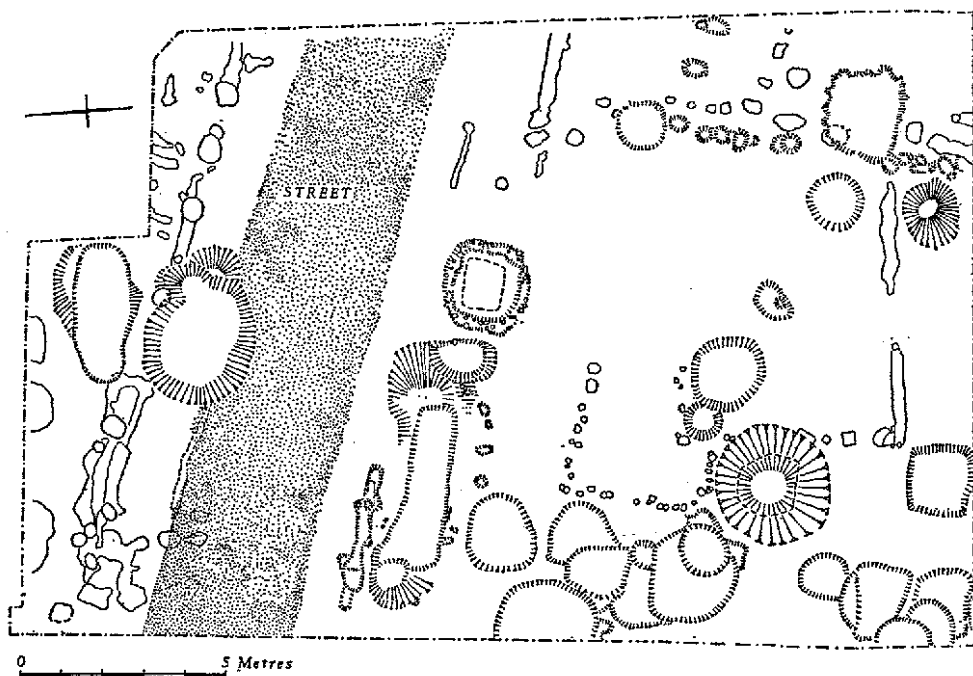


Fig. 118. Hamwic. Typical early medieval layout with a road, houses, wells, latrines and rubbish pits (according to Addyman 1973).

were only rarely marked out by shallow ditches, and/or enclosures. While in some cases it was the house walls that served this purpose the most frequent form of boundaries between parcels were rows of rubbish pits. It seems that the pits could have been used by both neighbouring households. One form of the parcel enclosure could occasionally have been replaced by another form.

The fundamental settlement structure in Hamwic is based on the network of streets (Fig. 123). We can identify two, or three (the third road skirts the river) main streets running in the north—south direction, i.e. essentially in parallel with the river bank. A number of streets running crosswise connect the main roads in the east—west direction. The roads had a gravel finish sometimes laid in many layers. They were between 5 to 5.6 m wide. The whole system probably evolved by filling in the empty spaces between the two main north-south thoroughfares. It was obviously a controlled process. The street was not used for dumping waste nor were there any pits dug into them. The whole system was most probably modelled on Roman towns.

The houses in Hamwic have survived mainly in the form of postholes or trenches. The typical large rectangular structures were 7–15 m long and 3–6.5 m wide. They were entered mostly through the centre of the longer side. In some cases the inside hearth has been preserved. They were predominantly buildings serving residential purposes, although some of them could have been partly used as workshops. As such we could identify especially the smaller rectangular buildings (1.5–4 m wide, 2–6.5 m long), interpreted as shelters. In Six Dials the excavations involved around 60 houses of standard size. Judging from their dimensions none of their inhabitants can be attributed a higher social status. In terms of their size, space, plan, and the structural elements used the houses are quite irregular.

The pits identified in Hamwic do not belong to above-ground structures of houses. They served as storage pits, rubbish pits or wells. A half of the pits is unclassifiable. During the excavations in Six Dials more than 500 pits and 21 wells were uncovered (Fig. 119). This means that there was roughly one pit per 10 m². Elsewhere in Hamwic their density was about twice as low (we can observe a general trend that the north of the agglomeration was more densely populated than the south). The deepest pits were up to 3 m deep. Exceptionally, they were dug in rows up to 30 m long, although they are more often found in short rows in which three or more pits are lined up (Fig. 120). This was the frequently applied method of marking out the boundaries of the



Fig. 119. Hamwic. Six Dials. Settlement features from the “Middle Saxon” phase (according to *Andrews 1997*).



Fig. 120. Hamwic. Six Dials. Selection of the structurizing settlement features (according to *Andrews 1997*).

parcels (Fig. 121). While wells were sometimes dug in the immediate vicinity of the streets so that they could be used as a public source of water, the majority of them were situated in the back part of the plot at various distances from the house (Fig. 122). While in use the wells were carefully cleaned.

In Hamwic there is evidence of intensive craft production. The investigations in Six Dials show that the craft was plied inside the individual household units. There was no apparent grouping of the individual crafts within the agglomeration. Although the evidence of craft production in Hamwic is clear, given its expected intensity and duration the quantity of production waste is relatively low. It is therefore highly probable that its findings are rather underrepresented in the archaeological context and a simple quantification need not be correct.

In Hamwic we know regular and irregular burial grounds. In the settlement there are even burials in pits, all of the cases involving children.³⁹³

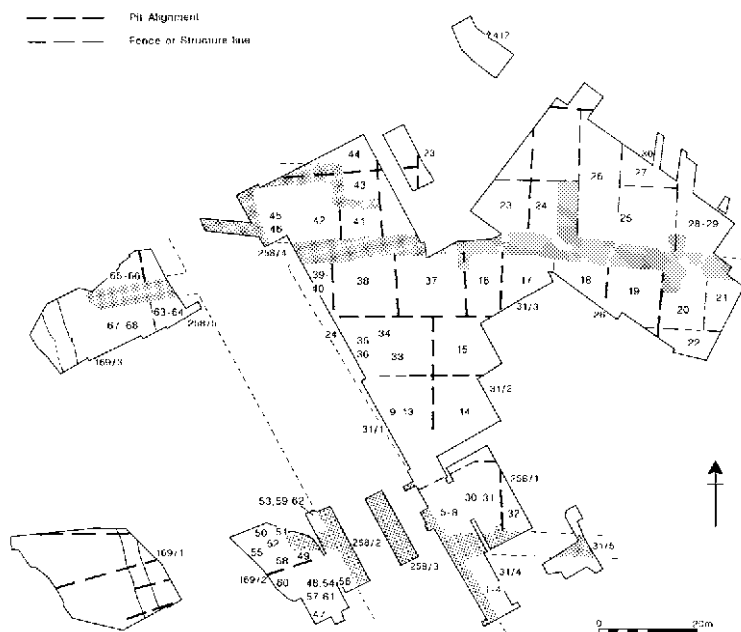


Fig. 121. Hamwic. Six Dials. Expected parcelation (according to *Andrews 1997*).

³⁹³ Andrews (1997); Brisbane (1988); Morton (1992).

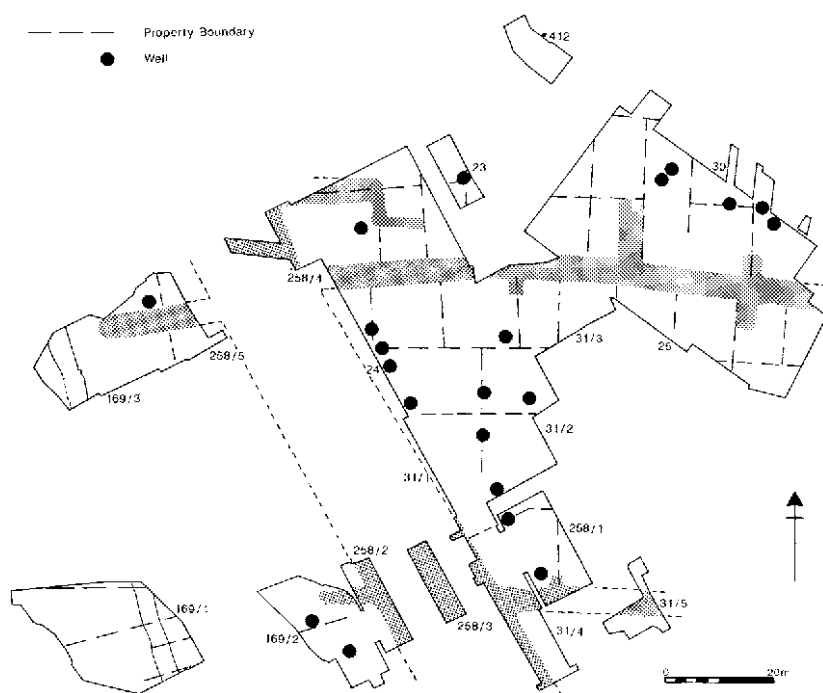


Fig. 122. Hamwic. Six Dials. Distribution of the wells in the plots (according to Andrews 1997).

While the layout of Anglo-Saxon towns is more typified by a chequer-board model (Fig. 123), the parcelation of the Viking towns in the Baltic region is defined linearly (probably due to their being directly related to the coast). Investigations in many Viking sites of the urban type show that the plot boundaries existed continually for a long period. They were marked out, for example, by shallow ditches (e.g. Ribe) or fences. In Hedeby an average area of a parcel varied around 300 m². The settlement parcelation in this system shows that it was founded intentionally and not as organic growth around an earlier agricultural centre.³⁹⁴

Hedeby is a typical example of an emporium and an early urban settlement (Fig. 124). The earliest phase of the emporium from the 8th century consisted of an irregular layout. During the 9th century the occupation started to concentrate in the middle of the settlement,

³⁹⁴ Clarke, Ambrosiani (1991), pp. 128–172.



Fig. 123. Hamwic. Reconstruction of the settlement layout from the 8th century (according to *Brisbane 1988*; drawing by John Hodgson).

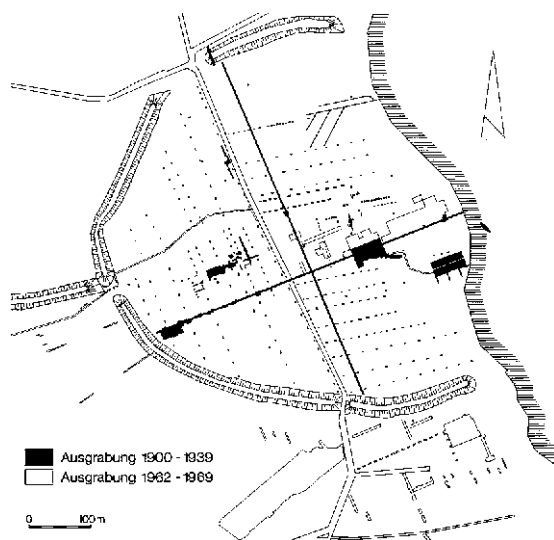


Fig. 124. Hedeby. Excavated areas between 1900–1969 (according to *Jankuhn 1986*).

enclosed from the second half of the 10th century by a semi-circular rampart. The gradual increase of the occupied area culminated in the 10th century when the whole area (24 ha) inside the rampart was virtually built up. The nature of the layout from the 9th and 10th century was described mainly on the basis of the excavations in the centre of the agglomeration, close to a stream running through the middle of the agglomeration from the west to the east. Part of the area excavations were realized in locations with a high groundwater level, which helped to preserve even the wooden parts of above-ground houses and other buildings. The buildings differed in their size (3×3 m to 7×17.5 m), and construction. It is remarkable that even during reconstructions they were always erected on the same site and their plans overlapped. The surviving hearths were situated in the middle of the buildings. In addition to dwellings we find smaller sheds and stables. They were different types of above-ground structures. The data ensuing from the finds of fences delimiting the parcels were especially important (Fig. 125). In the western section of the settlement, laid on dry sandy subsoil, they were identified only rarely and appeared as rows of posts. They have been preserved only in the waterlogged terrain in the eastern part of the agglomeration. The planned settlement layout was defined by the stream and the routes of the roads (Bohlenweg). The main road crosses the stream at a right angle via a bridge. The main road is joined by other perpendicular roads. The houses stand with their gables facing the roads, from which they are separated by a large or small approach. The plot plans were narrow, just a little wider than the houses which stood on them. They were extended as far as the roads from which they were separated by fences. Sometimes the plots had backyards with sheds or stables. In almost all cases there was a well behind the house.³⁹⁵

The majority of the Hedeby inhabitants were merchants, craftsmen, seamen, etc. They were people who were not significantly engaged in agriculture as is indicated by a relatively small amount of agricultural implements which is in contrast with the numerous pieces of evidence of craft production and imports. They may have been partly in a dependent position as the events from 808 might suggest when after the destruction of Reric the Danish king had the local merchants transferred to Hedeby. They were then obliged to pay duties to him.

³⁹⁵ Jankuhn (1986); Schietzel (1981); Steuer (1974).

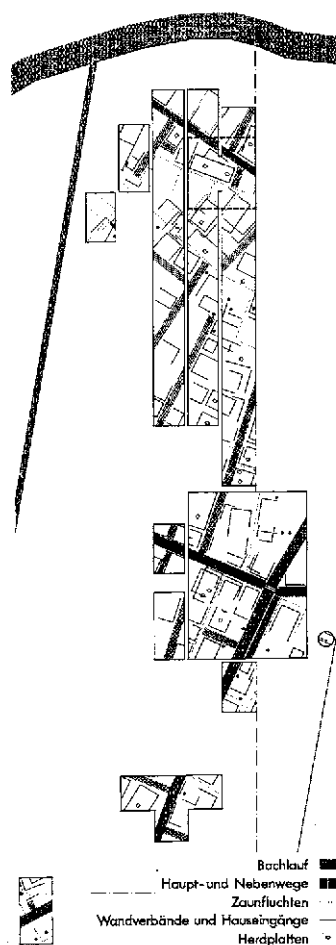


Fig. 125. Hedeby. Schematic of the layout in the lowest settlement layers (according to Jankuhn 1986).

The king also owned land in Hedeby which was at his own disposal.³⁹⁶ The interests of the fisc were represented in the 9th century Hedeby by officials called “comes vici” (Wikgraf). They were mainly involved in collecting taxes and maintaining order and piece inside the settlement. In war time they also took care of the external security of the emporium.³⁹⁷

³⁹⁶ Schwind (1984), p. 303.

³⁹⁷ Jankuhn (1986), p. 140, pp. 204–205, pp. 212–215.

Another of the great towns of the Viking world was York.³⁹⁸ Originally the capital of the Anglo-Saxon kingdom of Northumbria, Eoforwic was captured for the first time by the Vikings in 866. They founded there their own town of Jorvik, which with interruptions remained in their holding until 954, when the last Viking king Erik Bloodaxe was ousted from the city. Jorvik became an important centre of long-distance trade and craft production. This is supported by the finds of imported silk and Arabic dirhams, frequent artisan tools, half-finished products and raw materials.

When the Viking army arrived in 866 the remains of the Roman military camp and the colony of Eboracum were still visible. However, the urbanization structures from the Viking period significantly differed in their disposition from the older Roman layout. This conclusion was reached by archaeologists following the excavations in the Coppergate St area which yielded most of our present knowledge of the early medieval town. The Roman ground plan was overlain by layers created naturally over the 150 years of the relatively inactive Anglo-Saxon settlement, so that it was easy to clearly separate it from the later contexts. The parcels emerging under the Vikings had fairly standardized dimensions with a width of 5.5 m (Fig. 126), which confirms the presence of a strong central authority, although not all parcels were built up in the same way. In some parcels there was only one house, others had two rows of houses. Somewhere the house was shifted back to the back part of the parcel. There were fences put up between the parcels, marking the courtyard boundaries in their back part. The investigated parts of the parcels in Coppergate St. were at least 43.5 m long. Most of the organic waste was scattered on the surface in the back part of the parcel. Only the roads remained clean. Part of the waste found its way to the deep pits dug in the back parts of the parcels. Some of them originally served as wells, others were faecal sumps. The backyards were divided up by fences from wicker, which could have delimited, for example, enclosures for cattle.

The investigations revealed that the adjoining parcels which formed a single block had similar types of houses. It cannot be ruled out that the blocks belonged to a single owner who settled people in a dependent position on the different plots and who then participated in the results of their production activity or trading. Alternatively, we can

³⁹⁸ Hall (1994).

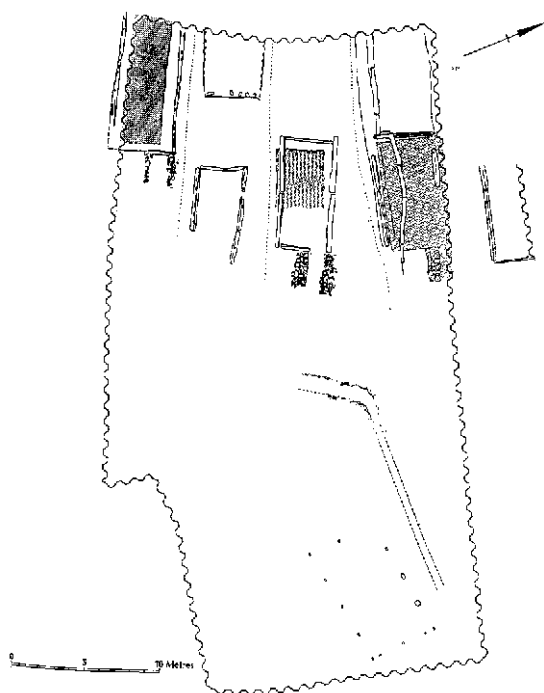


Fig. 126. York, 16–22 Coppergate St. Settlement layout from the 10th–11th century (according to *Hall 1994*).

also consider the possibility that the owner would lease the parcels on a commercial basis.³⁹⁹

Merchant and craftsmen settlements emerged from the 8th century in the heartland of the Frankish empire. In contrast to most of the Nordic wiks these pre-urban settlement complexes were built in close proximity to existing important sites, such as ancient Roman towns, or bishop's seat, monasteries, royal *Pfalz*, etc. They are characterised by "*topographic dualism*" arising between the earlier centre of power and the later market town. Sites of this type started to develop in the Rhineland and on the banks of the Maas and the Schelde.⁴⁰⁰

The decisive factor for the emergence of the merchant and craftsmen settlements in the Frankish empire were groups of merchants who no longer journeyed to seasonal fairs from their farmsteads, but

³⁹⁹ Ibidem, pp. 48–80.

⁴⁰⁰ Schulze (1998), pp. 259–260.

began to consider trade their main occupation and settled in towns. Apart from the members of various Germanic peoples (Frisians, Anglo-Saxons, Franks), who strove to emulate a model known from the Roman empire, there also appeared colonies of foreign merchants of Syrian and Jewish origin, which were the prototype of the merchant settlements. The driving force behind the new development was predominantly long-distance trade, which had a positive influence on the establishment of new organizational and settlement forms. It should not therefore be surprising that the merchant settlements, although not situated in the centre but rather on the boundaries of political units, gained in importance in the genesis of urban settlements. From the late Carolingian period the groups of merchants settled in those locations were given special privileges.⁴⁰¹

In the early Middle Ages commerce was principally bound up with waterways (e.g. Frisian trade). Merchants would settle immediately on the river banks or the coast regardless of the danger of floods or enemy attacks. They built their own ports for ships of their own and of their business partners which terminated the usually long and narrow parcels. The warehouses were erected nearby the ports while the residential house cum place of business transactions stood at the opposite end of the parcel. The merchant plots or homesteads stretched between the waterway and the street, running in parallel with the coast. The individual plots would be separated by fences (e.g. Hamburg). In the territory of the ancient, resettled Roman towns, where the merchant quarters are confirmed from the mid-8th century at the latest (e.g. Mainz in 762), they are usually situated between the original late antiquity fortification wall and the bank (e.g. Mainz, Cologne, Worms, Strasbourg, Regensburg; Fig. 127–Fig. 128). From the beginning of the 10th century the merchant plots were integrated into the town fortification, whereby they lost direct access to water. In the towns that were established later (e.g. Lübeck, 1158) this settlement type plays no role at all.⁴⁰²

The extent of the early medieval merchant quarters is difficult to estimate. Written sources mention nineteen bankside parcels from the 8th–9th century in Mainz while about twenty from the 9th century are known from Hamburg. In each of the confirmed cases the merchants

⁴⁰¹ Ellmers (1984), pp. 16–29.

⁴⁰² Ibidem, pp. 176–212, pp. 266–270.

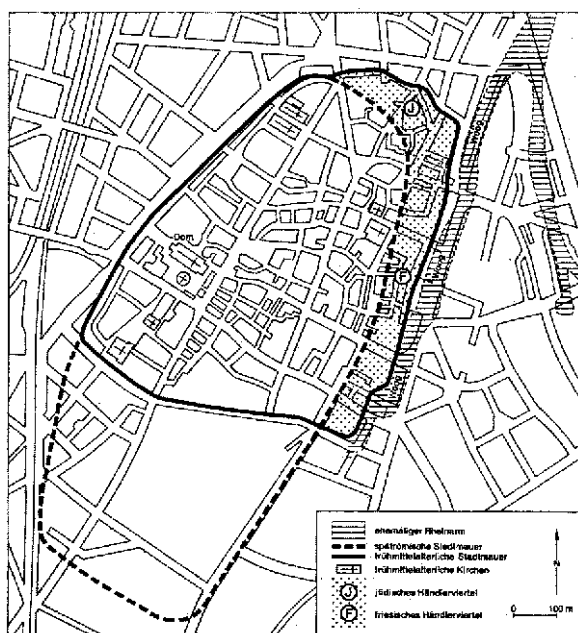


Fig. 127. Worms. Map of the town with the highlighted early medieval merchant quarter and the original river branches (according to *Ellmers 1984*).

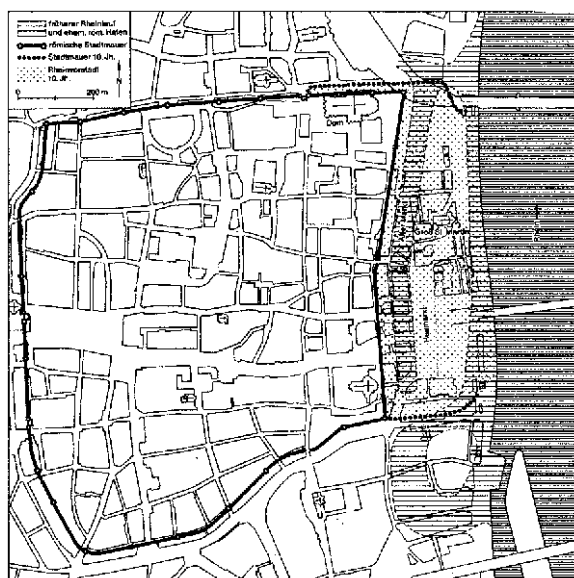


Fig. 128. Cologne. Map of the town with the highlighted early medieval merchant quarter (according to *Ellmers 1984*).

settled on land owned by somebody else. The plots belonged either to the fiscus, aristocracy or clergy. Of the 25 owners mentioned in Mainz, not a single one was from the group of the merchants (11–12 parcels were in the possession of non-clerical owners, 13–14 belonged to church institutions). The written sources inform us that the land owners rented the parcels either for a paid rent or settled there their own dependants. Instead of rent they were entitled to claim various services as is shown in the example of the monastery in Lorsch, which required, for the renting of its Mainz parcel, the provision of water transport to cater for the needs of the monastery. The tenants could acquire the parcel including the buildings.⁴⁰³

The merchant and craftsmen settlements in the Rhineland and northwestern Germany, just as the emporia on the coast of the Baltic and North Sea, played an important role in the birth of a new model of space organization and the way of life which led to the emergence of the medieval town in Central Europe. In the advancing process of urbanization there arose, first nearby administrative (castles, strongholds) and ecclesiastical centres (bishoprics, monasteries), settlement complexes described as proto-urban structures or early towns. From the legal, functional, topographical and social point of view, these settlements were different from the later communal towns of the high Middle Ages, which developed (often *ab novo*) in connection with the profound economic changes of the 12th and 13th century.⁴⁰⁴

The earliest stage of development of the high medieval cities in Central Europe is characterized by an irregular layout. There was no continuation of the late ancient town model, which did not match the new needs, dictated by a different structure of society and a different approach to ownership and agrarian economy. It was only during the further development that there was a discernible tendency to a more systematic arrangement. This was probably due to the effort towards an optimum use of the given space and regulation of land ownership. From the beginning of the 12th century we observe regular distribution of the houses along the streets in German towns. In Bohemia (Prague) a similar phenomenon is recorded one hundred years later. The original parcels on which the houses and the outbuildings were situated, mostly had a wide front and can be termed proto-urban. It

⁴⁰³ Ibidem, 177, pp. 182–183, p. 206, p. 269.

⁴⁰⁴ Piekalski (1999), pp. 249–250, p. 256.

was not until the high Middle Ages that standardised parcels with a narrow front appeared. Their genesis may be an unintentional effect due to the competition, land prices and overpopulation in towns.⁴⁰⁵

In order to be able to fully appreciate the significance of the spatial arrangement at Pohansko it would be beneficial to mention even examples of some well-researched sites where we do not find any analogies with the spatial structures from Pohansko, although they could be justifiably expected there. These principally include the baileys of important Ottonian *Pfalzen* and royal *curtes*, which were established in the course of the 10th century. On the one hand their residential centres exhibit a striking structural resemblance with the Magnate Court at Pohansko (see Chap. 6.2), a fact which has often been pointed out,⁴⁰⁶ on the other hand their baileys on the level of a spatial structure of a higher order are essentially different.

An eminent position among them is taken by the north Thuringian *Pfalz* of Tilleda, which was investigated, with interruptions, between 1935 and 1979, mainly by P. Grimm. During this period the excavations completely exposed both the main castle and the upper and lower bailey (Fig. 129). In written sources Tilleda is first mentioned as “*imperatoria curtis*” in 972, when the emperor passes it as a dowry to his Byzantine wife Theophano. Two years later Otto II issued a decree there. However, according to the written sources Tilleda never was one of the leading royal and imperial *Pfalzen* of the 10th and 11th century.⁴⁰⁷

In the baileys⁴⁰⁸ at Tilleda we find different types of settlement features (sunken-floored buildings, weaving workshops, warehouses, posthole and timber houses, etc.), some of which have, in terms of their function and morphology, very good parallels at Pohansko⁴⁰⁹ (e.g. large sunken-floored features/GEO; see Chap. 4.1.1). The finds of tools, raw materials, half-finished products, waste and production equipment in the bailey at Tilleda testify to intensive craft production which has an analogy in the Forest Nursery at Pohansko. It was, first and foremost, textile production, processing of bones, antlers, and

⁴⁰⁵ Ibidem, p. 251, p. 256, p. 264.

⁴⁰⁶ Most recently e.g. Macháček (2001d) with references.

⁴⁰⁷ Eberhardt (1968), pp. 51–58.

⁴⁰⁸ Grimm (1990), pp. 24–79.

⁴⁰⁹ Dostál (1986), pp. 132–134.

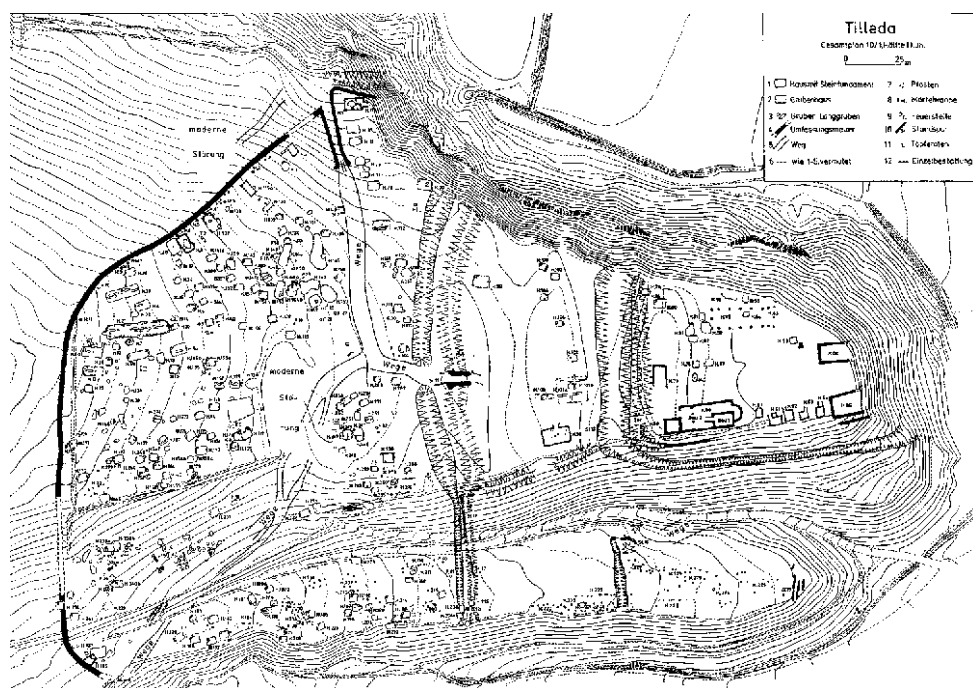


Fig. 129. Tilleda. Layout plan of an Ottonian *Pfalz* from the 10th / first half of the 11th century (according to Grimm 1990).

ivory, iron metallurgy and jewellery.⁴¹⁰ An important difference which distinguishes both sites is the settlement layout, which in the bailey at Tilleda is absolutely irregular and does not form any clear spatial structures. This space arrangement was constant as is suggested by the rebuilt houses always erected on the same sites. In Tilleda we can trace only hints of a functional division of the bailey area. It is suggested by a group of adjacent workshops in the western part of the upper bailey and irregular sunken-floored features with traces of production activity accumulated in the east. The southern sloping portion yielded accumulations of waste preserved in rubbish pits. In the lower bailey we find most of the ground-level posthole structures, with a storage function rather than a residential one.⁴¹¹

⁴¹⁰ Grimm (1990), pp. 92–98.

⁴¹¹ Ibidem, pp. 67–72, pp. 88–89.

P. Grimm assumes that the fortified bailey was settled by an unfree mixed population of Thuringian-Slavic origin who worked there. The unfree in the possessions of the king are often mentioned in Thuringia in the written sources from the Carolingian-Ottonian period and referred to as *servi*, *liten*, *mancipii*, etc. According to Grimm these people lived in Tilleda in sunken-floored buildings with a hearth dated back to the 10th–11th century, of which 109⁴¹² were excavated. However, his conclusions need to be slightly corrected in view of the investigations in new sites, most notably the Gebesee *curtis* (Thuringia).

Gebesee was systematically investigated between 1985 to 1993 by P. Donat.⁴¹³ The excavation area covered 2.8 ha, which represents 66 percent of the inner area of the settlement (Fig. 130). The central

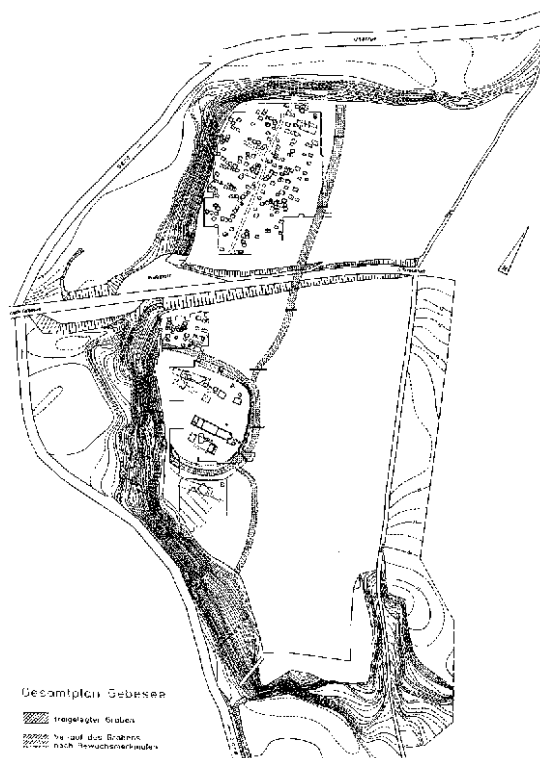


Fig. 130. Gebesee. Spatial organization (according to *Donat 1996b*).

⁴¹² Ibidem, p. 72, pp. 107–108.

⁴¹³ Donat (1996a); Donat (1996b); Donat (1999).

complex of residential buildings with the *palatium* was excavated almost completely; the southern bailey was dug up to 60%.⁴¹⁴

Written sources do not directly refer to this site. However it can be justifiably expected that it was the *curtis* of the Hersfeld monastery where, in 1004, hypothetically sojourned and issued a decree even Henry II. The results of the excavations clearly show that from the mid-10th to the second third of the 12th century there was a fortified settlement on the site which consisted of a central residential quarter and two baileys.⁴¹⁵ In the so-called main castle there was a church, originally of a cross-shaped plan, a large wooden hall, later replaced by a stone palace, adjoining the remodelled church. Additional stone buildings were built later.

In the northern bailey (Fig. 131) the excavation revealed 10 cellars, 3 posthole structures, 1 timber building and, most importantly, 242



Fig. 131. Gebesee. Northern bailey (according to *Donat 1996b*).

⁴¹⁴ Donat (1996a), pp. 111–112; Donat (1999), pp. 10–11.

⁴¹⁵ Donat (1999), p. 180.

sunken-floored buildings, of which 218 were completely explored.⁴¹⁶ In general, the sunken-floored buildings from Gebesee have no hearths. In 41 cases clay weights for vertical looms were uncovered on the floors. Other sunken-floored buildings had elongated oval pits interpreted as remains of vertical looms. All in all, there is evidence of textile production in at least 21.1% of the sunken-floored buildings, although their number could have been substantially higher in the context of living culture.⁴¹⁷ Given the absence of hearths in Gebesee it is impossible to consider a residential function of the sunken-floored buildings, just as with similar structures known from southern and western Germany. A problem arises in the case of the numerous rectangular sunken-floored buildings structures with furnaces, which appear in the *Pfalzen* in central Germany, such as Helfta, Magdeburg, Mühlhausen, Tilleda, etc. Their occurrence is restricted to a narrow strip west of the German-Slav ethnic boundary. Gebesee is situated on the western edge of this zone and is the easternmost site where sunken-floored buildings without a hearth appear. According to P. Donat, who analysed the situation in detail, the occurrence of furnaces in the sunken-floored structures in the *Pfalzen* in central Germany can be explained as a result of German-Slav contacts. It is not connected with the function of the sunken-floored buildings. Heated as well as unheated sunken-floored buildings of the Ottonian *Pfalzen* and royal *curtes* served, in great part, as workshops and mainly as weaving shops. There is no reason to assume that they would fulfil a residential function in Gebesee as they did in the Slav world.⁴¹⁸

In Gebesee, just as in Tilleda, the buildings in the bailey are in essence irregularly dispersed, which particularly applies to the earliest of the four defined horizons (Fig. 132). It was not until later that the buildings were loosely clustered alongside roads, running in the north-south direction in the middle of the bailey.⁴¹⁹ While we do not encounter the same spatial organization as at Pohansko, the craft production was concentrated even here—in addition to the dominant textile production there was also blacksmithing and non-ferrous metal metallurgy.⁴²⁰

⁴¹⁶ Donat (1996a), p. 126; Donat (1999), p. 65.

⁴¹⁷ Donat (1999), pp. 105–107.

⁴¹⁸ Donat (1996b), p. 124; Donat (1999), pp. 105–109.

⁴¹⁹ Donat (1999), pp. 180–184, Abb. 102.

⁴²⁰ Ibidem, pp. 164–167.

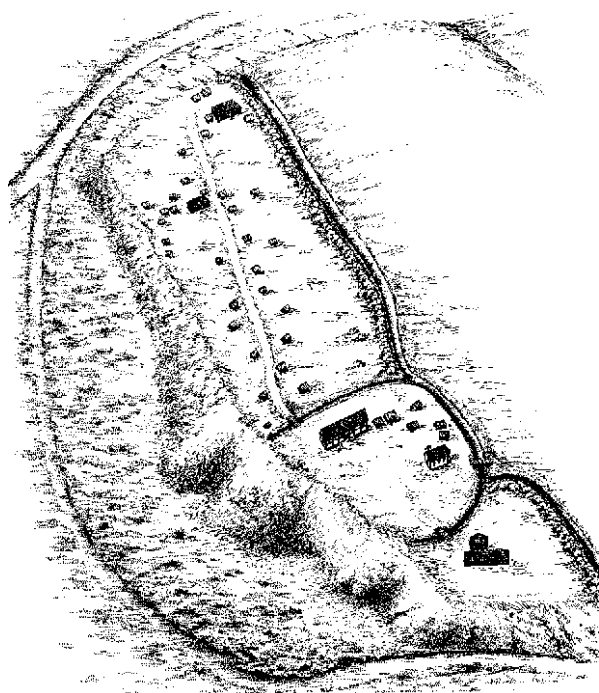


Fig. 132. Gebesee. Reconstruction of the first construction stage from the 10th to the beginning of the 11th century (according to *Donat 1999*).

Granaries and barns in Gebesee are found in the so-called southern bailey where nine large posthole houses were identified.⁴²¹ As any traces of settlement activity are missing, we are lead to presume that, just as the sunken-floored buildings without hearths in the northern bailey they served exclusively economic purposes. Considering that the average number of the sunken-floored structures belonging to a single phase was about 40, we can calculate that there were around 50 to 70 craftsmen working simultaneously in Gebesee. Together with their family members it was about 120 to 150 persons. They were undoubtedly the serfs of the manor established as early as 775, when Charlemagne presented the Mainz archbishop Lulo with vast landed property around Gebesee in order to found the Hersfeld monastery.⁴²² The manor house from that period has not been located yet, while the

⁴²¹ Ibidem, pp. 116–120.

⁴²² Ibidem, pp. 14–15.

archaeologically explored site became the centre of the great estate only later. We can justifiably assume that the craftsmen who worked in the Gebesee baileys lived in the surrounding villages belonging to the manor and by working on the manor only paid their duty. This may not be an exceptional case. The craft production in the *Pfalz* at Tilleda and elsewhere might have been organized in the same way. The picture is made complete by strong under-representation of agricultural implements, which suggests that there was no agricultural production in Gebesee and Tilleda.⁴²³

To sum up, the Ottonian *Pfalzen*, the baileys of which exhibit an essentially different spatial structure compared to the craftsmen's precinct at Pohansko, are the centres of extensive manors. The operation of the *Pfalzen* was provided for by the agricultural revenues from the great estate. In addition they had at their disposal craft production concentrated in the baileys. Some specialized work could have been done by hired craftsmen, but the dominant role in production was played by people dependent on the great estate. The fact that they worked but not resided there may have led to the emergence of a different spatial structure, in which we do not find the settlement units with a mixed residential-production function known from Pohansko and other sites. In the *Pfalz*, in its splendid rooms in the main castle, there lived the *vilicus* with his family, personal servants and, possibly a military garrison. Occasionally, it became a sojourn of the king or the emperor with his entourage.⁴²⁴ The spatial structure of this residential part matches very well the Magnate Court at Pohansko (see Chap. 6.2), to which we also attribute a similar function.⁴²⁵

Although the investigations in the *Pfalz* at Tilleda or the *curtis* in Gebesee document the situation as it was after the mid-10th century, there are hints that the conclusions described above could be, to a certain extent, extended to the Carolingian period. In the East Frankish empire at that time the *palatium* (residential quarter), manor and fortification did not form a single unit as in the bipartite Ottonian *Pfalzen*. On the contrary, the spatial dualism of the manor (which could have included a *palatium*) and the castle was quite common.⁴²⁶ The castle is usually built on a dominant elevated terrain feature and

⁴²³ Ibidem, pp. 196–201.

⁴²⁴ Ibidem, pp. 196–201.

⁴²⁵ Dostál (1975), pp. 253–259; Dostál (1988); Macháček (2001d).

⁴²⁶ Gauert (1965), p. 37.

the manor is situated in the valley below. Examples of this duality are Würzburg, Unterreggenbach, Hammelburg, Castell, Bamberg and Karlburg.⁴²⁷ The latter is relatively well-known archaeologically as it was the site of intensive investigation—field walking, as well as excavations in the castle and the extensive settlement in the valley, complemented by aerial photography (Fig. 133).

The earliest written reports mention Karlburg in a document of mayor Carloman of 741/42, in which he presents the newly established bishopric in Würzburg with the “*villa Karloburgo*” and the monastery. In 751/53 there is a mention of the castle with royal properties (*castellum cum fisco regali*). The whole complex lies on the southern bank of the Main, opposite the town of Karlstadt which was founded later. It is a day’s march (25 km) from Würzburg, at an important ford across the

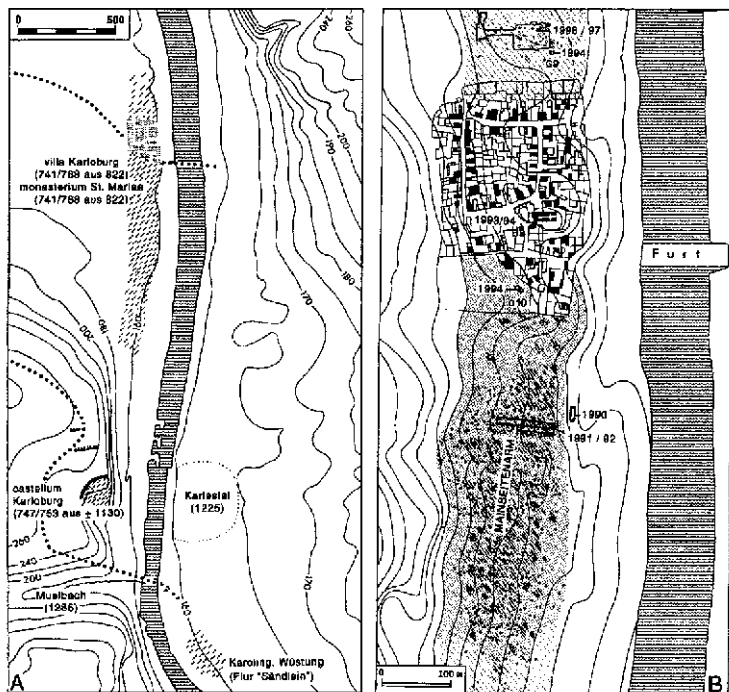


Fig. 133. Karlburg. Castle and the villa with a monastery. Surface finds and excavated areas (according to Ettel 2001).

⁴²⁷ Ettel (2001), p. 208, p. 234, p. 236.

river. The castle which sits on a rocky spur high above the river was, according to the excavations, rebuilt several times and existed there until the end of the high Middle Ages. In the earliest, Carolingian, period the castle area (about 1.3 ha) was fortified by a deep ditch, in which remnants of mortar were found. The interior of the castle produced postholes and settlement pits, testifying to an intensive development and use of the space.⁴²⁸ Compared to the settlement down in the valley archaeozoological analyses show that there was more “luxurious” food consumed in the castle (game, poultry, piglets).⁴²⁹ However, there is no evidence of intensive craft production there. This is typical for the unfortified settlement extending on the river terrace below the castle, at a distance of about 1 km. According to archaeological finds this 200 m wide and 1 km long area (20 ha) was intensively populated from the 7th until the 13th century. Excavations were carried out north and south of what is today Karlburg, under which is the centre of the whole early medieval agglomeration, including St. Mary’s church and a port. Excavations and field walking provided convincing evidence of craft production in the form of half-finished products, tools, casting moulds, and slag.⁴³⁰ There is no doubt about the fact that the craftsmen worked mostly in the sunken-floored buildings, which yielded remains of vertical looms and clay weights. In the published sunken-floored features the hearths were missing.⁴³¹ Apart from the sunken-floored features, the villa Karloburg contained above-ground posthole structures as well. They were interpreted as stables, barns or granaries and, sometimes, as dwellings.⁴³² However, their residential function is hard to define, as we have no complete plan available. So far no hearths or evidence of living in them have been found.

As in the Ottonian *Pfalzen*, in the Karlburg settlement there are no spatial structures that could be interpreted as settlement units with a mixed residential-production function. The only identified spatial division consists in dividing the built-up area into two zones. In the eastern section, adjacent to the river, there are concentrations of sunken-floored buildings with evidence of craft production, while in the westward direction, farther from the river, there occur above-ground

⁴²⁸ Ettel (1998), pp. 146–151.

⁴²⁹ Ettel (2001), p. 79; Vagedes (2001).

⁴³⁰ Ettel (1998), pp. 152–156.

⁴³¹ Ettel (1998), pp. 156–167; Ettel (2001), pp. 51–54.

⁴³² Ettel (1998), p. 167.

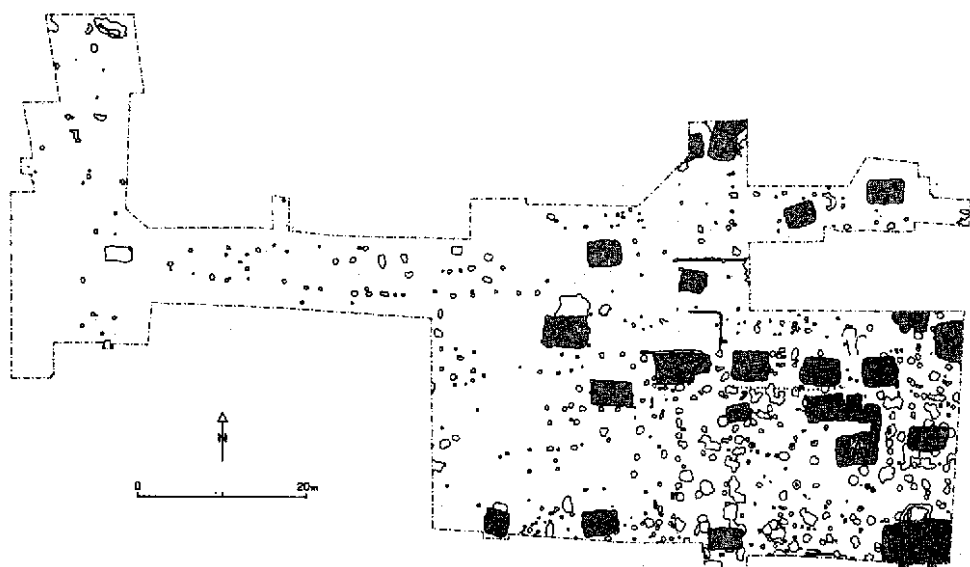


Fig. 134. Karlburg. Investigated area in 1997. Black—sunken-floored buildings (according to Ettel 1998).

posthole structures (Fig. 134). The division is visible throughout the whole area of the inhabited terrace and is observed in all the development phases.⁴³³ It is reminiscent of the Tilleda or Gebesee situation where the posthole storage houses are separated from the production facilities in baileys dedicated to this purpose (see above). Based on these similarities we cannot rule out that Karlburg operated on the basis of the same model as the Ottonian *Pfalzen* in central Germany, where the craftsmen did not reside on the site but came to do their duty from the surrounding villages. This is supported by the fact that Karlburg as a royal manor with a castle was the centre of a great estate (*castellum cum fisco regali*), just as the Ottonian *Pfalzen*.⁴³⁴ The great extent of the agglomeration was very likely a consequence of the fact that Karlburg functioned as an important military, administrative, and political-ecclesiastical centre of east Franks. Its significance was multiplied by the advantageous position on a communication artery.

⁴³³ Ibidem, p. 153, p. 167.

⁴³⁴ Ettel (2001), pp. 94–99.

If we summarize all the existing pieces of data, we can state that the rectangular spatial structures that we know from the Forest Nursery and other locations within Pohansko, can be considered settlement units with a mixed residential/production function. Their important attribute is an enclosure, which in some cases was revealed by the archaeological investigation. In central Europe these units appeared from as early as the end of the late Bronze Age. They are generally considered a demonstration of the emerging privately-owned landed property which, for the early Middle Ages, is also confirmed by legally binding written sources.

In the early medieval settlements in western and northwestern Europe we can observe several models of spatial organization. Structures that we know from the Forest Nursery at Pohansko, have good analogies in the Frankish, Alemannic, and Bavarian rural settlements, where we register farmsteads of free farmers and owners of an early medieval manor and the people dependent upon it. We do not, however, know them from royal manors and the *Pfalzen* of the Carolingian-Ottonian period, which were centres of great estates. This difference may have been due to the fact that the people dependent on the great estate did not live but only worked there. On the contrary, a combined residential/production function was fulfilled by the settlement layout divided into plots, which arose in the merchant and craftsmen settlements in the Frankish empire and in the neighbouring regions (England, Scandinavia). The land on which the settlements were founded, belonged to the ruler, and/or aristocracy or clergy who settled on their land people in a dependent position, or rented it out to tenants. A particularly progressive model was applied in the merchant settlements in the central region of the Frankish empire (e.g. Mainz), where the tenants paid for their parcel to the land owners with money or services. This system required a more complicated social structure and a relatively well-developed monetary system,⁴³⁵ which in the 9th century did not exist in Moravia.⁴³⁶

The parcelation of the land, which at Pohansko was clearly delimited by the rampart, could have only been enforced by a higher authority—in Moravia most probably the ruler (see Chap. 6.3 and Chap. 6.4)—who

⁴³⁵ E.g. Schulze (1998), pp. 269–272; Steuer (1987), pp. 123–131.

⁴³⁶ E.g. Charvát (2000), pp. 257–258; Kučerovská (1998).

may have had a personal ownership relationship with this particular piece of land. The identified parcelation is in contrast with the organization of the settlement space outside the fortification, whether in the suburbs of the agglomeration at Pohansko or in the regular agricultural settlements in the surroundings (see Chap. 3.2), where similar structures were not uncovered. This was because in the 9th century there was still not in place a form of privately-owned landed property that is archaeologically identifiable.

CHAPTER FIVE

THE EARLY MEDIEVAL CENTRE AS A SYSTEM

In order to take full advantage of the results so far obtained through the detailed examination of the excavations in the Forest Nursery area and understand the rise of towns and states in East Central Europe, it is necessary to integrate them into the overall context of what was previously known about Pohansko. The problem needs to be approached holistically with the proviso that the properties of each investigated object are not determined only by the properties of its parts but rather by the properties of the whole they are part of. We will attempt to define the early medieval centre as a system.

In defining the system we will follow the example of Colin Renfrew¹ who studied the origin and evolution of the Minoan-Mycenaean civilization in the third millennium BC. In the same way as C. Renfrew, we will base the methodology on the systems theory the application of which to archaeology has been already described in some detail above (see Chap. 2.2). With the assistance of systems theory we will attempt to abstract from the concrete structures identified in the archaeological records at Pohansko, and thus to create an archaeological model of the early medieval centre, which may be compared at a sufficiently general level with the identified categories of living culture, associated with the existence of equally extensive and complicated agglomerations in various regions and periods. Our hope is that in this way some issues related to the function, purpose and meaning of the Great Moravian centre at Pohansko may find a satisfactory solution.

First, we will delimit the relevant sequence of the cultural system and define its temporal/spatial relationships. Next, we will isolate the individual subsystems and examine their functionality. Finally, we will concentrate on the relationships between them with regards to the multiplier effect. This will be based on the assumption that the origin, rise and decline of a large early medieval agglomeration of a type similar to Pohansko is the result of a positive feedback between different

¹ Renfrew (1972).

subsystems, which in the end can lead to the explosive development and/or to the collapse of the whole system. The model obtained by such means will then be compared with models derived from other archaeological, historical and/or ethnographic contexts.

5.1 SYSTEM DEFINITION

The temporal/spatial framing of the system to be investigated is easy as far as Pohansko is concerned. One may start by observing the system at the time when the first early Slavic settlement was established there. Similarly, the end of its existence is the moment at which the last remains of the reduced occupation disappeared from the site in the Late Hillfort (Post-Great Moravian) Period, as a result of which Pohansko is abandoned for several centuries. In terms of space limits, we will take into consideration both the area of the agglomeration proper and the wider agricultural hinterland, which was the necessary precondition of its existence. Because this appears to be a rather complicated system, one must begin by defining its subsystems. In highly developed societies, such as that of ninth-century Moravia, one can expect to encounter many of the subsystems, to which Colin Renfrew² referred in his description of the Aegean civilization. Most important for the purpose of this book are population and settlement; subsistence; craft technology; as well as the social, projective/symbolic and trade/communication subsystem.

As archaeological systems are dynamic one must also observe their behaviour over time. Four relative chronological phases have been identified in Pohansko (Tab. 102), mainly on the basis of the analysis of pottery (see Chap. 4.2.2). Those phases are sufficiently well-defined to reflect the dynamics of the development within the whole area under consideration. There is unfortunately no secure way to obtain an absolute dating of those phases. With only one dendro-date available (see Chap. 4.2.2), a standard typological classification of artefacts remains the only means to obtain a basic chronology.³ Other issues are related to the synchronization of the individual elements of the system. In some cases it is a very complicated problem in the solving of which one must take into account a considerable measure of

² Ibidem, pp. 485–496.

³ E.g. Bialeková (1980b), pp. 213–228.

Tab. 102. Břeclav-Pohansko. Relative-chronological stages.

<i>Relative-chronological stage</i>	<i>Dating</i>	<i>Duration</i>
Post-Great Moravian (Late Hillfort period)	9th /10th c.–10th c.	max. 50 years
Late Great Moravian	9th c.–beg. 10th c. (882 AD)	max. 50 years
Early Great Moravian	9th c.	max. 50 years
Pre-Great Moravian (Early Slavic and Early Hillfort) period	6th–8th c. AD	min. 200 years

uncertainty. Due to that uncertainty one must also understand the causative relationships contained in the model as hypothetical constructs which correspond to the current state of research at Pohansko. The model thus created is very likely to be modified and expanded in the future, as knowledge of the whole site gets more detailed.

5.2 THE POPULATION AND SETTLEMENT SUBSYSTEM

The population (Tab. 103) does not form a subsystem in the proper sense of the word. It is more of a parameter which influences and is influenced by all the defined subsystems.⁴ However, this is a crucial element for understanding the dynamics of the social and cultural development (Diagram 127).

During the pre-Great Moravian period there were several smaller, unfortified settlements at Pohansko. Their traces have been located at several different spots within an area of some five hectares, in the northern section of the later agglomeration (Magnate Court, Forest Nursery, North-eastern Suburb), as well as, more recently, in the westernmost part of the Southern Suburb. The number of the inhabitants of Pohansko must have been relatively low at that time, as is confirmed by the Cremation Cemetery with its 55 graves so far excavated. Given that the cemetery appears to have remained in use for between 200 and 250 years, no more than two families, each with three or four members, could have possibly buried their dead there.⁵ However, the number of the inhabitants of Pohansko may have been a little higher

⁴ Renfrew (1972), p. 486.

⁵ Dostál (1985), p. 20.

in that period. On the basis of the excavated dwellings, B. Dostál⁶ has suggested that up to 18 people lived in Settlement II alone. In the Forest Nursery three percent of all dated features can be associated with the pre-Great Moravian period.

A sharp increase in the population came about in the Great Moravian period, at a time when the fortification was also built at Pohansko. The whole agglomeration including the suburbs may have comprised, by the most conservative estimates, an area of between fifty and sixty hectares. The church cemetery, which has been completely excavated, produced 407 burials, which suggests that the community residing in the *palatium* (the Magnate Court) was between 100 and 120 strong.⁷ Elsewhere within the site, in an area covering some 22 percent of its total surface (with the Magnate Court taking 24.7%), archaeologists found 459 burials. Assuming that outside the church cemetery, burials were uniformly distributed within the area enclosed by ramparts (there are 25 graves per hectare in the Southern Suburb, but 85 per hectare the North-Eastern Suburb; this is in sharp contrast with the ratio obtained for the Magnate Court area—289 graves per hectare), the population of the Pohansko during the Great Moravian phase was of about 700 people for a period of between 50 and 100 years. This is of course just a minimal estimate, given that the actual number of inhabitants may have varied considerably in time (the population in certain areas, such as the Southern Suburb, may have been replaced and/or buried its dead in some other places) and could have well been much higher.⁸ Over 100 sunken-floored dwellings originate from the excavated section of the Southern Suburb alone, which suggests between 400 and 600 inhabitants.⁹ Initially, there may have been up to 300 sunken-floored dwellings throughout the Southern Suburb with a correspondingly larger number of inhabitants. However, with no way to tell which features coexisted at any given time, the estimates must be treated with great caution. Such information, however, exists for the Forest Nursery area, in which 31 percent of the 99 settlement features with secured dating belong to the early, and sixty percent to the late Great Moravian phase. It is possible to conclude, therefore, that the density of occupation, and so, the number of inhabitants, increased considerably during the late Great Moravian phase of occupation at Pohansko.

⁶ Dostál (1982b), p. 51.

⁷ Dostál (1975), p. 253.

⁸ Vignatiová (1992), p. 98.

⁹ Dostál (1988b), p. 149.

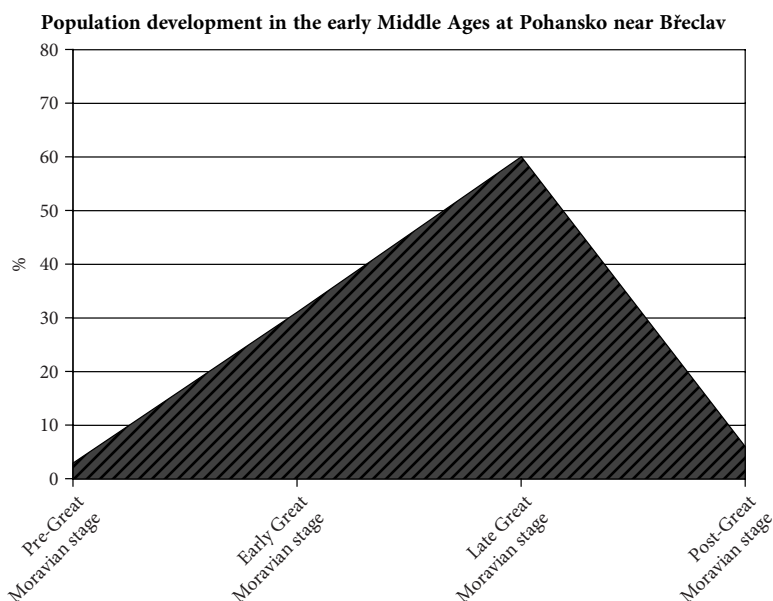


Diagram 127. Břeclav-Pohansko. Evolution of the population in the early Middle Ages.

By contrast, the post-Great Moravian period witnessed a sharp decline in population. This conclusion is substantiated by the small number of graves within the church cemetery which could be dated to that period on the basis of grave superposition, grave goods, and specific grave orientation (E-W). Altogether, there are no more than 25 graves, i.e. six percent of the total number of graves within the cemetery. The ramparts of Pohansko had by then crumbled, while the density of buildings substantially dropped. Only six percent of the dated features in the Forest Nursery area may be attributed to the post-Great Moravian period.

Colin Renfrew¹⁰ has listed the following factors responsible for population growth: increasing efficiency of food production; more efficient food re-distribution within the social unit; change of social order and religious orders, which originally provided for homeostatic population level control (hypothetically); higher level of medical knowledge (hypothetically); improved military protection organized within a hierarchic society and practically realized by building reinforcement

¹⁰ Renfrew (1972), p. 490.

Tab. 103. Břeclav-Pohansko. The population and settlement subsystem.

<i>Relative-chronological stage</i>	<i>Population</i>
Post-Great Moravian (Late Hillfort Period)	sharp population decrease
Late Great Moravian	maximum population in a fortified settlement and its suburbs
Early Great Moravian	sharp population increase
Pre-Great Moravian (Early Slavic and Early Hillfort) period	small population in an open settlement

To those factors one could add enforced population transfers to the agglomeration area due to extensive war campaigns (hypothetically). Conversely, a decline of population is caused by the opposite effects of those factors, in addition to which one must also consider the loss of human lives in war.

5.3 THE SUBSISTENCE SUBSYSTEM

The processes one can isolate in the subsistence subsystem lead to the provision of the sources and distribution of food in the early medieval society (Tab. 104).

In the pre-Great Moravian stage there was an agricultural settlement at Pohansko, which was probably fully autarkic in terms of food sources. This conclusion is substantiated by the existence of silos,¹¹ of which eight were explored in the Early Slavic Settlement II. Those were typically small silos, between 70 and 95 cm deep. Silos were found at two locations, in the middle and on the edge of two settlement clusters consisting of several sunken-floored dwellings. All inhabitants of the pre-Moravian rural settlement appear to have contributed to the site's economy of subsistence. The main crops were wheat, barley, rye, and millet, while cattle represent over a half (51 percent) of all animal bone assemblages, followed by pigs (30 percent) and sheep or goats (8 percent). Only a few bones have been found, which indicate the presence of horses, domesticated poultry or wild animals.¹²

¹¹ On the function of those pit-like features, see Meurers-Balke, Lüning (1990), p. 91; Pleinerová (2000), pp. 211–221.

¹² Dostál (1982b), pp. 47–56.

A dramatic change occurred at Pohansko in the Great Moravian period when all silos disappear.¹³ Given its size, the agglomeration could not have supported itself in terms of basic foodstuffs. Food was supplied from the outside, namely from the surrounding agricultural villages. The excavation of one of them, Břeclav—Líbivá, shows that, unlike the pre-Great Moravian period, the silos of the Great Moravian period were considerably larger (see Chap. 2.2), which suggests an intensified production of agricultural products. The largest pits were concentrated in a special district and in contrast to the smaller silos found around the sunken-floored dwellings, they do not appear to have been used by the inhabitants of the village for their own needs.¹⁴ The intensification of agricultural production in the Great Moravian period is also indicated by finds of asymmetrical ploughshares, which were undoubtedly manufactured in Pohansko, as demonstrated by the discovery of an unfinished specimen in a smithy excavated in the Forest Nursery area (feature 82a/LŠ).¹⁵ The introduction of asymmetrical ploughshares has been associated with considerable improvements in plowing techniques, as the soil was not just scratched, but also turned over to create a protective cushion for the seeds.¹⁶ It is commonly assumed that the plough with asymmetrical share marked a considerable progress in medieval agricultural technology, and that it had already been in use wide-spread in Moravia before the tenth-century Magyar invasion.¹⁷

As the previous finds from Pohansko indicate, the diet of the stronghold's inhabitants included cereals, as well as pulses, various nuts and fruits. A remarkable find is that of peach stones. Together with the specimens found in Mikulčice, those stones constitute the earliest evidence of the cultivation of peaches within the present-day territory of the Czech Republic, and an indication of pomiculture. The peach tree originated in Eastern Asia, but its presence north of the Alps dates back to Roman times. Pips of vine are also known from Pohansko, indicating the presence of both the wild (probably part of the typical flora of the flood plain) and the domesticated variant. Vines were

¹³ Dostál (1975), pp. 87–92; Dostál (1993), p. 44; Vignatiiová (1992), p. 30.

¹⁴ Macháček (2001b).

¹⁵ Macháček (2002a).

¹⁶ Beranová (1980), p. 192.

¹⁷ Le Goff (1991), pp. 212–213.

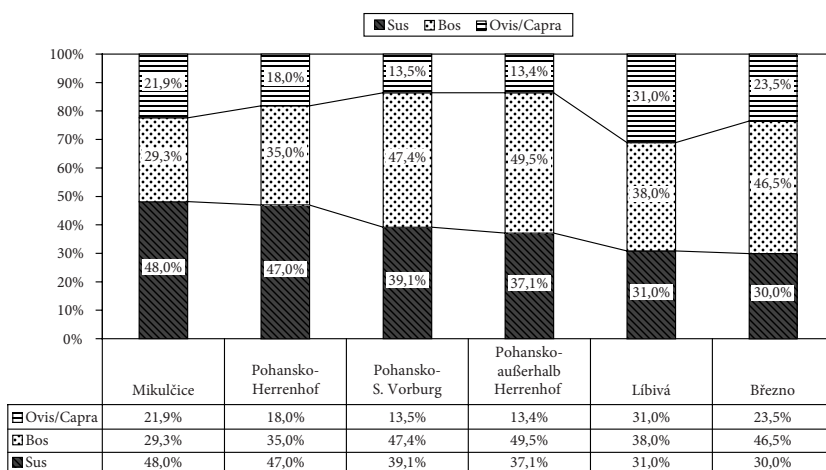


Diagram 128. Mikulčice, Břeclav-Pohansko/Magnate Court, Břeclav-Pohansko/Southern Suburb, Břeclav-Pohansko/outside the Magnate Court, Břeclav—Líbivá, Březno near Louny. Distribution of the principal domesticated animal species by the number of bones.

intensively grown in Moravia in the early Middle Ages, as confirmed mainly by the numerous finds from Mikulčice.¹⁸

There are also radical changes in the composition of faunal assemblages.¹⁹ Moreover, the proportion of various animal species varied widely across the site (Diagram 128). The inhabitants of the Magnate Court primarily ate pork, for pig bones have been found there in larger numbers (47 percent than those of cattle (36 percent) or sheep and goats (eighteen percent). In that respect, their diet was no different from that of the inhabitants of Mikulčice, the centre of Great Moravia, a site which produced animal bone assemblages with an almost identical composition—Líbivá and (for the sake of comparison) Březno near Louny display a much more even distribution of species. In Pohansko, cattle appears in great numbers in the Southern Suburb (47.4 percent) and in the remaining areas inside the fortification (49.5 percent), where bones of sheep and goats appear only in small numbers. The distribution of non-domesticated species was also very uneven. In the Southern Suburb only 0.5 percent of all the 8,243 classifiable bones

¹⁸ Opravil (2000a), pp. 168–169; Opravil (2000b), p. 29, pp. 34–35.

¹⁹ Kratochvíl (1992), pp. 101–104, p. 155; Pleinerová (2000), pp. 232–235; unpublished zooarchaeological analysis from the Líbivá site by M. Roblíčková.

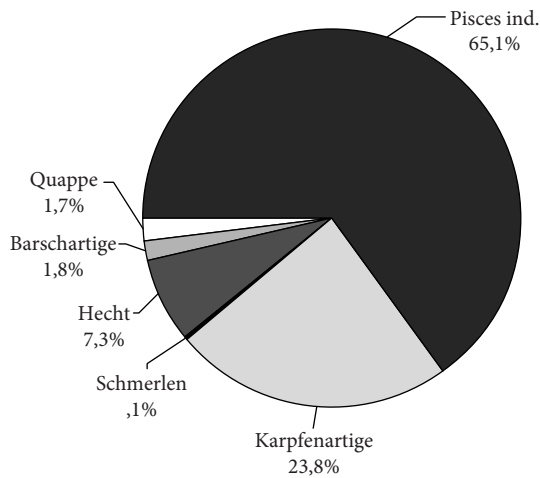


Diagram 129. Břeclav-Pohansko. Distribution of the early medieval finds of fish bones by species: burbot (*Lota lota*)/Quappe, Perciformes/Barschartige, pike/Hecht, loach (*Cobitidae*)/Schmerlen, carp family (*Cypri-nidae*)/Karpfenartige (after Galik—Macháček 2003).

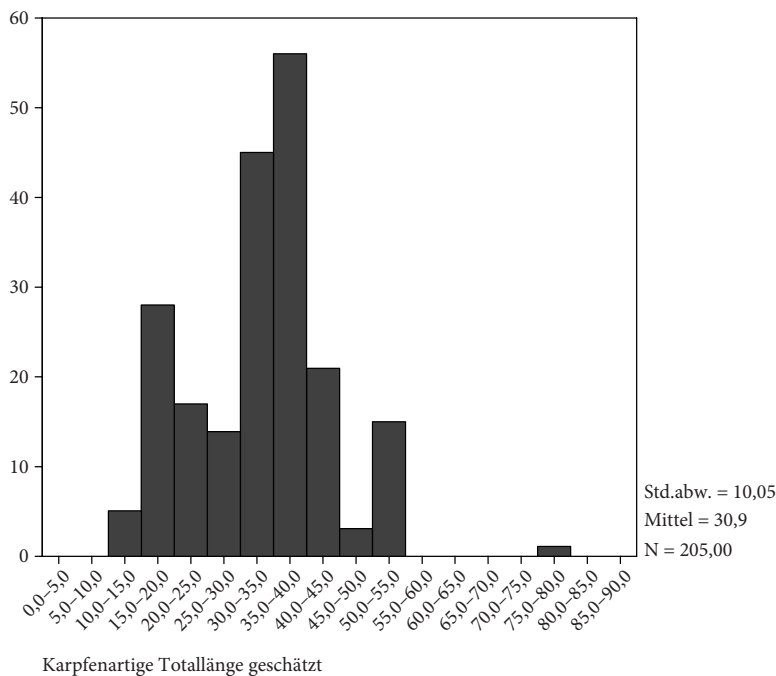


Diagram 130. Břeclav-Pohansko. Distribution of fish of the carp family (*Cyprinidae*) by size (cm). Histogram. (according to Galik—Macháček 2003).

were attributed to wild animals,²⁰ while in the Magnate Court area two percent of all 9,804 identified bones are of wild species.²¹

Tab. 104. Břeclav-Pohansko. The subsistence subsystem.

<i>Relative-chronological stage</i>	<i>Nutrition and food distribution</i>
Post-Great Moravian (Late Hillfort Period)	?
Late Great Moravian	Distribution of foodstuffs from the surrounding agricultural settlements, unequal access to food sources, intensive use of alternative sources of food/fishing, growing vine and cultivated fruit species, introduction of new technologies/asymmetrical ploughshare
Early Great Moravian	
Pre-Great Moravian (Early Slavic and Early Hillfort) period	autarkic technologically undemanding small scale agricultural production

An important complementary source of nutrition at Pohansko was fishing, for which the flood plain of the Dyje river offered ideal conditions. An analysis of 7,153 fish scales and bones²² has revealed at least 20 different species of fish of various sizes, which were part of the diet of the early medieval inhabitants of the stronghold. By far the most important role was played by species of fish of the carp family (*Cyprinidae*), followed by pike and the family of the perch (*Percidae*).

We do not have sufficient relevant information on the further developments of the subsistence system in the post-Great Moravian period.

According to Colin Renfrew,²³ several basic factors have a positive effect on the development of the subsistence subsystem. Most important for the conditions present at Pohansko appear to have been the introduction of new types of tools, increasing the efficiency of agricultural production; the fact that the agricultural production was stimulated by the redistribution system (on one hand, the effort to acquire reciprocal goods, on the other hand sanctions for failing to meet the required quota); social factors, stimulating demand for exceptional

²⁰ Kratochvíl (1992), p. 101.

²¹ Dostál (1982b), přehled III.

²² Galík, Macháček (2003).

²³ Renfrew (1972), p. 490.

products (fruit, wine); the effort to produce sufficient quantities of foodstuffs, which could be exchanged for new types of craft products; the development of long-distance trade; the need for some commodities for religious purposes (wine); pressure by the growing population.

5.4 THE CRAFT TECHNOLOGY SUBSYSTEM

There is no evidence of a sophisticated craft production in pre-Great Moravian Pohansko. Technologically simple pottery (handmade, of the Prague type, or decorated, of the Middle Danube cultural tradition), spindle whorls and whetstones bespeak the household character of the craft production. Metal objects are rare, although the slag finds in some settlement features appear to indicate some blacksmithing activity. One possible result of that activity was the knives, buckles, and arrowheads, found in cremation graves. Technologically more demanding artefacts include two iron kettles, which were discovered in the area of the Magnate Court, bone combs, and glass beads. None of them appears to have been manufactured in Pohansko. Only the find of the mould for star-shaped pendants of earrings of the Čadavica—Martynovka type indicates that dress accessories may have been produced on site before the Great Moravian period. With no actual earrings of that type known from Pohansko, it is nonetheless quite possible that the mould was never used on site.²⁴

Pohansko suddenly became a craft centre during the early Great Moravian period. There were workshops dedicated to metalworking and cloth production at that time in the Forest Nursery area (see Chap. 4.2.1 and Chap. 4.3). Pottery assemblages now include professionally produced vessels, the manufacture of which required higher standards in terms of material, decoration, morphology and dimensions. Pottery production clearly indicates a considerable increase in the role of crafts in the economic profile of the site during the Great Moravian period. By the late Great Moravian period, only a few pots were still produced within the household, while the majority of the pots in existence on the site were the products of pottery workshops. The ratio between home-made goods and professionally manufactured artefacts may be estimated as high as 1:2 in favour of the latter. The question is

²⁴ Dostál (1982b), p. 34–38; Dostál (1985), pp. 28–30, pp. 67–73.

what was their share in the living culture. If taking into consideration verified data from other sites where residual (early) pottery can make up as much as 55 percent of all ceramic assemblages, then one may assume that during the late Great Moravian phase the household production of pottery has practically ceased at Pohansko.²⁵

During the late Great Moravian period the professional craft production was concentrated in household units or plots of a typically rectangular plan, sometimes surrounded by a fence. This came into being as a result of the systematic division of land, delimited at Pohansko by the earth-and-timber rampart with a stone facing wall, which is considered proof of the presence of a strong central authority responsible for the organization of both land and craft production. There is clear evidence of cloth making at Pohansko during this period, which appears to have taken place in large, collective workshops of the gynaeceum type. Equally certain is the production of weapons and belt sets, agricultural tools, and dress accessories of non-ferrous metals. The finds of semi-finished products and specific types of tools provide evidence of other crafts, such as wood, leather and fur, and bone processing. The metallographic analyses of metal residues found on the sides of a crucible uncovered in the Magnate Court area indicate the smelting of silver, possibly the manufacturing of typically Great Moravian dress accessories under the direct supervision of the ruler or of his deputy.²⁶ The jewellery production in Moravia is remarkable in terms of the frequent use of sophisticated techniques such as filigree and granulation.

In the late Great Moravian period the professional craft production was concentrated in an industrial/residential area divided into fenced household units or plots of a typically rectangular plan. Crafts were not restricted to the so-called craftsmen's quarter, as B. Dostál labelled a portion of the area investigated in the Forest Nursery district.²⁷ Textile production is betrayed especially by numerous finds of tools and implements associated with cloth making (awls and whorls). Looking at their common, relative distribution (per 100 settlement features) in individual excavated areas, it would seem that such tools appear most

²⁵ Macháček (2001c), pp. 262–263.

²⁶ Macháček, Gregerová, Hložek, Hošek (2007), pp. 171–178.

²⁷ Dostál (1993a); Dostál (1993b).

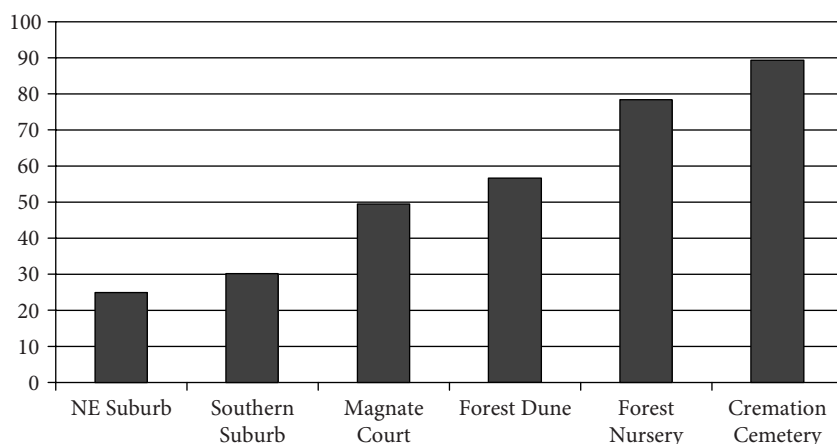


Diagram 131. Břeclav-Pohansko. The number of whorls and pointed bone implements (awls, etc.) per 100 settlement features.

frequently in the settlement features from the areas of the Forest Nursery, Forest Dune and Cremation Cemetery. The settlement inside the fortification was thus distinctly different from the two suburbs where such artefacts are relatively rare (Diagram 5).

The craftsmen active at Pohansko in the Great Moravian period were capable of building stone-walled structures. Their work was not restricted solely to the Christian church and buildings inside the Magnate Court as remains of minor stone architecture are also occasionally found elsewhere (e.g. the sunken-floored dwelling 54 in the Forest Nursery area, with a corner built in stone bonded with mortar).

It seems that craft production at Pohansko continued to a limited extent in the post-Great Moravian period as well. This is confirmed for example by the proven link between the late graphite pottery and evidence of blacksmithing production (see Chap. 4.3.3.3). However, the level of craftsmanship quickly deteriorated, as is shown by the decline in the quality of pottery from the last phase of occupation in Pohansko.²⁸

²⁸ Macháček (2001c), p. 262.

Tab. 105. Břeclav-Pohansko. The craft technology subsystem.

<i>Relative-chronological stage</i>	<i>Crafts and technologies</i>
Post-Great Moravian (Late Hillfort Period)	production continuity, craftsmanship level regression
Late Great Moravian	professionalization of craft production, using sophisticated technologies, stone architecture, production organized by a central authority
Early Great Moravian	rapid development of specialized crafts
Pre-Great Moravian (Early Slavic and Early Hillfort) period	prevalent technologically undemanding domestic production

Colin Renfrew²⁹ defined two subsystems related to technology and crafts. Taking into consideration the specific developments in the Aegean during the third millennium BC, he distinguished metallurgy which at that time became extraordinarily important. However, with regards to the evolution of an early medieval society metal processing does not stand out against other crafts, and may therefore be considered part of a single technological-craft subsystem. During the early Middle Ages Europe the following factors are important for the development of that subsystem in Central Europe: the manufacture of weapons and military equipment, associated with more intense military activity; the demand for prestige, 'luxury' goods; the deposition of metal and other artefacts of high value in graves as gifts (and, as a consequence, their withdrawal from everyday circulation); more efficient supply of raw materials thanks to long-distance trade; higher craftsman specialization, enabled by the intensification of agricultural production; the concentration of economic resources, due to redistribution mechanisms (pressure on the growth of craftsmen's specialization in the vicinity of redistribution centres); population growth, which releases human resources in the village communities for craft production; new requirements for specialized artefacts based on the needs for religious and secular ceremonial display; pressure from long-distance trade on increasing the production of commodities.

²⁹ Renfrew (1972), pp. 490–492.

5.5 THE SOCIAL SUBSYSTEM

No significant social difference and no private property appear to have existed in the community living in Pohansko during the pre-Great Moravian period. The site was probably inhabited by a clan or kin group with clear patriarchal/extended-family elements. This is confirmed by the layout of the settlement, with the sunken-floored dwellings grouped together in clusters of inhabitants working and living together. A similar structure may be observed in the contemporary cremation cemetery. Graves with only a few grave goods form two clusters, which may have been associated with two different lineages or groups of people. Members of the leading family (man, woman, three children) were buried in the middle of one of those clusters. The ashes of the head of the lineage were buried together with the cremated remains of a small child and an unidentifiable animal. This was the only grave with a weapon (iron arrowhead). The grave of neighbouring female burial (perhaps the man's wife) contained an unusually large number of vessels (3). The graves of the next generations are found on the edge of that cluster. Judging from the distribution of the graves it appears that by the end of the burial ground, the originally extended-family structures broke apart, as graves were not randomly distributed throughout the terrain with no relation to the original cluster.³⁰

The Great Moravian period witnessed a massive change. During the early phase an important settlement structure emerges at Pohansko, which is traditionally referred to as the Magnate Court and believed to be the replica of a *palatium*, the main residential component of a Carolingian-Ottonian *Pfalz*.³¹ At any rate, the Court may be taken as clear evidence for the existence of an upper class residing in buildings unlike any other on the site which were physically separated from the other members of the Great Moravian community at Pohansko. The *palatium* at Pohansko became the centre of a sophisticated redistribution system, which on this scale could have been organized only by the highest authority in the country, i.e. the ruler or his immediate deputies. The *palatium* was used as a place for the collection of both agricultural dues and products made by dependent craftsmen, as well

³⁰ Dostál (1982b), pp. 54–59; Dostál (1985), pp. 28–30, p. 15, p. 33; Macháček (1995).

³¹ Dostál (1975); Macháček (2001d).

as of prestigious objects and raw materials imported into the country by means of long-distance trade. That some of those goods were also made available, perhaps by means of redistribution, to the other members of the community living in the *palatium*, is indicated by the goods and accoutrements found with some of the graves excavated in the church cemetery. Those richly furnished burials serve, at the same time, as evidence for the establishment of clear hierarchies of wealth in society. Members of the privileged, property-owning class could belong to various newly emerged professional groups (e.g. the clergy), but most of them were elite warriors, a fact which was conspicuously marked in death by the deposition of weapons (especially swords) and horse gear (especially spurs), as well as dress accessories of symbolic value (such as belt sets) in the grave. The military organization turned into an important social phenomenon. In the late Great Moravian stage, at the latest, but more probably earlier, an extensive earth-and-timber fortification with a stone facing wall was built at Pohansko the construction of which must have required significant efforts on the part of the entire society. Although it appears that the rampart played an important role in the protection of the agglomeration against floods,³² its military function is undeniable. However, protection against enemies was not provided for only passively through fortification, but also actively by concentrating troops in the vicinity of the stronghold. Evidence of a permanent presence of a large body of people involved neither in agriculture nor in craft production comes mainly from the Southern Suburb. They are thought to be members of a large “state” retinue.³³ Weapons and horse gear (stirrups, bits, and spurs) are diagnostic artefacts indicating the presence of those people. There are also marked differences between the dwellings of the warriors from the Southern Suburb and those of craftsmen settled inside the fortification.

The late Great Moravian stage also provides indications of the existence of landholding and extensive landed property at Pohansko. Such indications concern the division of the land inside the fortification. The plots of land belonging very likely to the ruler were used to build the individual homesteads surrounded by fences. The craftsmen who

³² Macháček, Doláková, Dresler, Havlíček, Hladilová, Přichystal, Roszková, Smolíková (2007), pp. 306–309.

³³ Vignatiová (1980); Vignatiová (1992), pp. 94–99; Macháček (2005), pp. 109–114.

worked in them had a very low social status and were most likely subjects of the land owner.

By the post-Great Moravian period, this social system began to break down. A little earlier, that part of the Magnate Court enclosure which had been at least once rebuilt disappeared,³⁴ and even the earth-and-timber rampart with a stone facing wall was severely damaged by fire. No absolute dates are yet available for that event. Unfortunately one cannot rely on the finds from a hoard discovered in the sunken-floored dwelling 10, which were undoubtedly buried by debris from the damaged rampart.³⁵ The rather narrow dating of the so-called Blatnica-Mikulčice horizon,³⁶ the second phase of which B. Dostál³⁷ associated with the artefacts from the hoard in the sunken-floored building, cannot be supported any more in the light of the recently published evidence, for example from the Italian abbey of San Vincenzo al Volturno.³⁸ The rampart could have been razed to the ground at virtually any time during the ninth century (according to as yet unpublished dendro-dates this may not have taken place before the 880s), but it was certainly in ruins during the post-Great Moravian phase of occupation. The violence suggested by the fire, which destroyed the rampart, may have also been responsible for the death of some of the people buried in the church cemetery. The forensic analysis of their skeletons shows that some of them, at least, died of severe wounds. For example, the man buried in grave 20 had two diamond-shaped arrowheads stuck in the collar bone and in the pelvis, respectively. The man in grave 275 from the narthex of the church died apparently of the wound inflicted by an arrow which pierced his chest. Both graves are commonly regarded as evidence of Magyar invasions into Great Moravia.³⁹ Diamond-shaped and deltoid arrowheads found in the Magnate Court area have been associated with the raids of the Magyars.⁴⁰ Unfortunately, it is impossible to establish with any precision the degree to which all those facts coincided in time.

³⁴ Dostál (1975), pp. 35–36.

³⁵ Dostál (1977/1978).

³⁶ E.g. Bialeková (1979); Bialeková (1980a); Dostál (1993c), p. 59.

³⁷ Dostál (1977/1978), p. 119.

³⁸ Mitchell (1994); Mitchell (1996).

³⁹ Schulze (1984), p. 486; Schulze-Dörrlamm (2002), p. 111; Kalousek (1971), pp. 35–36, pp. 159–160.

⁴⁰ Kouřil (2003), p. 125 with references.

During the post-Great Moravian period the graves dug in the church cemetery area had few or no grave goods, which suggests that no differentiation in terms of property ownership or social status may have been in place any more at that time.

Tab. 106. Břeclav-Pohansko. The social subsystem.

<i>Relative-chronological stage</i>	<i>Society</i>
Post-Great Moravian (Late Hillfort Period)	fortification in ruins, Magnate Court palisade extinct, war events?, erosion of the social structure
Late Great Moravian	existence of vast fortification, private landholding and extensive landed property, existence of complex social hierarchy (craftsmen, members of the large “state” retinue, elite warriors, clergy, clerks, ruler?)
Early Great Moravian	origin of a redistribution centre and a residential settlement (<i>palatium</i>), establishment of clear hierarchies of wealth in society, elite warriors
Pre-Great Moravian (Early Slavic and Early Hillfort) period	little differentiated society, a clan with extended-family elements

According to C. Renfrew⁴¹ the development of the social subsystem was influenced by the following factors: intensified redistribution of economic resources in society; new types of prestigious objects and forms of property, widening the gaps in social differences in society; visible and demonstrated wealth provokes arguments and wars; access to new types of weapons and equipment facilitates war and the establishment of the class of professional warriors; the presence of learned men (perhaps clergy or clerks) facilitates the organization of redistribution; population growth favours social self-identification by profession (craftsman, member of the retinue, peasant, cleric, etc.) at the expense of kinship relationships.

⁴¹ Renfrew (1972), pp. 492–493.

5.6 THE PROJECTIVE AND SYMBOLIC SUBSYSTEM

When attempting to describe the activities by which the people living at Pohansko in the pre-Great Moravian period expressed their feelings, faith or knowledge about the world surrounding them, one has access only to the outward expressions of ritual practices. The pagan nature of their religion is beyond any doubt. This is clearly confirmed by the cremation burial rite. Nevertheless, even at that time Pohansko may have played the role of a religious centre for the wider surroundings.⁴² This is suggested by the find of a structure of rectangular plan (4 by 4.5 m), the remains of which, in the form of nine post holes, were uncovered under the floor of the church nave.⁴³ Six additional post holes identified in the narthex may have also belonged to the same structure. Associated with it may have been three sunken-featured buildings (No. 119–121), which produced Early Slavic and Early Hillfort pottery.⁴⁴ Feature 121 was placed on the longitudinal axis of the structure and consisted of two bowl-shaped pits (diameter 90 cm, depth 10–15 cm), filled with greasy black earth. It was superposed and cut through by a later post hole lined with stones. The post hole has been attributed to a scaffolding, which is believed to have been erected for the building of the church.⁴⁵ In fact, it may well have been little more than a fireplace. On the other hand, it is likely that the features mentioned above are the remains of the core of a pagan shrine, as long suggested by V. Richter.⁴⁶ The shrine may have been located inside the “cult” enclosure, which was later (?) joined by the palisade of the earlier phase of the Magnate Court (Fig. 135). Judging from the greater depth of the palisade trench the appearance of the cult enclosure must have been quite impressive. It may have been 1 m higher than the perimeter fortification of the palatial compound (Fig. 136). Even though B. Dostál believed the coincidence in time of both the enclosure and the early phase of the “court” to be beyond any doubt,⁴⁷ the former may have well been an earlier date than the so-called “Magnate Court”. If so, then it was probably a palisade of

⁴² More details in, for example, Konečný (1989), p. 18.

⁴³ Dostál (1992), pp. 81–84.

⁴⁴ Dostál (1975), pp. 329–330, tab. 40 : 1–3; 98 : 5–25.

⁴⁵ Ibidem, p. 330, tab. 40 : 2; 98 : 5–8.

⁴⁶ Richter (1965), p. 203.

⁴⁷ Dostál (1975), p. 104.

rectangular plan opened on the eastern side, a plan known from other examples of pagan sanctuaries.⁴⁸ That the Pohansko sanctuary may have been related to the cult of the sun is an idea supported by the alignment of the longer sides of the cult enclosure in the direction of the sunrise at summer solstice.⁴⁹

It has so far been impossible to establish a firm date for the cult enclosure, although it is clear that it pre-dated the church cemetery, the graves of which are either not aligned to the enclosure or dug into its remains. The cemetery may have coincided in time with the first building phase of the church, for irrespective of being crammed within a narrow space, none of the graves excavated so far has been found underneath the foundation of the church.⁵⁰ Unfortunately, it is currently not possible to establish any absolute dates for the beginning of the cemetery, mainly because of the lack of a typological and chronological system for the Great Moravian artefacts.⁵¹ B. Dostál⁵² proposed that the burial ground around the church was first opened in the mid-ninth century, and recent studies seem to substantiate that hypothesis. As for the date of the earlier palisade of the palatial compound, which B. Dostál (whose interpretation was based on the estimated lifetime of the wooden structure) believed to have coincided in time with the cult enclosure, it must have come into being 25–50 years before the founding of the cemetery, that is, according to B. Dostál, sometime in the 820s.⁵³ This appears now to be little more than a rough estimate. If accepted, then it cannot be ruled out that the cult enclosure had existed there even before the onset of the Great Moravian period. The likelihood of that scenario increases considerably if the cult enclosure was indeed earlier than the first phase of the Magnate Court palisade. Such a possibility is further enhanced by the fact that the dimensions and orientation of the cult enclosure became the module⁵⁴ for subsequent building structures within the Great Moravian stronghold such as the inner courtyard of the earlier phase of the Magnate Court, the earth-and-timber rampart with a stone facing wall, the division into

⁴⁸ Konečný (1980), p. 131.

⁴⁹ Macháček, Pleterski (2000), p. 111, Abb. 2.

⁵⁰ Dostál (1975), pp. 240–241.

⁵¹ Dostál (1990b); Dostál (1991), pp. 81–87; Galuška (1996); Chorvátová (2004); Klanica (1990); Štefanovičová (2004).

⁵² Dostál (1975), pp. 34–36.

⁵³ Ibidem, pp. 34–36, p. 243.

⁵⁴ Macháček, Pleterski (2000).

plots or household units; see Chap. 4.5.2). If true, this scenario would imply that a pre-Christian sanctuary came into being shortly before the building of the Magnate Court which may have well been associated with the sanctuary from the very beginning, i.e. at some later stage of the pre-Great Moravian period.

The specific orientation of the cult enclosure was also adopted by the subsequent church. Its construction is associated with another important stage of the development of the projective subsystem, which was ushered in by a radical change in the religion – the conversion to Christianity. According to the latest, albeit tentative, conclusions of Czech historians the event must have taken place in 831 at the latest, when Prince Mojmir I. and “*all Moravians*” were baptised by Reginhar, Bishop of Passau.⁵⁵ At Pohansko, the conversion was accompanied by a shift from cremation to inhumation. The pagan sanctuary was replaced by a church, but the continuity in both location and orientation between the two buildings suggests a certain degree of pagan-Christian syncretism.⁵⁶

The adoption of Christianity went hand in hand with a number of essential innovations at Pohansko. Stone buildings appear for the first time on the site. The size of the church building seems to have been established on the basis of the Roman or Carolingian foot. It certainly matches the size of most other Great Moravian temples.⁵⁷ New forms of art were adopted by the inhabitants of the stronghold at Pohansko, as indicated, for example, by fragments of fresco inside the apse and the triumphal arch of the church. The fresco consisted of geometric, floral and figurative motifs in yellow, black, brown, and reddish-brown. In addition, the interior decoration of the church included engraved lines.⁵⁸ A number of building details suggest a specific layout of the interior. The foundations of the altar screen, which closed off the altar and the presbytery, were uncovered in the church nave. In the middle of the nave was a pit with a paved bottom, possibly a reliquary or a symbolic grave.⁵⁹ In the second building phase a narthex was added to the nave.⁶⁰ It has been noted that in Moravia the narthex, a structure asso-

⁵⁵ Třeštík (2001b), pp. 117–126.

⁵⁶ More details in Konečný (1980), p. 137.

⁵⁷ Richter (1965); Dostál (1992), p. 74.

⁵⁸ Kalousek (1961).

⁵⁹ Dostál (1992), pp. 80–85.

⁶⁰ Dostál (1975), pp. 101–103.

ciated with the arrival of the Byzantine mission, appears only in very important churches, in which they were used primarily for baptismal ceremonies, the education of catechumens, and as burial ground for important individuals in the community.⁶¹ Although no styli have so far been found, which could be compared to those from Mikulčice or Sady near Uherské Hradiště, it is quite possible that much of the reading and writing involving members of the clergy took place in the narthex.

At the beginning of the post-Great Moravian period the Christian church lost its sacral function. A fireplace was installed in the narthex, which now served as dwelling. A small pagan shrine (feature No. 39), consisting of a massive central post, eight perimeter post holes and a palisade trench, partly encircling the shrine, was built in the vicinity of the church. The whole feature, which was erected on top of a Great Moravian grave was between 250 and 300 cm in diameter.⁶² A similar feature was uncovered in the Cremation Cemetery, in a location where the dead had long been laid to rest prior to the building of the stronghold. The above mentioned feature which stood in the middle of the cult precinct⁶³ was associated with a group of identically oriented inhumations and three horse burials. They are all aligned to the axis between the centre of the shrine and the position of the sunrise at the summer and winter solstice. By means of analogy with the structure of the shrine proper (eight elements in a circle, one in the middle) and because of the presence of horse burials, it has been suggested that this was in fact a sanctuary associated with some agrarian cult of the sun. The sacral precinct in the Cremation Cemetery area, much like the circular feature near the church, may be dated with some caution to the very end of the Great Moravian or to the post-Great Moravian period. This is supported by the fact that one of the horse skeletons and many human graves associated with the sacral precinct overlaid or were directly dug into Great Moravian features. A late date of those graves is also supported their uniform orientation and relative lack of grave goods.⁶⁴ The finds discussed above show great changes taking place in the projective and symbolic subsystem after Christianity lost its position of predominant ideology in the post-Great Moravian period, which apparently witnessed a serious pagan reaction.

⁶¹ Galuška (1996), pp. 56–60; Galuška (2004), pp. 126–127; Binding (2002), p. 1030.

⁶² Dostál (1975), pp. 104–110.

⁶³ Macháček, Pleterski (2000); Macháček (2000a).

⁶⁴ Dostál (1982a), p. 136.

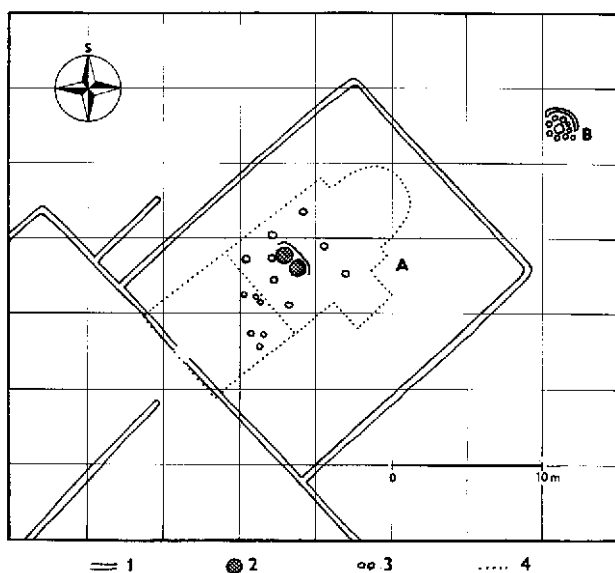


Fig. 135. Břeclav-Pohansko. A—pre-Christian shrine with a cult enclosure B—post-Great Moravian pagan shrine. 1—palisade trenches, 2—feature 121, 3—post holes, 4—church outline.

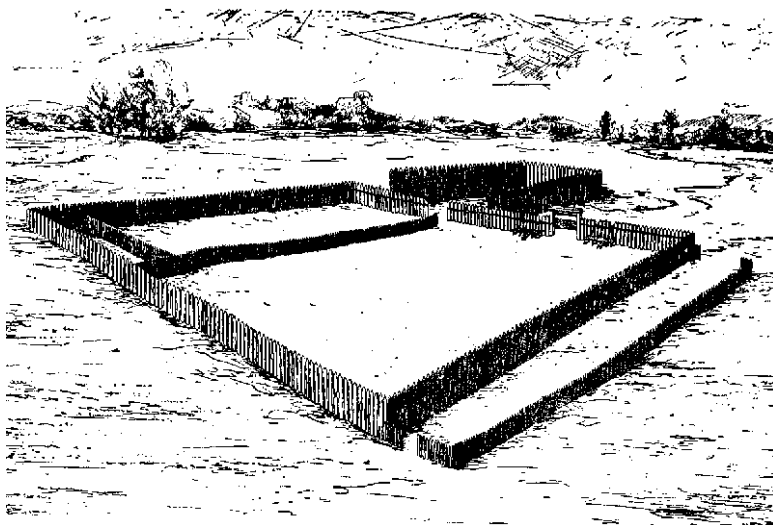


Fig. 136. Břeclav-Pohansko. Magnate Court. Reconstruction of the early palisade with the pre-Christian cult enclosure (according to Dostál 1975).

Tab. 107. Břeclav-Pohansko. The projective and symbolic subsystem.

<i>Relative-chronological stage</i>	<i>Religion, art, symbolism</i>
Post-Great Moravian (Late Hillfort Period)	pagan reaction, retreat of Christianity, agrarian solar cults
Late Great Moravian	narthex, Byzantine mission (?), script
Early Great Moravian	Christianization, beginning of inhumation rite, building of the church, art
Pre-Great Moravian (Early Slavic and Early Hillfort period)	paganism, cremation rite, origin of the religious centre for the wider surroundings

Among the factors, which Colin Renfrew⁶⁵ considered important for the development of the projective systems, the following are thought to be relevant for early medieval Pohansko: craft specialization, as new technologies (e.g. construction) and trade require using standardized dimension and weight units; social development leading to the origin of new forms of symbolic expression; transformation of the social order effects changes in ideology and religion; contacts with other countries lead to innovations in art and changes in religion; crafts and technologies offer new means for the development of art; population growth promotes new forms of rituals.

5.7 THE TRADE AND COMMUNICATION SUBSYSTEM

From the pre-Great Moravian period only rare evidence of contacts with distant areas is available in the wider surroundings of Pohansko. That evidence consists of exceptional artefacts, which need not have found their way to the country by trade and exchange, but perhaps as loot or as gifts. A typical example of that is a hoard of silver artefacts (bracelets, neck rings, ingots) from nearby Poštorná, which has most recently been dated to the first half of the 7th century.⁶⁶ Equally significant in that respect are the fragments of Merovingian earrings

⁶⁵ Renfrew (1972), p. 493.

⁶⁶ Košnar (1994).

and beads found in Břeclav—Líbivá.⁶⁷ In Pohansko proper, the only find confirming contacts with distant regions at this time is a mould for earrings with a star-shaped pendant.⁶⁸ According to D. Staššíková-Štukovská⁶⁹ this type of jewellery originated in Byzantium and may have been brought to the Slavs by merchants and artisans travelling from the Avar kaganate. The mould from Pohansko indicates that such artisans could have been at work on the site as early as the 7th or the first half of the 8th century. Most other finds at Pohansko dating back to that period are believed to be of local production.

By contrast, artefacts which could be treated as either imports or evidence of contacts with remote regions appeared in great numbers at Pohansko during the Great Moravian period. Such artefacts came from the west and south-east: swords of Damascus (Wootz) steel,⁷⁰ belt mounts and strap ends with enamelled ornament,⁷¹ silk⁷² and brocade,⁷³ as well as amber and *millefiori* beads.⁷⁴ The Northeastern Suburb produced a glass smoother, the origin of which is to be sought either in the Baltic-Scandinavian area or in the Frankish Lower Rhineland.⁷⁵ Contacts with the Baltic region are also indicated by a stirrup from the Southern Suburb, which is decorated with silver inlays and perforations.⁷⁶ More stirrups with a ball-shaped bow, which have been found in feature 77 from the Southern Suburb, have good analogies among stirrups of the Immenstedt type⁷⁷ although they appear to belong to the Balladoole type, which is most typical for northwestern Europe. The Viking-age grave from Balladoole on the Isle of Man also produced buckles and strap ends, for which there are very good parallels in the church cemetery at Pohansko.⁷⁸ The bits of the Tara type found in feature 254 of the Southern Suburb⁷⁹ were very popular in

⁶⁷ Macháček (2000b).

⁶⁸ Dostál (1975), p. 224.

⁶⁹ Staššíková-Štukovská (1999), p. 284, p. 287.

⁷⁰ Vignatiová (1993).

⁷¹ Kalousek (1971), pp. 147–148, Tab. 42; Wiczorek—Hinz eds. (2000), pp. 234–235.

⁷² Kostelníková (1980).

⁷³ Kalousek (1971), p. 105.

⁷⁴ Ibidem, p. 158, p. 201.

⁷⁵ Ibidem, p. 111.

⁷⁶ Vignatiová 1992, pp. 59–60.

⁷⁷ Ibidem, pp. 60–61.

⁷⁸ Schulze-Dörrlamm (1988), pp. 425–429; Kalousek (1971), p. 121.

⁷⁹ Vignatiová (1992), pp. 63–64.

Scandinavia. Such bit may have originated in the east, with the Vikings adopting them as a consequence of their trade missions to Russia).⁸⁰

All the artefacts mentioned above could have well been obtained by means of gifts or loot. Some of them may have been in the possession of resident foreigners. They stand out in sharp contrast to finds, which could not have been procured but by means of trade. Such is the case of raw materials and artefacts of everyday use, imported from more or less remote places, more likely through the so-called inter-regional exchange than through long-distance trade.⁸¹ Typical examples for this category of artefacts are quernstones made of different types of rock brought in from various directions, as indicated by the petrographical analyses of 207 specimens found in Pohansko.⁸² Most of them (62 percent) were made of mica schist, the nearest sources of which are between 60 and 100 km to north-west from Pohansko. According to observations from Mikulčice and the nearby site at Mutěnice mica schist quernstones began to be imported into the region only during the Great Moravian period.⁸³ The second largest group of quernstones from Pohansko (14 percent) was made of rhyolite quarried in the mountains of Central Slovakia (Kremnica – Štiavnica Hills), at a distance of between 130 and 150 km to the east. A similar distribution of raw materials has been identified in a set of 421 quernstones from Mikulčice (whole specimens and fragments): mica schist represented 53 and rhyolite 27 percent of the total number under study.⁸⁴ The rock employed for stone whorls and the graphite added to the temper of the Great Moravian pottery found in Pohansko was also of non-local origin.⁸⁵ It is possible that large quantities of iron were brought on the site from the outside in the form of so-called axe-shaped ingots, which some historians believe to have been a form of currency during the Great Moravian period. In Pohansko such ingots appear in hoards.⁸⁶ A less common raw material brought on site from the outside for the workshops specializing in non-ferrous metalworking was lead. Again, the lead found in Pohansko appears in the form of ingots.⁸⁷

⁸⁰ Schulze-Dörrlamm (1988), p. 41.

⁸¹ More details in Verhulst (2002), pp. 97–103.

⁸² Gilíková (1997).

⁸³ Marek, Skopal (2003), p. 520.

⁸⁴ Ibidem, p. 501.

⁸⁵ Dostál (1994a); Dostál (1998).

⁸⁶ Dostál (1983).

⁸⁷ Dostál (1980b); Macháček (2002a).

Lead was rare in the ninth century in northern Europe where it was probably imported from the British Isles.⁸⁸ In the early Middle Ages precious metals were also processed at Pohansko as is confirmed by the find at the Magnate Court of a crucible with silver remains. Nothing is known, however, about how were gold and silver delivered to Moravia. Coins, a common source of silver for jewellers in northern Europe,⁸⁹ are extremely rare in Moravia.⁹⁰ There have been no finds of either gold or silver in the form of ingots. Nonetheless, given the large number of Great Moravian dress accessories made of gold or silver, there must have been a steady flow of relatively large quantities of precious metals into Moravia.⁹¹

A question that remains open is what commodities could the Moravians have offered in exchange for weapons, luxurious fabrics and precious metals, provided that such goods found their way to Pohansko by means of long-distance trade. It is possible that one of the most desirable goods leaving Moravia for Spain across the Alps and through Venice and the Near East were slaves.⁹² In addition, the Moravians may have exported horses, wax and honey.⁹³ Unfortunately, none of those commodities is visible archaeologically.⁹⁴

On the other hand, the presence of foreign merchants in early medieval Moravia, especially Jewish Radaniya and Venetians, is confirmed by written sources. Such merchants participated in what seems to have been a well-known, on which they probably sought for slaves. The main Moravian market remains a matter of controversy. Mentions to such a market may be found in the Raffelstetten Customs Regulations of 904 and in a few Muslim sources.⁹⁵ Pohansko could have played an important role in long-distance trade.⁹⁶ The site was after all situated on the important Amber Trail,⁹⁷ in the vicinity of the Danube, a key

⁸⁸ Steuer (1987), p. 186.

⁸⁹ Ibidem, p. 186.

⁹⁰ E.g. Charvát (2000), p. 257–258; Kučerovská (1998).

⁹¹ Poláček (2000a), p. 147.

⁹² E.g. McCormick (2001), p. 691, p. 767, p. 774; McCormick (2002); Třeštík (2000), pp. 52–54; Verhulst (2002), p. 107, p. 112.

⁹³ E.g. Warnke (1987); Poláček (2000a).

⁹⁴ More on slaves, for example, Henning (1992); a critical evaluation Galuška (2003).

⁹⁵ E.g. Třeštík (1973); Třeštík (2000), pp. 52–54.

⁹⁶ E.g. Pošvár (1966), p. 47.

⁹⁷ E.g. Dostál (1983), p. 197; Dostál (1988b), pp. 148–149.

communication axis of medieval Europe⁹⁸ and in a strategic location, controlling access to the central Moravian territory.⁹⁹ Moreover, it is very likely that western merchants knew Pohansko very well. It was the only important Moravian centre which had a German name—*Laudentburch*. That name was later incorporated, in a modified form, in the German name of the nearby town of *Břecław*—*Lundenburg*.¹⁰⁰

However, when compared to the large trade centres (emporia), on which archaeological excavations revealed the signs of a long-distance trade with western and northern Europe of extraordinary intensity, the quantity of goods possibly obtained through trade is relatively small at Pohansko. However, in qualitative terms, those goods are directly comparable to those from the commercial centres in northwestern Europe.¹⁰¹ There the sophisticated exchange system was based on coins, the existence of which is viewed by some authors as a key attribute of civilization. In reality, coinage begins to play an important role in long-distance trade at the moment efforts are made to regulate the already existing trade and its formal organization. True coinage comes into being only after precious metals are used as currency because of being essential for the making of prestigious objects, which were goods of crucial importance in the process of redistribution. Precious metal in the form of ingots was occasionally used in international trade as a means of exchange side by side with coins. In addition to gold and silver, tin and lead have been found, for example, in south-eastern England or in great amounts in *Kaupang* in Norway. Iron ingots should not be overlooked either. The list of traded commodities in western and northern Europe, as well as in Pohansko, includes also jewellery and products manufactured from precious metals, weapons (especially sword blades from the Rhineland), luxurious fabrics (silk), glassware and glass beads, as well as amber. Apart from prestigious goods, trade also operated with such utilitarian items such as quernstones, which became the foundation of the Frisian trade system, whetstones, salt, etc. Probably the most important article of trade in early medieval Europe was slaves, who were exported in great numbers to the Muslim world.

The quantity of goods obtained by means of trade and retrieved by archaeological excavations depends upon the number of different

⁹⁸ Třeštík (2000), pp. 52–53.

⁹⁹ Macháček (2005), pp. 113–131.

¹⁰⁰ Třeštík (1988).

¹⁰¹ e.g. Hodges (1982), pp. 104–129.

factors, such as the length of the merchants' sojourn on site, the value and the nature of the imported artefacts,¹⁰² as well as the method of transportation (by land or by water). A good example in that respect is pottery which, contrary to the situation in the emporia in northwestern Europe, could hardly have been imported to Moravia, for it was produced locally in sufficient quantity and was of excellent quality. One should also bear in mind that the so-called Amber Trail lost its original pan-European significance. In the early Middle Ages it ended within the territory of southern Moravia, as is shown by the distribution of Byzantine coins (Fig. 137), delimiting the corridor between Venice and Moravian locations.¹⁰³ Those must have been the final destinations along the trade route, at which points, the merchants had already sold or exchanged much of their cargo of commodities.¹⁰⁴ The goods that the merchants intended to take with them from Moravia must therefore have been more often exchanged for some general equivalent, such as precious metals and luxurious fabrics. Furthermore the imported valuables were quickly distributed further inside Moravia and shortly after that were deposited in burial assemblages at locales with a higher concentration of social elites, but without much evidence of commercial transactions.

The involvement of Pohansko in long-distance land route trade is substantiated by the latest finds of bones of mule (*Os metacarpale II and III*), which were retrieved from the Forest Dune site.¹⁰⁵ North of the Alps donkeys appear as early as the Roman period, although they may not have been bred there. It is very likely that their presence is to be associated with merchant caravans crossing the Alps from the Italian Peninsula. At the end of the Roman period, such animals disappear from the faunal assemblages in the area. Donkeys reappear in Central Europe in the ninth century.¹⁰⁶ The few bones of donkey which can be dated to the early Middle Ages are rather remarkably concentrated on sites in the environs of Pohansko. They were identified in Mikulčice¹⁰⁷ and in Kúty, just 11 km away. On the latter side, they have been interpreted as evidence of the trade contacts with the

¹⁰² Ibidem, p. 57.

¹⁰³ McCormick (2001), p. 370, p. 376; Třeštík (2000), p. 53.

¹⁰⁴ The so-called Tröpfelmodell of long-distance trade advanced by H. Steuer (1987), Abb. 25.

¹⁰⁵ Unpublished zooarchaeological expert report by G. Dreslerová.

¹⁰⁶ Müller (1998), p. 395.

¹⁰⁷ Kratochvíl—Štěrba (1970), pp. 463–464.

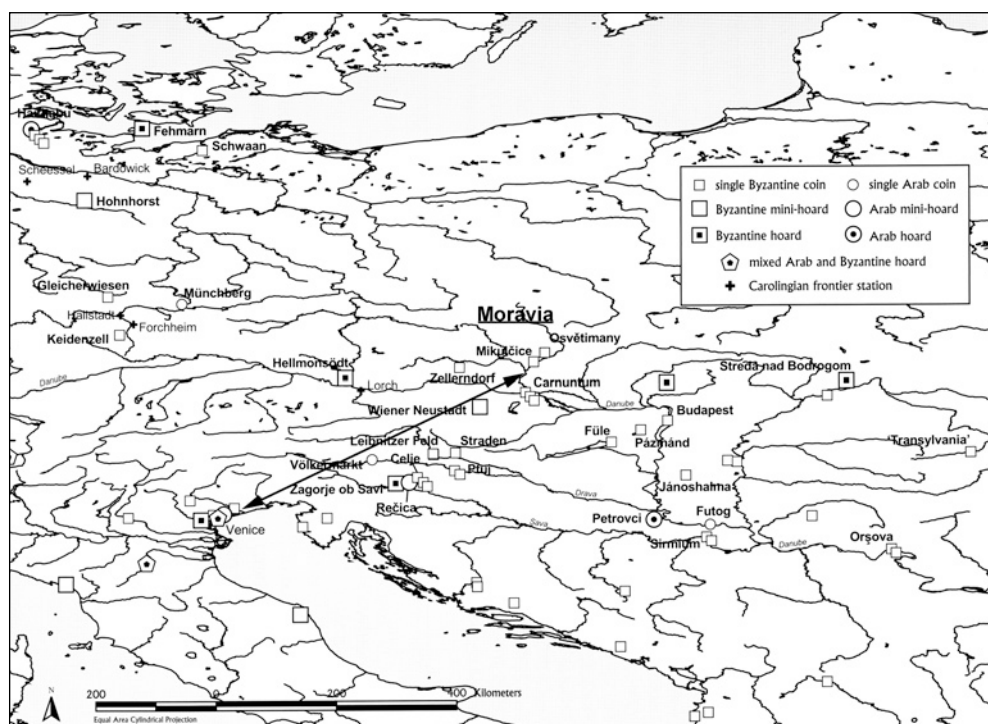


Fig. 137. The Amber Trail in the early Middle Ages. Distribution of Arabic and Byzantine coins (after McCormick 2001).

regions in southern or southwestern Europe from which the animals were coming.¹⁰⁸

In the post-Great Moravian period, the evidence of contacts between Pohansko and distant regions peters out. Exotic artefacts are mostly associated with the intervention of the Magyars.¹⁰⁹ Apart from diamond-shaped and deltoid arrowheads, which may have been of local origin, one particular artefact is an arrowhead with a split edge from the Forest Nursery, which is a typically nomadic kind of weapon dated in the steppe lands of Eastern Europe between the 9th and the 13th century.¹¹⁰ Another object which could have been brought to Pohansko with the Magyars is a miniature spoked bronze wheel, which judging by the numerous analogies in assemblage of the Saltovo-Mayaki culture is probably of Khazar origin.¹¹¹

¹⁰⁸ Ambros (1962), p. 256.

¹⁰⁹ Kouřil (2003), pp. 122–124.

¹¹⁰ Dostál, Vignatiová (1987), p. 37.

¹¹¹ Kouřil (2003), p. 124.

Tab. 108. Břeclav-Pohansko. The trade and communication subsystem.

<i>Relative-chronological stage</i>	<i>Communication and trade</i>
Post-Great Moravian (Late Hillfort Period)	rare finds from nomadic environment
Late Great Moravian	Numerous finds of exclusive objects of foreign origin (weapons and equestrian equipment, luxurious fabrics, jewellery), intensive import of raw materials and objects for everyday use
Early Great Moravian	
Pre-Great Moravian (Early Slavic and Early Hillfort period)	Infrequent finds of rare objects of foreign origin, travelling artisans (?)

The factors affecting the development of trade and communication in early medieval Moravia are as follows:¹¹² increasing diversity of subsistence production; great demand for raw materials, mainly iron, non-ferrous and precious metals; new products by craftsmen; wealth and a high social status of a specific stratum of society which stimulates the circulation of luxurious goods; new forms of religion, perception of the world and ideology, enabling new methods of communication through art and symbols.

5.8 SYSTEM INPUTS AND OUTPUTS

There must have been a great number of inputs and outputs into a system as complicated as that of the early medieval agglomeration at Pohansko. We will restrict their description to include only those which could have vitally influenced the behaviour of the defined system (Tab. 109).

Leaving aside the earliest phase in the history of the system at Pohansko, which is marked by the arrival of the new Slav population to Central Europe in the 6th century, the pre-Great Moravian period is devoid of any significant inputs or outputs that could have affected the working of the system or its surroundings. The economic basis was agriculture which because of its subsistence character¹¹³ has a very limited impact on the surrounding cultural landscape, which had been continually inhabited since the Mesolithic. In material culture terms,

¹¹² Renfrew (1972), p. 494.

¹¹³ Dostál (1982b), p. 49.

the pre-Great Moravian occupation of the site left no traces of any outstanding cultural, power or political influences acting inwardly or outwardly.

By contrast, the system inputs and outputs grew in importance during the Great Moravian period. According to anthropological studies, the Pohansko population at that time was different in physical appearance from the neighbouring populations. This is particularly true for females. Male skeletons from the church cemetery were fairly similar to those from some of the burial grounds in Mikulčice.¹¹⁴ However, in general terms the populations of the large Great Moravian agglomerations appear to have been different from the “local” rural inhabitants. Anthropologists do not agree as to whether those differences are linked more to the females than to males.¹¹⁵ In any case, based on the results of the anthropological research it is possible to admit that a population with a different physiognomy arrived from a different locale and settled in the Moravian centres. Given the sudden increase in the number of inhabitants this event at Pohansko can be dated to the early Great Moravian period. It is unclear where the people came from, but some have assumed a Middle Danubian origin.¹¹⁶ It is a fact that the destruction of the Avar kaganate was followed by clear impoverishment and the decline of the population living in the Carpathian Basin. Some have even suggested that the “Avar” warriors found a new future for themselves in the Moravian centres.¹¹⁷ However, at that time a great majority of the Avar population appears to have been thoroughly Slavicized as a result of acculturation processes taking place ever since the Middle-Avar period on the northern and northeastern frontier of the kaganate.¹¹⁸ Shifts in population could have taken place even later, mainly due to the increasing workforce demand for craft production¹¹⁹ or the concentration of troops at Pohansko.¹²⁰ This is further substantiated by the steady growth of the population in the late Great Moravian period.

A significant intervention from the outside which certainly affected the entire region was the military campaigns which Charlemagne led

¹¹⁴ Drozdová (2001), p. 121.

¹¹⁵ Drozdová (2001), p. 122; Stloukal—Vyhnánek (1976), p. 81.

¹¹⁶ Poulík (1985), p. 57.

¹¹⁷ E.g. Pohl (1988), p. 327; Fiedler (1996), p. 209.

¹¹⁸ Zábojník (1995), pp. 279–280; Zábojník (1999), pp. 163–164.

¹¹⁹ Dostál (1993b), p. 48.

¹²⁰ E.g. Vignatiová (1992), p. 98.

against the Avars. In their aftermath, the power and cultural conditions were radically changed, and not just in Moravia. A new stratum of social elites appeared, a phenomenon associated with radical changes in lifestyle, as weapons and equipment now displayed conspicuous links with the Carolingian Empire. One significant consequence of those changes was the Christianization which came to Moravia from the west.¹²¹ Members of the new elite with their new culture and ideology which was formed under the influence of external inputs essentially affected the whole system which was radically transformed at that time.

Naturally, the system acted in the outward direction as well. This may be seen primarily in the forming of the agricultural hinterland, without which the populous agglomeration at Pohansko would have been inconceivable. Agricultural villages concentrated in the surroundings of important centres and intensified their agricultural production. The area under cultivation increased considerably when compared to that of the earlier period, as confirmed by the size and volume of silos found in Břeclav—Libivá. There must have been an intensive exchange of produce of various kinds between the agricultural settlements and the centre, although no information exists about social and economic background of this exchange. At any rate, a settlement network fully subordinated to the needs of the centre was established in the 9th century in the immediate surroundings of Pohansko. Judging from the model created by Z. Kurnatowska for early medieval Great Poland, that network of settlements did not arise by means of a natural local development in the region, but artificially, by means of enforced centralization. According to Z. Kurnatowska¹²² the hinterland of the Piast centres was settled systematically. In the case of Pohansko it is obvious that the location of contemporary agricultural settlements was not arbitrary.¹²³ The peripheral areas on the interface between the hinterlands of two neighbouring centres remained only sporadically settled. Such areas were probably de-populated due to the dislocation of the population which provided for the needs of the centre. In addition to supplying the centres with food the re-settled labour force must have contributed to the construction and maintenance of the road and

¹²¹ E.g. Třeštík (2001b), p. 107–126; Bialeková (1979); Bialeková (1980a).

¹²² Kurnatowska (1999), p. 55.

¹²³ Dresler, Macháček (2008).

fortification systems.¹²⁴ In Poland, this drastic rearrangement of the settlement pattern took place only after the establishment of the Piast castles in the tenth century.¹²⁵ The end result of the rearrangement appears to be quite an archaic model of territorial organization typical for early medieval societies standing on the point of establishing statehood. The new settlement pattern is characterized by the concentration of large fortified agglomerations with a densely populated hinterland into an area which may be considered the core of the early “states”.

The growth of the population and the whole agglomeration from the early Great Moravian period greatly influenced the ecosystem around it. The explosion of building activity must have had a great impact on the condition of the surrounding woods which, judging from the pollen analysis were of a mixed type, with a predominance of oak trees.¹²⁶ Paleobotanical studies have indeed confirmed the existence of forests of oak and elm or oak and hornbeam in the hinterland of Pohansko.¹²⁷ Most trees felled during the ninth century were oaks, which were used for three quarters of all wooden constructions.¹²⁸ A relatively low number of bones of wild animals in the faunal assemblages (2 percent at the Magnate Court, 0.5 percent in the Southern Suburb),¹²⁹ which is in contrast to the situation on other contemporary sites (8.7 percent at Rubín near Podbořany, 14 percent at Hradsko)¹³⁰ or in the earlier phases of occupation (the early Slav settlement II: 4.5 percent bones of wild animals)¹³¹ strongly suggests that the wild animals in the surrounding woods had been hunted to virtual extinction. Also, intensive fishing led to great pressure on the river ecosystem and the local fish population. The ichthyoarchaeological study of fish bones and scales from early medieval contexts at Pohansko¹³² shows that in the early Middle Ages people ate a broad variety of fish species (up to 20 species) in various size categories (including clearly undersized individuals, such as pikes of only 20 cm or more in length). The absence of bones from large fish in the finds could indicate, among other things, their absence due to over-fishing.

¹²⁴ For more on the subject see Kurnatowska (1999), p. 55.

¹²⁵ Moździoch (1999), pp. 41–43.

¹²⁶ Svobodová (1993), pp. 94–96, p. 98.

¹²⁷ Opravil (1999), p. 175.

¹²⁸ Opravil (2000a), pp. 167–168.

¹²⁹ Kratochvíl (1992), p. 10; Dostál (1982), přehled III.

¹³⁰ Kyselý (2000), p. 157.

¹³¹ Dostál (1982b), p. 51.

¹³² Galík, Macháček (2003).

Undoubtedly, important system inputs and output must have also been associated with military actions of an expansive and defensive nature. Many of the 65 military events recorded for early medieval Moravia occurred between 871 and 894,¹³³ i.e. during the late Great Moravian stage. However, the main Frankish assaults on central Moravia took place earlier, in the 850s and 860s.¹³⁴

Contacts with the system surroundings can also be proven by objects of foreign origin, which can serve as evidence of trading activities or political bonds cemented by valuable gifts. The relationships with the nearby locations with the characteristics of a centre were significant as well. Within an area around Pohansko with a 30 km radius there are three such fortified agglomerations. The political centre of early medieval Moravia is traditionally believed to have been located in Mikulčice,¹³⁵ at a distance of a mere 16 km.

In the post-Great Moravian period we mainly record system inputs with a negative impact on the working of the system. First and foremost, it was the military actions of the Magyars and other nomads who operated in the region of Central Europe from the end of the 9th century and possibly even earlier.¹³⁶ It is presumed that they raided Pohansko with powerful attacks.¹³⁷ This external intervention must have had a fatal impact on the behaviour of the whole system. The climatic changes at the end of the Great Moravian period indicated by the relocation of sediments through flooding, identified under the collapsed Great Moravian rampart in Mikulčice could have been equally influential. The flood plain where the most important early Moravian centres including Pohansko had been built began to experience, at that time, irregular floods and a shifting of the river channel.¹³⁸ While geologists assume that intensive depositing of flood sediments started in Pohansko in the 10th century, and intensified during the 12th century,¹³⁹ a number of small-scale natural catastrophes could have occurred in the flood plain as early as the post-Great Moravian stage, disasters to which the settlement in the plain covered by floodplain

¹³³ Ruttkay, A. (2002b), pp. 107–108.

¹³⁴ Třeštík (2001b), pp. 164–200.

¹³⁵ E.g. Poulík (1975), pp. 153–159.

¹³⁶ Schulze-Dörrlamm (1988).

¹³⁷ E.g. Schulze-Dörrlamm (2002), p. 117; Kouřil (2003), p. 125.

¹³⁸ Poláček (1999), p. 230.

¹³⁹ Havlíček (2001), p. 72.

forest had not been exposed before.¹⁴⁰ The whole system must have faced a great deal of external pressure.

One of the results of that pressure was a sudden drop in the number of inhabitants at Pohansko. Some of them could have been killed during military encounters, some probably left the unstable region of southern Moravia on the edge of the Hungarian domain, and perhaps moved elsewhere. In Moravia the new centre of the population in the tenth century was in Olomouc, some 100 km north of Pohansko which, in the first half of the 10th century, was gaining in importance.¹⁴¹ The close relationship of the Olomouc agglomeration with Pohansko and Mikulčice is supported by pottery of the Mikulčice type found in Olomouc—Předhradí.¹⁴² The Great Moravian assemblages excavated there contained a surprisingly large quantity (71.2 percent) of fragments of vessels with grooved, calix-shaped rims well-known from Mikulčice and Pohansko. The pottery of the Mikulčice type uncovered in Olomouc forms an remote pocket in the north Moravian region which is isolated from the Mikulčice “pottery zone” by an extensive district characterized by ceramics of a different type (e.g. the Morava basin ceramic zone).¹⁴³ The Olomouc pottery is distinguished from that of the surrounding countryside by its high quality. J. Bláha¹⁴⁴ even suggests cultural and political relationships between Olomouc and Southern Moravia, which were established towards the end of the Great Moravian period. Admittedly, the inhabitants of Pohansko and Mikulčice, who used this typical ware in the late Great Moravian period, could have moved much farther as is shown by finds of the so-called Litoměřice type clustering within a small area in northwestern Bohemia. Those are vessels with an egg- or a barrel-shaped body, horizontally truncated with a grooved rim and decoration in the form of two horizontal combed bands and a combed wave in between.¹⁴⁵ Judging from those attributes, this pottery is very similar to Dostál’s Group 4 or Macháček’s Group B from Pohansko,¹⁴⁶ to Klanica’s Type 3

¹⁴⁰ Opravil (1999), pp. 177–178.

¹⁴¹ Měřinský (1986), p. 49; Kouřil (2003), p. 134.

¹⁴² E.g. Bláha (1980), pp. 30–34; Macháček (2001c), pp. 248–250.

¹⁴³ Macháček (2001c), fig. 186.

¹⁴⁴ Bláha (1980), p. 36.

¹⁴⁵ Zápotocký (1965), p. 252.

¹⁴⁶ Macháček (2001c), p. 138, obr. 100.

from Mikulčice,¹⁴⁷ as well as the finds from Olomouc, which have been mentioned above. Its appearance in the Litoměřice district suggests a transfer of the population from the south-east.¹⁴⁸

Tab. 109. Břeclav-Pohansko. System inputs and outputs.

<i>Relative-chronological stage</i>	<i>→Inputs—Outputs←</i>
Post Great Moravian (Late Hillfort Period)	→Magyar invasion →climate and water regime change in the floodplain ←mass departure of part of the population (?)
Late Great Moravian	←pressure on the surrounding ecosystem ←→military events ←→trade and political contacts ←→relations with nearby centres (Mikulčice) →further population transfers (?)
Early Great Moravian	→arrival of new inhabitants (?) →Christianization →political and cultural influence of the Carolingian Empire →formation of the agricultural hinterlands
Pre-Great Moravian (Early Slavic and Early Hillfort period)	→arrival of the Slavs in Central Europe

5.9 THE MULTIPLIER EFFECT IN ACTION AND THE INTERACTION BETWEEN THE SUBSYSTEMS

When synchronizing and comparing all the subsystems, it appears that their inner development evolved in a very similar rhythm (Tab. 110). In the pre-Great Moravian period the whole system was evidently in a state of long-term, very stable balance. Over a period of 200 to 250

¹⁴⁷ Klanica (1970), pp. 103–114; Macháček (2001c), pp. 224–225; Poláček (1995), pp. 137–148.

¹⁴⁸ Bubeník, Meduna (1994), p. 186.

years there occurred virtually no significant changes in the system. It was perfectly adapted to the environment surrounding it. The population size may have been homeostatically regulated, whether by birth control, enforced sexual abstinence or removal of unwanted children. The pre-Great Moravian community at Pohansko must have also been very conservative in its nurturing habits, as was the case in many other pre-industrial societies. Nor did the production technologies change much during this period, for they were at a very low level of development. The social structures and religion were strictly regulated by tradition and behavioural patterns handed down between generations. The whole culture had a natural tendency to stay in an unmodified state maintained in balance by negative feedbacks. Any aberrations within the system were eliminated.¹⁴⁹ The only change of some significance appears to have been the building of a fairly significant pagan sanctuary, which emerged probably at the end of the pre-Great Moravian stage. It is difficult to establish whether this “innovation” in the projective subsystem was dampened by the homeostatic control systems or whether it had already contributed to the substantial transformation of the whole system.

The cultural homeostasis was thrown off balance in the early Great Moravian period when radical changes and exponential growth occurred in every subsystem. A transformation of a single subsystem led, as a result of their mutual interaction (mutual implies positive feedback), to changes in the other interlinked systems. A multiplier effect was set into action.¹⁵⁰ Interaction between the different areas of human activities led to permanent growth. A new civilization, traditionally called Great Moravia, was born. The emergence of an extensive agglomeration in the 9th century at Pohansko was clearly a consequence of those cultural processes. Analogical processes appeared at different times in different places throughout the world.¹⁵¹

The problem of the primary cause which triggered off the dramatic growth of the system is extremely complicated and it is a “chicken or egg” type of question. The prime mover could have been either an important innovation inside one of the subsystems (such as the establishment of the pre-Christian cult centre), or a disruption due to exter-

¹⁴⁹ Renfrew (1972), pp. 485–487.

¹⁵⁰ *Ibidem*, p. 487.

¹⁵¹ *Ibidem*, p. 500.

nal inputs (such as the Frankish encroachment initiating a “cultural shock” of the Slav elites and the arrival of new people). Although a full understanding of the causal relationships from the available archaeological records has so far been impossible, the result of the whole process is quite obvious.

Each system tends towards inner balance ensured by the action of negative feedbacks which dampen both the impact of the innovative changes inside the system, and the external shocks.¹⁵² However, in the Great Moravian period the cultural system at Pohansko never reached that state. After an initial growth the essential transformations of the various subsystems did not stop in the late Great Moravian period: the population kept growing, craft production became professionalized, big estate land ownership developed, etc. In addition, the system also had many outputs which had a great impact on its surroundings. A highly complex social structure developed. Although the functioning of the system must have been very demanding in terms of energy, no mechanisms were created that would effectively channel the energy flows (e.g. a working market based on a developed monetary system;¹⁵³ see Chap. 6.4). The system entered into a short-term, very unstable state.

The system's existence was terminated by fatal turbulences probably due to external inputs (Hungarian invasions, change of the water regime in the flood plain, etc.). In the post-Great Moravian stage the whole system started to collapse in the same way as the Aegean civilization in the 12th century BC or as other cultural systems in various periods and at various places. *“The palaces were abandoned, the organization of the distribution collapsed, military protection disappeared and the wide range of luxurious products made by specialized craftsmen ceased to appear”*.¹⁵⁴ The majority of the inhabitants left or were killed in battles. The destructive action of the positive feedback—set fully on course—led not only to the extinction of the agglomeration at Pohansko, but in the broad context to the fall of the whole Great Moravian civilization.

¹⁵² Ibidem, pp. 24–25, pp. 485–487.

¹⁵³ Hodges (1982), p. 187.

¹⁵⁴ Renfrew (1972), p. 502.

Tab. 110. Břeclav-Pohansko. The early medieval centre as a system.

Relative-chronological stage	Dating/duration	Population and settlement subsystem	Subsistence subsystem	Craft technology subsystem	Social subsystem	Projective and symbolic subsystem	Trade and communication subsystem	Inputs—outputs	State of the system
Post-Great Moravian (Late Hill-fort period)	9th/ 10th c.– 10th c. (max. 50 years)	sharp population decrease	?	craftsmanship level regression, partial production continuity	fortification in ruins, Magnate Court palace extinct, war events?, erosion of the social structure	pagan reaction, retreat of Christianity, agrarian solar cults	rare finds from nomadic environment	→ Magyar invasion → climate and water regime change in the flood-plain ← mass departure of part of the population (?)	multipplier effect of positive feedbacks; COLLAPSE of the system
Late Great Moravian	9th c.–beg. 10th c. (882 AD) (max. 50 years)	maximum population in a fortified settlement and its suburbs	distribution of foodstuffs from the surrounding agricultural settlements, unequal access to food sources, intensive use of alternative sources of food (fishing), growing vine and cultivated fruit species, introduction of new	professionalization of craft production, using sophisticated technologies, stone architecture, production organized by a central authority	existence of vast fortification, private landholding and extensive landed property, existence of complex social hierarchy (craftsmen, members of the large “state” retinue, elite warriors,	narthex, Byzantine mission (?), script	numerous finds of exclusive objects of foreign origin (weapons and equestrian equipment, luxurious fabrics, jewellery), intensive import of raw materials and objects	← pressure on the surrounding ecosystem ←→military events ←→ trade and political contacts ←→ relations with nearby centres (Mikulčice) → further population transfers (?)	short-term UNSTABLE state of the system; homeostatic equilibrium not reached

	technologies (asymmetrical ploughshare)	clergy, clerks, ruler(?)	for everyday use	
Early Great Moravian	9th c. (max. 50 years)	sharp population increase	rapid devel- opment of specialized crafts	Christian- ization, beginning of inhumation rite, build- ing of the church, art
		origin of a redistribu- tion centre and a residential settlement (<i>palatium</i>), establish- ment of clear hier- archies of wealth in society, elite warriors	→ arrival of new inhabit- ants (?) → Christian- ization → political and cultural influence of the Carolin- gian Empire ← formation of the agricul- tural hinter- lands	multiplier effect of positive feedbacks; exponential GROWTH of the system
Pre-Great Moravian (Early Slavic and Early Hillfort) period	6th–8th c. AD (min. 200 years)	small population in an open settlement	prevalent technologi- cally unde- manding domestic production	→ arrival of the Slavs in Central Europe
		little dif- ferentiated society, a clan with extended- family ele- ments	infrequent finds of rare objects of foreign ori- gin, travel- ling artisans (?)	long-term state of homeostatic EQUILIB- RIUM of the system

CHAPTER SIX

THE EARLY MEDIEVAL CENTRE MODELS AND INTERPRETATION

The practical function, social significance, and symbolic meaning or the original name of the structures and patterns contained in the archaeological records cannot be explained from the sources themselves. This is because they consist of dead material objects which are halfway between a past social world and a return to a natural state. Although they still possess information on the human past under study, they are simultaneously characterized by a high degree of entropy. They cannot be “read” using a simple method as is attempted, for example, by post-processual archaeologists.¹ While with the assistance of the systems theory, the processes and relationships have been successfully described, which occurred inside the very complex socio-economic system of early medieval Pohansko, its interpretation requires models derived from academic disciplines, which employ dynamic means. Those are capable of expressing causal relationships in categories of the living culture, which can in fact be given their original names. One of the most important disciplines in this respect is history, which processes written resources, and ethnography, which studies culture in real time. During the interpretation we compare the systems of archaeological structures with models derived from a living culture trying to arrive at a new theory of the archaeological context (set of archaeological records) under examination. Most of the time it is necessary that several alternative models are applied in order to determine which of those best matches the archaeological structures and systems.² We will proceed in the same way in creating the models required for the interpretation of archaeological structures identified at Pohansko. The system defined above will be compared with three models designated as *munitio*, *palatium* and *emporium*.

¹ Neustupný (1995); Neustupný (1998).

² Neustupný (1995).

6.1 THE MUNITIO MODEL

The first attempts at interpretation described Pohansko as a Great Moravian fortress and one of the fortified settlements with an essential role in the defence and expansion of early medieval Great Moravia³ (see Chap. 3.3).

The existence of extensive fortifications in early medieval Moravia is clearly confirmed by written reports. The so-called Bavarian Geographer (*Descriptio civitatum et regionum ad septentrionalem plagam Danubii*), a work written shortly after 843 by an unknown author, probably Grimoald, the abbot of Weissenburg,⁴ mentions two groups of Moravians⁵ with eleven and thirty “*civitates*” respectively.⁶ The term *civitas* was very likely applied to describe real castles instead of just some organizational-political districts, as is sometimes believed.⁷ In connection with Moravia, the Annals of Fulda (*Annales Fuldenses*) cite even other locations as *civitas Dowina*, *ineffabilis Rastizi munitio* or *urbs antiqua Rastizi*.⁸ Based on an analysis of the settlement terminology in Carolingian sources it is obvious that the terms are always used to describe fortified places. Those were centres of religious and secular administration, mostly of ancient origin or tribal centres in territories with no Roman roots (*civitas*, *urbs*), or any other fortified sites (*munitio*).⁹

The reasons which forced the Slavs, and not just those of Moravia, to build fortifications, are presently still unclear. The thesis according to which the rise of hillforts was mainly associated with internal social developments,¹⁰ was elaborated primarily by archaeologists working in East Germany under the Communist regime. In the Slavic territories to the east of the Elbe River, the existence of fortified refuges (*Fluchtburgen*) for the predominantly peasant population has been posited for the seventh century at the earliest. At such an early date, the building of hillforts may have been initiated by tribal chiefs or tribal noble-

³ Kalousek (1960a); Kalousek (1960b).

⁴ Třeštík (2001b), 132.

⁵ Marharii and Merehani; possibly inhabitants of the Moravia and Nitra regions of early medieval Great Moravia; see Třeštík (2001b), pp. 132–135.

⁶ Havlík (1978), pp. 69–70.

⁷ E.g. Třeštík (2001b), p. 307; Henning (2002), pp. 135–136.

⁸ Staňa (1985), p. 157.

⁹ Bláhová (1986), pp. 75–76.

¹⁰ E.g. Štěpánek (1965), p. 202.

men, who established their courts directly in the strongholds or in their vicinity. Functionally, the strongholds could have been agricultural settlements, the residences of a higher social stratum, assembly places, and places of cultic significance. In the continuing process of social evolution, accompanied by the deepening of "class differences" the upper social layer is said to have isolated itself from the rural environment and, beginning with the eighth century, to have built separate seats of power, which had a residential function, but were also means for displaying power, often ostentatiously. Fortified baileys with evidence of craft production appeared in the ninth century.¹¹ The intrinsic weakness of this interpretation theory has been revealed recently by the means of dendro-dates obtained for strongholds in Lower Lusatia.¹² The dates showed that the idea of Slavic strongholds on the Elbe appearing as early as the seventh or even sixth century needed to be abandoned. Most strongholds came into existence during the period between the late ninth and the first third of the tenth century. The building of strongholds, which could not have been therefore used continuously as seats of power for the local nobility, took place in cycles, over particular periods of political events, such as the Ottonian military expansion into the Slavic territories. A more permanent presence of political and economic power can be expected in only a few central castles. Based on the new dendro-dates, J. Henning¹³ has advanced the idea that the Slavs had adopted the concept of hillfort from the West. For the first time, shortly after 800, they appeared in the region under discussion east of the Lower Elbe in the territory of the Obodrites who, as the "foederati" of the empire, fortified themselves against the Danes and their Veletian neighbours. Soon afterwards, strongholds were built in other borderlands as well, in which they formed buffer zones between the Slavs and the Frankish or German empire striving to bring the territories to the east into tributary dependence.¹⁴

Even in the lands of the Germanic tribes, fortifications appeared as a result of external pressure. The earliest ones are those of southwestern Germany, which are believed to have been erected as a result of direct confrontations with the neighbouring Romans. The so-called

¹¹ Herrmann, Coblenz (1985), pp. 187–189, p. 210.

¹² Henning (2002), pp. 134–139.

¹³ Ibidem.

¹⁴ Ibidem, p. 143.

Alemannic hillforts prematurely vanished during the Frankish expansion. The Franks themselves became acquainted with the construction of fortifications in the Roman lands on which they settled. The new hillforts were gradually transformed into their centres of political power. Later, more hillforts were also built by other Germanic tribes in the lands to the east from the river Rhine. This was by no means a continuous process, but was instead closely associated with the military activity during the Frankish expansion. Fort building reached its climax during the Carolingian period, when the territories east of the Rhine were brought under Frankish domination and the Franks consolidated their supremacy. The result of their colonization endeavours was the founding of border fortresses and whole defensive systems, administrative, cult and military centres, as well as fortified seats of religious and lay feudal lords.¹⁵

A similar picture emerges from the examination of the history of fortifications in ninth-century Moravia. Historical sources suggest that the interaction with neighbours and the inner development were to a great extent based on the power of the military. The cult of military power, heroism and worship of weaponry is confirmed by archaeological and anthropological finds, which demonstrate the importance attributed to professional warriors and their high-quality weapons in society.¹⁶ In this respect, the fortified Moravian centres are no exception.¹⁷ This is indeed the background against which one needs to understand the emergence of the massive rampart at Pohansko, so far the largest fortification of its kind in early medieval Moravia.¹⁸ The construction of the 2 km-long fortification must have been a considerable effort of mobilizing the labour force. Moreover, the sand- and limestone required for the facing stone apron were brought to the flood plain from afar. Geological and petrological studies showed that the building material came from the southwestern slopes of the White Carpathians. The nearest quarries are at a distance of about 25 km from Pohansko, as the crow flies,¹⁹ but the stone must have moved along much more winding routes, mainly by water.

¹⁵ Brachmann (1993), pp. 207–210.

¹⁶ Ruttkay, A. (2002b), p. 107; Třeštík (2001b), pp. 109–112, p. 127, pp. 163–166, pp. 175–178, pp. 186–200.

¹⁷ E.g. Válka (1991), p. 24.

¹⁸ Procházka (1990), Tab. 1–Tab. 2; Macháček (2001d), p. 283, Abb. 6.

¹⁹ Štelcl (1971), pp. 5–9, pp. 12–13.

The defense was not simply passive, in the form of a fortification, but also active, as troops were concentrated in the vicinity of the stronghold. Evidence of a permanent presence of a large group of people who were involved in neither agriculture nor crafts originates mainly from the Southern Suburb²⁰ (see Chap. 4.3.5). Most conspicuous finds from that area are weapons and horse gear (stirrups, bits and spurs) suggesting that at least some of the local inhabitants were professional warriors, some of them on horseback. The identification of this group of people as a distinctly military class is based on finds of identical gear, such as stirrups of the Balladoole type over a large area from Britain to France and as far as Eastern Prussia and the Carpathian Basin.²¹

Indeed, the phenomenon observed in the Southern Suburb at Pohansko is not unique. In fact, it brings to mind as a good parallel the conditions in early medieval Meissen documented both in written and archaeological records.²² The fort of the German kings was built there in 929 as an advanced position within the tribal territory of the Slavic Daleminzi. Some time later a bishopric was established in Meissen, and the fort became seat of a margrave. As a strategic point it was a frequent target of military campaigns. For a short while, it was occupied by Duke Boleslav II of Bohemia, later by others as well. The layout of the fort is known from reports of events taking place in 1015, when the Polish duke Boleslaw Chrobry attempted to capture Meissen. At that time, the *suburbium* was apparently inhabited by *vethenici* and their families. First mentioned in 1002, the *vethenici* were warriors of lower social status who fought on horseback. They had a considerable political influence in Meissen given their role in the defense of the fort. When Boleslaw attacked Meissen in 1015, the *vethenici* abandoned the *suburbium* and withdrew with their families to the fortified acropolis of the site, which they managed to keep thanks to a concurrent flooding of the Elbe.

Pohansko, where the military defence may have well been organized in a manner similar to that of Meissen, was of a position of extraordinary strategic importance for the Moravians. Fortifications at river confluences, which were the key points of the communication net-

²⁰ Vignatiová (1980); Vignatiová (1992).

²¹ Schulze-Dörrlamm (1988), pp. 425–429, Liste 25.

²² Lübke (2000); Schmid-Hecklau (2000).

work, were strategically the most significant for the defence against the advancing enemy. This is in fact precisely how the Annals of Fulda describe the fighting near Dowina, which was probably located at the confluence of the Danube and the Morava rivers.²³ Another key point of the Moravian defence was located only 60 km to the north, at the confluence of the Morava and the Dyje rivers. Any enemy approaching from the southwest on the right bank of the Morava had to cross the river at this point. It was there, at the main crossing over the Morava opening access to the central regions of Moravia, that Pohansko was sited. It was most likely one of the largest Moravian forts known even from historical reports.²⁴

6.2 THE PALATIUM MODEL

The centre of the early medieval agglomeration at Pohansko is undoubtedly the settlement structure identified within the area of the Magnate Court.²⁵ The results of its excavation informed some of the most influential interpretations of the site as a whole. Such interpretations point to analogies with Carolingian and Ottonian buildings of a residential-cum-representative nature.²⁶ Reference has been made to structural parallels with the so-called *palatia*—centres of the *Pfalzen* from the Carolingian and Ottonian age, primarily because of the position and arrangement of the constituent buildings. A *palatium* was indeed a cluster of buildings, which typically included the royal residence (*caminata*), a hall (*aula*), and a chapel. *Palatia* had great symbolic and practical significance.²⁷ The *palatium* was built on the estate within a relatively large are, which has a separate enclosure or fortification. In Aachen, the palatial area was 350 × 350 m, in Nimwegen 115 × 100 m, in Werla 150 × 140 m, in Tilleda 100 × 100 m, and in Ingelheim 99.5 × 91.5 m. By comparison, the Magnate Court in Pohansko was 64 × 70 m in the early, and 80 × 100 m in the late phase.

That the Magante Court at Pohansko may have indeed been a *palatium* results from striking analogies with the building structures of the

²³ Třeštík (2001b), pp. 186–187; Wolfram (1987), p. 286; Štefaničová (2000), pp. 327–328.

²⁴ E.g. Bowlus (1995), p. 161; Wolfram (1987), p. 362.

²⁵ Dostál (1975).

²⁶ E.g. Dostál (1975); Dostál (1988); Macháček (2001d); Třeštík (2001b), p. 36.

²⁷ Binding (1996), p. 64; Renoux (2001), p. 37.

earlier phases of the Ottonian *Pfalzen* in Tilleda and Grone, as well as with settlements in Elten²⁸ and Gebesee,²⁹ which have also been interpreted as palaces. The most important element of analogy is the spatial arrangement of the individual buildings of the *palatium* (Fig. 138). The church or chapel, which in Carolingian or Ottonian *Pfalzen*, as well as in Pohansko, is commonly placed near the main entrance,³⁰ is adjoined by the royal residential buildings (*caminata*, *camera*, *casa*, *domus*), which share similar characteristics in all sites mentioned above. Those formed isolated clusters of adjacent houses of fairly small size, which were lined up in a row behind the chapel. Their proximity to the church is of crucial importance. In some *Pfalzen*, the palace is connected to the chapel by means of a corridor.³¹

Another important component of the *Pfalzen* is the hall (*aula*), which is primarily used for assemblies on important events (such as the imperial Diets). The large assembly hall is located on the opposite side of the *palatium* from the church and the residential buildings, a feature easily recognizable on the plan of the Magnate Court at Pohansko, as well as on that of the *palatia* in Tilleda, Grone, and Gebesee. As in many other *Pfalzen*, there is a large, open area between the two groups of buildings. The excavations of palatial sites in Germany showed that relatively small assembly halls could be about 9 m wide and more than 20 m long.³² This matches the size of the hall at the Magnate Court in Pohansko during its latest building phase.³³

The overall shape of the *palatium* at Pohansko, delineated by a symmetrical, almost square palisade, is in sharp contrast to the irregularity of the Ottonian *Pfalzen* at Tilleda, Werla, or Grone, all sites on which the general plan appears to have been dictated by the specific terrain on which the palace was built—a hill, a spur, or a terrace. However, the square shape of the palisade at Pohansko is nothing unusual and may have roots in the traditions of late antiquity.³⁴ A similar plan is found, for example, in Charlemagne's *Pfalz* in Ingelheim,³⁵ which consists of a rectangle almost identical in size (99.5 × 91.5 m) with the later palisade

²⁸ Binding (1996).

²⁹ Donat (1996a), pp. 111–126.

³⁰ Binding (1996), p. 65.

³¹ Ibidem.

³² Ibidem, p. 59, p. 64.

³³ Macháček (2001d), p. 281.

³⁴ Dostál (1988a), p. 284.

³⁵ Binding (1996), pp. 99–114.

at Pohansko, as well as a semi-circle with towers (the so-called *exedra*), for which there is no parallel at Pohansko. The comparison thus shows that the size of the *palatium* in Pohansko was sufficient to accommodate the court of a high-ranking individual or supreme ruler.

The *Pfalz* consisted of multiple elements, which could have been more or less linked together to create a spatial entity (Fig. 139). In addition to the *palatium* they included mainly the manor and the fortification.³⁶

The basic element and the starting point of the *Pfalz* in the Carolingian period was the manor also designated as the *curtis* or *villa*³⁷ in sources. According to Günther Binding,³⁸ “*die curtis oder villa... war ein landwirtschaftlicher Eigenbetrieb und zugleich auch Haupthof des umliegenden Königsgutes (fiscus) als Sammelstelle für die Abgaben der Nebenhöfe und den diesen zugeordnete zahlreichen Bauernstellen, den Hufen.*” The manor was the centre of a more extensive estate.³⁹ The manorial system developed in the early Middle Ages as a synthesis of the late antiquity colonate with its economic, and legal, relationships, and Germanic traditions, according to which the unfree were settled in the farmsteads of their lords, but there arose no specific legal relationship between them from this act.⁴⁰ In the early Middle Ages the situation changed and a legal relationship (see above) came into effect between the tenant and his lord. The tenants could cultivate a part of the lord’s estate for themselves in exchange for services, deliveries of goods and payments to the lord.⁴¹ The manorial system spread from the areas of strong Roman tradition and became established throughout the Frankish empire by the ongoing “Frankification”. The greatest estates were in the hands of the ruler who inherited the Roman *fiscus* and acquired new properties by expansion to the east to the Alemannic, Bavarian, Thuringian and Saxon regions. However his royal estates were distributed throughout the empire rather unevenly. Apart from the ruler, the other important owners of great estates were ecclesiastical institutions and the aristocracy who could have come into the

³⁶ Gauert (1965), p. 4.

³⁷ Gauert (1965), p. 2; Binding (1996), p. 60.

³⁸ Binding (1996), p. 46.

³⁹ Gauert (1965), p. 4.

⁴⁰ Schulze (2004a), pp. 99–106.

⁴¹ Verhulst (2002), p. 33.

possession for their services to the ruler in the colonization of new territories, etc.⁴²

The manor (Villikation, Fronhof) was the most widespread form of the great estate in the early Middle Ages. This particular form is well suited to an economic system with a less developed market economy and limited currency circulation, founded primarily on agricultural production.⁴³ In the centre of the estate was the manor house (Fronhof, curtis) with dependant peasants (mansii). The manor also incorporated the fields, meadows and gardens, the cultivation of which was provided for directly by the great estate owner or his representative (villicus, maior), either by his own unfree servants or slaves (mancipia, mansii serviles) or by the tenants from the dependent farmsteads, who were compelled to render to the landlord's manor both agricultural products and services.

This form of the great estate emerged during the 7th and 8th century and developed in the central parts of the Carolingian empire. It was particularly typical for royal estates. From the 11th century it was declining in importance with the development of market economy and intensified money circulation.⁴⁴ We can imagine the size of such a great estate using the example of a west Frankish *Pfalz* in Attigny in the Ardennes, which incorporated at least five dependent farmsteads (*villae*) and 3,500 hectares of land.⁴⁵

In addition to agricultural land under cultivation the royal manors (*curtes*) and *Pfalzen* had control over forests which constituted a very important part of the fisc.⁴⁶ From the Frankish and early German written sources we know that the royal forest was under the administration of a special official—“*forestarius*”, and apart from hunting it provided the court with fish, timber, and grazing grounds for pigs and cattle.⁴⁷

In important great estates there is evidence of settled craftsmen and links to long-distance trade. The personnel and craftsmen in the Carolingian *curtes* were mostly the unfree (*servi*), often women (*serviles feminae*), dependent upon their lord.⁴⁸ This is recorded for example

⁴² Schulze (2004a), pp. 113–114, pp. 126–140.

⁴³ Ibidem, p. 117, pp. 123–126.

⁴⁴ Rösener (2002), pp. 1694–1695; Schulze (2004a), pp. 123–124.

⁴⁵ Renoux (2001), p. 37.

⁴⁶ Binding (1996), p. 29.

⁴⁷ Ibidem, p. 51.

⁴⁸ Dette (1996), p. 72.

in the royal manor in Gernsheim.⁴⁹ By their production they provided for the needs of both the owners of the great estates and, when necessary, of the tenants belonging to the manor. They did not produce for the market and had no monetary reward from their labour. However, apart from the dependent craftsmen there was in the early Middle Ages a group of free producers.⁵⁰

From the research by German archaeologists it is obvious that the dwellings of the servants from the palace and the workshops were situated in the baileys.⁵¹ The separation of the *palatium* and the manor, which were together protected by fortification, is considered an Ottonian innovation.⁵² At that time extensive fortified baileys with evidence of intensive craft production were a regular part of *Pfalzen* and *curtes*. The sites where the craftsmen's quarters were confirmed by excavation include Tilleda, Helfta, Mühlhausen and Gebesee.⁵³ In the earlier Carolingian sites the situation need not have been always different, as is shown, for example, by data from the *Pfalz* in Werla with origins dating back to the 9th century, where there is a large fortified bailey with evidence of craft production. This is further confirmed by the list of crafts in the *Capitulare de villis*.⁵⁴ However, the formulation of clear conclusions has so far been prevented by the poor state of archaeological research into this field. In general, the Carolingian *Pfalz* is viewed as a manor, while the Ottonian *Pfalz* is taken to be a castle.⁵⁵

The fortification of the *Pfalzen* began to evolve as late as the 9th century. Before that, even the royal *curtes* were only enclosed by a palisade just as any other manor.⁵⁶ From the 9th century *Pfalzen* begin to be described in written sources as *castra*,⁵⁷ with an emphasis on their military function. According to G. Binding, this can only mean "*daß jetzt der Komplex der Palastbauten, wahrscheinlich der Komplex von Hof und palatium, von einer Befestigung umgeben war.*"⁵⁸ Fortifications are archaeologically known from slightly later Ottonian *Pfalzen*. At

⁴⁹ Binding (1996), p. 42.

⁵⁰ Schulze (1998), pp. 265–266.

⁵¹ Gauert (1965), p. 4; Binding (1996), p. 67.

⁵² Gauert (1965), p. 39.

⁵³ Donat (1996b), pp. 123–124; Donat (1999); Grimm (1990).

⁵⁴ Binding (1996), p. 51, p. 171.

⁵⁵ Gauert (1965), pp. 42–43.

⁵⁶ Ibidem, p. 43, p. 54.

⁵⁷ Binding (1996), p. 25.

⁵⁸ Ibidem, p. 64.

first, from the beginning of the 10th century, the Ottonian *Pfalzen* at Werla, Tilleda, Grone or the princely castle of Elten were surrounded by earth-and-timber ramparts, possibly doubled by ditches.⁵⁹ According to G. Binding,⁶⁰ earth-and-timber fortifications are quite common and sufficient in the 10th century. The fortification protected both the bailey, often containing evidence of craft production and the *palatium* proper, which was in addition separately fortified.

It is obvious that Pohansko was partly created as an imitation of the *palatium* in the simpler Carolingian *Pfalz*, which so far has not been thoroughly investigated archaeologically. However, if there is a significant similarity between Pohansko and the later of the early Ottonian *Pfalzen* it must go back to a shared model. The process of adopting the structures and models from the late antiquity-Carolingian world, which could be termed “*imitatio imperii*”, is recorded in other territories around the Frankish empire as well. A typical example are the Slavic confederations in northern Germany which, between 780 and 840, had very close relationships with the empire. The Obodrite and Lutizian delegations regularly took part in the imperial assemblies in the most important *Pfalzen*. The fascination with imperial greatness and the glamour of the Frankish court culture could not remain without consequences.⁶¹ Excavations in Starigard/Oldenburg, the central fort of the Obodrites, revealed a complex of impressive wooden buildings, the models for which can be looked for, just as at Pohansko, in the Carolingian *Pfalzen*, and in the case of Oldenburg in Paderborn.⁶² Further evidence of massive Frankish influence in the building of the complexes of ostentatious residential buildings of the ruling class in the Slavic principalities, more or less dependant to the Frankish empire, is known for example from the central site of “Joseph’s principality” in Gars/Thunau. Explorations inside a massively fortified stronghold included a palatial compound with dimensions and characteristics very similar to the *palatium* in Pohansko.⁶³ Remains of a similar residence were identified in a complicated location in Pribina’s

⁵⁹ Ibidem, p. 163, p. 171, p. 175, p. 181, p. 186, p. 193.

⁶⁰ Ibidem, p. 190.

⁶¹ Gabriel (1986), p. 360.

⁶² Ibidem, pp. 360–362.

⁶³ Friesinger, H. (1992), pp. 61–66; Friesinger, I. (1992), pp. 67–72; Szameit (1995), pp. 274–282.

Mosaburg/Blatnograd near Zalavár⁶⁴ and in some sites in its surroundings, e.g. Zalasabar.⁶⁵

The interaction between early medieval Moravia and the East Frankish Empire is relatively well known from written resources. The close relationships between the ruling families are beyond any doubt. According to some historians, for example, Rostislav, assigned to the position of ruler of Great Moravia by the Franks, was brought up in Bavaria,⁶⁶ where he could have come in close contact with court culture and architecture.

The arrangement of the *Pfalz* (Fig. 139) was not transposed to Moravia completely. There is no evidence of the existence of a functioning manor, the foundation of which is the great estate settled by tenants, tied to the land owner by legal relationships and rendering him rent in the form of produce, services, or payments. It seems that the traditional society of early medieval Moravia had not reached a level of development that would enable it to accept such profound changes. Only the section of the Carolingian *Pfalz* related to the external representation of power was adopted. This imitation very likely reinforced the prestige of the builder of the *palatium* at Pohansko, but his economic needs could not have been satisfied. These were sustained rather by the control of long-distance trade and redistribution of prestigious artefacts in society or by the archaic tax based on the number of offspring which, in fact, was a willingly paid “tribute” by the people to the tribal chief.⁶⁷ The ruler’s further needs were ensured by the organization of craft production in a delimited area which he managed to secure for himself in the process of self-emancipation. At Pohansko it was demarcated by an earth-and-timber rampart and was characterized by a planned layout and parcelling of land (see Chap. 6.3).

6.3 THE EMPORIUM MODEL

A re-evaluation of the layout of the early medieval centre at Pohansko has shown that close parallels to its spatial arrangement may be found in settlements of merchants and craftsmen in the Frankish empire and

⁶⁴ Erdélyi (1986), p. 155.

⁶⁵ Müller (1995), pp. 91–100.

⁶⁶ Kučera (1986), pp. 71–72.

⁶⁷ Třeštík (1997), p. 293.

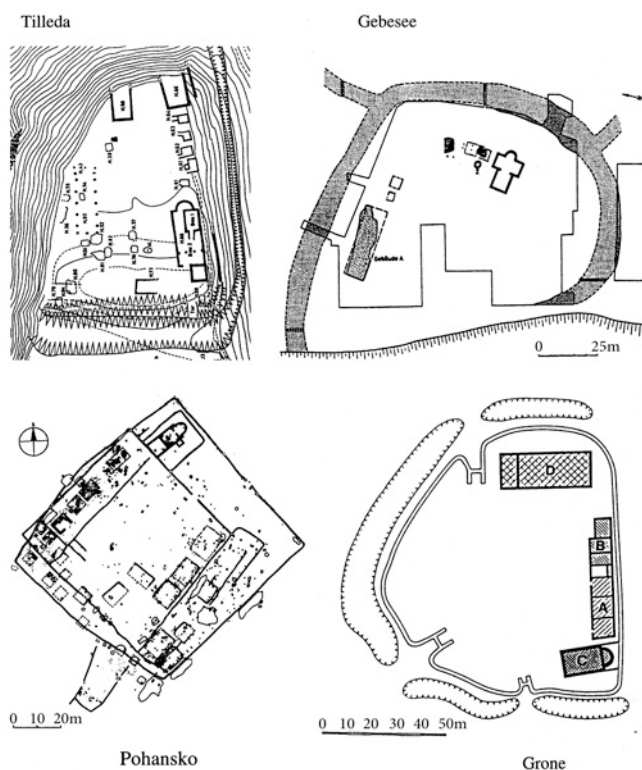


Fig. 138. Early Ottonian *Pfalzen* and the *palatium* at Pohansko near Břecław (identical scale).

the neighbouring territories. Specifically, the early medieval emporia, known from northwestern Europe, show quite similar characteristics to Pohansko, and therefore deserve more attention. They were important hubs of long-distance, dendritically organized exchange which, in a monopolistic fashion, controlled regional and international trade. In early medieval Europe and other archaic societies the trade was based on principles widely differing from those of the modern world.⁶⁸ It was not about the profit to be gained from the difference between the local prices of the traded goods but about obtaining prestigious artifacts, short-supply goods, and possibly a slave workforce. The driving force behind long-distance trade at that time was import rather than export. The emporia were the gateway communities through which the

⁶⁸ More details in Polanyi (1971); Dalton (1971), pp. 261–264.

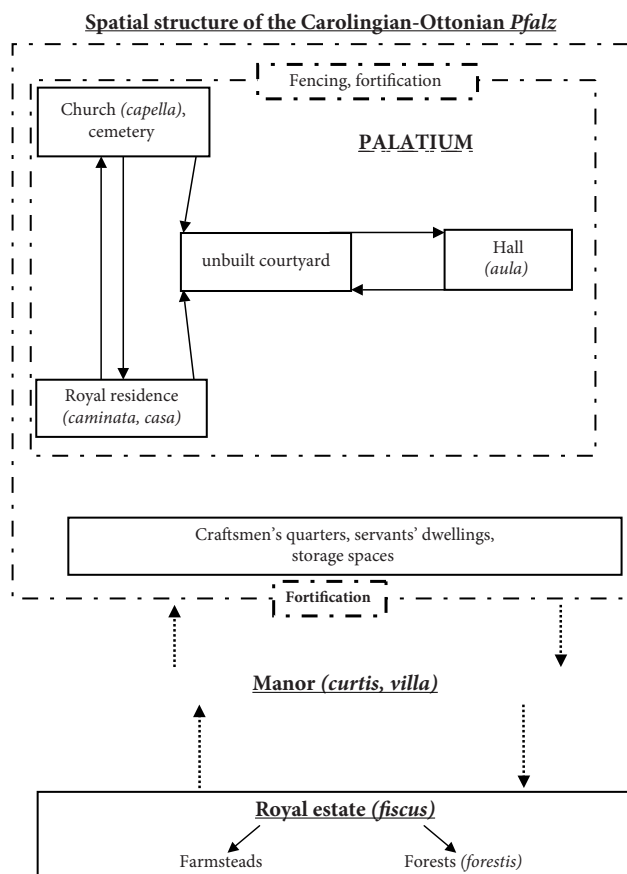


Fig. 139. Spatial and functional arrangement of the Carolingian-Ottonian Pfalz.

artifacts entered the country. The economic and geographical basis of the system, of which the emporia were a constituent part, was profoundly different from the system in the Roman Empire or from that in place during the high and late Middle Ages. It consisted neither of the Roman towns of conspicuous consumption, nor of the pre-capitalist markets of the late Middle Ages. Kinship-based relationships continued to play an important role and the division of labour was yet to develop. This particular category of settlements is associated with a turning point in the evolution of Europe where the ancient model is being replaced by the medieval model.⁶⁹

⁶⁹ Hodges (2000), pp. 69–70.

The best analogy to the arrangement and function of the settlement layout at Pohansko, identified within the fortification both in the Forest Nursery and elsewhere, appears in Hamwic, representing Anglo-Saxon emporia, and in Hedeby, the leading early urban community of the Viking world (see Chap. 4.5.3).

Hamwic is considered to have been the first English town.⁷⁰ It is located on a low spur between two rivers,⁷¹ which flow into a narrow 12 km long bay (Southampton Water). The Roman predecessor of Hamwic was called Clausentum and was situated about 1.4 km north-east of the early medieval site. It very likely served as the port of the town of Venta Belgarum (Winchester), 15 km away. Although in the Roman Clausentum we recover a few later finds, it is evident that early medieval occupation concentrated in a new settlement on the opposite side of the river and the ancient ruins were scarcely visited. From the archaeological viewpoint it is important that roughly from the year 1000 the site of the extinct early medieval Hamwic was covered mostly by orchards and pastures, which secured the preservation of the site up to the 19th century when it succumbed to the Victorian development boom, as a brick factory was opened there. Modern excavation of Hamwic did not start before 1946. From the beginning of the 1970s it has been the worksite of the Southampton Archaeological Research Committee which between 1977 to 1985 carried out the largest open excavation on the site—a rescue dig in a location called Six Dials with an excavated area covering 5,000 m².

Historians think that the founder of Hamwic might have been king Ine (688–726), who ruled over a remarkably long period. This assumption is in line with the radiocarbon and dendrochronological dating which indicates that the origins of the site can be dated back to somewhere at the beginning of the 8th century. In historical sources the site was referred to as being a *mercimonium* for the first time in 721. However, this comes from a later, although a relatively reliable, report of 778. In 840 an important battle with the Vikings took place near Hamwic. The last reports on the site appeared in written sources at the beginning of the 10th century. From the combination of all the dating

⁷⁰ Astill (1994), p. 37.

⁷¹ Andrews (1997); Brisbane (1988); Morton (1992).

methods it can be concluded that the site existed in the 8th and 9th century.

Hamwic developed very quickly as an administrative and trade centre, basically on virgin land. It cannot be ruled out though, that it was built around an earlier core. It could have been the royal *villa* of *Ham tun*, the existence of which is confirmed in the mid-7th century. The *villa regalis* is mentioned by written sources even in 840 but the interpretation of this important report is problematic. The majority of researchers hold that the *villa regalis* was found somewhere inside Hamwic, while others maintain it could have been a designation of the settlement as a whole. Presently we have no clear archaeological evidence. The idea that it existed as an independent part of the agglomeration was recently been supported by the discovery of a burial ground on the site of the Southampton Football Club, where graves with military weaponry and gold jewellery were uncovered.⁷² The excavations on the Six Dials site testify to the fast, but controlled, growth from a single earlier core. It is thought to have been on the bank or near the Church of the Virgin Mary.

Based on archaeological prospecting and fieldwork it was possible to successfully define the area taken up by early medieval Hamwic. A modest opinion founded on clear finds mentions about 42 ha. A more generous approach puts the estimated area to be 52 ha. Hamwic was twice as large as the neighbouring high medieval town of Southampton four times as big as the Roman Clausentum. It is one of the largest settlements of its time in north-west Europe. The settlement limits had been marked out very early and the enclosed area was then almost completely built up. Obviously, the builders had counted on Hamwic being of above-average size. The basic settlement structure in Hamwic is based on a network of streets and plots (see Chap. 4.5.3).

A ditch was detected in several locations. It is not quite clear whether it was always the remains of the same ditch or whether there were more ditches on the site. In the widest cross-section it measured 3.35 m and its greatest depth was 1.5 m. The ditch does not run around the whole settlement area; it had not been completed. It seems that it was to separate Hamwic from the surrounding fields, not just physically, but also on a symbolic level. It also seems that it was soon backfilled.

⁷² Hamerow (2002).

Both regular and irregular burial grounds are known from Hamwic. There were eleven regular burial grounds, where the deceased, probably Christians, were interred in coffins oriented in the west-east direction. The grave pits were rather shallow, around 0.6 m. The burial grounds were small, the largest one contained 81 identified individuals. In total we know only about 150 graves from Hamwic mostly with a small number of grave goods (necklace, knives, bronze clasp, only in later graves a weapon—sax, spear, glass vessel, etc. Researchers expect the existence of another great, central, as yet unexplored burial ground (see new excavations at the Southampton Football Club). In the settlement, there were also non-ceremonial burials in pits, mainly of children.

The excavations also show that a significant change occurred in the course of time, during which the early Christian burial grounds, originally situated outside the settlement, were abandoned and replaced by Christian graveyards located within the settlement. At the same time there was a substantial reduction in the grave goods. To a certain extent it might have been associated with the building of churches in the settlement (probably after 750 ?). The reality may have been rather more complicated as only one structure in Hamwic had been identified as a potential early medieval church.

The largest burial ground exhibited a high masculinity index. Men outnumbered women by 2:1. The situation is similar, for example, to Hedeby and Trelleborg, and is explained by the fact that the trade centres were inhabited predominantly by men—traders and craftsmen without families.

There is evidence of intensive craft production in Hamwic. The processing of iron is confirmed by numerous finds of smithing slag but it was smelted elsewhere. There were only two finds of features for processing iron in Six Dials. The most often produced objects were knives, nails, rivets and keys. Evidence of working with precious and non-ferrous metals (copper, lead, gilding) is provided by moulds, crucibles, and unfinished products. They are found throughout the area in small concentrations. Remains of processing bone and antlers come from a number of places. They were used to make combs, whorls, awls, needles, etc. Cloth making concentrated on processing wool. This is borne out by the relatively old age of the sheep recorded in the osteological material from Hamwic as well as by the finds of two combs for wool. Weaving is also proven by finds of whorls and annular loom weights

of baked clay. There is also evidence of processing leather, glass and wood.

The significance of Hamwic for trade is confirmed by its designation in written sources as *marcimonium*. Long-distance contacts can be inferred from the finds of Frisian and Low Country or Danish coins. Approximately 18% of pottery (by weight) was imported to Hamwic from the continent, mainly from northern France. There appears pottery from Badorf and Mayen and quernstones of volcanic rock, which probably came from the same area. Contacts with other regions in England are shown by pottery finds and coins. The imports also included pig iron, stone, silver, lead, and copper, although the quantity of imports brought in through long-distance trade was relatively low. The imported objects were dispersed throughout the settlement and were not restricted to any particular part. While poultry and pigs may have been kept there it seems that most of the slaughter animals were supplied from outside. There were coins distributed from Hamwic—sceattas of series H, which were minted there.⁷³

The importance of Hamwic should also be considered in the light of its relationship to Winchester which is 18 km away. The functions of the sites are complementary. While Hamwic was a commercial centre specializing in long-distance trade and intensive craft work, with a regular layout and relatively high density of population, at the same time (from the end of the 7th to the 9th century) Winchester was the seat of the royal and ecclesiastical power and a place where the members of the highest social class held their private property. Similar symbiotic towns are, for example, Fordwich and Canterbury in Kent or Ipswich and the East Anglia centres. The newly established commercial centres lie on the sea shore or on river banks and, in contrast to the ecclesiastical and royal centres, are not a continuation of the former Roman towns. Exemptions from this model are London and York, which grew up within the Roman walls and combine both functions.⁷⁴

If we concentrate on the early Viking proto-towns or settlements established under Viking influence, their basic characteristics can be summed up as follows:⁷⁵ The settlements are firmly connected with

⁷³ Andrews (1997); Brisbane (1988); Morton (1992).

⁷⁴ Biddle (1976), pp. 114–116, p. 120.

⁷⁵ Clarke, Ambrosiani (1991), pp. 128–172.

water routes, situated nearly always in the vicinity of the coast or a river. Water transport must have obviously been of primary importance for the urban economy of the Viking period. Another significant aspect associated with the location of the early medieval centres was the presence of an agrarian population in their surroundings supplying the centre with food, fuel, raw materials, feed, etc. While the relationship between the centre and its hinterland, especially the issue of their trade exchange, remains to be clarified, some recent studies point to more intensive contacts than had been expected before.⁷⁶

It is more and more obvious that in Scandinavia the urban and commercial functions were usually associated with the royal, and only occasionally aristocratic or later ecclesiastical, settlements. Apparently they constituted an important part of the royal wealth. Scandinavia has frequent examples of the founding of urban settlements on land, which was later shown by written sources to belong to the royal estate, such as Birka, Sigtuna, Lund, and Kaupang. Some of the sites have been in continual existence down to our times, others were abandoned and replaced by other centres (e.g. Birka—Sigtuna—Stockholm, Hedeby—Schleswig, Kaupang—Skien). In western Europe the shifts are not so frequent although sometimes they can be detected (e.g. Hamwic/Southampton, London, York).

A discussion of the internal structure of the settlements is made difficult by the fact that only small parts of them have been explored (e.g. 0.125 percent in York, 5 percent in Hedeby) and there is no complete plan available. Many of the early medieval settlements of the urban type consist of the main streets, which run parallel to the coast line or the river. Sometimes narrow streets branch out from it at a right angle (e.g. Dublin, Sigtuna). Less regular development can be seen, for example, in Hedeby, where the streets cross at all angles.

Originally, the early medieval settlements of the urban type in the Baltic area had no fortification, although occasionally simple fortifications were situated in their surroundings. Their own fortification did not come about until the 10th century, when the residential area was surrounded by a semi-circular earth-and-stone rampart (e.g. Hedeby, Aarhus, Västergarn, Löddeköpinge, Wolin). The coast line is sometimes fortified by an underwater palisade. Some of the sites had never

⁷⁶ Müller-Wille (1991); Müller-Wille (2002).

been fortified (e.g. Kaupang, probably due to its being abandoned before 900).

All of the settlements discussed above typically shared a non-agrarian economy and intensive craft production. There is frequent evidence of metal working (both iron, and non-ferrous and precious metals), processing of bones and antlers, production of glass beads, weaving, leather processing, pottery.⁷⁷

A typical example of the emporium and an early urban settlement is Hedeby. It has been intensively excavated (with intervals) since 1900. The most important data are the result of mainly modern research between 1963 and 1980, when the excavations explored both the central area fortified by a massive semi-circular rampart, and the southern settlement outside the fortification and the port with shipwrecks.⁷⁸

The oldest written reports on Hedeby come from the Roman annals and relate to 804, when the Danish king Godfred (or Gøtrik, 800–810) with his army marched into the place. In 808 he had the merchants from the destroyed Reric resettle there. Until the end of the 9th century Hedeby came under the domain of the Danish kings, later it fell under the rule of the Swedish dynasty. For a time it was dependent on the German king Henry I, and finally it returned into the possession of the Danes.⁷⁹

The earliest phase of the emporium from the 8th century was made up of random developments. The residential unit consisted of several smaller sunken-floored buildings. Originally, the built-up area concentrated in the southern part of the whole agglomeration near the coast and alongside a freshwater stream (in the southern settlement), but it spread quickly. Its structure can be best recognized in the southern settlement (outside the later semi-circular rampart), where it had not been overlain by later settlements. Even as early as that Hedeby was inhabited by traders and craftsmen. Their dead were initially cremated on a nearby sand dune. Urn and pit graves were progressively replaced by inhumation graves. Fortification did not exist at that time as it was not necessary.⁸⁰ There is evidence of settlement activity around 800 on three locations near the coast, always close to the stream. Each of

⁷⁷ Clarke, Ambrosiani (1991), pp. 128–172.

⁷⁸ Jankuhn (1986), pp. 77–79; Schietzel (1981); Steuer (1974), p. 13.

⁷⁹ Steuer (1974), pp. 154–155.

⁸⁰ Steuer (1974), pp. 157–159; Jankuhn (1986), p. 87.

the three settlements had a burial ground where the deceased were buried in different ways. It is still unclear whether or not the three complexes were interconnected into a single stretched out coast settlement. However, the buildings were dispersed in several clusters over a large area as is known from several Baltic trade settlements from the 7th and 8th century (e.g. Grobin/Libau, Helgö, Elbing). It cannot be ruled out that even at that time the inhabitants of Hedeby used as a refuge a smaller fortification (240 m long, 40–60 m wide) in the location called Hochburg, built on a natural rise in the northern part of the agglomeration.

Some time during the 9th century the southern settlement was abandoned, later to be overlain by inhumation graves and richly furnished mounds, and the community began to concentrate in the middle of the residential quarter, later delineated by the semi-circular rampart. The inhabited area gradually increased, culminating in the 10th century, when the whole space within the rampart was basically built-up. It seems, however, that the settlement activities were not evenly distributed throughout the area. For example, the southern part was built up later and rather thinly. Some production activities (e.g. iron working) were concentrated at the outer edges of the settlement.⁸¹ It was not until sometime in the second half of the 10th century that a massive earth-and-timber rampart was built around the inhabited area,⁸² enclosing up to 24 ha. The semi-circle was not perfect; obtuse-angled corners can be observed in some places. In its eastern section the rampart follows the coastline. Even today it still reaches a height of 5–6 metres. Access through the fortification was via three gateways. The fourth rampart interruption was enforced by the stream running through the middle of the settlement. The fortification was not built in one go. In the cross-sections it is possible to discern nine construction phases. The rampart construction might have been associated with the Swedish conquest of Hedeby.

The developments from the 9th and 10th century, which follow a plan, were determined by the the routing of the roads and divided up into plots marked out by fences (see Chap. 4.5.2). Part of the open excavations was carried out in locations with a high level of groundwater,

⁸¹ Jankuhn (1986), pp. 89–92.

⁸² Steuer (1974), pp. 160–161.

which helped preserve even the wooden sections of above-ground houses and other structures.

As opposed to the centre of the settlement, in the western part of Hedeby with greater elevation there appear sunken-floored houses. They are exclusively smallish structures (most of them around 3×4 m) with remnants of posts in the middle of the shorter walls.

The inhabitants of Hedeby buried their dead in several locations.⁸³ Most of the examined graves (approx. 700) were from the southern burial ground, outside the rampart. Pit cremations containing pottery from the 7th–8th century are some of the oldest there. Even a little earlier the graves could have been delimited by a circular ditch inside which the ashes might have been scattered on the then surface. Sometime in the 8th century there appeared inhumation graves, without grave goods, oriented in a north-south direction. These burials were in the last phase overlain by frequent graves with the west-east orientation (influenced by Christianity?), containing readily datable grave goods from the 9th to the mid-10th century. Overall, 1000 to 2000 people could have been buried there.

A part of the second large burial ground was investigated inside the fortified area, in its western part. It included 350 burials, partly in wooden coffins. Their total number is estimated at 2000 to 5000. According to the grave goods the burial ground existed from the beginning of the 9th century to the mid-11th century. However, the graves with grave goods oriented in the WNW-ESE direction overlay earlier groups of graves oriented strictly in the E-W direction, with no grave goods. Based on the stratigraphic relations these can be dated to around or before 800.

South of the large burial ground a small group of eight chamber graves from the beginning of the 10th century, distinct both by their construction and furnishings, was examined. The male graves are almost always furnished with weapons. The difference might be due to the different ethnicity or social status of the deceased.

Another group of graves was identified inside the fortification in Hochburg. It consists of about 40 flat-topped mounds with cremation burials and hardly any grave goods. Just by the rite it could be stated they originate over a large time span between the turn of the millennium and the 10th century.

⁸³ Jankuhn (1986), pp. 100–117.

An exceptional position in Hedeby is held by a chamber grave with a ship, situated outside, south of the fortification. It contained three men with extraordinary grave goods (swords, glass vessels, shields, etc.) and three horses. Laid over the grave chamber was a 16 m long and 3 m wide ship. This could be dated back to the turn of the 9th and the 10th century. It is not impossible that it was the grave of a member of the Swedish ruling dynasty.⁸⁴

The king was the lord of the town. From the written sources it is clear that in Hedeby and, for example, in Birca as well he owned land in the town which was at his free disposal. Whether he was in possession of all the land or just part of it is not known.⁸⁵ The presence of the king and his retinue in Haitahbu is confirmed for the first half of the 10th century by two of the so-called Sigtrygg Runestones with rune inscriptions, originating from the environs of Hedeby (the large stone was approx. 1 km away).⁸⁶ These monuments were ordered to be made by a woman named Asfrid for her son King Sigtrygg, who can be identified as the grandson of Olaf—a Swedish chief who, according to Adam of Bremen conquered Denmark sometime at the beginning of the 10th century. His son Chob (Knuba), the father of Sigtrygg, was, according to Widukind, subjugated in 934 by the German king Henry I, compelled to pay tribute and baptized. Sigtrygg, who may have lost his life in Normandy in 943, was the last of this short dynasty. Other runestones from the time of King Sven in the last decade of the 10th century prove the presence of the king's retinue in Hedeby, where one of them, Skarthe, died in battle. To honour him, King Sven had a rune inscription cut in stone. With the exception of the Swedish dynasty the kings did not make Hedeby a long-term residence but they had their officials assigned there who represented their interests.⁸⁷ In the 9th century these officials in Hedeby were called "*comes vici*" (Wikgraf). We also know them from other wiks or emporia, where they are referred to as "*Wicgerefa*" (London, 685 AD), "*praefectus vici*" (Birka), "*praefectus emporii Quentowic*" (Quentowic, 858–868), etc. The officials were to act in the interest of the fisc, particularly in collecting the

⁸⁴ Ibidem, pp. 100–117.

⁸⁵ Ibidem, p. 139.

⁸⁶ Ibidem, Plan I.

⁸⁷ Ibidem, pp. 70–76, p. 215.

duties, and maintain order and peace inside the settlement. In time of war they provided for the external security of the emporia.⁸⁸

Most of the Hedeby inhabitants were traders, craftsmen, seamen, etc. They were people who were not involved in large scale agricultural production, as is indicated by the relatively small amount of agricultural tools and a very high percentage of pigs (bones 45.2 percent, min. number of individuals 63 percent) accompanied by a reduction in domestic animals fed by grazing. Within the numerous community (a cautious estimate puts it at 800–1000 inhabitants when the settlement flourished) it is possible to observe certain social distinctions indicated, for example, by large and carefully built dwellings from the port area which are different from the smaller houses on the western periphery of the settlement. Even written sources mention, for the mid-9th century in Hedeby, “*primores*”, i.e. very likely a social stratum of a high status. Much is also suggested by the graves with weapons and a chamber where, probably, members of the military-merchant layer were buried in the first half of the 10th century.⁸⁹

Hedeby yielded frequent evidence of craft production. The processing of non-ferrous and precious metals—mostly bronze, but also gold and silver—was especially important. This is confirmed by fragments of moulds, approx. 200 fragments of moulds intended for the production of about 45 different types of jewellery and utility objects), crucibles, ingots and pressmoulds. The technologically most demanding products were the castings of bells. In addition to casting and gilding, the specialized artisans started to use filigree and granulation techniques in the 10th century. The craftsmen who were involved in Hedeby in this production for a period of one hundred to one hundred and twenty years (from the mid-9th century to the third quarter of the 10th century), resided in a relatively small quarter (50 × 80 m, the so-called “*Handwerkerviertel*”), distributed along a road roughly in the middle of the fortified area on the edge of the old settlement core. In the 10th century it was extended by about 50 m. The craftsmen quarter also yielded a glass-making furnace, probably used for the production of mainly glass beads. While it is obvious that the specialized craftsmen were spatially separated from the other inhabitants, it is impossible to say whether they also had a different social or legal position.

⁸⁸ Ibidem, p. 140.

⁸⁹ Ibidem, pp. 204–205, pp. 212–215.

Another important type of craft supported in Hedeby by archaeological evidence is the processing of iron. Iron was smelted both from local bog iron and imported high-quality Swedish ores. The distribution of slag and tuyeres suggests that the making and processing of iron was concentrated in several locations, most importantly at the rampart on the western edge of the settlement. Evidence of other crafts in Hedeby includes bone and antler processing (combs, board game pieces, handles, hairpins, etc.). This production is also concentrated at two locations inside the fortification. Further specialized crafts expected in Hedeby are pottery (the so-called *Hedeby—Kochtopf*), weaving (frequent finds of weights for looms) and amber processing (pearls, pendants, board game pieces).

The craftsmen appeared in Hedeby in the wake of the traders. They took advantage of the economic boom in a place well supplied with raw materials thanks to long-distance connections. The rich merchants had enough means to also take care of the product sales. The area where the craftsmen's products were heading can be identified by the style of jewellery made on the location. In the 9th century it was mainly the western part of the north-Germanic world (Jütland, Norway). In the 10th century the goods destinations radically changed and the jewellery made in Hedeby was exported to the coastal areas of the Baltic sea.

The most important precondition for the founding and rise of Hedeby was long-distance trade.⁹⁰ The most profitable goods at that time were probably slaves. Slave trade in Hedeby is historically confirmed as early as the 9th century, described most vividly, for example, in a scene from the life of Bishop Rimbert from 870. It continued in the 10th century when the slaves were brought in mostly from the Slav territories. Cloths were another type of goods. The exports consisted mainly of Frisian woolen cloth (*Tuchen*), and may have included local products as well. Quality cloths were also imported to north-western Europe via Hedeby. This is confirmed, for example, by the finds of cloths from combed wool yarn (the so-called *Kammgarnstoff*) and brocade. Remains of silk have so far been missing in Hedeby (found in substantial quantities in Birka). Another traded commodity was wine. Evidence of its import is provided by the finds of casks, with secondary application in the construction of wells. Although furs were an

⁹⁰ Ibidem, pp. 140–169.

important trade article heading from the north of Europe to the south, we have no concrete evidence from Hedeby. On the contrary, there is ample archaeological evidence with frequent finds of quernstones from soft basalt, originating from the Eifel region near Mayen in the Rhineland. This stone of volcanic origin was popular for its properties. It could be easily worked and was resistant to smoothing even after prolonged use. Its working surfaces remained permanently coarse and porous. Basalt near Mayen was quarried in large quantities as early as the Romans and its processing continued in the early Middle Ages. Hedeby was one of the key centres of the trade in quernstones imported from the Rhineland. From the opposite direction, i.e. the north of Europe (particularly Norway), Hedeby was the destination of vessels made from soapstone (*Speckstein*). Western Europe supplied Hedeby with glass vessels the remains of which are occasionally found in the settlement layers as well. Rhineland workshops (9th century Badorf, 10th–11th century Pingsdorf) were the origin of the imported pottery, e.g. large amphoras decorated with mouldings. From the limited choice of shapes of the imported pottery in Hedeby (from the broad spectrum of shapes of the Pingsdorf pottery restricted almost exclusively to large double-handled pots), it can be assumed that the pottery was used as packaging for the goods and was not a commodity by itself. H. Jankuhn points out that, given the brittle goods, a great portion of the transported ceramic vessels required sea transport. From the west there was a small-scale import of silver jewellery which could have also served as currency. From the Frankish region (the products are characterized by plant ornament distinct from the Nordic animal motifs) this import is confirmed from as early as the mid-9th century. The second region from which jewellery was brought to Hedeby was the British Isles (the so-called insular art). The trading in weapons, especially sword blades with the inscription ULFBERHT from the Rhineland, was of great importance.

Important trade connections were also established with the east, the Baltic, Finnish and above all Slavic regions—to places such as Staraia Ladoga, Novgorod, and Kiev. This is proved, for example, by the spreading of the so-called bracteates (*Halbbrakteaten*) minted in Hedeby. The minting of coins may have started there as early as the second quarter of the 9th century with imitations of the deniers of Charlemagne from Dorestad. Overall, the 9th century is mainly characterized by (non-monetary) weight-based economy (*Gewichtsilber-*

währung). Coins from Hedeby gained in importance after 940 when the striking of the bracteates was begun.⁹¹

The hinterland of Hedeby consisted of rural communities mainly from the 10th century. One of the settlements (Kosel 12 km away) has been excavated. Evidence of occupation from the 8th–10th century was found at two locations. In the first location five long houses and 50 sunken-floored houses with a cupola furnace were investigated, in the second location it was two long houses and 30 sunken-floored buildings. An important result of the excavation are the finds of imports (Tating ware pitcher, gilded clasp from the central Rhineland, quernstones from Mayen basalt, soapstone vessels, Arabian coin from the 8th century, a pair of scales, etc.) proving close relationships between the centres, which must have been supplied from their agricultural hinterland, and the villages, which were within a so-far unspecified local market connected to long-distance trade.⁹²

From the general point of view the problem of the classification of the emporia was addressed especially by R. Hodges,⁹³ who distinguished the following types of sites:

Type A. The earliest (end of the 6th century–675 AD) and the least developed emporium type are the periodic fairs situated on the frontiers, mainly on the coast. Foreign merchants visited them for a short time only once a year or seasonally. Archaeological evidence of such places is found, for example, in the 6th–7th century horizon in Dorrestad, in Löddeköpinge in south Sweden or in Hedeby from the 8th century. The finds merely consist of separated clusters of settlement features, e.g. sunken-floored houses. Alternatively, there could have been just tents pitched there for a given period. The sites cannot be designated as urban for one simple reason that they do not incorporate structures common in the local rural settlements. Their area is relatively small, ranging between 0.5 to 3 ha. Type A emporia were situated in the vicinity of royal residences, the main consumers of the imported goods. The new settlements are associated with the circulation of prestigious objects, often ritually destroyed in the funerary context. The important fact is that the early phase emporia appeared

⁹¹ Ibidem, pp. 166–187.

⁹² Müller-Wille (1991), pp. 226–236.

⁹³ Hodges (1982); Hodges (1988); Hodges (2000).

in different periods at different locations.⁹⁴ The question that remains open is whether these settlements were really under direct control by the elites⁹⁵ and whether they were established as the consequence of the efforts of the Merovingian magnates to gain control over the flow of the prestigious artifacts.⁹⁶

Type B is represented by sites (675–775/790 AD) attempting to maximize the existing periodic long-distance trade. Their existence is related to a greater emphasis on independent traders, controlled from afar by the ruler, who wanted to increase the import of prestigious and specific utility goods. The sites sprang up suddenly thanks to massive investment by the king or a similar authority who tried to gain control over local production and distribution in this way. A significant role in this development is certain to have been played by the rivalry between kings and traditional family aristocracy. They were clearly permanently lived in settlements of the urban type. They are distinguishable by the street arrangement of the built up area constructed to a plan in a pre-defined network, superimposed over the previous cluster settlement structure. An example is again Löddeköpinge, Hedeby or the Anglo-Saxon Hamwic and Frisian Dorestad. It seems that, in the emporia, the buildings were allocated too much space and covered an unusually large area, especially when compared to later medieval standards. The sites of this type (e.g. Hamwic/Southampton—min. 45 ha) were 40 to 50 times larger than the other sites in the settlement hierarchy. It is not quite clear whether the merchants lived directly in the settlements or whether they pitched their tents or makeshift shelters in the vicinity of the emporia, as is known from later descriptions. However, they were almost certainly outnumbered by the local craftsmen, who settled there to satisfy, among other things, the needs of the foreign traders. This led to important socio-economic consequences. Distribution of the craftsmen's products intended for local consumption and the necessity to supply the town centre with provisions stood at the beginning of the genesis of a market-oriented society. The process is illustrated by the finds of keys and locks associated with the existence of private ownership. The emergence of the new order, represented mainly by urban

⁹⁴ Hodges (1982); Hodges (1988), p. 3; Hodges (2000), pp. 76–77.

⁹⁵ Condon, Perring, Whyman, Roseff (2002), p. 25.

⁹⁶ Hodges (2000), p. 77.

craftsmen, is accompanied by the transformation of social bonds and the deepening of production specialization which unavoidably leads to the destruction of the original tribal society. In the emporia, various craftsmen work under supervision in collective workshops, just as in the neighbouring Carolingian world. This is well-known, for example, from the idealized plan of the St. Gall monastery.

The ruler controlled these important hubs of long-distance trade either directly or through his agents. An example is the king of Wessex, who may have held the *villa regalis* in Hamwic. Another villa existed in Ipswich. The king of Kent had his estates at the end of the 7th century in London and the Carolingians sent their agents to Quentovic and Dorestad. Godfred of Denmark was involved in establishing the settlement in Hedeby and the Norwegian emporium in Kaupang was also under control by the king who might have had his local residence there. Royal residences in the Anglo-Saxon urban settlements are proved by written sources for the late 6th century in Canterbury and the third quarter of the 7th century in London. While they are also expected in York, no archaeological evidence has been found yet. It cannot be ruled out that the residences were situated outside the settlements.⁹⁷ Archeologically, these structures are difficult to identify. Some consideration in this context is given to the Hochburg in Hedeby (although it tends to be treated more as a refuge or *Fluchtborg*)⁹⁸ or a similar place in Birka. However, the presence of the royal or chieftdom authority can be deduced from a clearly arranged building pattern. It seems (see for example Hamwic) that the royal authority had a broad impact on the control and regulation of trade and craft production.⁹⁹

The population of the sites was up to ten times higher compared to the contemporary rural settlements. Type B emporia often took up an extremely large area in the range between 12 to 100 ha, whereby the English sites (Hamwic, Ipswich) are significantly greater than in Scandinavia (Hedeby, Birka). Compared to the considerably smaller type A emporia they also contain much greater quantities of imports. However, their presence or absence in the archaeological context is determined by various factors, such as the length of the stay of the merchants and the value and nature of the imported artifacts.

⁹⁷ Astill (1994), p. 45 with references.

⁹⁸ Jankuhn (1986), pp. 68–69.

⁹⁹ Hodges (1988), p. 5; Hodges (2000), pp. 77–80.

In type B emporia we can expect a much higher spatial dispersion of the imported objects, which seeped through via certain limited and irregular exchange to the local craftsmen. In general it is assumed that the majority of the imported artifacts which dominate the assemblages from the emporia were personal articles of the merchants who brought them for their own need. Consequently, the number of imports on the site will be highly influenced by the transport options available to the merchants (compare the potential of sea, river and land transport) and the nature of the local products or the sophistication of the hinterland which the merchants used. Type B emporia can be considered monopolistic centres of production and trade.¹⁰⁰

In Anglo-Saxon England the sites typically appear in a pair with settlements of a different type. A good example is Hamwic and Winchester 18 km away. While in Winchester, referenced in written sources as *civitas* or *urbs*, there is clear evidence of the presence of the king, bishop and the existence of private property of the members of the highest social rank, Hamwic, known from written sources as a *mercimorium*, *villa*, *pagus*, *wih*, *wic* or *tun*, is characterized by minting, regular planned settlement layout, long-distance trade, intensive craftsmen's production and a relatively high density of population.¹⁰¹

Type C. At the moment when the local market economy based on the hierarchy of the marketplaces started to develop the emporia lost their *raison d'être* (793/4–850 AD). The period started symbolically with the reform of the Carolingian monetary system. The king capitalized on revenues which he invested into a permanent army, which ensured a steady increase in his power. The supervision over exchange was facilitated by an easily controllable currency. His wealth was generated from his landed estate. He gained the upper hand over traditional nivelization mechanisms.¹⁰² The emporia were replaced by regional centres.

When the long-distance trade which is a precondition for the existence of type B emporia dies away, the sites are either abandoned or acquire a new function within the local economy as the so-called solar centres. In the latter case the local workforce which maintains a high standard of its production remains. The sites become administration

¹⁰⁰ Hodges (1982); Hodges (1988), p. 5.

¹⁰¹ Biddle (1976), pp. 114–116, p. 120.

¹⁰² Hodges (1982), p. 197.

centres of great political significance and more emphasis is placed on their defence. Foreigners travel to the sites regardless of whether or not they lie on the trade route network. However, finds of imports are only rare. The model is typical mainly for the emporia of the Viking period in Scandinavia and Ireland, where the original trade stations took on administrative functions. In the case of the extinct earlier centres they are superseded by successors often situated in a short distance. So, Dorestad was replaced by Quentovic, Hamwic by Southampton, Lundenwic by Lundenburg and Eoforwic by Jorvik.

Many Anglo-Saxon emporia became extinct at the end of the 9th century. The settlements were often shifted to another location and fortified. Their function may have been changed and the area they covered shrank (e.g. London, Ipswich). The long-distance trade suffered from interruptions. Although the changes are often explained by Viking invasions, it is possible that the emporia declined prior to the Viking attacks as the specialized settlements became redundant. This was due to the changing underlying fabric of the kingdoms whose power no longer needed to be asserted by prestigious objects acquired through long-distance trade. Using the resources they owned, especially land and the revenues generated from it, was much more important. The emporia (*wic*) transformed at the end of the 9th century to fortified *burhs*. These sites became the tools of the increased exploitation of the land, serving the accumulation of wealth. Late Anglo-Saxon (*late Saxon*) towns are defined by the local market, minting and fortification. They become re-oriented towards their own territory and local exchange, which in the final consequence led to the establishment of a market economy.¹⁰³ Locations of a similar nature (e.g. Aarhus, Odense) also emerged in the 10th century in the Viking Denmark.¹⁰⁴

The work of R. Hodges deeply influenced many researchers who study the problem of central places and the emporia in western Europe in particular. His conclusions are considered a paradigm in the archaeology of the early Middle Ages¹⁰⁵ and with certain reservations have been accepted by modern historiography.¹⁰⁶ At the same time they received

¹⁰³ Astill (1994), pp. 52–54 with references; Biddle (1976), pp. 124–137.

¹⁰⁴ Randsborg (1980), p. 72.

¹⁰⁵ Scull (1997), p. 270.

¹⁰⁶ E.g. Verhulst (2002), p. 8, pp. 133–135.

criticism not just on the part of historians,¹⁰⁷ but archaeologists as well. Some refute the applied models as oversimplistic for the early Middle Ages and as being unable to capture the complexity of the problem and the dynamics of the development. They also require its harmonization with the evolution on the continent.¹⁰⁸ Others point out the fact that R. Hodges overestimates the research results from Southampton. Still others presume that the establishment of the emporia was associated with the formation and consolidation of land ownership and was from the beginning controlled by the king or monasteries. They also fail to provide evidence of the separation of the elites from the craftsmen and traders. In settlements such as Ipswich or London, burials of members of a higher social stratum appeared as early as the 7th century.

The most important deviation from R. Hodges' conclusions is the opinion that the emporia became involved in craft production very early on and from the beginning were integrated into the local economic system. They consider the study of interactions between the emporium and other sites in the settlement hierarchy essential. The emporia were inhabited by a mixed population of craftsmen and merchants. However, nothing is known about when the community started to form and with what social relationships the individual groups were interlinked within it. The need to supply the emporia, as well as the planned and specialized nature of the sites is suggestive of controlled economy. According to R. Hodges, it was an expression of the royal monopoly. In contrast to that, some researchers expect that various aristocratic families were able to assert their interests and extend their estates as well.¹⁰⁹

However, R. Hodges' critics have so far failed to offer interpretations capable of completely replacing the existing paradigm models. On behalf of all it was best expressed by Ch. Scull:¹¹⁰ *"I'm trying to offer some sort of critique. One point is that this simple typology of type A and type B emporia does not really work.... The situation is more complex than has been represented. I'm not really sure yet how we can go about explaining it or modelling it."*

If we look at Pohansko using R. Hodges' classification of emporia we can say that it best matches type B, the existence of which is more

¹⁰⁷ More in Hodges (1988), p. 3.

¹⁰⁸ E.g. Hill (1987), p. 52; Scull (1997).

¹⁰⁹ Condon, Perring, Whyman (2002), pp. 24–27 with references.

¹¹⁰ Scull (1997), p. 304.

or less generally accepted.¹¹¹ Type A emporia, which are the most frequent target of criticism¹¹² do not occur in Moravia at all.

Just as at Hamwic or Hedeby, Pohansko has an above average size within the settlement hierarchy, which roughly corresponds with the two sites even in absolute terms. Also, the principle of a planned settlement layout divided up into parcels is very similar. There appear the same types of crafts, from weaving to precious metal working. The presence of the ruler or his representative is clearly confirmed at Pohansko by the *palatium*, modelled on the Carolingian *Pfalz*, and it must have played an important role in the control of the production and distribution on the site. The nutrition habits of the inhabitants at Pohansko (especially in the *palatium*), if they can be recognized from the distribution of the consumed animal species, were also in line with the situation found, for example, in Hedeby. In contrast to the Viking emporia, Pohansko was fortified a little earlier, in the 9th century. This was undoubtedly associated with the turbulent military and political situation in Central Europe, a result of the long-term tense relations between the Moravians and the Frankish empire. As opposed to the large emporia in western and northern Europe, in Pohansko we find only a small quantity of true imports brought in by long-distance trade. However, they are fully compliant in terms of their qualitative range. The imported valuables could quickly move inside Moravia through the redistribution mechanisms and were more likely to enter the country in those locations with a higher concentration of social elites, for example in Mikulčice, 16 km away, which was, in all probability, the seat of the ruling and ecclesiastical power and a place where the members of the highest social rank held their estates. This is confirmed by the remains of twelve churches including a large basilica and an extraordinary concentration of artifacts of a prestigious nature, uncovered during the 50 years of systematic excavations.¹¹³ Pohansko and Mikulčice therefore form a typical pair, similar to, for example, Winchester and Hamwic in the medieval Wessex.¹¹⁴ Like many Anglo-Saxon emporia, Pohansko started to decline at the end of the 9th century and the task of the centre of the whole region was taken over by

¹¹¹ E.g. Scull (1997), p. 290.

¹¹² Ibidem, p. 281, p. 290.

¹¹³ Poulik (1975); Poláček (2000b), pp. 317–319.

¹¹⁴ Biddle (1976), pp. 114–116, p. 120.

the smaller, newly built castle of Břeclav,¹¹⁵ the foundation of which tends to be associated with the Bohemian prince Břetislav I (from 1021 the governor of Moravia).

6.4 MODEL COMPARISON AND INTERPRETATION

A comparison of the alternative models against the archaeological structures identified at Pohansko resulted in a surprising discovery that it is impossible to determine just one model which would be the best match but that the actual purpose of Pohansko is inherent in all the three proposed solutions. It is at the same time a *munitio*, *palatium* and *emporium* of the Moravian rulers. While the first two interpretations have been thoroughly discussed in recent specialized literature,¹¹⁶ the same cannot be said about the finding that Pohansko corresponds, both formally and functionally, with the emporia, although this idea has already been put forward.¹¹⁷ The designation of Pohansko as a type B emporium, according to the classification of R. Hodges, has serious consequences which are important both for the interpretation of the early medieval centre at Pohansko, and for understanding the evolution of early medieval society in Moravia in general.

Richard Hodges in his work titled *Dark Age Economics* stated that the establishment of the individual types of emporia, or the early urban centres in western Europe was closely related to the economic and social framework in which they originated. He places their development into causal relationships with the genesis of the early medieval state. According to R. Hodges, type A emporia can be associated with chiefdoms and redistribution of wealth, type B emporia with cyclical chiefdoms, or endeavours to mobilize wealth and only the regional type C solar centres with the state and emerging market economy.¹¹⁸

The so-called chiefdoms preceded in western Europe, and elsewhere, the emergence of the bureaucratic state. Until the time of the migration period this social formation was clearly prevalent. Its importance

¹¹⁵ E.g. Měřinský (2001).

¹¹⁶ E.g. Herrmann (1986), pp. 47–48; Kalousek (1960a); Kalousek (1960b); Dostál (1975); Dostál (1988a); Dostál (1990a); Macháček (2001d); Ruttkay (1998); Třeštík (2001b), p. 36; Válka (1980); Válka (1991), pp. 23–24; Vignatiová (1992).

¹¹⁷ Dostál (1988b).

¹¹⁸ Hodges (1982), p. 197; Hodges (2000), p. 79.

increased throughout Europe after the collapse of the Roman empire.¹¹⁹ The concept of the chiefdom is based on the American neo-evolutionist school of Elman Service, which assumes that the evolution of a social organization took place in several stages: band, tribe, chiefdom and state. Although it is obvious today that the unilinear evolutionary model is simplified and cannot be considered universally applicable, chiefdom is taken to be one of the central theoretical notions for anthropologists and archaeologists, who study the social organization of archaic societies.¹²⁰ According to Service, its essence is a hierarchical social unit, which incorporates several tribes. Although there is some social stratification, the whole structure is focused on a single central person—the chief. His power is not unlimited as it is effectively kept within limits by existing social regulators. The economic foundation of the whole system is the principle of *redistribution*. There are two primary tendencies acting against each another within this principle. One is represented by the so-called *levelling mechanisms* with a negative impact on the accumulation of wealth, disappearing from under the hands of the leaders at various potlatches, rallies, and in relation with costly funerary rituals. An opposite trend is chiefly embodied by the so-called *mobilisation*, which is the amassing of goods and services for the benefit of the elite strata. The economic development in the chiefdom can be looked upon as a process that progressively leads to gaining control over the levelling mechanisms and the accumulation of wealth through its mobilisation. However, the main production means—land—remains in collective ownership.¹²¹

In his definition of the state R. Hodges¹²² developed the ideas of K. Flannery. According to him, the state is a well defined political organization. Its leaders are no longer held back by regulatory mechanisms. There is a strong central power consisting of the professional ruling class which is generally immune to the restrictions ensuing from kinship-based relationships. The state is built on the foundations of an efficient and stable hierarchy which must withstand the destructive effect of a whole series of shocks and disturbances. In relation to this the state leader has to attain some attributes of being sacred or he should be inaugurated by specific ceremonies associated with his

¹¹⁹ Earle (1987), pp. 285–286.

¹²⁰ Skalník, Chabal, Feinman (2004), with references.

¹²¹ Hodges (1982), p. 15, p. 26; Charvát (1989), pp. 209–211.

¹²² Hodges (1982), pp. 186–193.

extraordinary status. The sacredness then becomes an instrument of power (compare, for example, the coronation of medieval kings by important church dignitaries). It is a new concept of society which isolates the leader of the state from the rest of the population on the ideological level as well. The state is an extremely costly form of social organization. Its effective function requires transfers of large energy resources and permanent growth through positive feedback. The state needs an army and bureaucracy, a complete infrastructure which is provided for by an efficient collection of taxes. The only natural economic expression of this system is the market. Only a market allows efficient circulation of energy in society and the existence of a sophisticated infrastructure.

In the process leading to the establishment of the state R. Hodges¹²³ assigns great importance to the advanced chiefdom phase which he terms cyclical (*cyclical chiefdoms*). The notion emphasizes a specific transitional condition when the chief temporarily attains the more or less honorary political status of sovereign. The central power is gradually consolidated and takes control over the economic sphere. The whole system is undergoing a transformation until it reaches a state when the chief has accumulated sufficient wealth necessary to separate himself from the rest of the community. According to R. Hodges, the process which is typical of cyclical chiefdoms is the “mobilisation” of wealth that the chief uses to his advantage in promoting his status and which facilitates the establishment of the ruling elites. Another characteristic trait is the striving for tight control over the local and neighbouring territories which is usually of a transitory nature. However, the charisma of a leader by itself is not enough to generate positive feedback, which would lead to the change of the whole system. For the time being, it is an unstable entity, achieved by aggression, but it provides a platform for the state to be built on. The process leading to the origin of the state is accompanied by the withering away of the levelling mechanisms and a gradual emergence of the market. However, these circumstances also undermine the importance of long-distance trade, which was originally instrumental in acquiring valuables intended for redistribution within the levelling mechanisms. This trade marks a transition to the regional model and the distribution of wealth slowly acquires a new, more hierarchical spatial dimension. It

¹²³ Ibidem, pp. 187–188.

contrasts with the redistribution-based economy where the levelling mechanisms dispersed wealth which, as a result, could not be accumulated. Long-distance trade was not reconstituted until under the new conditions of the continental and overseas market system. The trade was operated by entrepreneurs who gradually evolved into a new social elite.

Richard Hodges¹²⁴ distinguishes two types of state in the early Middle Ages: primary and secondary.¹²⁵ They are also associated with two models of early medieval centres. The primary state involved territories which used to be parts of Roman provinces. Their craft and agricultural production reached a high standard. There were periodic fairs, although under direct control by the ruler or his agents. However, until the turn of the 8th and 9th century there is no evidence of an overall growth in towns.

The evolution of the civilization under which the kingdoms from the Pyrenees to Jutland were united into a single state was closely linked to the rule of the charismatic leader Charlemagne. The extraordinary area covered by the Carolingian state was the source of administrative difficulties, especially when the emperor attempted to support new economic developments. Impulses for economic growth should have been based on the promotion of long-distance trade and stimulation of the market economy, within a framework of a tightly controlled monetary system. It is indicated by the attempted founding of towns, development of production centres in the Rhineland, monetary reform and boom in long-distance trade culminating under Charlemagne's reign. However, the ruler was gradually losing control over the economic resources, which passed into the hands of a narrow group of people. The elite was becoming stronger, which in the end resulted in regional disharmony as opposed to the regional harmony which Charlemagne sought. The process had, as a final consequence, a substantial influence on the shaping of feudalism.

Charlemagne's death was followed by internal political strife and wars of succession. Another factor attacking the system from the outside was the invasions of the Vikings and Arabs. Only in the 10th century, after the break up of Charlemagne's empire, stable territories

¹²⁴ Ibidem, pp 188–190, p. 194.

¹²⁵ More in Randsborg (1980), pp. 7–8.

characterised by slow agricultural and regional growth arose. It was on this basis that the towns which Charlemagne may have envisioned developed.

Charlemagne's aim was to create a state. According to R. Hodges he attempted to achieve it by the capitalization of the vast resources in the empire and the territories beyond its frontiers. He invested in long-distance trade expecting to bring to life the local markets controlled by his silver currency. The system was to increase the wealth of the imperial family and consolidate the dynasty. It was, however, too extensive and required a stratified structure of regional management which finally resulted in social fission. As a result of the interlinking of the social subsystems and the negative feedback, which in this case promoted the decline of the system, a spiral of negative events was set in motion, leading to the crisis of the empire after 840.

The development in the so-called secondary state which R. Hodges tries to explain on the example of Anglo-Saxon England was rather different.

In the 8th century there was a gradual centralization of power in England. The dominant position among the small kingdoms from the 7th century (Lindsey, East Anglia, Northumbria, Kent, Mercia, Wessex) was assumed by Mercia, and later also Wessex. Offa, the king of Mercia (ruled between 757–796), created efficient administration of the country. He was able to ensure the loyalty of his people thanks to the wealth he acquired through contacts with Europe. He may have attempted, following the example of his contemporary and neighbour Charlemagne to activate the economy in his kingdom through the controlled markets project but in spite of that he failed to achieve the positive feedback necessary for a change in the system and his rule remained at the level of cyclical chiefdom. He was forced to permanently fight to maintain his power. A power which disappeared together with him.

In the 9th century Anglo-Saxon England experienced changes which could have been associated with the events in the Carolingian empire, where long-distance trade deteriorated as a result of inner upheavals. The Anglo-Saxons responded positively to the losses of economic inputs. They extended their estates and created capital until their power was firmly centralized. R. Hodges supposes that it was the promotion of crafts and the accumulation of wealth that formed the

basis of the later success of the Wessex king Alfred the Great. His rule (871–899) was preceded by intensive incursions of the Vikings who even settled in York in 867 and established their own kingdom there. When the Danes attacked Wessex in 870 there arose an acute need for centralized leadership. After Alfred fought and won several battles with the Vikings, he started with the consolidation of his territory. He built a network of fortresses and fortified settlements (*burhs*), formed a stable army, founded new towns and promoted the growth of the existing ones. Alfred embarked on the road towards the creation of a market system in his country. For the first time the bonds of the traditional society were broken and the kingdom could be redefined. The result was a new powerful and stable political unit, in which power was handed down from the father to the son. This must have certainly been associated with the growth of the population. It was the working of the positive feedback which led to changes in the system and its development.

The Vikings in Denmark achieved something similar. The problems of the 9th century were compensated for mainly by looting raids complemented by the colonization of the new territories during the favourable climatic conditions. In this situation Harald I Blutooth (Blåtand: 958–987) extended his control over society which he reinforced by adopting Christianity—as part of his new political status. His place was taken over by his son Svein I Forkbeard (Tveskægg: 987–1014). Part of their success was the building of a chain of royal fortresses probably with a permanent army stationed—a significant result of the new state. Another important innovation was the establishment of regional markets the development of which was supported by looted silver. This promoted the growth of the village population and the development of agriculture and was also helped by the good climatic conditions. Just as in England, however, the emergence of a state was preceded by the cyclical chieftdom phase and a maze of a number of smaller and larger territorial units. In the same way as Offa, king Godfred (or Gøtrik, 800–810) became so strong that he was able to oppose Charlemagne. He was, however, unable to pass the acquired power onto his successors.

To sum up, there were two important preconditions for the origin of a secondary state in the approach of Richard Hodges: first—a response to long-distance trade and the concept offered by a much more complex civilization—the primary state, second—the ability to

concentrate wealth and separate itself from the equalizing mechanism which formed the basis of the traditional chieftdom.

From the model proposed by Richard Hodges, it is possible to put forward two plausible origins of urban-type settlements, including Pohansko. In the Carolingian empire it may have been associated with the evolution of the elites and their power which originally relied on the wealth generated from long-distance trade. However, the economic development of Anglo-Saxon England and Scandinavia was based on the termination of long-distance trade, the deterioration of which brought the developed chieftdom to its knees. The change enabled a morphogenesis of the whole social system. In its transformation the educated king Alfred could have been inspired by classical authors or the Carolingian capitularies, while Harald I Bluetooth and his son found a model in their neighbour Otto the Great. In both cases the urbanization process was promoted by massive capital injections. In the primary state the means flowed into the hands of the members of the wider social elite. On the other hand, central ruling power successfully established itself in the secondary state.

From the archaeological viewpoint the simplified model put forward by R. Hodges is very interesting as it assigns, to the individual phases of the development of the early medieval society and its economic foundations, the settlement structures that a particular social formation produces. R. Hodges has a special focus on the emporia—the hubs of long-distance trade, which, in north-western Europe, have been excavated in some detail. The emporia are always located on the frontiers of a territory, often on the sea shore. Therefore, they can also be called a *gateway* (community)—according to the terminology of the geographers, or a *port of trade*, according to K. Polanyi.¹²⁶ They were neutral places which offered security to foreign merchants, storage spaces, the authority of law and contracts for traded goods. The distribution system that the early medieval emporia were part of is structurally similar to the so-called *dendritic central-place system*, as defined in her classic work by the geographer C. Smith.¹²⁷ It is a partially commercialized, but predominantly monopolistic market, which

¹²⁶ Polanyi (1971); Dalton (1971), pp. 238–260.

¹²⁷ Smith (1976), pp. 315–317, pp. 334–335.

appears on the peripheries of modern economic systems (e.g. in north-western Guatemala or in Java in the second half of the 20th century). There is no competition and the exchange is subject to supervision. The administrator controls who sells and stipulates when and where the sale is to take place. Typically this trade crosses over political and cultural frontiers. Historically, extensive trade subject to political control resulted in the growth and expansion of bureaucratic empires. However, as a final consequence trade control led to deterioration or allocation of newly generated resources to non-economic areas. The system is organized mainly through vertical links, a local horizontal network does not exist. It creates good conditions especially for external suppliers—foreign merchants of different ethnic backgrounds.

The above-described model facilitates intensified inter-regional exchange and stimulates the emergence of new forms of socio-economic organization. There appear people specializing in trade and some communities distributed along key trade routes prosper from the growing long-distance exchange. It involved mainly trade mediators concentrating on wholesale. They were not engaged in retail activities typical for another type of trading place called the *solar central-place*. These were already based on the local marketplace. The *gateways or ports of trade* need not have always been marketplaces. They were principally established to reduce the cost of transporting the goods and addressed the specific requirements for the transfer of some commodities (such as slaves—see below). In some sites of this type there did later occur a transformation from the monopolistic wholesale market which was part of a dendritic system to the marketplace of the solar centre type, which was a direct predecessor of competition-based trade in a market economy.¹²⁸

The more sophisticated distribution system based on solar centres was still only partly commercialized. The exchange took place in locations with an administratively controlled market which often were at the same time the administrative and bureaucratic centres of the emerging states and empires. This system of a controlled economy is typified by a specific type of property ownership stratification, where on the one hand there is the unstratified agricultural population and on the other side the administrative elite, which is formed into a different group surpassing the peasants in all areas but especially in the

¹²⁸ Hodges (1982), pp. 16–17, pp. 24–25.

standard of living. Merchants and craftsmen are separated as a special group diligently controlled by the administrative elite, and at the same time not completely trusted by the village population. The members of the elite live almost exclusively in the centres, often of an urban type, physically separated from the peasants. The urban centres are few and far between. They are greatly different from the agricultural hinterland and much bigger than the other settlements within the system. There are no middle-sized settlements. The exchange is mostly bound with the marketplace in the urban centre. While there is a market exchange going on between the food producers and the producers of other products, inside these groups it is direct exchange on a non-market basis. A typical example of this distribution system is the Spanish territories in America, such as the Chiapas region in Mexico. The local elite of Spanish extraction derives its power from its military power. Economically, it is oriented on the export of the wealth to their home country. Its members reside in towns and control the import, export, local market and the wage level. They are involved in the trade at the top level only, they visit marketplaces only as buyers. However, they completely control external trade and at the same time they exert a tight control over small traders moving back and forth between the town and the agricultural areas. These form a special urban class and are restricted solely to retail exchange. The relationship between themselves and the elite is based on clientele relationships rather than market exchange. This does not save them from being heavily taxed. The economic relationships between the small traders and the agricultural population are conditioned by the market. The traders from towns must have monopolistic control over a particular good necessary for the agricultural population, so that they can set a sufficiently high price for it. This is because the profit they make sustains both themselves and, through taxes and fees, the administrative elite.¹²⁹

The transition to a full-fledged market economy based on competition is not effected until the moment when medium level market places oriented on trade between village population begin to emerge within the central-place hierarchy. The result is the so-called *interlocking central-place system*.¹³⁰ The regional market economy built around

¹²⁹ Smith (1976), pp. 338–345.

¹³⁰ Ibidem, pp. 353–354.

the market hierarchy requires minimum interventions by the central authority in order to function completely.¹³¹

If Pohansko matches type B emporia from the formal point of view, as we have tried to prove above, it must also match them in terms of its practical function and social significance. This ensues from the methodological foundations of archaeological modelling according to which “*the same form of two phenomena is evidence of the same content*”.¹³² Supposing the premise is valid even in the case of Pohansko and early medieval Moravia, we can state that the distribution of the economic resources in the 9th century was based on the dendritic central-place system. In the early Middle Ages period this distribution model is associated with the pre-state form of social organization referred to as cyclical chiefdom. The same social arrangement can logically be expected in 9th century Moravia as well. This conclusion is in line with works by some Czech historians who ascribe the distribution system represented in written sources mainly by the so-called central market of the Moravians (*mercatus Marahorum*) to the pre-state period.¹³³ With regards to the nature of the most important Great Moravian settlements they also state that the so-called Great Moravia was a transitional unit which was only just approaching an early feudal state.¹³⁴ This is supported by the corresponding basic stratification of Moravian society which maintained the characteristics of a late tribal structure.¹³⁵ A more general adoption of the appropriate term chiefdom to characterize the social structure in the 9th century both in Moravia and Bohemia is only hindered by its unusualness and the absence of a tradition of anthropological study of Czech and Moravian history.¹³⁶

Great Moravia, just as the other social structures based on the chiefdom principle, was a very unstable unit, principally founded on military aggression.¹³⁷ Power was not passed on from father to son, but rather within wider family relations (compare the term known from Latin sources: *nepos*). It was only towards the end of the existence of

¹³¹ Hodges (1982), p. 197.

¹³² Neustupný (1986), p. 544; Neustupný (1993), pp. 159–163.

¹³³ Žemlička (1996), pp. 17–18.

¹³⁴ Hoffmann (1992), p. 27.

¹³⁵ Třeštík (1997), p. 293.

¹³⁶ Klápště (1994), pp. 37–38.

¹³⁷ Třeštík (1987), p. 40.

the so-called Great Moravia in 894 that Svatopluk managed to pass the reign on to his son Mojmir II. But even that may not have been done without heavy fighting for succession. Soon afterwards its instability became palpably apparent and the whole “empire” collapsed.¹³⁸ It may have not even happened as an outcome of a long series of incursions and fights, but as a result of a single lost battle with the old Magyars.¹³⁹

The position of the rulers in early medieval Moravia could be best compared to Offa in Mercia, Ine in Wessex or Godfred in Denmark. In a similar way, the Moravian Mojmir family attempted, by massive investment in agglomerations of the Pohansko type, to gain economic control over society, neutralize the equalizing mechanisms, mobilize wealth and separate themselves from the rest of the community. However, the fruit of their effort was not the origin of a state, reminiscent of the Wessex of Alfred the Great or the Denmark of Harald I Bluetooth, but the fall of the “empire”.

The causes of the unhappy end of Great Moravia¹⁴⁰ can be recognized even at Pohansko where we were able to quite clearly define the evolution of the social and cultural system. After an explosive growth at the beginning of the Great Moravian period the system did not have enough time to become stabilized. It failed to establish economic relationships that could sustain the energetically extremely demanding system over a long period. There was no local trade based on market relationships which is the only one that can provide effective circulation of energy in a complex society at the level of a state. Even though such a market would have existed there, the Moravian rulers could not efficiently control it due to the absence of their own monetary system. For the same reason they were unable to ensure efficient collection of taxes which are absolutely essential for the existence of the whole state infrastructure with its bureaucratic apparatus and a permanent army. In Moravia we have only evidence from that time of some archaic tribute on “fertility”.¹⁴¹ Although there is evidence of the beginnings of large estates possession at Pohansko, which was the main source of wealth of the ruler and the elites of an early medieval state in western Europe, its extent was considerably limited (at Pohansko only in the

¹³⁸ Ibidem, pp. 41–42.

¹³⁹ Třeštík (1997), pp. 286–287.

¹⁴⁰ Třeštík (1987).

¹⁴¹ Třeštík (1987), p. 40; Třeštík (1997), p. 293.

precinct delimited by the rampart) and it could not have become a completely developed source of revenue for the Moravian ruler. The village settlements in the environs probably continued to function on the basis of clans and collective ownership of land (see Chap. 4.5.3). Nothing indicates that large estates would have been forming such as in Denmark at the end of the Viking period, when farmsteads of an above-average extent started to appear in village settlements (e.g. Vorbasse),¹⁴² which were likely the centres of the emerging large estate ownership. In the Alemanni or the Bavarians the bigger than average farmsteads are archaeologically confirmed before the 7th century at the latest (see Chap. 4.5.3). In the Anglo-Saxon world the economy based on the large estate principle also starts to form quite early as is shown, for example, by the law code of king Ine (694 AD).¹⁴³ In Bohemia and Moravia the manorial system, according to the latest opinions, did not play an important role until the period from the 10th/11th to the 12th century.¹⁴⁴ The traditional stream of research even doubts the importance of the large estate for the early medieval economy in Bohemia and the surrounding countries and assumes that the main producer was the mass of independent peasants who outwardly remained free people. They may have been subject only to the prince and his officials. The peasants are thought to have had collective inheritance rights to the land respected even by the prince who awarded his lords, until the 12th century, mainly by profitable offices instead of land.¹⁴⁵

The early medieval manor as is known from the Frankish empire and elsewhere, where it is the foundation of the economy of an early medieval state,¹⁴⁶ failed to fully develop in Moravia in the 9th century although the development was undoubtedly aiming towards the creation of large estate ownership¹⁴⁷ as is also shown by the findings from Pohansko. The ruler, or perhaps still a chief, was perpetually forced to assert his social position mainly by controlling the redistribution of prestigious objects (e.g. weapons, luxurious fabrics, products from precious metals) supplied to the country via long-distance trade.

¹⁴² Randsborg (1980), p. 60, pp. 167–168.

¹⁴³ Stenton (1947), p. 310.

¹⁴⁴ Petráček (2002), pp. 207–222.

¹⁴⁵ E.g. Třeštík (1987), p. 38; Žemlička (1997), pp. 151–154, pp. 193–196 with references.

¹⁴⁶ E.g. Verhulst (2002), pp. 31–49, p. 126; Žemlička (1997), p. 150.

¹⁴⁷ E.g. Válka (1980), p. 274.

They were exchanged mostly for slaves¹⁴⁸ who he obtained through his aggressive expansion policy. At the same time he is sure to have attempted to accumulate sufficient wealth necessary to separate himself from the rest of the community and to become a sovereign, a goal he was not able to achieve in 9th century Moravia.¹⁴⁹ The whole process was accompanied by the mobilization of wealth which helped the chief enforce his status and was instrumental in the constitution of the governing elites. A typical attribute was the striving for tight control over his own and the neighbouring territories which, however, was only transitional in nature.

The logical consequence of the development outlined above was the emergence of the trade centres, fortifications and separate royal residences. At Pohansko the three functions are integrated into a single whole. It is therefore simultaneously a *munitio*, *emporium* and *palatium* of the Moravian rulers with whom it shared their destiny. Pohansko went down after their fall without managing to transform itself into the so-called regional solar centre which we tend to associate with an emerging state and the beginnings of a market economy.¹⁵⁰ The new centres resemble the late Anglo-Saxon sites of the type of the burhs of Alfred the Great, which replaced the earlier emporia at the end of the 9th and in the 10th century (see above). Their network laid the foundation of the administrative organization of the English state.¹⁵¹ In Moravia sites of this type appeared as late as the 11th century¹⁵² when a new statehood brought by Czech princes was beginning to form. They were distinct from the earlier Great Moravian centres by their uniformity and characteristics (smaller area, clearly laid out inner space). Their system which had been fully established by at least the reign of Břetislav I (1035–1055) formed the supporting fabric of an early feudal state. In Bohemia its beginnings are detectable as early as the second half of the 10th century when we register, for the first time, the determining attributes of an early state.¹⁵³

¹⁴⁸ E.g. McCormick (2001), p. 691, p. 767, p. 774; McCormick (2002); Třeštík (2000), pp. 52–54.

¹⁴⁹ Třeštík (1987), p. 41.

¹⁵⁰ Hodges (1982), p. 197; Hodges (2000), p. 79; Smith (1976), pp. 338–345.

¹⁵¹ Carver (1994), p. 4; Vince (1994), p. 117.

¹⁵² Žemlička (1996), pp. 18–21.

¹⁵³ E.g. Klápště (1994), p. 38; Sláma (1987), pp. 184–186; Štěpánek (1965), pp. 142–146, pp. 211–213; Třeštík (1987), pp. 39–40; Žemlička (1997), p. 155.

CHAPTER SEVEN

CONCLUSION

The aim that we set out at the beginning of this work was to understand the purpose of the central places in the early medieval society in the eastern part of Central Europe and their significance in the genesis of the medieval town and state. We decided to acquire the knowledge with the assistance of the archaeological method and the evaluation of the systematic excavations at Pohansko near Břeclav, which in our opinion represents a model site for addressing problems of this kind.

The introductory chapters were dedicated to describing the archaeological method applied. We primarily focused on the relationship between archaeology and historiography which is key in research into the early Middle Ages. Further, we clearly defined the individual steps of the archaeological method (analysis, synthesis, validation, interpretation) as they have been developed mainly by E. Neustupný. Special attention was paid to the action of the depositional and post-depositional processes and the possibilities in working with the archaeological formal and spatial structures offered by up-to-date computer technology with an extra emphasis on multivariate statistical analysis (mainly the principal component analysis from the group of factor analyses) and geographic information systems (GIS) which were at the technological core of the present solution. We also highlighted modelling, which is of extraordinary importance for the interpretation of archaeological structures. In highly dynamic and complicated systems such as human society this is a very demanding task. For this reason systems theory was introduced into archaeology. Its application, explained using the example of works by C. Renfrew, was one of the basic methodological procedures of processual archaeology.

Based on the current state of research we defined a preliminary interpretation model of the entire investigated archaeological context (the archaeological record) from Pohansko near Břeclav. The site developed in the early Middle Ages from the 6th to the 10th century, attaining important economic, administrative, military and religious functions as late as the 9th century, whereby at that time it clearly met the criteria of a complex central place. Pohansko could have been,

according to existing opinions, “a strong fortress”, “a reduced *Pfalz*”, “an early medieval Slavic town” even a base of “a large state retinue”. Throughout the work we attempted to confirm or refute the ideas and, when applicable, add to or modify them.

The formulation of a new theory of Pohansko was based both on a different (*processual-plus*) paradigm and the evaluation of essential but as yet unpublished large-scale excavations (Forest Nursery, Forest Dune) as well as the application of new methodological procedures (relational database, geographic information systems, multivariate statistical programs, geophysical prospecting, dendrochronology, etc.).

The core of the work consists of the evaluation of the excavations carried out in the location called the Forest Nursery between 1961–1990 with an examined area of around 1.9 ha. The archaeological data amassed from the Forest Nursery is available to researchers in the form of a digital catalogue of archaeological records.¹

Initially, we concentrated on the settlement features from the Forest Nursery. A total of 285 sunken-floored features and 43 above-ground posthole structures were identified. With regards to the sunken-floored features the procedures of a formalized analysis and synthesis were predominantly applied to check their classification which had already been made by B. Dostál. It was confirmed that the main types of sunken-floored settlement features (sunken-floored dwellings, large sunken-floored features, trough-shaped features, wells, and hearths) defined by their location within a multi-dimensional space determined by fourteen selected descriptors (Area, Depth, Length-to-width Index, Irregularity, Rounding, Steps in Profile, Vertical Pit Walls, Concave Profile, Hearth in Corner, Hearth in Pit Wall or Pit Bottom, Postholes, Pottery Density, Bone Density, Number of Artefacts Other than Pottery) are valid from the statistical point of view and can be worked on as an objective value. This piece of knowledge was particularly significant for the next stages of work when the types of settlement features were compared with other archaeological structures.

In addition to the sunken-floored settlement features the research on the site of the Forest Nursery also detected above-ground features. The majority were posthole structures, which were at the centre of our study. Their evaluation was based on an extensive set of 954 postholes. Instead of a clear interpretation of the structures in terms of structural

¹ Macháček (2002a).

details or their function we attempted rather to identify the general trends in the distribution of the above-ground structures in space and in the changes of their orientation or size. The reconstruction of their floor plan was considered probable or possible and was based on general criteria, such as parallel or perpendicular rows made up of a greater number of postholes, or on analogies appearing, for example, in the building culture of north-western Slavs or in the Viking and Frisian houses. The building structures which had been successfully identified were validated according to the dimensions of the postholes and the distribution of the surface structures in space. The completed validation showed that the structures that had been intuitively retrieved, following the given criteria, from the large set of postholes from the Forest Nursery, withstood the confrontation with independent data of the external evidence. We continued working with the structures as the remains of various early medieval above-ground constructions (e.g. houses, fences, palisades). They played an important part later particularly during the discussion of the urban planning concept of the whole precinct. The question of the function of the above-ground posthole structures remained open. It cannot be ruled out, however, that in the precinct of the Forest Nursery where an unusually small number of typical sunken-floored buildings had been uncovered many of those served as dwellings.

The key problem in the processing of the research in the Forest Nursery was the dating of the settlement features. The assumption that the numerous sets of pottery acquired from the site can be of significant help in this respect had been verified earlier.² The complete evaluated ceramic material from the settlement features in the Forest Nursery consists of 58,543 fragments with a total weight of 962.4 kg. For the purposes of resolving some specific issues (e.g. validation by means of stratigraphic relationships) the set was extended by more finds from the other parts of the Pohansko agglomeration. In the description of the pottery from Pohansko we unanimously opted for formalized description. The descriptive system that we proposed can be classified as one of the “higher-level descriptive systems with a prevalence of evaluated attributes”. Its definition was based on the preliminary model which was subsequently tested several times and improved. Prior to commencing the actual formalized synthesis and

² Macháček (2001c).

interpretation of archaeological structures, we endeavoured to acquire detailed knowledge of the sets that our conclusions were based on. Using taphonomic data we attempted to grasp as best as we could the post-depositional history of the assemblages and to identify pottery sets which would be sufficiently representative for the formulation of general conclusions. So we selected 108 pottery assemblages from the individual settlement features which were described by 40 different qualities. The formal structures that we extracted from the matrix, defined as explained above, using the principal component analysis, were validated independent of the input data. This was made possible by employing the so-called external evidence, i.e. data not included in the descriptive matrix that the calculation was based on, such as—first and foremost—the stratigraphic relationships between settlement features as well as data on the types of settlement features from which the pottery originated and the taphonomic characteristics of the pottery assemblages. After a validation was carried out we arrived at the opinion that the formal structures extracted from the descriptive matrix of the assemblages are valid and associated mainly with the changes of pottery over time. They correspond to specific chronological horizons although the substance of one extracted factor was not primarily chronological. We managed to demonstrate the dynamics of the development of pottery in the Forest Nursery manifested by gradual changes in the average distribution of the individual pottery attributes between the following chronological groups of which we defined a total of five. Chronological group 1 falls entirely within the pre-Great Moravian (Early Hillfort) period. Group 2 incorporates assemblages with finds from the beginning of the development of Great Moravian pottery at Pohansko. Group 3 consists of features with pottery from the high Great Moravian phase and group 5 of features from the very close of the Great Moravian development at Pohansko. There is a partial problem only with the position of group 4 on the timeline. In this case it is a structure which based on the validation cannot be considered primarily chronological, but we have justifiable reasons to believe that it belongs to the high to late phase of the Great Moravian development in the Forest Nursery at Pohansko.

The relative-chronological system, which was created in the Forest Nursery from the results of processing the pottery, was complemented by absolute data obtained from the dendrochronological evaluation of the timbering in well No. 203, re-opened during re-assessment excavation carried out in 2001. The acquired dating (882 AD) is the first

absolute dating available from Pohansko. It was synchronized with the third chronological-pottery group. It provides clear evidence of the fact that the majority of the settlement structures examined in the Forest Nursery may be dated to the high Great Moravian period.

In the following chapters we attempted to specify and to detail the purpose of the whole area and the individual features in the Forest Nursery. Based on the preliminary model we expected that the best way to their determination would be via the evaluation of artefacts other than pottery uncovered on the site. Our point of departure was the hypothesis that objects of everyday use, tools, raw materials and workshop products are relatively stable spacewise, i.e. their significant quantity remains, in the archaeological context, at a short distance from the place where the activity associated with them had been undertaken. However, the spatial stability cannot be absolute even in artefacts other than pottery. Although they must have been subjected to post-depositional processes, for the application of multivariate statistics it will suffice when there is at least a strong tendency in these finds towards spatial stability.

Given the considerable variability of artefacts other than pottery originating from the Forest Nursery, some of them needed to be grouped into broader categories while others were left alone given their structurizing significance. Some specific objects which did not occur in sufficiently representative numbers in multiple features were not included. The total number of descriptors was settled to 23: Bucket, Blacksmith Metal Casting and Metal Chasing Implements, Parts of Locks, Pointed Bone Tools, Iron Ingots, Clay Weights, Whorls, Quernstones, Whetstones, Arrowheads, Equestrian Equipment, Agricultural Implements, Roman Bricks, Iron Fittings, Bone Skates, Unspecified Implements, Iron Plates, Roasting Trays, Jewellery, Bronze Artefacts, Rings, Hook nails, Small Metal Bars. Part of them had to be taken out of the descriptive matrix as a control solution showed that their occurrence is strongly influenced by the field research methodology (flotation). The basic factor solution was therefore based on a matrix of 262 rows, containing the assemblages from the individual settlement features examined in the Forest Nursery, and 19 columns being the categories of artefacts other than pottery, quantified mostly by their absolute numbers in the assemblages.

Using the principal component analysis we extracted from it four factors, which were subsequently verified. During validation we used production waste (slag), and the factor relations to different types of

settlement features and pottery. The validation confirmed the validity of all the formal structures. In the interpretation phase the formal archaeological structures were compared to the categories of living culture.

The first factor of the basic solution was made up of various metal-working tools (punches, cutters, hammers, anvils, crucibles), iron plates and small bars (that could have served as engraving tools, awls or small punches), iron ingots, metal sheet and iron implements (including agricultural tools). During the validation this factor was clearly associated with slag, including large plano-convex pieces, the so-called slag cakes. Based on our general knowledge of smithing, smithing tools and waste, which are derived from ethnographic, archaeological, and metallographic data, we can arrive at a highly probable conclusion that the structure that showed itself as factor 1, is associated mainly with the processing of metals. Overall, three metallurgical districts in the Forest Nursery were identified in which we have evidence of the processing of non-ferrous metals in addition to iron smithing. The range of the finds coming from the metal-processing workshops at Pohansko testifies to the fact that it was primarily the site of the production of military weapons and equipment, partly complemented by the manufacture of agricultural and other implements.

The second factor of the basic solution is characterized by a combination of horse gear, arrowheads, lock components, iron mounts and buckets. During validation it was found that the factor is particularly associated with the sunken-floored dwellings and the fourth pottery group, the substance of which is not, in contrast to the other pottery groups, primarily chronological and which is typified by a high standard of the pottery. Factor 2 can be linked with a special group of the population at Pohansko, who were not engaged in craft production nor agriculture in their dwellings and held an exceptional position (see the stone-and-mortar corner of sunken-floored dwelling No. 54 or the more than usual access to the finest pottery). In the Forest Nursery precinct the inhabitants lived in sunken-floored houses, which sets them apart from the majority of the population inside the fortification at Pohansko who were involved in craft production, as is confirmed by the finds from the Forest Nursery. On the other hand, the typical type of the house associates them with the inhabitants of the Southern Suburb who, we suppose, belonged to the military component of the society of that period and formed the extended retinue of the Great Moravian ruler. It remains unclear why those people also

lived inside the stronghold, where we find, outside the Magnate Court, mainly craftsmen and their residential/production household units. Those warriors may have supervised production or were involved in the defence of the northern section of the extensive fortification.

The third factor is comprised of high coefficients of descriptors specifying some manufacturing tools and aids. They include various pointed bone implements, whorls, whetstones, clay weights for looms and the so-called bone skates. According to our existing knowledge most of those objects can be associated with textile production. As the validation of the factor solution suggests the third factor is mostly linked to the so-called large sunken-floored features. Their analogy is found in the *Pfalz* in Tilleda, where such structures are interpreted as women's textile workshops, referred to as *gynaecea*. A relatively high score to factor 3 was obtained for the trough-shaped features—very narrow and long pits more or less sunken below ground (0.3–1 m). In this group of features we also found the highest average representation of clay weights. It is very likely that some of them functionally correspond to the elongated pits, known from various sites, where they ensured greater humidity of the environment necessary for weaving cloths from plant material on a vertical loom.

The fourth and last factor is characterized by descriptors such as bucket mounts, quernstones and Roman bricks. According to the factor score values it is most significantly associated with feature No. 203 which, based on its attributes (shape, depth, timbering) can be clearly identified as a well. Several of the other features with a high factor score to factor 4 resembled wells by some of their parameters, e.g. floor plan (trapezoid to rectangle), relatively greater depth and smaller area. Explaining the significance of the extracted structure is not a trivial task in this case. No interpretation problems are found in the bucket mounts, the presence of which in the wells is not surprising. However, the other two descriptors that make up the factor are more difficult to interpret. The finds of quernstones and stone backfill in wells are far from being unusual at Pohansko as they appear relatively frequently. The explanation of this phenomenon is not quite clear. A functionalist approach according to which the stones originally served as the rim reinforcing access to the well, or were used for weighting the cover, is just one interpretational alternative. It is more probable that the quernstones were thrown into the wells or the well was back-filled with stones during their intentional closing, which was certainly of great importance in the transitional ritual, which confirmed the

irreversibility of the removal of the well from the living culture. The Roman bricks may also have been of non-utilitarian significance. As their finds are very rare at Pohansko their relationship to wells cannot be clearly confirmed. They appear at other sites as well. Just as many other antiquities of Roman-provincial origin they are found even in early medieval graves where they fulfilled the magical-ritual function of protective amulets. For the same reason the Roman bricks could have found their way to the wells which, according to ethnographic observations, are associated with various customs to ensure the protection and cleanness of water.

The archaeological structures identified on the basis of artefacts other than pottery from the Forest Nursery at Pohansko, when compared, with models derived from the living culture, were interpreted in respect to their function, significance and meaning. The function which expresses the practical point of view and the way in which the facts of the living culture are usually used, is contained in the first, third and partly even the fourth factor. They are a reflection of the most important craft activities undertaken in the precinct of the Forest Nursery, i.e. metal processing and weaving, and the use of wells for drawing water. The significance which is given by the social environment and reflects people's relationships to other people, is associated with the second factor and a specific group of people settled in the Forest Nursery. The fourth factor is primarily linked with the symbolic meaning of the archaeological structures, which reflect the spiritual life of the early medieval society. In the settlement context of the Forest Nursery it was manifested by the relationship of the local inhabitants to wells and other deep features.

Within the framework of this book we also attempted to reconstruct the social status of the people buried in the Forest Nursery, and throw light on some aspects of their spiritual life. For addressing these issues the most important pieces of information concern the graves and their goods. In the Forest Nursery a total of 81 graves were uncovered. They do not form any continual burial grounds, rather they are dispersed individually or in small clusters among the settlement features. They can be considered as being very poor. Apart from pottery they contained only a knife, firesteel, simple bronze earrings, a bead, buckle, etc. This set of archaeological data was also evaluated by means of multivariate statistics. In the descriptive system, the structurizing entity was one grave. The descriptors that characterize it were of several types. Most of them are objects placed in the grave as grave goods.

Another descriptor is related to the dimensions of the grave pits. The last group of descriptors specifies the skeleton—its orientation, state and position. The principal component analysis was carried out based on a descriptive matrix composed of 8 descriptors/columns and 50 entities/rows. The reduction in the number of entities (graves) in the matrix, compared to all the recorded graves from the Forest Nursery (81), is due to the fact that in several graves some of the attributes could not be observed and therefore the related data was incomplete.

The identified formal structures were validated with the help of independent external evidence, such as the age or sex of the deceased and the distribution of the graves in space. During the interpretation of the graves it was highlighted, first of all, that they were found within the settlement area. Spatial overlapping of the residential, production and funerary component occurs within a single settlement precinct. This is not unknown in the Great Moravian period. We expect that it was due to the adoption of Christianity, in a similar way as with the Alemanni or the Bavarians at the turn of the 7th and 8th century AD. In the Great Moravian centres the unmistakable expression of this process consists of church buildings with cemeteries. Christianity changed the original religious and social structure so much that graves in the vicinity of a house were tolerable for the local inhabitants, although fear from the “living dead” had not disappeared, on the contrary it intensified, as is proven by various anti-vampire measures. The existing social arrangement became disintegrated. Fundamental changes in the ideology related to the process of Christianization gradually percolated from the top social levels to the rest of the population. The structures found in the Forest Nursery must therefore be interpreted from this perspective as well. On the one hand we should expect some expressions of Christianity which could have spread through all layers of the population in the milieu of an early medieval centre, on the other hand there may be evidence of the pagan rite with examples of measures protecting the living from the dead. It cannot be denied that the interpretation of the structures related to the spiritual world and religion of the people from the early Middle Ages is extraordinarily complicated. In addition, everything is made more difficult by the relatively small number of graves, that create the individual structures. As a result our findings could not have gone beyond the level of a hypothesis and cannot be considered final.

The only identified formal structure that could be associated with the Christian rite is the positive side of factor 3 where attributes

such as the W-E orientation and folded forearms, often placed over the pelvis appear. It is mainly adult women that are in a non-random relationship with this group. Graves with the W-E orientation are also typified by the absence of grave goods. A perfect opposite to the positive side of factor 3 is the positive side of factor 1. The graves that form this structure are among the “richer” ones within the Forest Nursery and contain various grave goods. Most of them do not have a W-E orientation. Burials with grave goods other than pottery (including jewellery) appeared most often inside clusters of graves. It seems that these people held, within the community which buried their dead in the Forest Nursery settlement, an average to above-average position and formed its core. On the contrary, people laid in the graves related to the negative side of factor 4 were separated from the majority of society even after death. Their characteristic attribute are bent legs, or a flexed position as such, and location in peripheral zones. The last conspicuous structure that we managed to extract from the matrix made up of graves from the Forest Nursery is factor 2, specifically its negative side. With regards to the performed validation there is no doubt that it is made up of children’s graves with ceramic vessels. The occurrence of vessels in the graves testifies to the placing of food in the graves, which is obviously a pagan custom. The situation that in the Forest Nursery (and elsewhere) the custom is mainly linked to children’s graves might be explained by the fact that they were given special attention after death and that the customs related to children’s burials exhibited more conservative features than burials of adults.

An extensive chapter was dedicated to the spatial properties of the archaeological records from the Forest Nursery. In contrast to the formal archaeological structures which have been relatively well explored the spatial structures have not been even systematically described. Archaeologists usually approach them from the traditional, intuitive point of view. Unfortunately, none of the methods which were available to us are capable of formalizing the search for more complex spatial structures, reaching beyond the level of simple clusters. We had to rely on our own empirical evaluation throughout although in order to make the work with spatial data—such as sorting and visualization—more efficient we employed GIS tools. We endeavoured to divide the settlement in the Forest Nursery into the individual chronological phases. We assumed that within a single period of time the spatial structures will become so clearly organized they will be identifiable merely by

empirical experience and logical analysis. We singled out three main relative-chronological phases. The output of this chronological-spatial analysis was plans depicting the situation during the individual phases of the development of the Forest Nursery precinct.

In the pre-Great Moravian period there existed a spatially delimited accumulation of sunken-floored and above-ground features in the north-eastern section of the excavated area. In the early Great Moravian period the situation changed dramatically. The settlement features cover the whole excavated area and are arranged in irregular rows in the direction from NE to SW or from NW to SE. The majority of the settlement features are also oriented by their longer axis along those lines. The most complicated spatial structure is typical for the late Great Moravian phase, to which we assign the greatest number of the sunken-floored and above-ground features, all the graves and palisades or fences. The bipolarity between the northern and southern part of the investigated area is striking. It is more than obvious that the structures and graves oriented in the NW-SE and NE-SW direction are concentrated in the northern section of the Forest Nursery, while the N-S, E-W orientation (including small deviations) dominates in the southern half. Another remarkable spatial phenomenon identifiable in the Forest Nursery in the late Great Moravian phase is the rectangular structures, outlined by sunken-floored features, post-hole constructions, or possibly by palisade troughs and graves. This structure is clearly observable in the north-western quadrant of the excavation.

As the above mentioned spatial structures were identified by non-formalized empirical procedures, an independent confirmation of their objective existence was of extraordinary importance. However, the problem of the validation of complex structures of geographic space has not yet been satisfactorily resolved. In this work we proposed what might be called a hierarchic-structural method to this purpose. In this validation method we assumed that no spatial structure exists in isolation, rather it is part of a hierarchically organized social geographic space. In verifying the validity of an identified structure we must prove that it is a meaningful component of a higher order spatial structure and vice versa that itself it is composed of functionally interconnected lower order structures.

An example of a very simple but clearly observable spatial structure are the settlement features of pre-Great Moravian age in the north-eastern part of the Forest Nursery. They form an uncomplicated, sharply

delimited cluster which is validated, above all, by its links to the wider early Slavic settlement at Pohansko.

A relatively simple spatial structure is also characteristic of the early Great Moravian phase. It consists of irregular rows of sunken-floored and above-ground features, oriented mostly in the NE-SW and NW-SE direction. The possible existence of this structure can be surmised in relation to the arrangement of the social geographic space in the earlier, or later, Early Medieval period, which was different. In making the decision whether or not this was realistic the essential role was played by establishing the orientation of the structures that it consists of. This is because they more or less agree with the orientation of the Magnate Court or one of its earliest sections the "cult" enclosure. It served as a model for the orientation of all the other buildings and constructions of the Magnate Court, including the Christian church and the surrounding graves, as well as the earliest Great Moravian layout in other locations within the emerging agglomeration. The spatial structure of the early phase of the Great Moravian settlement in the Forest Nursery can, in this regard, be considered meaningful and perfectly realistic. It is an integral part of the geographic space of a higher order which was remodelled most probably to reflect the layout of the central pagan sanctuary. This is not unusual and could be observed even in towns from the high Middle Ages the ground plans of which reveal the endeavour of the founders towards some level of orientation of the town in agreement with the points of the compass. The pivotal point were churches, which determined the orientation of the square and thus of the gate and indeed the whole town.

The most complicated spatial structure from the Forest Nursery was created in the later Great Moravian phase. It was defined by three principal attributes: a different orientation in space in the northern and southern section of the investigated area, existence of several rectangular structures and an empty strip with no constructions. In the first phase of validation it was necessary to determine whether the bipolarity in the Forest Nursery precinct in the late Great Moravian phase was real. If it was not fictitious or random, this striking phenomenon must have found expression in the geographic space in some other element as well. During validation it was shown that the bipolarity in the northern and southern part of the excavated area was determined by the rampart which, exactly at the point where the orientation of the buildings and graves is reversed, sharply changes its direction from NW-SE to N-S. Obviously, the fortification was one of the principal

space-defining elements at that time. The empty unbuilt section, which may have served as the communication space, runs parallel with the rampart, or alternatively at a right angle to it. This hypothesis is also confirmed by the arrangement of the sunken-floored houses, which in the northern section of the Forest Nursery form two rows along both sides of the empty strip. The late Great Moravian buildings, graves, communications and fortification are spatially and functionally interlinked and evidently contemporary. They are parts of a higher order structure.

Another outstanding spatial structure identified in the Forest Nursery was rectangular clusters of sunken-floored features, posthole constructions, palisades or fences, and possibly graves. During its validation we had to prove that it was not an isolated or random phenomenon, and that similar structures appeared in the other parts of the agglomeration as well. The validation was based on the data from the existing excavations extended by outputs from new geophysical prospecting. Thanks to the GIS capabilities allowing us to merge spatial data from various sources it was possible to combine, in a single plan, selected geophysical anomalies with the results of the field excavations from various locations within the agglomeration. The rectangular structures under discussion were identified both on the research site in the Forest Nursery and in the other digging areas at Pohansko (the so-called Cremation Cemetery and Forest Dune). They were also observed in the area of geophysical measurement. All in all, a total of 26 similar structures were found, of which 7 were from excavations and 19 by geophysical measurement. The rectangular settlement structures identified in the Forest Nursery are definitely not a random or isolated phenomenon, but rather a component of a very complex structure of a higher order, which was an essential finding for the validation of the spatial structures from the Forest Nursery.

The existence of rectangular structures, made up of sunken-floored and above-ground features, palisades and graves, was also confirmed by a spatial analysis carried out on a more detailed scale. A suitable external spatial structure that could be used to this purpose was the distribution of settlement refuse on the original, early medieval surface, which has survived in the overlying layer as shards from a vessel, animal bones or daub from the destroyed buildings. During validation we observed whether the distribution of the waste is compatible with the rectangular settlement structures and whether both independent structures are spatially and functionally interlinked. The solution to

this task was the subject of the archeological excavation carried out between 1999–2003 on the site of the Forest Dune in the south-eastern sector of the inner area of the stronghold. For the purpose of the spatial analysis the whole surface area under investigation was divided by a meter grid which was used to specify the so-called square closing polygons with a dimension of 1x1 m. During the excavation the individual categories of finds (mostly pottery, bones and daub) from the topsoil (i.e. the original surface and the topmost parts of the sunken-floored features) were recorded in accordance with the polygons. The result of the analysis was a database containing 4 025 entities (the individual dug up polygons/squares 1×1 m), characterized by the number and weight of pottery fragments, animal bones and daub, which were uncovered inside them. The obtained values were interpolated by means of GIS tools. The result of the interpolation was a distribution map, depicting the density of finds in space. We found that the distribution of waste is fully compatible and spatially and functionally interconnected with the rectangular settlement structure that it validates. A similar distribution of waste was recognized in the topsoil (on the original surface) of the Magnate Court, which virtually rules out an assumed randomness during its origin.

On the whole, we managed to prove that the spatial structures identified in the Forest Nursery at Pohansko are an integral part of the hierarchically arranged early medieval space, which dynamically changed over time. The individual structures were not isolated, rather they were interlinked by a multitude of spatial and functional bonds. They are not a random phenomenon. Their real existence was confirmed using the hierarchical-structural validation method.

In the following phases of our work we concentrated on the interpretation of the identified and validated spatial structures.

The earliest spatial structure in the Forest Nursery, composed of a group of sunken-featured and occasionally above-ground features of pre-Great Moravian age, can be interpreted in the categories of living culture from the point of view of function and significance as a settlement of the clustered type, lived in by members of a socially and economically fairly unstratified early Slavic society, predominantly engaged in agricultural production.

The early Great Moravian spatial structure is made up of irregular lines of sunken-floored and above-ground settlement features. The characteristics of the identified settlement structure are not unusual in the world of the western Slavs. Lines of elongated oval pits appear, for

example, on the territory of the Slavs from the Elbe region. We also know them both from the baileys of strongholds, and from agricultural settlements. Regardless of the location, including Pohansko, they elude clear explanation in the categories of living culture. It is however obvious that at Pohansko the spatial structure is a result of the new organization of space, related to the novel ideological concept. This was demonstrated mainly by the construction of the cult enclosure, and possibly the early phase of the Magnate Court, which dictated the orientation of the rest of the built-up environment.

A much higher interpretation potential was offered by the spatial structure of the late Great Moravian phase. It was confirmed with sufficient evidence that the inner area at Pohansko, at that time most certainly delimited by a rampart, was systematically built up by rectangular settlement structures, which are in line with the other important elements of the whole agglomeration (the Magnate Court, fortification) and together form a very complex spatial structure of a higher order. Inside the rectangular structures the residential and production activities were merged as is confirmed by the distribution of waste which is fully compatible with them, and the nature of the movable and non-movable finds. In some of them we detected an enclosure and small burial grounds. The interpretation of these structures was based on the analogies from research on sites from various regions and periods as well as historical and ethnographic sources.

On the basis of the analogies mentioned above, the rectangular spatial structures from the Forest Nursery and other locations at Pohansko can be considered settlement units with a mixed residential/production function. Their important characteristic is an enclosure, which in some cases was captured by archaeological methods. In central Europe similar units appeared as early as the end of the late Bronze Age. They are generally taken to be an expression of private land ownership which, for the period of the early Middle Ages, is also clearly proven by written sources of legal status.

In the early medieval settlements in western and north-western Europe it is possible to observe several models of spatial organization. The structures that we are familiar with from the craftsmen's precinct Pohansko, have good analogies in Frankish, Alemannic, or Bavarian village settlements with farmsteads of free farmers and owners of the early medieval great estate and the people dependent on it. However, we do not know them from royal *curtes* and *Pfalzen* from the Carolingian-Ottonian period, which were centres of royal estates. This

difference may have been due to the fact that the people dependent on the manor did not reside in the *Pfalzen*, they only worked there. On the contrary, the combined residential/production function was fulfilled by the buildings on the parcels set out in the merchant and craftsmen settlements in the Frankish empire and in the neighbouring countries (England, Scandinavia). The land on which the settlements were built belonged to the ruler or alternatively to the aristocracy and the church. The owners would settle people in a dependent position on their land or even rented it. A particularly progressive model was applied in the merchant settlements in the central part of the Frankish empire (e.g. Mainz), where the tenants paid the land owners with money or services for the parcel. This system naturally required a more complex social structure and a relatively well developed monetary system, which did not exist in Moravia in the 9th century.

The parcelling out of the land visibly delimited by the rampart at Pohansko could have only been enforced by a higher authority—most probably the ruler in Moravia. He was very likely to have had a personal ownership relationship to the plot. The identified parcelation is in contrast to the organization of the residential space outside the fortification, whether in the suburb of the Pohansko agglomeration or in standard village settlements in the environs, where no similar structures were detected. This was because in the 9th century there was no form of private land ownership which could be archeologically identified.

We further attempted in this work to integrate the results of the findings concerning the area of the Forest Nursery into the overall context of the existing knowledge of Pohansko. We addressed the problem holistically with the proviso that the properties of each object under examination are not determined only by the properties of its parts but rather the properties of the whole that they are part of. We attempted to approach the early medieval centre at Pohansko as a system. Firstly, we defined a relevant cultural sequence and its temporal and spatial relationships. Next, we isolated the individual subsystems and scrutinized their functioning. Finally, we concentrated on the relationships between the subsystems with regards to the multiplier effect. We proceeded following the example by C. Renfrew, who described, in a similar way, the Minoan-Mycenaean civilization from the third millennium BC. We started from the assumption that the origin, development and extinction of the large early medieval agglomeration of the Pohansko type is the result of a positive feedback which could have

acted between various subsystems and in the final consequence led to the explosive development and collapse of the whole system.

We began to observe the system at the time of the origin of the first early Slavic settlement. It ceased to exist at the moment when, in the Late Hillfort Period period, even the last remains of the reduced settlement disappeared from the site and Pohansko remained abandoned for centuries to come. From the spatial point of view we took into consideration both the area of the agglomeration proper and the its agricultural hinterland which was an essential precondition of its existence. We also defined the individual subsystems: population/settlement, subsistence, craft technology, social, projective/symbolic and trade/communication. As the archaeological systems are dynamic we had to observe their behaviour over time. At Pohansko we could manage with four relative-chronological stages which roughly correspond with the development of pottery and sufficiently reflect the dynamics of the evolution of the whole site.

If we synchronize and compare all the subsystems between themselves, we find that the inner development evolved to a very similar rhythm. In the pre-Great Moravian period the whole system evidently found itself in the state of a long-term, very stable balance. Over a period of 200–250 years there occurred virtually no significant changes.

The cultural homeostasis was overcome in the early Great Moravian stage when there occurred radical changes and exponential growth in all the subsystems. A transformation of a single subsystem led, as a consequence of the interaction of positive feedbacks (*mutual implies positive feedback*) to changes in the other linked subsystems. The multiplier effect was set in action. The interaction between the different fields of human activities led to continual growth. A new civilization, which we traditionally call Great Moravia, was born. The origin of the vast agglomeration in the 9th century at Pohansko was clearly a result of the cultural processes which analogically appeared at different times in different places throughout the world.

However, within the Great Moravian period the cultural system at Pohansko never achieved internal balance. After the initial growth the profound transformations of the various subsystems did not stop even in the late Great Moravian period. At the same time the system generated many outputs, which had a strong effect on its surroundings. A highly complex social structure developed. Although the functioning of the system must have been very demanding in terms of energy, there were no mechanisms in place to efficiently direct the

energy flows (such as a functioning market based on a fixed monetary market). The system entered into a short-term, very unstable state. Its existence was terminated by fatal disturbances which are likely to have been generated by external inputs (Magyar raids, water regime change in the flood plain, etc.). In the post-Great Moravian stage the whole system collapsed. The majority of the inhabitants moved away or were killed in battles. The destructive action of positive feedbacks was in full force leading both to the extinction of the agglomeration at Pohansko but in the broader context also to the fall of the whole Great Moravian civilization.

At the end of our work we attempted to explain the function, significance and meaning of the archaeological structures identified at Pohansko near Břeclav. As they cannot be “read” from the archaeological records themselves we had to turn to academic disciplines working with dynamic elements. These are capable of expressing causative relationships between categories of living culture and in some cases even put original names to the identified structures. We use them as a basis to create models which are subsequently compared with the systems of archaeological structures.

The interpretation was initially based on three alternative models called *munitio*, *palatium* and *emporium*. We arrived at a conclusion that the purpose of Pohansko is partly contained in each of them.

The early medieval centre at Pohansko was built in its high phase following a unified urban planning concept on the place of an earlier agricultural settlement. It lies in a strategic location where Moravia was entered both by foreign armies and merchants. Its task was military protection as well as the control and management of long-distance trade. At the same time it concentrated professional craft production. A site of this type could have only been built by somebody with the highest authority in the country, i.e. the ruler. He also had one of his residences there, which he had built on the model of the palatium of the Carolingian *Pfalz*.

The reasons which led the Moravian ruler to the massive investment into the vast agglomeration at Pohansko ensued from his efforts to achieve personal independence. It is associated with the fact that in Moravia in the 9th century the state was yet to emerge and society was in the stage of so-called *cyclical chieftdom*. The term is used to characterize the transition between traditional chieftdom and the state during which the central power is gradually consolidated and takes control over the economic sphere. The system undergoes transformation until

the situation when the chief has accumulated sufficient wealth necessary to separate himself from the rest of the community and become a sovereign. The whole process is accompanied by the "mobilization of wealth, with the assistance of which he ascertains his status and is instrumental in the establishment of the ruling elites. It is characterized by the striving for tight control over his own and neighbouring territories which is often of an only temporary nature. A logical consequence of this development is the emergence of the trade centres, fortifications and separate royal residences. At Pohansko the three functions are integrated into a single whole. It is therefore simultaneously the *munitio*, *emporium* and *palatium* of the Moravian rulers.

Similar processes also occurred in the other territories surrounding the Frankish empire. The political entities which gradually came to being there responded to the identical impulses coming from the empire independently but in a very similar manner. This is why we find a structural similarity between the early medieval centres in Moravia, in the Anglo-Saxon kingdoms and in the Viking world. The whole process resulted in the establishment of the so-called secondary states. However, in Moravia the process was not successfully completed due to outside disturbances. The metamorphosing and still unstable social system collapsed although within sight of statehood, taking with it into historical oblivion both the Mojmir family which failed to establish itself as a sovereign ruling dynasty and Pohansko, whose fortunes were fatefully linked with the Moravian rulers.

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