Jana Apiar

Carbonised macro-remains from a Germanic settlement in Jevišovka-Nová

A contribution to current archaeobotanical knowledge of the Roman period

Czech Academy of Sciences, Institute of Archaeology, Brno

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With contributions from Peter Apiar, Michaela Kmošková, Balázs Komoróczy, Zuzana Porubčanová, Alina Szabová and Marek Vlach

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Jana Apiar October 2022

Competing and data availability statement

The principal author of this monograph honestly declares that the presented work does not have a conflict of interest in intellectual property rights, especially regarding claims to the original primary results of analyses of archaeobotanical material.

The work focuses on analysing and evaluating the archaeobotanical collection obtained as part of the rescue excavation conducted by the Institute of Archaeology of the Czech Academy of Sciences, Brno, at the Jevišovka–Nová site. The head of this excavation, B. Komoróczy, provided all acquired archaeobotanical data to the author with permission for its comprehensive processing and publication. This book also includes selected results of the author's doctoral thesis, which was prepared at the Faculty of Arts of the University of Constantine the Philosopher in Nitra under the guidance of supervisor M. Hajnalová (the thesis consultant was J. Rajtár) and was successfully defended in 2017 (opponents of the thesis were J. Hečková, P. Pokorný, and V. Varsik). This doctoral thesis has been publicly available since 2020 in the Central Register of Final and Qualification Theses of the Slovak Republic under the persistent link https://opac.crzp.sk/?fn=detailBiblioForm&sid=7521CD21230D5DBDE37BF890A9CE&seo=CRZP-detail-kniha. In this book, except for the comprehensively processed material from the Jevišovka–Nová site, no other source data from the author's doctoral thesis than the already accessible are presented.

During the preparation of her doctoral thesis mentioned above, numerous authors listed in the Acknowledgments provided the author of this book with original primary results of archaeobotanical material analyses from several archaeological sites in Slovakia and the Czech Republic. These original data, in the form of reports or digital data, were provided to her with the express consent of the individual authors (written consents are stored in the archive of the Department of Archaeology FF UKF Nitra). The author is not authorised (and has no intention) to publish these original data in the form of specific numerical data on finds from individual samples, features, or sites. Therefore, in this or any other publication based on her doctoral thesis, she does not provide original data, except for those collections for which she has the express consent of a specific author or if it is an output in the form of joint authorship. For the same reason, this publication does not include specific finds or samples from individual sites, except for the mentioned Jevišovka–Nová site or those whose archaeobotanical results have already been previously published. For the same reason, the book uses general terms, including certain groups of unspecified sites (e.g., "Slovak", "Moravian" and "Bohemian" sites, or sites in the "Limes" zone, in "Barbaricum" or "unspecified", "barbarian-Germanic" or "Roman-provincial" sites). Only general data on the chronology of sites and data sets are also intentionally used (e.g., "Early Roman period", "Late Roman period"), and only aggregate numerical data for certain groups of sites are always presented.

The list of individual analyses, the original data of which are not the author's work and therefore cannot be published in this book, but from which were used data by the author for the preparation of her doctoral thesis, can be found in the form of summary information in the Appendix section, Tab. 15. There (apart from several places also in the text itself) the authorship of archaeobotanical analyses of individual sites, which could be and were fully used in the author's dissertation, is also clearly stated. Permission to acquire source data from individual samples, features and sites must be obtained from these authors. In the presented book, only the author's additional analytical research results, partial interpretations, and overall conclusions are presented. These are substantial contributions to the conception and design of this work, representing her creative processing of the original data provided, and, therefore, are the exclusive intellectual property of the author.

In the book, the true authorship of individual images, maps, and tables is always stated. Also, the descriptions of situations and analyses developed in co-authorship with other colleagues are truthfully authorised. All authors who contributed to creating individual parts of the work through consultation or inspiration are also listed. All digital and internet resources that were (or could have been) used are also truthfully listed in the book.

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1. Introduction

Jana Apiar

Agriculture and activities related to it are a permanent part of a person's daily life. It does not need to be emphasised that the process of procuring sustenance is, with changes, everywhere, and its need is timeless. However, it is essential for the Roman period that we have the opportunity to observe an encounter between two worlds whose mutual differences may not be clearly definable but are demonstrably present. It also applies to Moravia, southwestern Slovakia and the adjacent regions of the Czech Republic, Austria and Hungary.

The cultural and political situation reflected in the economy can be seen globally. It is also dealt with by several authors, considering the Roman period's population. Similar research indeed tends to focus mainly on tracking the occurrence of Roman-provincial provenance products in the barbarian territory. In our scientific environment, the emphasis is primarily on archaeological artefacts, such as Terra Sigillata, parts of drinking services, weapons and equipment, buckles or other pieces of clothing and jewellery, to immovable artefacts such as buildings. Less frequently, the centre of interest is the daily life of the inhabitants of both cultural environments or the population of a non-military nature. Moreover, in what way or in what field of life could this potential cultural climate influence manifest itself?

To a certain extent, the very proximity of the Roman-provincial element in the area under study and its subsequent coexistence with the barbarian environment must have caused an inevitable change in the inhabitants of both regions. Such information comes from our research and also from several foreign archaeobotanical studies in the English, French and German environments.

However, it is crucial not to look at the process of "romanisation" as unilateral. There are indications that the Romans in France adopted or adapted the Celtic economy in the area. Although several written sources (Cato, Apicius, Collumela) describe Roman agriculture or fruit growing in sufficient detail, this view is exclusively from the Roman side. At the same time, it needs to be clarified what differences in agriculture existed in the Roman provinces or how such influences infiltrated the more distant Roman-provincial and adjacent barbarian areas. It is questionable to what extent this situation can be similar to, e.g., the situation in southwestern Slovakia, southern Moravia or Bohemia – that is, in the area north of the Danube.

This work results from a postdoctoral study at the Czech Academy of Sciences, Institute of Archaeology, Brno (ARÚB), Research Centre for the Roman Period and the Migration Period. It directly follows the author's dissertation research results. The original purpose was to reconstruct part of the economy of the Roman period population, concerning plant production, in the Germanic and Roman-provincial environment. The nature of the investigated issue presupposed the evaluation of the results in a large geographical region, which resulted, among other things, in different chronological and cultural-political conditions. Hence, the obtained results were divided according to the geographical areas (Slovakia, Moravia and Bohemia), the distance from the Limes Romanus in the investigated territory, and the archaeological dating. The contribution was processing archaeobotanical material from more than 40 archaeological sites (some of them unpublished) by applying thorougher research methods.

One of the conclusions of the dissertation research, as mentioned above, was the need to supplement the acquired results with a more detailed archaeobotanical analysis of individual sites, which are still scarce in our scientific environment. The archaeobotanical analysis of the material from the Jevišovka site (location Nová) was an opportunity for supplementation and mutual comparison with previously obtained results.

The dissertation research already included part of this material. In this work, for the first time, the preliminary results of the Jevišovka archaeobotanical analysis are presented and evaluated in the context of the dissertation research results.

Since the primary input material is archaeobotanical samples and finds, the structure of the work and the sequence of chapters were adapted to this. After the introductory chapters, the third and fourth chapters deal primarily with material from the Jevišovka site, review the sources and summarise the methods used to solve the problems arising from the processing of various archaeological and archaeobotanical sources. The range and types of archaeological information related to the examined samples are also listed here. Chapter four contains the work's introductory (general) methodological starting points. Detailed methodological procedures are always found in the relevant part of the work in which they are used. The chapter also presents the criteria used to determine carbonised plant macro-remains and the same procedure introduced in the previous analyses of the dissertation research. Above all, these are criteria related to the macro-remains from Jevišovka. The chapter is supplemented by an extensive photographic addendum, listed in the Appendix section.

The chronological and present archaeobotanical background is generally described as relevant from the available information on the samples used and from the results published to date.

The chapters on general results (the fifth) and taphonomy (the sixth chapter) are the original archaeobotanical part of the work. The analyses of plant macro-remains results are interpreted, and the samples are subsequently evaluated in terms of pre- and post-depositional processes.

The seventh chapter on ecological attributes of wild plants deals with the relationship between wild plants and cultivated plant products found in archaeobotanical samples. At the same time, the ecological properties of wild plants are described and evaluated here.

The eighth chapter on economics evaluates the examined assemblage in terms of economic models known from the archaeobotanical literature. Based on the results obtained in the previous chapters, potential differences in the economy of the Roman period population in the monitored territory are described.

In the ninth chapter, the assemblage from Jevišovka is evaluated through statistical models from the sampling point of view. The last chapter presents conclusions and a discussion to the obtained results.

2. A research issue and current archaeobotanical research

Jana Apiar

2.1 A research issue

The research topic is the economy of the Roman period population on part of the Middle Danube territory. Expressly, in the presented study, the economy is understood as the plant production component, especially the process of post-harvest treatment of crops and the activities resulting from it. Archaeobotanical finds from sediment samples (context or deposit) and the available archaeological information related to them are the critical means for solving the chosen issue. In this case, archaeobotanical finds mean preserved carbonised plant macro-remains.

It is not the intention of the work to solve the problem in a complex way, either concerning the archaeobotanical and archaeological finds or the chronological and cultural-historical background. The researched regions and groups of sites are not analysed in detail in terms of their internal chronology or the cultural (ethnic) affiliation of their inhabitants. Within the investigated issue, the desired solution will be the confirmation/revelation (or questioning) of specific plant production trends in the period discussed.

The primary goal of the research is to answer the main questions regarding the composition and extent of the plant component of food (perhaps also fodder) at the Jevišovka site and to find out whether there are differences in this composition within the different chronological stages and archaeological features; furthermore, based on the previous dissertation research, the possibility to compare both results and, if possible, to set the results from Jevišovka within the studied region.

2.2 Main geographic and chronological range

2.2.1 Geographical region

The region of interest of the presented work is defined on several levels. The primary region of interest of the comparison set is mainly the territory north of the Danube, limited to the territory of western Slovakia, south Moravia and central Bohemia (Appendix Fig. 67). The definition was given primarily by suitable archaeobotanical material, which formed the resulting database of dissertation research and was physically analysed. Data analysed by E. and M. Hajnalová, P. Kočár, D. Krčová, J. Mihályiová (Appendix Tab. 15) from the monitored areas were initially included in the dissertation analysis. These data are not presented in detail in the current work. Some of them will be part of separate studies.

The processing of archaeobotanical material made it possible to directly compare the acquired data, namely data from the territory of southwestern Slovakia, with south Moravia as the nearest neighbouring region.

During the heuristic work – from the literature – a larger number of sites were obtained than were actually used. However, based on entirely fragmented information, these were not included in the database, even if they contained rare archaeobotanical material (for example, several analyses performed by Z. Tempír or A. Klečka, cf. Klečka, Skutil 1937; Kühn 1981; Tempír 1966; 1968; 1982; 1992; Pleinerová 2007; etc.).

2.2.2 Chronology

The 1st–4th century AD period is essential for this work and corresponds to the Roman period in the investigated region. Regarding the archaeological-historical development of the territory, the proximity of the Limes is elemental to this work.

The chronology of the Roman period has already been elaborated in a comprehensive and detailed way, and many researchers have devoted themselves to resolving it in different regions (Droberjar 1999; 2006; Eggers 1955; Godłowski 1970; 1992; Kolník 1971; 2012, 220, 221; Lund Hansen 1987; Motyková 1976; Motyková-Šneiderová 1965; Pieta 2010, 56; Salač 2008, 11, 39, 40, with additional refs.; 2010, 351–353, 363, 364; Tejral 1977; 1992; 1994; Varsik 2011a; 2011b; 2012, 217, 218; Wiełowiejski 1970; Wolfram 2012, 219f; cf. Hajnalová, Varsik 2010; Valachovič 2011, 91; etc.). Nevertheless, the chronological information regarding the archaeobotanical assemblage was often only general in nature. This is usually given, logically, by the archaeological situation itself. The sampled deposits often do not contain suitable or other archaeological material enabling their dating. Otherwise, the site's chronology is refined during the material evaluation. In that case, this refinement will not occur in the case of archaeobotanical samples because their processing can happen at a different time than the processing of other archaeological material obtained from the site. At least partially, this clarification was possible in the case of Jevišovka. Other archaeological sites are still waiting for such synchronisation of finds and dating; for some, it will no longer be possible.

Therefore, the work uses dating according to the relative chronological stages of the Roman period or the beginning of the Migration period (Early Roman period, Late Roman period). This is due to the state of the available information that accompanied the samples, especially in the case of dissertation research. Only some samples contained more detailed chronological information, such as a specific stage.

2.3 Basic terminology of the work

Slovak/Moravian/Bohemian sites – the geographical designation of sites is often used in the work. Above all, it results from the nature of the assemblage, which is naturally divided into these three units. Even though it is a recent political designation of sites which did not exist in the examined period, it reflects some aspects of the issue quite clearly.

Distance from the Limes – the terms "distance from the border of the Roman Empire" or "distance from the Limes/Limes Romanus" indicate the potential regional cultural-political conditions used to secondarily group the sites and subject them to analyses. However, these designations were always assigned only within the "label" so as not to affect the data groupings. If sites were divided into separate groups based on location, their distribution without this categorisation (without belonging to a certain regional group) was always tested to ensure the greatest possible objectivity in the assessment.

The collective designation "Germanic sites" refers to barbarian sites located mainly north of the Danube. Among them, some sites could have been inhabited by the remnants of the Celtic population (for example, Rusovce-Horné pole, Varsik 1999a; 1999b; Hlavatá, Varsik 2019). However, resolving this issue is out of the focus of the work.

"Roman-provincial sites" – this term refers to all sites located directly on the Limes or in its immediate vicinity that were designated as "Roman" in the literature (cf. Hajnalová, Varsik 2010). Again, e.g. in the case of sites in the cadastre of Rusovce (the location of Horné pole cited above, perhaps also the location of Tehelný hon, Beňová et al. 2010), it is not yet clear whether they did not represent an enclave of the barbarian population (cf. Hlavatá, Varsik 2017; 2019). Nevertheless, they were kept in the group. All groups of sites created based on distance from the Limes and the cultural (ethnic) affiliation are not strictly given (separated) and are presented in work rather as hypothetical, with an effort to find out whether such groups are manifested in the archaeobotanical material.

Products/stores/reserves/waste – products of the post-harvest crop treatment process phases. In the Anglo-Saxon archaeobotanical literature, terms such as product and by-product are used. In cases where the term "product" is used, it means all types of products that can be created during the stages of the post-harvest crop treatment process or the specific types of products – such as grain store/storage/reserve and waste.

2.4 Current archaeobotanical research in the region

In the Czech and Slovak republics, comprehensive studies have been created in the last two decades that summarise the current state of archaeobotanical research. The first are studies by P. Kočár and D. Dreslerová (2010; 2013). There is also very little archaeobotanical material from the sites of the Roman period in the territory of Bohemia and Moravia. The Roman and the Migration periods were characterised by only a small number of sampled sites – 27 in total (Kočár, Dreslerová 2010, 213). In the territory of the Czech Republic, the wider assortment of cultivated crops changes to a narrower one with a predominance of barley, compared to the previous period, approximately from the end of the La Tène period (Dreslerová et al. 2016, 36, 37). The authors mention barley, emmer and millet as the dominant crops in this period (Kočár, Dreslerová 2010, 216, 222). During the Migration period, it should then be bread wheat, barley and spelt (Dreslerová, Kočár 2013, 264). The information is rather general, and it can be said that it corresponds more or less to data from Slovak territory.

In their study, M. Hajnalová and V. Varsik (2010) dealt with the processing of Slovak archaeobotanical material concerning the Germanic economy or husbandry regimes. Based on their study and the underlying data, we can state several facts regarding the research method. First, similar analyses are greatly influenced by the state of research, the choice of archaeological excavation methods, and the method of sampling the investigated sites. Simply put, environmental sampling as such (archaeobotanical and other) is absent from the vast majority of Roman archaeological sites in Slovakia, and only two of the analysed 27 sites used archaeobotanical systematic sampling. If field samples were taken at other sites, they are almost exclusively limited to subjective sampling, i.e. selecting "interesting" features and situations. In total, according to the authors, from the territory of southwestern Slovakia, four sites from the Roman period came into consideration, from which plant remains were collected and which the authors could use in the given analysis (Hajnalová, Varsik 2010, 191).

Nevertheless, the determination results, the analysis of plant macro-residues and their partial multivariate statistical analysis yielded more information. First, considering written sources, the discovered situation points to the importance of agriculture among the Danube Germanic people who lived in our territory during Roman period. This is evidenced by the spectrum and number of finds of cultivated crops from Germanic – Quadi settlements, such as Veľký Meder or Beckov (Hajnalová, Varsik 2010, 214–216). The authors also stated that among the cereals grown in Germanic territory north of the Danube, there was barley, which is linked to the references made by Tacitus in his work *Germania* (Hajnalová, Varsik 2010, 214). The question (also) for the mentioned study remains whether barley was a typical cereal (only) for Germanic sites or whether it was just one of several important crops grown in the studied period.

The results of their analysis showed that there is a partial difference in the assortment and proportion of individual cereal species between Roman sites outside the province of Pannonia and Roman sites in the province, as well as between Roman and Germanic sites (Hajnalová, Varsik 2010, 214–216, with additional refs.). According to the authors, the difference in assortment, i.e. the importance of crops, is also noticeable at a chronological level – some species appear to be central to the Early Roman period, others to the Late Roman period.

In 2010, F. Gyulai published an extensive work on archaeobotanical finds and their interpretation in Hungary. The work covers the period from the Neolithic to the Middle Ages and summarises the state of archaeobotanical research. In an article on the Roman period, the author divides the information into that relating to Roman (provincial) sites and sites from the Roman "Barbaricum" area (Gyulai 2010, 152–169). It states that the level of (agricultural) farming in the Roman province of Pannonia was generally high. Several plant species were introduced into the Carpathian Basin (Gyulai 2010, 152; cf. Hartyányi, Nováki 1975). According to him, this is evidenced, for example, by pollen analyses, which for the Roman period show a constant occurrence of walnut pollen and vines (grapevine). Archaeozoological findings also support new plant species or their more large-scale import. According to F. Gyulai (2010, 442, Table 3), there are noticeable differences between the assortment of cereal species in the Pannonian and barbarian sites in Hungary in the first century AD. Cereals at barbarian sites include six-row barley and emmer wheat, einkorn wheat, hulled barley, millet and rye, while these were millet, rye, bread wheat, einkorn and emmer at Pannonian sites. For the whole Roman period in Hungary, however, it can be said that so-called bread cereals dominate the Pannonian sites – bread wheat (naked) and rye; and "non-bread" barley predominates in barbarian sites outside the province (Gyulai 2010, 394–437, Table 1; cf. Kenéz 2014).

According to M. Hajnalová (2011a, 163), who processed material from the Harta – Gátőrház site (on the barbarian-provincial border) and compared it to older published sources, there are noticeable differences between provincial Roman sites in Hungary and sites outside the province of Pannonia already at the level of the assortment of cultivated cereals. While finds from the provincial sites point to the dominance of naked types of wheat, at sites outside Pannonia (with a possible "autochthonous" influence?), hulled types of wheat, namely spelt wheat and emmer wheat, predominate. The author associates the preference for naked wheat at provincial sites with a direct Roman influence (Hajnalová 2011a, 163). This finding corresponds with the results of F. Gyulai (2010) and the situation in Slovakia according to M. Hajnalová and V. Varsik (2010, 214–216).

The bearers of the Przeworsk culture inhabit the area of Poland in the studied chronological period. According to J. Rodzińska-Nowak (2012, 155), the spectrum and quantitative representation of cultivated crops in the "pre-Roman" period is also not different from the situation in the rest of "barbaric" Europe. According to the author, this is mainly due to the low proportion of barley compared to finds, e.g. from the territory of Slovakia. On the one hand, it cannot be said that barley dominated Przeworsk culture agriculture, as is typical of other barbarian areas. On the other hand, according to the author the results of the cited work do not differ from the rest of barbaric Europe. The most significant limitation lies in the lack of similar research, or primary data for similar analyses. Some indications point to the development of the Przeworsk culture from the autochthonous Celtic background and the adoption of certain types of tools, such as the Celtic scythe and the stone rotary mill (Rodzińska-Nowak 2012, 155). In the Late Roman period, M. Lityńska-Zając (1999, 183–195) records the presence of barley, bread wheat, einkorn and emmer, rye, millet, and occasionally oats. Other crops include lentils, flax, peas and broad bean (cf. Lityńska-Zając 1999).

The archaeobotanical study by A. Kreuz (2004) aimed to detect the influence of the Roman-provincial environment on the agriculture of the "autochthonous" population in Germany. Geographically, the work focused on Hesse and Main-Franconia (Kreuz 2004, 99). Based on the archaeobotanical analysis, the author distinguished three types of agriculture – Celtic, Germanic and Roman, while according to her, Germanic partially replaced and assimilated Celtic. The author mentions barley, emmer wheat and millet as typical crops, with the highest percentage at Germanic sites (Kreuz 2004, 128). In contrast, the main crop at Roman sites in general is spelt wheat, followed by barley and rye.

Regarding the preference for wheat at Roman sites, spelt wheat remains first, followed by einkorn wheat, naked wheat (bread and durum wheat) and emmer wheat. Millet was also intentionally grown, but in the same lower quantity as naked wheat and emmer (Kreuz 2004, 126, 127, 129, Abb. 3, Tabelle 10). Among the cereals, the author also mentions Italian millet, stating that it is still not clear whether this crop was intentionally grown (cf. P. Kočár 2017, personal communication).

In a comparison of Germanic and Roman agriculture, A. Kreuz (2004, 127) states that the Germanic people did not deliberately grow spelt wheat or bread wheat, in contrast to cereal cultivation at Roman sites. Such traditions have not been recorded or confirmed in the Middle Danube area. For example, Germanic tribes living in today's southwestern Slovakia grew spelt wheat (Hajnalová, Varsik 2010, 216), and millet was typical in the province of Pannonia in present-day Hungary (Gyulai 2010, 394–437).

In short, based on previous research, Germanic sites may be characterised by the predominance of barley over other cereals. At the same time, at Roman-provincial sites, it is wheat – bread wheat in today's Hungary, spelt in Germany.

From this point of view, the paleoeconomic analysis of new archaeobotanical finds from Moravia, Bohemia and Slovakia, which complement the monitored area from a historical and geographical point of view, is essential. The analysis of these assemblages could show differences or similarities between the groups of Germanic sites. Such comprehensive work is represented by the author's dissertation (Hlavatá 2017), the main results of which are presented in the current study.

3. Characterisation of selected archaeological situation in Jevišovka

Michaela Kmošková, Jana Apiar, Balázs Komoróczy, Marek Vlach

Information on the type of archaeological feature, or its parts or layers, was used to evaluate the archaeobotanical material in the context of archaeological finds. The dimensions of the features and the thickness of the layers were also used to model the volumes of their fill (cf. Szabová, Porubčanová 2021). Features primarily interpreted as interior postholes were also revisited for a possible change or specification in interpretation (for example, the feature designated as an interior posthole was reclassified as an entrance niche after the revision, cf. Zelíková 2019). Archaeological documentation was edited by M. Kmošková.

The archaeological information was influenced by how the archaeological situation was described. The information contained on the archaeobotanical sample tags was used and compared to archaeological documentation created during the field research (Apiar, J., Apiar, P. 2021). At the same time, this information was revised based on current interpretations of archaeological material (cf. Sofka in prep.; Zelíková 2019). Thus, it was mostly highly variable information in terms of the detail of the description, whether on the labels or the overall level of archaeological documentation (e.g. inconsistently marked layers, etc.).

3.1 Archaeological excavation in Jevišovka

With a total area of 0.23 ha, the shape of the implemented rescue excavation in Jevišovka (location Nová) represents roughly an N–S oriented strip 16 m wide (only 10 m in the southern part) and 163 m long (Fig. 1–4). Under the supervision of B. Komoróczy (et al. 2013) and the Institute of Archaeology of the CAS Brno (Dolní Dunajovice), archaeological features were discovered along its entire length. A total of 95 features were identified (five were documented only in the construction foundation trench profile). A total of 37 features could be determined as Roman period residential features based on the typology of their shape or the majority of material dating to the mentioned period. Their description will be addressed in this work. The dating of features represented one of the results of the diploma thesis of M. Kmošková (Zelíková 2019) in an expanded form, with the consultation of B. Komoróczy and M. Vlach.

Components dating from Prehistory to the Early Middle Ages were also discovered in the examined area (especially components of the Linear Pottery, Lengyel, and La Tène cultures and the Early Middle Ages), to which it was possible to include some uncovered settlement features. Many others, however, could not be more closely classified due to the disparity or absence of datable components. The funerary component was represented in one case – a skeleton grave dated to the Migration period, which disturbed one Roman period feature.

3.2 Pithouses

The pithouses are archaeological features representing the remains of partially subterranean structures. The above-ground parts of organic materials – predominantly wattle and daub – have not been preserved. In the investigated area, similar features are found from the Hallstatt period to the Early Middle Ages. A feature identified as a pithouse (sunken-featured building) represents the subterranean elements of the original building, mainly with a quadrangular floor plan (I. Peškař states the actual deepening is 30–70 cm for the Roman period and researched geographical area; Peškař 1962, 415).

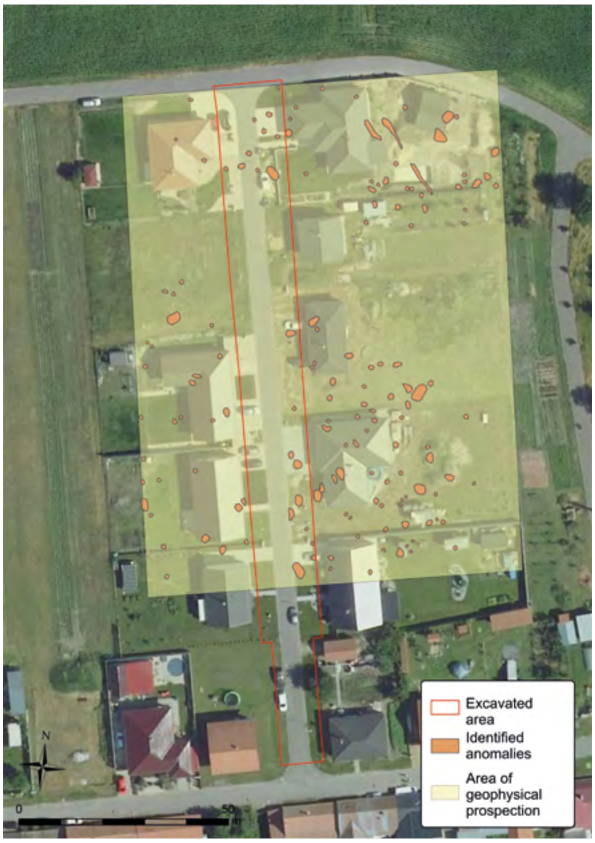


Fig. 1. Jevišovka. Orthophoto map of the rescue excavation area with magnetic anomalies identified in 2013. Source map base: CUZK. Author: M. Vlach, ARÚB.

Fig. 2. Jevišovka. Orthophoto map of the rescue excavation area with archaeological features excavated and documented in 2013. Source map base: CUZK. Author: M. Vlach, ARÚB.

In the Roman period, their original construction may be evidenced by prints on the remnants of daub spread on the walls of such dwellings. The presence of imprints of poles, which can occur inside and outside the subterranean parts, testifies to the more significant structural elements (Kolník 1962, 386). The wooden pole construction primarily testifies to the existence of a gable roof. The remains of the load-bearing structure show signs of the presence of 2–6 load-bearing poles, with the most frequently represented architectural element in the central European Barbaricum being six-pole pithouses (Droberjar 1997, 22, Abb. 11; Kolník 1962, 385–386; Kolník et al. 2007, 19; Varsik 2011a, 27). The basic structure of the gable roof, which was supported on two opposite poles, was, in Jevišovka's case, supported by other poles in the shorter walls of the pithouse, sometimes in the middle of the interior (cf. Peškař 1962, 421; Kolník 1962, 386, type III/1–2; Droberjar 1997, 22, type B).

Pithouses are often oriented to the south, with slight deviations – the orientation of structures can be determined by the presence of an entrance niche. The so-called entrance pit can be a good guide in the case of the absence of such an element (Peškař 1962; Kolník 1962, 386; Droberjar 1997, 22–23, Kolník et al.2007, 19). Its function is not entirely clear. The authors of the research previously believed that it could be a furnace or storage pit (Kolník 1962, 386). Due to the peculiar nature and the absence of burnt layers, it is thought to have served for better access to the house (Droberjar 1997, 25) or could have been covered (e.g. by a mat) and used as a draining space (cf. Kolník et al. 2007, 19).

A residential function is most often attributed to the Germanic pithouses of the Roman period (Droberjar 1997, 25; Komoróczy, Vlach 2011, 394), though with reservations, such as the absence of fireplaces, which most authors explain as a possible indication of heating in other ways (e.g. hot charcoal in vessels or heating by open fires in the outer space of the pithouse; see, e.g. Kolník 1998, 149–150; Varsik 2011a, 27). Depending on the material found, these buildings could also have different manufacturing functions, e.g. as workshops or as shelters used in inclement weather, etc. (Droberjar 1997, 25).

A total of 10 features interpreted as Germanic pithouses were discovered at the Jevišovka settlement. They represent the most common feature type dated to the Roman period (014, 015, 029, 034, 036, 038, 039, 058, 059, 084; Appendix Fig. 68, 69, 71–74, 77) and are relatively loosely arranged within the examined area. The southernmost pithouse 034 is somewhat secluded. Further from it, a cluster of pithouses 014, 015,

Fig. 3. Jevišovka. Overall view of the excavated area during the topsoil removal. Author: M. Lukáš, ARÚB.

036, and 038 form a semicircle (cf. Fig. 2, 4). Further north, pithouses 058, 059, 029 and 084 form smaller groups, for which it is possible to assume other pithouses beyond the surveyed area (cf. Fig. 1). In the case of Jevišovka, the Roman period pithouses are not in a superposition with each other, which may reflect the single-phase settlement of the studied area (Komoróczy, Vlach 2011, 39; cf. Komoróczy 2011). The superposition of pithouses occurred in only two cases – two La Tène pithouses, disturbed by Germanic ones (080 and 038, 039). It must be said that these conclusions are based on a survey of probably only a fraction of the original settlement. The Germanic pithouse 038, with its corner, disturbed part of the La Tène pithouse 080 (Appendix Fig. 76). Of the original oblong-shaped feature, only the part with the remains of two supporting columns on the shorter sides has been preserved. The orientation of the longer axis is NW–SE. Feature 039 (Appendix Fig. 72) represents the superposition of probably La Tène and Germanic pithouses, which partly extends beyond the investigated area. A square-shaped feature dating back to the Roman period was dug into the La Tène pit. Due to the hard-to-recognise situation in the field, it was impossible to distinguish between the excavated material from both features.

These two features (080 and 039) do not belong to the Roman period. Still, due to their position within the settlement, the presence of a more significant number of samples taken and macro-remains extracted from them, they are part of the analyses presented below.

According to the typology of pithouses (after Droberjar 1997), there were six-pole pithouses of the Group B (Droberjar 1997, 22–23, Abb. 11; Peškař 1962, Fig. 1–2), III (Kolník 1962, 368). These are further divided into pithouses with an entrance niche (B2, III/2), represented at the Jevišovka settlement in four cases – 014, 034, 058 and 084. The others are without a niche (B1, III/1) – 015, 029, 036, 038. For example, in the case of pithouse 034 (Appendix Fig. 71), a more significant number of postholes indicates evidence of several phases of repair (renovation) of the structure rather than a complex irregular wooden pole construction. For pithouses 029 and 059 (Appendix Fig. 69, 74), it was impossible to interpret the layout of the supporting poles with certainty due to the incompleteness of their excavation. Likewise, the interpretation of pithouse orientation is complex in these two cases. Most presumably, however, like other pithouses, they are oriented by the entrance to the south. The entrance element is documented either by an entrance niche (Peškař 1962, 416) or an entrance pit, which is located in all cases just behind the two poles forming the south wall (present at pithouses 014, 015, 029, 034, 036, 058; Droberjar 1997, 23–25).

In addition to the main structural elements, the function of which was to create the roof of the pithouse, other structural elements may also appear. At the Jevišovka settlement, it is possible to consider the doubling of the poles, which may indicate a repair of the pithouse structure (Zelíková 2019, 37; cf. Droberjar 1997, 25, with additional refs.). In addition to the pithouse 034, as mentioned earlier, duplication occurred at features 014 and 084. The construction of pithouse 034 was probably repaired to a greater extent. In features 015, 038, 058 and 084, the roof was secured in the middle of the inner part of the pithouse (Kolník 1962, type IIIb).

3.3 Above-ground structure

In the Germanic environment north of the Middle Danube, larger above-ground pole structure features do not commonly occur (Droberjar 1997, 28) but more likely, they are not yet recognised (Varsik 2011a, 27). In particular, large above-ground structures, including residential functions (so-called Wohnstallhaus), typical for the northern and northwestern barbarian regions (more, e.g. Leube 2009; Zimmermann 1992; Trier 1969), are difficult to identify reliably in this residential area. Exceptions can be found, for example, at the sites of Veľký Meder (Varsik 2003, 159–160, Abb. 6, 9: 4), Pellendorf (Artner-Krenn 2005, 25) and Vyškov (Šedo 1991, 30, Abb. 8; for pole structures in the Danube Barbaricum see, e.g. Droberjar 1997, 26–28; Varsik 2011a, 23–28). In the area of the frequent occurrence of these large features, several functions are usually attributed to them – mostly in combination with each other – primarily residential and economic (housing and storage of crops; Leube 2009, 112).

In Germanic settlements north of the Middle Danube, pole constructions of smaller dimensions of an economic (especially storage) function tend to be found. Smaller above-ground pole structures are often considered to be granaries (Droberjar 1997, 26; Varsik 2011a, 27).

An above-ground structure (Appendix Fig. 73, cf. Fig. 2, 4: features 042–057) was uncovered at the Jevišovka settlement, which was dated to the Roman period based on the material and spatial distribution of the features. The exposed part of the building consists of the remains of sixteen postholes, arranged in a rectangular floor plan measuring 6 × 5.5 m, greater length – remained undiscovered beyond research. As a result, other interpretive hypotheses are quite significantly impossible.

The layout of the postholes of the Jevišovka structure is relatively dense. The spacing between the individual poles is about 50 cm (20–80 cm). The largest spacing of 1 m is only between the two columns of the east wall (where the construction could hypothetically continue in the case of larger dimensions). It is not possible to determine the entrance to a potential building elsewhere. This may indicate the continuation of the construction to the east (in this case, the eastern row of columns would represent an internal partition). Whether it was only a partial floor plan of a larger above-ground structure, this is not easy to identify in the environment of central Europe. If this is the case, then it would be true that the western postholes (045–050) form a shorter wall, the orientation of which would be N–S. The minimum width of above-ground longhouses was 5.3 m (Zimmermann 1992, 42), so its length should be at least 10 m (Leube 2009, 112).

If the above-ground structure at the Jevišovka settlement was uncovered entirely and should serve the purpose of preserving the harvested product (as grain storage), its construction would be out of line with usual granaries discovered in Germanic settlements. These usually consist of 4–9 poles, and their dimensions generally range from 2 × 2 m to 4 × 4 m (Leube 2009, 160, note 115, with additional refs.).

Due to the layout of individual features in the settlement, it is possible to assume that the structure could have had an economic function in the case of its location within a cluster of Germanic pithouses in the centre of the surveyed area (Fig. 2, 4). Whether using a pole structure "only" as a kind of enclosure or as an above-ground granary, its presence near residential structures is typical – structures with a storage function are often located near residential buildings (Leube 2009, 159; Kolník 1962, 391). However, even in the environment of the Danube Barbaricum, storage pits are often used for food preservation (Komoróczy, Vlach 2011, 396). The storage pits located near pithouses 029 and 084 (see below) also correspond to this assumption.

3.4 Storage pits

Settlement features, which can be interpreted as Roman period storage pits, often appear at Germanic settlements (Kolník et al. 2007, 20). Such features frequently have a circular to oval floor plan and a bag-like, bottle-shaped or pear-shaped profile, mainly with a flat bottom (Kolník et al. 2007, 20). Storage pits of a similar nature appear in large numbers at Roman settlements (summary, e.g. Varsik 2011a, 37). However, their identification and dating can continually be problematic due to transformation processes, site polyculture and insufficient preservation. Storage pits repeatedly became waste pits after their primary function ended (Kolník 1962, 391; Varsik 2011a, 37).

In the case of the settlement in Jevišovka, only three storage pits dating to the Roman period were uncovered. Storage pit 062 (Fig. 4; Appendix Fig. 74) had a circular floor plan and straight walls and bottom:

diameter 160 cm, depth 100 cm from the topsoil removal level. Another of the features – pit 067 (Fig. 4; Appendix Fig. 75), also had a circular floor plan with straight walls and a bottom: diameter 126 cm, depth 76 cm from the topsoil removal level. Remains of the skeletons of two dogs were found at its bottom (Sahulová 2019, 40, 54, Obrázok 17, Príloha 1, 2; cf. Zelíková 2019, 109; Jurkovičová et al. 2017, 28; Komoróczy et al. 2013). Storage pit 070 (Fig. 4; Appendix Fig. 75) had a circular floor plan, walls slightly deepened, flat bottom: diameter 220 cm, depth 86 cm from the topsoil removal level. It can be assumed that only the lower part of feature 070 has been preserved, and an initially greater depth for the storage pit should be considered. Still, transformation processes have already disturbed the upper parts of the feature.

3.5 Unspecified pits

In addition to storage pits, other settlement features (031, 032, 033, 083, 092, 095; Fig. 2, 4; Appendix Fig. 69, 70, 76) were dated to the Roman period based on a higher proportion of Germanic pottery. However, no further conclusions can be drawn about their purpose and function, as the remains of the settlement pits represent indeterminate functions. They did not contain great amounts of ceramic material, which was also of a very diverse chronological nature.

Fig. 4. Jevišovka. Plan of the excavated area with Roman and La Tène/Roman period features (labelled) excavated and documented in 2013, after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Author: M. Kmošková. Edited: P. Apiar, ARÚB.

4. Methods and source criticism

Jana Apiar

4.1 Sampling and extraction of macro-remains

Analysed samples come from various archaeological excavations, which is reflected in the quality of the analysed data. The set shows the most significant variability in sampling and extracting plant material from sediment samples. A somewhat inconsistent sampling method can be expected with such a heterogeneous set. This is mainly due to the time variance in the implementation of individual archaeological excavations, which took place from the 1980s to 2015. This variance results from the application of different sampling strategies according to the overall research method available and used in a particular period, as well as in specific archaeological research. The non-constant volume of individual samples and collecting isolated finds of seeds freely visible in the field also influences the informative value of the assemblage. For further analyses, such as calculating the macro-remains density per litre of sediment, the samples collected in that manner are challenging to use. For the above reasons, the specification of sampling and extraction procedure is given separately in the description of the Jevišovka site and the remaining assemblage.

4.1.1 Sampling and extracting of the Jevišovka assemblage

In terms of sampling strategy, the strategy of subsampling was chosen at the site in Jevišovka. This means that the site and all its features were not sampled entirely, but at the same time, zero sampling was not applied (without collecting samples at all). Within the chosen strategy, it can be said that the sampling selection of features from the Roman period was more or less systematic, i.e. almost all features from the Roman period were sampled. However, this is not possible to say about the method of sampling features in general (clear sampling preference for features dating back to the Roman period) or the fills of individual features at the site. The samples were collected without the presence of an archaeobotanist at the site during the excavation.

Sediment samples were placed into polypropylene packaging bags and marked with archaeological information of their origin. The labels generally contained simple information on the feature number and the layer or specific context within the feature, but without any additional information. The sample volumes were inconsistent and rather small. In most cases, additional information about sediment was not available and hence was not used for analysis at all.

The sample catalogue was not elaborated during the excavation but only in the course of macro-remains extraction, so it was not possible to check miswritten or missing values and descriptions. For this purpose, cross-checking with archaeological field documentation was applied, as mentioned above, but in this way, only some of the problems could be solved. There were multiple incoherences in documenting features and contexts for ground and section plans, such as different marking or numbering of the same layers, or layer marking present on sample labels but in plans without marking at all. The samples were processed after the research. They were stored on the premises of the Institute of Archaeology of the CAS Brno – Dolní Dunajovice base and processed during the dissertation project between 2014 and 2015.

Collected samples were processed by flotation utilising the Ankara-type separation machine (Watson 1976; cf. Struever 1968; Pearsall 2000; Arranz-Otaegui 2017, 60, 61; an improved type of flotation tank with sedimentation vessels cf. Hlavatá 2013). All archaeobotanical samples obtained as sampled sediment were processed through this device using calibrated analytical sieves with a mesh diameter of 0.25 mm. A flotation catalogue was created during the processing, which contained information from the original label. Each fraction of each floated sample received a new label during the process. This carried information about the sample volume, the floated fraction, the water content in the sediment, or the content of the finds, as long as it was recognisable. During the process, each sample received an additional so-called flotation number. If there is a collection field catalogue, this number avoids marking errors and allows reverse control during further evaluation. Therefore, each sample has a unique number, even if two (or more) samples have the same collection number in the assemblage. In the case of Jevišovka, however, it was the first (only) number that the sample received. The sediment volume was always measured in a dry state, using buckets with a measuring scale. After flotation of the finest fraction (FF), each sample was continued by processing the remaining sediment using the wash-over technique (WO). The first two portions of FF and WO were dried freely in the air or a heated room in fine textile cloths. After the flotation, the remaining part of the sample (heavy residue, HR) was showered with running water. The residue was allowed to dry freely on a sieve outside or in a heated room. After complete drying, all fractions were packed separately and assembled in one package marked with the sample's flotation number.[1]

4.1.2 Sampling and extracting of the comparative assemblage

The term "comparative assemblage" stands for the data collection analysed during the dissertation research (Hlavatá 2017).

The examined set consists of samples taken by systematic and non-systematic sampling methods. It contains judgementally collected samples (e.g. when a find of carbonised seeds was observed with the naked eye or when the archaeological layer was described as crucial). The labels usually contained only superficial information about the feature number, in some cases about the layer, and sometimes only the sample serial number without further information (see above). Systematically (at intervals) collected samples came from two Slovak sites (Hajnalová, Varsik 2010). Another Slovak site was sampled systematically and judgementally (M. Hajnalová 2014, personal communication; Hajnalová, Varsik 2010). Selected features excavated at the Bohemian and Moravian sites were sampled systematically; the remaining sites were sampled judgementally and partly systematically.

According to published information and personal communication with M. and E. Hajnalová, macro-remains from older samples (until the 1990s) were extracted by manual flotation, wash-over or wet sieving (cf. Hajnalová, M., Hajnalová, E. 1998). Wet sieving yielded bulky (approximately 1 to 3 litres) fractions, which contained a high proportion (from 50–90%) of unfloatable (M. Hajnalová 2017, personal communication) sediment and thus made it difficult to separate the plant material, which became very time-consuming. With the help of a flotation tank of the Siraf-type (Watson 1976; cf. Struever 1968; Pearsall 2000), samples from two Slovak sites (Hajnalová, Varsik 2010) and some of the Czech samples were processed, the latter also utilising the Ankara-type flotation tank.

In most cases, additional information about sediment was not available, and hence this information was not used for analysis at all (see Apiar, J., Apiar, P. 2021).

Considerable subjectivity is evident in collecting both assemblages. Linking them with published archaeological information is very time-consuming and logistically demanding. In the case of Jevišovka, descriptions of archaeological features documented during the research were available in the form of a research report (Komoróczy et al. 2013), which were revised during the analysis (M. Kmošková, see above; cf. Zelíková 2019). Therefore, it was decided to use the method of modelling the volumes of the examined features.

4.1.3 Volumetric 3D modelling of Jevišovka features

Alina Szabová, Zuzana Porubčanová

Today, 3D digitalisation is used extensively in many areas of archaeology. In this case, models are employed to evaluate the morphological characteristics of archaeological features (Popovski et al. 2021). To be specific, volumetric 3D models are reconstructed from 2D images, which represent digitalised field documentation (Guček-Puhar et al. 2021). The reason for this process was volume determination of 3D models and consecutively also the archaeological features from the Jevišovka site, which are then used for establishing the level of relevance of the archaeobotanical sample volume against the absolute volume of the feature. 3D modelling was used to determine the volume of the archaeological features – pithouses, settlement pits and postholes. A total of 148 models were created, including 30 for total feature volumes, 40 for every feature layer and 78 for postholes (Appendix Fig. 68–77). The 3D model of each feature was used to calculate its

1 I would like to thank V. Dvorská-Plháková, P. Apiar, A. Námerová, F. Štiglic, P. Jelínek and other members of the Budmerice team for their help with the flotation of material in 2014/2015.

volume. Open-source Blender v2.93 software was used for modelling. The creation of the 3D models was primarily based on graphic documentation and the feature's proportions (height, length, width, diameter) with a relevant scale (Senior, Birnie 1995; M. Kmošková prepared the materials for the creation of models according to Komoróczy et al. 2013 and Zelíková 2019). Basically, the volume of the empty inner space defined by the profile of the vector drawing of the feature was measured (Velasco-Felipe, Celdrán-Beltrán 2019). Although the dimensions acquired by the field documentation can differ slightly from reality, this difference is insignificant for this study. The features consisting of more than one layer were modelled through the individual layer 3D models and consequently joined together. The method allowed calculating the volume for every documented layer separately and simultaneously for the entire feature (Appendix Tab. 16). Otherwise, in the case of the postholes, 3D models were created only for the entire postholes, excluding separate layer models (Appendix Tab. 16, 17). The Blender software was able to estimate volumes in m^3 and then it was easily converted to litres. This method for estimating the volume values of various archaeological features was consistently applied by J. Köster (2014; 2015) and it produced earlier relevant results in other studies that dealt with ceramic vessel volumes (cf. Szabová, Porubčanová 2021; Emmit 2020). Similar methods were applied in this study, just for archaeological features instead of ceramic vessels.

4.2 Laboratory analysis

Before determining the macro-remains, the extracted material was divided into fractions (0.25 and 1 mm) by sieving. In the case of large volumes, the <1 mm fraction was further subdivided into 4-, 2-, and 1 mm fractions to separate large charcoal and straw fragments and simplify the subsequent taxa determination. For each sample, the entire 1 mm fraction was sorted out.[2] For 15% of the assemblage, the 0.25 mm fraction had to be subsampled due to the large extracted volume. Of these, 1/2, 1/4 or 1/8 were sorted, and the actual numbers of macro-remains in subsamples were recorded. The final database contains their conversions to entire sample totals.

4.2.1 Determination of macro-remains

The preserved plant material was determined in several steps. Atlases and publications on modern and archaeological plant seeds, which contained detailed graphic and descriptive documentation, were primarily used (e.g. Anderberg 1994; Beijerinck 1947; Berggren 1969; 1981; Bojňanský, Fargašová 2007; Digital Atlas; Jacomet et al. 2006; Köhler-Schneider 2001; Körber-Grohne 1991; Lange 1990; Schermann 1967 et al.). The determination criteria of finds were also supplemented by illustration figures, consisting of the author-drawn archaeological and modern seeds (Hlavatá 2008).

Subsequently, the seeds were compared with a reference collection of seeds of modern plants. The material, determined in 2014/2017, was consulted with M. Hajnalová and compared with her reference collection[3] within the dissertation project research. The material determined in 2020/2021 (Jevišovka) and the revised material from 2014/2017 (Jevišovka) was compared with the private collections of J. Apiar and H. Lukšíková, and the collection of seeds of the Research Centre for the Roman period and the Migration period of the Institute of Archaeology of the CAS, Brno, in Dolní Dunajovice[4].

All macro-remains were determined using the stereomicroscope ZEISS, V8.Discovery, in private possession of J. Apiar.

4.2.1.1 Morphological criteria for determining macro-remains of cultivated and harvested crop species

A documented selection of determined macro-remains can be found in the Appendix, Plates 1–19 (see Documentation of finds).

Cultivated plants

The finds of cultivated crops include mainly those that could be (realistically and hypothetically) grown or imported (?) in the examined chronological period in the given area. The analysed material mainly comprises the finds of cereals (grains, glumes and culm nodes) and legumes (seeds and pods), fibre/oil crops, cultivated fruits, vegetables, spices and condiments.

Cereal grains

The identification of naked wheat grains (*Triticum aestivum/durum/turgidum*, *Triticum aestivo-compactum*, *Triticum aestivum* s.l.) among other cereal grains was

2 Part of the fine-flot and wash-over fractions were sorted during the dissertation project. Of these, 25 portions were sorted by E. Hajnalová and 34 by F. Štiglic. V. Dvorská-Plháková, P. Apiar and other members of the team helped with HR sorting. I sincerely thank all of them for their help.

3 Thanks to M. Hajnalová for her consultations on the determination of rare species in 2014/2017.

4 The reference collection of seeds was obtained by the lead author, thanks to access to genetic resources (Secretariat of the CBD 2005; 2011), in cooperation with M. Chudomelová (Department of Vegetation Ecology of the Institute of Botany the CAS, v. v. i.) and L. Moravcová (Department of Invasion Ecology of the Institute of Botany of the CAS). I thank J. Malíšková for her help in cataloguing part of the collection. A part of the collection used was obtained in previous years by H. Lukšíková, for which I am indebted to her.

relatively uncomplicated. The grain of naked wheat is high (convex) on the dorsal side and, at the same time, the base and apex of the grain are blunt and slightly rounded. Morphological characteristics are observable in the transverse and transverse longitudinal sections of the grain. The species was the most straightforward determination. Several variants of naked wheat grains in the assemblage were divided according to the identification criteria published by S. Jacomet et al. (2006, 23, 24). The narrower and elongated grains were described as *Triticum aestivum* type A and morphologically correspond to the naked wheat *Triticum aestivum/durum/turgidum* (Jacomet et al. 2006, 23, 24). Naked wheat grains with a very round to distinctly round shape were specified as *Triticum aestivum* type B, and these grains could be determined as *Triticum aestivo-compactum/compactum* (Jacomet et al. 2006, 23, 24). Among *Triticum aestivum* type C, wheat grains were very similar to type A grains but narrowed to the apex. Thus, types A and C are evaluated as tetraploid and type B as hexaploid wheat. Within the group of naked wheat grains, some could not be assigned to any of the mentioned groups, while it was impossible to determine whether it was a tetraploid or hexaploid form of bread wheat. These were described as *Triticum aestivum* tetra/hexa. Grains determined with a probability to any listed groups were entered as "cf.". In addition to the determinable grains of bread wheat, in the samples from Jevišovka, some bore most of the characteristics of bread wheat but were significantly smaller. These were described as cf. *Triticum aestivum* small grain.

During the evaluation of the results, all types of wheat were merged into the group *Triticum aestivum* due to a comparison with the already published results of other studies and data obtained from finds, where varieties of naked wheat were often evaluated together (e.g. Hajnalová, Varsik 2010, 189). However, in the primary database, naked wheat grains were left in separated groups as described due to the possibility of further processing.

A certain percentage of type A and type C grains were very similar to spelt (*Triticum spelta*) grains, and in some cases, it was not clear which of the wheat species was considered. The grain of spelt wheat is usually longer and narrower than the grain of naked wheat and is flattened on the dorsal side. The apex of spelt grain is flattened, and, in several cases, is blunted to one side. The grain bears visible scratches after the chaff, one of the hallmarks (Jacomet et al. 2006, 22). In addition, spelt grain tends to be very symmetrical both laterally and dorsoventrally. In some cases, the grain base tends to narrow, and the apex is widened, which can be found in the literature under the description "tear-shaped" (e.g. Köhler-Schneider 2001, 116ff). Grains with missing or unclear characteristics were described as cf. or assigned to transitional categories *Triticum spelta/dicoccum*, *T.* cf. *spelta/timopheevi*, etc. In archaeobotanical literature, similar grains are known as a species of Timopheevi wheat (*Triticum timopheevi*), or, more commonly as a "new type wheat" or "new glume wheat" (cf. Jones, Valamoti, Charles 2000; Jacomet et al. 2006, 22, 32, ibid.; Hlavatá et al. 2016). In the examined group, grains morphologically in the range from narrowed and elongated spelt grains to grains of the two-grain form of einkorn were determined as probably new glume wheat (cf. *T. timopheevi/T.* cf. *timopheevi*). As in previous cases, unclear determinations were assigned to the transitional category *Triticum timopheevi/dicoccum*.

The normal (single-grain) form of einkorn (*Triticum monococcum*) and occasionally its drop-shaped (two-grain) form were determined in the assemblage. Single-grain einkorn has a convex grain on both the ventral and dorsal sides, being most convex in the middle to lower part of the grain (towards the embryo). The grain is narrowed (pointed) on both the apex and the base. The two-grain differs from the normal form by grain flattened on its ventral side, and the apex has a characteristic, albeit pointed but offset shape. Unclear determinations were designated as *Triticum monococcum/timopheevi/monococcum* 2-grain or *T. monococcum/dicoccum*.

The grain of emmer (*Triticum dicoccum*) is similar to einkorn, but the apex is not pointed or offset but rounded, and the grain is broadest in the lower third, behind the embryo. In the assemblage, except for a certain species determination, grains were described as *Triticum dicoccum/spelta*, *T. dicoccum/spelta* t-shape or *T. dicoccum/monococcum*.

All other grains that could not be determined according to morphological characteristics were assigned with probability to two species (*Triticum monococcum/dicoccum*, *T. aestivum/spelta*, *T. spelta/dicoccum*), or as wheat (*Triticum* sp., *Triticum* sp. tetra/hexa), naked wheat (*Triticum* free-threshing) or glume wheat (*Triticum* tetraploid hulled). Alternatively, if the assignment of grains to wheat species was not certain at all, the grains were described as *Triticum/Hordeum*, *Triticum/Bromus*, etc.

Barley (*Hordeum*) was determined in the analysed assemblage as multi-rowed barley (*Hordeum vulgare*) if whole or slightly damaged grains were preserved. Most barley grains have been assigned to *Hordeum vulgare* subspecies *vulgare*. The grains had a characteristic, "boat-like" shape (cf. Jacomet et al. 2006), both from the frontal and lateral view. In the transverse longitudinal section, such grain is widest approximately in its central part, and thus its thickness is more or less evenly distributed in the dorsal and ventral directions. The grain's apex is obtuse to narrow from the frontal view and narrow to pointed from the lateral view. The angle of inclination of the basal part is sharp (sharper than in wheat). In the case of preserved whole or slightly damaged grains, longitudinal lines were visible, which are the remains of the glume, thus proving that it is a hulled variety of barley. Unlike wheat grains, the dorsal side of the barley grain is flatter to regularly round, with a fine line running through its centre that connects the apex and embryo of the grain. Among the barley grains, there were also those called twisted, which prove the presence of multi-rowed barley in archaeobotanical samples. However, it was impossible to determine whether it was 4- or 6-row barley because both of these barley varieties contain "twisted" grains. Such information would be detectable from the statistical calculation of the ratio of the straight and twisted grains (in the case of multi-row barley, the proportion of straight to deformed grains would be 1: 2) or the presence of rachis nodes/internodes. If only straight grains were detected (i.e. the ratio of straight to twisted – 1: 0), this would mean the presence of two-row barley.

Since both twisted and straight grains were found in the samples, the presence of two-row barley also cannot be ruled out (van der Veen 1992, 22–24; Jacomet et al. 2006, 43; Hajnalová 1999, 42; 1993, 72–83). Unfortunately, the assemblage of barley grains is not large enough and does not allow a comprehensive statistical evaluation thus far. There were also grains detected with unclear rotation (twist). Some barley grains have also been preserved with the remains of the glume and rachis. Barley grains, which resembled naked barley (*Hordeum vulgare* var. *nudum*), were rare in the finds, and these were determined only with probability (<10 finds in the entire assemblage).

Similarly, as in the case of free-threshing wheat species, all determined barley grains were evaluated together as *Hordeum vulgare* and in the analysis were not differentiated according to variety. However, grains were left in the primary database in separated groups as described due to the possibility of further processing. Fragmented grains or those with unclear characteristics were described as cf. *Hordeum* or *Hordeum/Triticum*.

Millet (*Panicum miliaceum*) was found in large numbers in the assemblage. Morphologically, it differs significantly from the other cereals, so it was impossible to confuse it with other non-panicaceae grains. It is specific in shape and size. The length and width of the grain vary in the range of two to three mm (Hajnalová 1999, 51). Therefore, it is not a problem to distinguish such grain from wheat, barley, rye and oat grains. From the frontal and lateral view, the grain has an oval shape. The apex is usually pointed (the grain narrows towards it). Basal part – the embryo on the dorsal side reaches one-third to one-half of its height. In cross-section, the grain seems to be composed of two parts – the dorsal part exceeds the width of the ventral part; thus, this transition on the lateral sides creates a narrow groove (Jacomet et al. 2006, 57). If these specific features are not preserved in millet (mainly in the case of incomplete preservation – the destruction of seed-coat/testa and an embryonal area), it is usually problematic to distinguish it from the foxtail seed – *Setaria* sp. (Hajnalová 1999, 51; Jacomet et al. 2006, 57). The situation is different when comparing millet specifically to Italian millet, green foxtail/hooked bristlegrass and yellow foxtail/pearl millet (*Setaria italica*, *S. viridis/verticillata*, *S. pumila/glauca*). In this case, the overall grain size and the shape and size of the embryo were followed. The morphological criteria of already published studies were used (Jacomet et al. 2006, 57, 58, ibid.; Hajnalová 2012, 37, ibid.; see below). If the grains, or their fragments, mostly belonged to the first mentioned millet species, they were determined as probable millet (cf. *Panicum miliaceum* or cf. *Panicum*); if it was not possible to determine which of the listed species they were, they were identified as millet or foxtail (*Panicum/Setaria*) or as the group of millets (Panicaceae).

Rye (*Secale cereale*) was preserved in relatively good condition in the assemblage. Its determination was problematic in cases where the morphological features of the grains overlapped with the characteristic features of any wheat or barley. Otherwise, rye grains are easily distinguishable from other cereal grains, primarily due to the angle of inclination of the basal part and the shape of the embryo itself. The embryo of a rye grain reaches one-third, sometimes up to one-half of the total length of the grain, i.e. the angle of inclination is, in connection with the more or less flat ventral side of the grain, very sharp (Jacomet et al. 2006, 49, 50; Hajnalová 1993, 62–71). Moreover, this grain is characterised by the obtuse apex, which is visible from the frontal and the lateral view. In addition, the termination of the ventral side and the dorsal side in the apical part form a triangular shape, thus disposing of none of the other cereal species (M. Hajnalová, personal communication). Since rye was preserved only in small numbers, the ratio of short and long grains of rye was not calculated (cf. Hajnalová 1999, 47, 48).

Oat (*Avena* sp.) differs considerably from other cereal grains (van der Veen 1992, 22, 23; Jacomet et al. 2006, 53–55). It has an elongated shape. Compared to other cereals, it is narrow to subtle. A determination was based on the overall shape and the shape of the embryo. The grain is flat from the ventral side, and the central groove is very shallow and slightly concave from the dorsal side. It has an oval cross-section. It is also characterised by the oval shape of the embryo, which is elongated in the form of a narrow depression at the highest point (Jacomet et al. 2006, 55; van der Veen 1992, 23). The embryo tapers towards the middle part of the grain and thus creates a longer scar behind it. However, the grain resembles common wild oat (*Avena fatua*). Neither species can be distinguished without the presence of the lemma base. Since no oat glumes were preserved in the studied collection, the grain was designated as common/common wild oat (*Avena sativa/fatua*) or probable oat (cf. *Avena sativa*). Grains were also found, or fragments determined as *Avena* sp. and *Avena/Secale*. In some cases, the grains were preserved in smaller fragments, and the species was unclear. At that time, the grain fragment was determined as oat or brome grass (*Avena/Bromus*).

Cereal grains and fragments without a preserved surface structure, or fragments of porous cereal mass (remains of endosperm), badly damaged by fire, were assigned to the category of indeterminable cereals (Cerealia indet./-frag.). To be able to convert the number of detected fragments into whole grains (MNI), fragments were recorded according to size – in the range from one-half to one-eighth of a grain, or in very uncertain cases, according to size in millimetres (up to 3 mm, up to 2 mm, up to 1 mm). In the group of fragments, there were also those for which it was impossible to determine with certainty whether they were cereals and if they were, what group of cereals they were. These were determined as Cerealia/Panicaceae; Cerealia/Poaceae; Cerealia/Leguminosae; Cerealia/Panicaceae/Leguminosae.

Cereal chaff and straw

A group of finds named cereal chaff comprises the spikelet remnants (rachises, nodes and internodes) of naked cereals and the residues of glume bases and forks of hulled cereals (cf. Jacomet et al. 2006). Among hulled wheat, glume bases and forks of einkorn, emmer, spelt and probable new glume wheat were determined. In the einkorn forks, the standard single-grain form and sporadically its two-grain form was determined. The determination of single-grain einkorn forks is relatively simple, based on the broad and flat separation scar and the sharp angle formed by the glumes and rachis internode. In the case of two-grain einkorn, the angle the glumes and rachis internode make is less acute, even slightly obtuse, causing the forks to be similar to emmer. But in contrast to emmer, the separation scar is still very similar to the single-grain einkorn (cf. Jacomet et al. 2006, 26; Jones, Valamoti, Charles 2000, Table 1, Fig. 4; Köhler-Schneider 2001, 110–125). In an anteroposterior cross-section of the single-grain einkorn fork, a scar is visible in the shape of a hole,[5] where one grain was located. In the case of a two-grain form, the scars of two grains can be seen. The cross-section of the fork is approximately rectangular – the glume bases are thick and square in cross-section. The glumes of single-grain einkorn are narrow and have a significant primary and secondary keel on the lateral sides (longitudinal edges). The primary keel visibly protrudes from the glume to its base (cf. Hajnalová 2012, 39).

Emmer forks have a separation scar narrower, about one-third of the whole fork (cf. Jones, Valamoti, Charles 2000, Table 1; Köhler-Schneider 2001, 121, Abb. 28). At the same time, the scar is oval and more profound compared to einkorn. The glumes form an obtuse angle with the rachis internode because two cereal grains sit in the spikelet. The surface of the dorsal side of the glumes is structured by longitudinal nerves, which are almost absent in einkorn. Two scars for the separated grains are visible in an anteroposterior cross-section of the emmer fork. The cross-section has a square to rectangular shape – the glume bases are more or less square in cross-section, thinner and broader in size compared to einkorn.

Whole spelt forks were present in the assemblage. The glumes were mostly preserved from about two-thirds of the length. Spelt glumes are oval to round in cross-section, which differs from other wheat glumes. Keels are not very pronounced compared to einkorn and emmer. The forks have a rectangular to oval shape in an anteroposterior cross-section. Distinct nerves structure the surface of the dorsal side of the glumes – which end deep at the glume base (cf. S. Jacomet in Jacomet, Brombacher, Dick 1989, 325, Tab. 96, Taf. 11: 22, 23; Jacomet et al. 2006, 26).

The last wheat identified in the chaff is new glume wheat. In particular, the presence of glumes of this wheat confirms the correct determination of grains of the same species. The chaff was determined according to the published archaeobotanical literature (Jones, Valamoti, Charles 2000; Köhler-Schneider 2001; Jacomet et al. 2006; Köhler-Schneider, Canappele 2009, 61–74; Fiorentino, Ulas 2010; Hajnalová 2012; Toulemonde et al. 2015; Hlavatá et al. 2016; Plháková 2015). Glumes and forks of the Timopheevi wheat are morphologically similar to einkorn and emmer. The separation scar is similar in shape to the emmer but reaches the width of the einkorn scar (cf. Köhler-Schneider 2001, 116–125, Tab. 53; Tab. 54, column b "emmerähnlicher Spelzweizen"). The primary and secondary keels are as pronounced and lean away from the glumes like the einkorn. The glume nerves on its dorsal side are

5 This means a scar in the shape of a hole, which arises in the area of cereal grain separation by embryo from a spikelet – i.e. from a fork (cf. Novák, Skalický 2009, 294, 295–297).

similar to the emmer but disappear higher above the glume base. The forks and glumes are more massive in size. The glume is mounted on the rachis at an acute angle, similar to the einkorn. However, the distinguishing morphological feature is the fork's slightly rotated or "twisted" shape. Both glumes can tilt to one side of the fork, and the entire fork can be arched on the ab/adaxial axis (cf. Jones, Valamoti, Charles 2000, 134, 135, Fig. 2, 3; Jacomet et al. 2006).

In the material, it was possible to identify rachises of naked wheat of the tetraploid form (*Triticum turgidum/durum*, *T. aestivum* s.l.), but in the comparative assemblage the rachises of hexaploid form were also determined (*T. aestivum/compactum*). The rachis residues of both types of naked wheat were preserved differently in the material. While the rachis of tetraploid wheat was preserved in the form of internodes, sometimes with glume bases, mainly only nodes of the hexaploid wheat rachises were determined, with remnants of rachis internodes having been preserved. In the case of internodes, the distinguishing feature was their overall shape. The rachis internode of tetraploid naked wheat extends towards the node (it is widest at the top), and the sides of the internode are straight (Jacomet et al. 2006, 35, 36; cf. Hillman 2001). The internode of hexaploid wheat is widest just above the middle part (Jacomet et al. 2006, 35, 36; cf. Hillman 2001) or in the upper third, but not just below the node. The sides of the internode are rounded. Another important distinguishing feature is swelling (lumps) in places where the glume is attached to the node or glume base. The bulges are very pronounced in tetraploid-type wheat and form rounded-spheroidal protrusions. In contrast, in hexaploid wheat, they are less prominent, narrow and their upper parts are destroyed by glume separation (Hillman 2001 according to Jacomet et al. 2006, 36, criteria 1; Köhler-Schneider 2001, 125, 127, 129, Tafel 4: d; cf. Hlavatá 2008, 22, Obr. 2.1.10). The differentiation is possible due to the combination of the bulge's shape and the form of the nodes and internodes. The fact that the hexaploid-type nodes were preserved without glume residues was helpful.

Rachises of rye and multi-row barley were identified sporadically in the Jevišovka assemblage. Both were preserved in separate internodes and the rachis remnants (connected internodes).

The internode of the barley rachis is arched on the adaxial (ventral) side and extends towards the node, where it is widest. Another internode joins it with its rounded base and together forms a more pronounced bulge in the node (cf. Jacomet et al. 2006, 44, 45, 48; Köhler-Schneider 2001, 129–131, Tafel 5). The rachises with the rest of the glume base attached were preserved in several cases. Several fragments of the rachises were formed by several connected internodes with preserved pieces of glume bases and hairs on the lateral sides of the internodes.

The rye rachises are narrower than their barley counterparts. Their lateral sides are more parallel (cf. van der Veen 1992, 22). The internode is not arched but widens slightly in the lateral and ad/ab-axial axes toward the node and base. The node on the adaxial side forms a swollen/roughened part, a characteristic morphological feature of the rachis. The lateral protrusion may be preserved in the thickened part (Jacomet et al. 2006, 50). Rachis node fragments with attached internode bases were found in a certain amount in the comparative assemblage. On the adaxial side, only the roughened part of the internode with a lateral "protrusion"[6] (even without it) was preserved, on which the abaxial (dorsal) side the base of the next internode was placed. Due to the characteristic shape of the fragmented part of the rachis (cf. Jacomet et al. 2006, 50),[7] these finds could be determined as rye.

In one case, the spikelet base was found, which was determined as a probable oat (*Avena* cf. *sativa*).

The remaining glume and fork fragments were identified as *Triticum* sp. hulled, *Triticum sp.*, or as transitional categories *T. monococcum/timopheevi*, *T. monococcum/dicoccum*, *T. spelta/dicoccum*, *T. dicoccum/timopheevi*, *T. dicoccum/timopheevi*. The rachises and glumes that could not be assigned to any cereal species were identified as *Cerealia* indet.

Fragments of cereal culm nodes and internodes were determined in more significant numbers. The main morphological criteria for the determination of straw were a small radius of culms in a circular diameter, vascular bundles and parenchymal tissue. In addition to the fragments of the above-ground parts of the stems, fragments of basal culm nodes with remnants of scars from the roots were occasionally captured. Poorly preserved stem fragments were determined as cf. straw/*Phragmites* sp. Fragments that were impossible to distinguish even from subtle charcoal were determined as straw/*Typha*/*Phragmites*/charcoal.

Basal culm node fragments that could belong to tuber oat grass[8] occurred very rarely in the assemblage (cf. Roehrs, Klooss, Kirleis 2012; Effenberger et al. 2019). Still, due to the state of preservation and the fact that such finds tend to be very rare (and at the same

6 Protrusion = "basis of the narrow glume" (Jacomet et al. 2006, 50; cf. Hajnalová 2012, 40).
7 Some fragments (presented not only here) were more challenging to determine, and the authors' thesis identification criteria and photographic documentation (Hlavatá 2008, 23) were also used.
8 Thanks to Z. Vaněček and M. Hajnalová for pointing out similar finds.

time problematic in determination), it was impossible to determine the fragments with certainty. It could also be the remnants of the bulrush/reed root system. They have been entered thus far in the database as root/part of the stem cf. *Arrhenaterum elatius* subsp. *bulbosum*.

Legumes

Among legumes, only lentils (*Lens culinaris*) were determined in larger quantities (dozens of seeds), based on the round to oval shape of the seed, which in cross-section forms a lens with narrowed edges. At the same time, lentils are one of the few legumes that can be determined with probability even if the seed does not retain the hilum. The lentil hilum, usually flush with the surrounding surface, is short and makes up 1/12 to 1/10 of the total seed circumference (Anderberg 1994, 49). In the charred state, sometimes the root outline above the hilum protrudes from the seed (by the fact that the hilum can be destroyed and "fall off" during carbonisation), forming a "tail". Most of the lentil finds have been preserved in half of the seeds and whole or one-third of the seeds. It was possible in rare cases to distinguish pea seeds (*Pisum sativum*) and bitter vetch (*Vicia ervilia*) from other legumes. The former has a spherical shape, short hilum, forming 1/14 to 1/12 of the total circumference of the seed with a visible scar (Anderberg 1994, 52). The seed of bitter vetch has an ovoid shape with flattened side walls and a triangular cross-section. The hilum is short, similar to the previous two species. Legumes were preserved in whole seeds, halves or fragments.

Fragments (one-quarter to the whole seed), determined as probable faba bean (*Vicia faba*), were preserved in rare cases based on the seed fragments' longitudinal oval shape and size. However, since the hilum was not preserved on them, and the fragments were largely destroyed, the seeds could not be determined with certainty.

The remaining fragments were classified into transitional categories between the two species or only into the genus (*Lens*/*Pisum*, *Pisum*/*Vicia*, *Lens culinaris*/*Vicia ervilia*). Indeterminable cultivated legumes were named Leguminosae Sativae indet. (Leg. Sat. indet.).

Fragments of porous organic material

The finds marked as "carbonised organic material" (Appendix Pl. 14, 15) were assigned to the following categories: cf. carbonised bread/flatbread or porridge (cereal or cereal-legume-vegetable), cereal material, cereal-legume material, cereal/bone material, indet. porous organic material, indet. organic/inorganic material.

Occasionally, the cereal material made it possible to distinguish the main proportion/admixture of wheat grains (*Triticum* sp.) and millet (*Panicum miliaceum*). Millet/Italian millet grains were mixed with lentils (*Lens culinaris*). The other fragments remained determined only as organic material or porous organic material. In several cases, it was impossible to determine whether it was bone or plant organic material, cereal material burned together, charcoal or fragments of cereal straw and bulrush/reed.

Furthermore, fragments were recorded, classified only in carbonised inorganic/organic material or organic matter/pitch/resin.

Fibre and oil plants, vegetables, spices, condiments and other use plants

Finding carbonised vegetables, spices, and condiments seeds is exceptional, especially in periods older than the Middle Ages (Late Middle Ages).

A rare find of cumin (*Cuminum cyminum*, Appendix Pl. 16) spice was found in the archaeobotanical collection from Jevišovka. Carbonised seed was compared with modern seeds in the reference collection. In the case of cumin, the seed was compared to the modern seed of the same species but also to fennel (*Foeniculum vulgare*) and caraway (*Carum carvi*) to rule out a possible erroneous identification (Appendix Pl. 16: 2–6). The seed has an elongated spindle shape (5–6 mm) with five dorsal ribs on each mericarp, rugose and microstriate surface (Tuncay, Yeşil 2019, 548; Hussein et al. 2016, 516–519, Table (1), Figure 1 (E)). Transversally, the cumin seed is bean-shaped (depressed ovatus – Tuncay, Yeşil 2019, 554, Figure 4B), which corresponds to the carbonised find from Jevišovka. The overall shape, shape in transversal section and mericarp surface of other compared species seeds differ significantly (Tuncay, Yeşil 2019, 550, 554, Figure 4; Anderberg 1994, 113–119, Pl. 135, 140; Hussein et al. 2016).

From other probable medicinal (or other use) plants, one seed of likely vitex or monk's pepper (cf. *Vitex agnus-castus*, Appendix Pl. 17: 1), one seed of poison hemlock (*Conium maculatum*, Appendix Pl. 17: 3) and bearberry/kinnikinick (*Arctostaphylos uva-ursi*, Appendix Pl. 17: 2) were determined.

From fibre and oil plants, flax (*Linum usitatissimum*) was determined occasionally. Flax seeds were identifiable as cultivated flax seeds due to their elongated oval and flat shape. The seed is narrowed at the apex, while the base is rounded. The seed surface is smooth (Anderberg 1994, 72). In addition to whole seeds, flax has also been preserved in fragments.

Fruits and nuts

Danewort (*Sambucus ebulus*) was found in the assemblage in relatively large numbers of mineralised and non-carbonised seeds. Carbonised seeds occasionally occurred. Black (*S. nigra*) and red elderberry

(*S. racemosa*) were determined in non-carbonised or partially mineralised seeds. Distinguishing danewort from black and red elderberry was on the basis of the shape of the seed, which for danewort is oval, with a pointed apex and an oval base. Black elderberry seed is elongated, and its lateral sides are parallel straight, sometimes with an indented apex (cf. Beijerinck 1947; Digital Atlas). The difference between the danewort and red elderberry is the seed's width, which is for the latter smaller from both the lateral and frontal view. A characteristic feature for identifying elder seeds is their surface structure. As wild or domestic apple (cf. *Malus sylvestris/domestica*) was preserved only in fragments, the seed was determined only with probability. The other seed was determined to be probably a pear or an apple (cf. *Pyrus/Malus*, Appendix Pl. 13: 2).

Other fruit finds were determined mostly in the comparative assemblage material, as follows. Of the caneberries, several European dewberries (*Rubus caesius*) and the others only as caneberry (*Rubus* sp.), alternatively rowan/caneberry (*Sorbus/Rubus* sp.) were determined. Vine seeds are preserved only sporadically. In one case, the seed was determined as a grapevine (*Vitis vinifera*) based on morphological features, although based on metric dimensions (cf. Látková et al. 2017; Köhler-Schneider 2001), it seems that it may be a wild grapevine (*Vitis sylvestris*). Therefore, the seed was left in the database marked as *Vitis vinifera/sylvestris*. The remaining vine seeds occurred only in fragments and were specified as *Vitis* sp. The seeds of musk strawberry (*Fragaria moschata*) and unspecified strawberry (*Fragaria* sp.) were determined from the other fruits.

Several fragments found in the examined assemblage could not be determined other than as probable fragments of indeterminate fruit (indet.).

Only burned fragments of unidentifiable shells could be specified as nuts. Fragmented finds of acorn (*Quercus* sp.) and beech (*Fagus sylvatica*) were sporadic.

Wild plant species

The assemblage of wild plants from Jevišovka consists of more than 100 botanical taxa, of which 86 could be determined at the species level, between two species or genus, and use in some of the presented analyses. The group of the remaining taxa could be determined between two genera or family. The lower degree of determination was mainly the state of conservation, then the size of the seeds and their fragments and the availability of the necessary species in the reference collection of modern seeds, or the possibility of obtaining such a reference sample. Only exceptionally were the diaspores preserved in such a good condition that it was possible to use all the identification characteristics of the individual species. These are, for example, the surface structure and texture (pericarp), the shape, number and size of surface cells (epidermis, epidermal cells), and the structure of the endosperm. In this group of taxa, some finds were indeterminate, but the seeds were similar to a particular botanical species based on morphological characteristics. Such seeds have been specified by the name of a similar species with the designation "type"[9] (e.g. *Picris echioides* type). In addition to the mentioned degrees of determination, more numerous fragments or destroyed seeds of unidentifiable finds were marked as indeterminate (indet.).

Among the determined taxa of the family Poaceae, the most numerous were seeds of bromegrass and foxtail. Bromegrass was distinguished from oat grains (*Avena*) based on a longer but thinner grain, which may be conical and tapering to the edges (cf. Körber-Grohne 1991, 226, Tafel 22; Hajnalová 2012, 41, Obr. 3.6). According to the different shapes and surface textures (shape and direction of the cells) of the apexes and bases, field brome (*Bromus arvensis*), field/rye brome (*Bromus arvensis/secalinus*), rye brome (*Bromus secalinus*), downy brome (*Bromus tectorum*), downy or sterile brome (*Bromus tectorum/sterilis*), probable smooth brome (*Bromus* cf. *racemosus*) unspecified bromegrass (*Bromus* spp./*Bromus* sp.) and bromegrass or oats (*Bromus/Avena*) were determined in the assemblage.

Based on the overall shape similar to millet (see above), grain width and thickness, embryo height (depth) and surface texture, the following species were determined: foxtail (*Setaria italica*, *Setaria viridis/verticillata*, *Setaria pumila/glauca*, *Setaria* sp.), foxtail or crabgrass (*Setaria/Digitaria*), smooth crabgrass (*Digitaria ischaemum* or cf. *D. ischaemum*) and cockspur grass (*Echinochloa crus-galli*). The foxtail embryo extends up to two-thirds of the grain length (Köhler-Schneider 2001, 134; Jacomet 2006, 57), and the grain lacks the characteristic lateral grooves that are observable on the millet grain. In addition, yellow foxtail/pearl millet (*Setaria pumila/glauca*) is simple to determine by the wrinkled surface structure of the grain in part above and around the embryo, which distinguishes it from other grains similar in shape. As a result, it is also possible to determine fragments of these grains.

The same grains, but without the wrinkled surface, were determined as green foxtail/hooked bristlegrass (*S. viridis/verticillata*; cf. Köhler-Schneider 2001, 172). Italian millet (*S. italica*) was distinguished from the remaining foxtail grains and millet, on the one hand,

9 However, such determinations are not applicable in further analysis. As it was impossible to determine with certainty which species it is, and these seeds cannot be used in an ecological or taphonomic analysis (due to the physical properties of weed seeds).

thanks to smaller dimensions, but also due to the remnants of the soft glume, which remains burned on the carbonised seeds. Unspecified seeds of grasses were specified only by the family name (e.g. Poaceae agg., cf. Poaceae), by an attribute referring to the size group of grass seeds – as Poaceae small-seeded (less than 2 mm) or referring to probable genus (cf. *Poa* sp.).

Most Viciaceae/Fabaceae seeds could only be specified by family name or attribute referring to size – Fabaceae small-seeded (less than 2 mm). The poor preservation status of these seeds made it impossible to adhere to their surface structure or the size and location of the hilum. Of those determinable, these are round to oval seeds in the dimensions of approximately 1.6–2.5 mm, with an elongated hilum of an oval shape – smooth tare (*Vicia tetrasperma*). From the *Vicia* genus, the group of tufted vetch (*Vicia cracca* agg.) was also determined based on the globose shape, elliptic hilum and larger size (2.1–3.6 mm; Anderberg 1994, 47). Poorly determinable seeds of the family were specified as *Vicia* sp. or cf. Viciaceae. Oval seeds, laterally flattened, measuring approximately 1.9–2.7 × 1.2–1.8 mm (cf. Anderberg 1994, 53) and with characteristic protrusions over the entire surface of the seed, were specified as the field restharrow (*Ononis arvensis*) and spiny restharrow (*O. spinosa*). Caley pea (*Lathyrus hirsutus*) was determined due to seed size and hilum size and shape (Anderberg 1994, 37; Lhotská, Chrtková 1978, 127, 128). Black medick, sickle medick, medick, probable medick (*Medicago lupulina*/cf. *lupulina*, *Medicago falcata*, *Medicago* sp., cf. *Medicago* sp.), melilot (*Melilotus alba*/*officinalis*, *Melilotus dentatus*), medick/melilot (*Medicago*/*Melilotus*) were determined generally by a characteristic oval to ellipsoidal seed shape, markedly flattened on the side. They were distinguished based on apex shape, base, and specifics of both species' overall shape and the size and shape of the radical. In some cases, very poorly determinable destructed seeds of small sizes were assigned to the group *Trifolium*/*Melilotus* small.

Sporadically, carbonised seeds of galega (*Galega officinalis*/cf. *G. officinalis*) were identified. The seed was of a slightly compressed cylindrical shape with a blunt or rounded apex and bottom (3.5–4.5 × 1.8–2.2 mm; Bojňanský, Fargašová 2007, 309, 310; Digital Atlas). The hilum was located in the middle of the length.

A small (c. 1.5 × 1.3 mm), oval to globose, slightly laterally flattened seed was determined as Bird's-foot trefoil (*Lotus* cf. *corniculatus*; cf. Anderberg 1994, 62, Pl. 80; Bojňanský, Fargašová 2007, 347, 348; Digital Atlas). Another seed from the Fabaceae family was determined as probable little white Bird's-foot (cf. *Ornithopus perpusillus*) with an elliptic shape and indistinctly granulate surface (Anderberg 1994, 63, Pl. 81; Bojňanský, Fargašová 2007, 349, 350, 351; Digital Atlas).

Seeds of the subfamily Chenopodioideae (amaranth family) are characterised by a round shape, with dimensions of about 1–2 mm, oval to flattened in cross-section. The seed tapers to a tail-shaped protrusion in the germinal area that encloses the seed's overall round shape. These seeds can be determined in individual species only if the seed's surface structure (seed coat, "*testa*") is preserved (van der Veen 1992, 25). In the case of the *Chenopodium* genus, there is a shallow round depression in the middle dorsal side of the seed, to which the grouped cells of the surface structure usually point. Seeds of the aggregate species *Chenopodium album* agg. were determined based on regular round shape, oval cross-sectional shape and fine surface structure of the seed, formed by cells pointing on the dorsal side to the centre of the seed, on the ventral side transversely, and the dimensions (c. 0.9–1.2 mm). In the case of *Chenopodium polyspermum*, the cells of the surface structure of the seed are more pronounced and form distinct lines. The seed may also be slightly flattened at the edges of the dorsal side, giving it a slightly conical shape. The seeds are usually smaller than white goosefoot – *Chenopodium album*. Maple-leaved goosefoot (*Chenopodium hybridum*) differs the most from the mentioned species in its size (c. 1.7–1.9 mm), but especially in the surface structure of the seed, which is formed by well-visible, regularly grouped oval cells. Seeds preserved in small fragments were specified as *Chenopodium* sp. The seeds of the mentioned species were preserved in both non-carbonised and carbonised states in the analysed samples. Probable oak-leaved (*Ch.* cf. *glaucum*) and fig-leaved goosefoot (*Ch. ficifolium*) were identified in non-carbonised seeds. In cases of poorly preserved morphological marks, seeds were assigned to the transitional categories *Ch. album*/*polyspermum* or *Ch. ficifolium*/*polyspermum*. Field needleleaf (*Polycnemum arvense*) seeds were determined based on their oval shape, significantly flattened in cross-section, the dimensions (approximately 1–1.2 mm), and the surface structure formed by slightly convex small, oval cells. Prickly saltwort (*Salsola kali*) was determined by the characteristic helical shape of the seed, which differs significantly from other seeds of the amaranth family (Berggren 1981, 46, Pl. 29: 3). Saltbush seeds (*Atriplex* spp.) are similar to goosefoot seeds, but they are larger (1.8–2 mm), and their surface structure is formed by cells grouped into fine lines leading to the seed germ. Amaranth (*Amaranthus* sp.) differs from goosefoot and saltbush in its more delicate surface structure and markedly flattened seed edge (creating a narrow edge in cross-section). They were also determined as *Amaranthus lividus*/*retrofelxus*. From this family, the seeds of common saltwort (*Salsola kali* syn. *tragus*) were also found in the assemblage, with a typical inverted cone-like shape (Berggren 1981, 46, 47, Pl. 29).

There have also been several cases where only the seed cores have been preserved. At that time, assigning these finds to anything other than the Chenopodiaceae family was impossible.

Of the starwort (Caryophyllaceae), only the chickweed (*Stellaria media*) could be determined based on the shape of the seed and the typical surface structure consisting of small, not-pointed protrusions. Other starworts and their fragments were not further identifiable (*Stellaria* sp.). Of the pinks (Caryophyllaceae), the determination included the bladder campion (*Silene vulgaris*), Nottingham catchfly (*S. nutans*), and unspecified campion (*Silene* sp.), baby's breath (*Gypsophila paniculata*) and common corn-cockle (*Agrostemma githago*). Campion seeds have a round, oval cross-section; the shape of the seed around the germ (indented bulge) and the seed's surface structure were important. Campions, baby's breath, and starworts were non-carbonised/partially mineralised in the assemblage, and only sporadically were they preserved in a carbonised state.

The knotweed family (Polygonaceae) is characterised by its triangular cross-section. The seeds of knotgrass (*Polygonum*) have an elongated shape, and their greatest width is usually found in the lower half of the seed. The assemblage included common knotgrass (*Polygonum aviculare*) and unspecified knotgrass (*Polygonum* sp.) seeds. Compared to docks (*Rumex*), knotgrasses have rounded seed edges (docks have sharp-edged to pointed seeds). It was possible to identify the curly dock (*Rumex crispus*), bitter/curly dock (*R. obtusifolius/crispus*), red sorrel (*R. acetosella* syn. *Acetosella vulgaris*), and fragments of an unspecified dock (*Rumex* sp.). Highly damaged seed fragments, coats and cores were called *Rumex/Polygonum*, cf. *Fallopia convolvulus* or Polygonaceae. Black bind-weed (*Fallopia convolvulus*) seeds are the widest in the middle part, symmetrical with narrowed ends. As in the case of knotgrass, seed edges are rounded. Black bind-weed was also preserved separately in fragmented seed cores and seed coats. In addition, persicaria seeds (*Persicaria lapathifolia*, *P. maculosa*/cf. *maculosa*, *Persicaria* sp.) were present in the assemblage.

Seeds of field gromwell (*Lithospermum arvense*) were determined in higher numbers; the seeds of this species, among other things, are also characterised by turning white from carbonising. Occasionally, the seeds or fragments thereof occurred in a non-carbonised state. Specifically, in some samples they were preserved in halves. Seeds of common gromwell (*Lithospermum officinale*), common mallow (*Malva sylvestris*), and mallow (*Malva/Althaea/Malva* seed core or *Malva/Agrostemma* seed core) also occurred in rare cases.

Several genera of mint (Lamiaceae) were determined. It was possible to determine the species annual yellow woundwort (*Stachys annua*), stiff hedge-nettle (*S. recta*), probable marsh woundwort (*S.* cf. *palustris*), hedge-nettle (*Stachys* sp.) and hedge or hemp-nettle (*Stachys/Galeopsis*). Furthermore, common henbit (*Lamium amplexicaule*), deadnettle (*Lamium* sp.), yellow bugle (*Ajuga chamaepytis*), blue bugle (*A. reptans*), cutleaf/wall germander (*Teucrium botrys/chamaedrys*, *T.* cf. *botrys*, cf. *Teucrium*), water germander (*T. scordium*), Breckland thyme (*Thymus serpyllum*), probable mint or salvia (*Mentha/Salvia* sp.) and horehound (*Ballota* sp.). In one case, the mountain ironwort (*Sideritis montana*) was found in the sample.

In addition to other finds from the Apiaceae family (i.e. Umbelliferae Anderberg 1994, 100; see above Spices and Condiments), carbonised seeds of thoroughwax (*Bupleurum rotundifolium*) were found. These seeds were distinguished from other family seeds based on their elongated oval shape, smooth surface, and glabrous ridges combined with valleculae distinctly wider than the ridges (Anderberg 1994, 115, Pl. 137:1).

From the Ericaceae family, only bearberry (*Arctostaphylos uva-ursi*) was found, the seed of which is half-moon shaped and laterally flattened (Bojňanský, Fargašová 2007, 365).

Several seeds and their remnants were found from the daisy family (Asteraceae). Unfortunately, they were preserved in poor condition and usually could be determined only to the family or genus state (e.g. Asteraceae indeterminate; cf. *Achillea*, cf. *Alchemilla*, cf. *Anthemis*, *Cirsium* sp.). In one case it was possible to determine a seed between two species with a higher degree of probability (cf. *Anthemis tinctoria/austriaca*). The carbonised seed of a probable scarlet pimpernel (cf. *Anagallis arvensis*, Primulaceae) was a rare find. It was determined according to its "*triquetros ellipsoid*" form, "*flat dorsal side*" and "*prolonged hilum on suture*" as described in V. Bojňanský and A. Fargašová (2007, 493), and as typical for many of the Primulaceae family seeds.

The mustard family (Brassicaceae) is represented in the assemblage by several finds, but only a few could be determined up to the species level: field pennycress (*Thlaspi arvense*) and probable black mustard (*Brassica* cf. *nigra*). Other seeds or fragments were determined as *Brassica* sp., *Lepidium* sp. and Brassicaceae. All finds of this family were distinguished considering their characteristic overall form, reticulum of testa, radicular and cotyledonary furrows (cf. Berggren 1981, 108–111; Digital Atlas: Brassicaceae, etc.).

The madder family (Rubiaceae) is represented only by seeds of the bedstraw genus (*Galium*), specifically *G.* cf. *aparine*, *G. tricornutum/aparine* and *G. spurium*. The determination of these seeds was somewhat problematic due to carbonisation. Therefore, distinguishing morphological features of the given species, which are the shape of the seed opening (Grubenöffnung, s.s. Lange 1979, 8 Bestimmungsschlüssel, Teil a, b) and the inner wall of the seed (opposite opening), were not wholly recognisable. Carbonisation caused the seed opening covering to sink into the interior of the seed and thus partially made a determination difficult due to the similarity to *Asperula*. Also, the seeds' surface texture was not fully visible. If the distinguishing features were not sufficiently recognised, the seed was determined with probability (cf.) or by genus (*Galium* sp. – bedstraw).

Ribwort plantain (*Plantago lanceolata*), probable plantain (cf. *Plantago* sp.) and ivy-leaved speedwell (*Veronica hederifolia*), both from the plantain family (Plantaginaceae), were found in rare cases as carbonised finds. However, the last was also preserved in partially carbonised, non-carbonised and mineralised seeds.

In the case of the cinquefoils (*Potentilla* genus, Rosaceae family), it was primarily problematic to determine individual species. Determined were seeds of the silverweed (*Potentilla anserina*) and probable bushy cinquefoil (*P.* cf. *supina*). Other seeds were designated as cinquefoil (*Potentilla* sp.) The seeds were preserved carbonised and non-carbonised/partially mineralised. Of the nightshades (Solanaceae), only black nightshade (*Solanum nigrum*) was determined in the assemblage, as for the buttercup family (Ranunculaceae), it was lesser meadow-rue (*Thalictrum minus* or cf. *Thalictrum* sp.) and for sedges (Cyperaceae) occasionally indeterminate sedges seeds or fragments (cf. Cyperaceae indet.).

Considering indeterminate macro-remains, which were impossible to assign to any genera or family, those were simply kept in the database under the designation "Indet" (indeterminate). In most cases, a further description was added to individual categories of indeterminate finds (e.g. indet. tear-shaped cells, indet. small seeds, indet. frag., etc.) to retain the opportunity for additional and more detailed analysis of these finds.

4.2.2 Quantification of finds

During determination, all finds of plant macro-remains (grains/seeds, glumes and their fragments, culms, seed coats and cores, various fragments) in the fraction >1 mm were sorted out and identified. In the fraction >0.25, all finds of plant macro-remains were sorted out, except for indeterminable charcoal. Macro-remains were quantified as follows.

4.2.2.1 Grains and seeds of cultivated plants

Each complete cereal grain was quantified as one individual. Grains damaged or severely disturbed by the heat but still retaining a solid shape were quantified as one individual. When fragments have been preserved – e.g. half, apex, base or middle part of the grain, the remaining grain fractions in the assemblage were considered. In other words, two halves (parts) of the probable exact grain were counted as one individual when possible. Unless related parts of such grains were identifiable, all parts were counted separately as one individual. However, this procedure only applied to grain fragments equal to or larger than one-half (clearly recognisable part of the grain). Pieces smaller than one-half of the grain were divided into 3-, 2-, and 1 mm groups. Fragments <1 mm were counted and collected only if the sample contained no other cereal finds. This was done to clarify from the survey of the sample information that, although it had cereal finds, they were preserved only in microscopic fragments. In samples containing larger cereal fragments or complete grains, pieces <1 mm were recorded, and their relative presence in percentile was recalculated. Fragments (i.e. ≤3 mm) were left in the database in their actual numbers, but the recalculated MNI number was added. At this point, it is essential to note that such recalculation of small fractions to MNI is problematic due to the large dimensional and volume variability of the fragments, so this parameter is only informative. In the case of samples with a large number of small cereal fragments (more than 2% of the sample volume), a small portion of the fragments was quantified and weighted to the nearest thousandth of a gram. Subsequently, the entire volume of these fragments was weighted, and their proportion was calculated. Primarily, the NISP was entered into the database, but was converted to MNI for further analysis.

4.2.2.2 Wild plant seeds and fragments

Each seed of a wild plant taxa was counted as one individual. In the case of seed fragments, when one exact seed could be identified, related parts were counted as one individual. Otherwise, each fragment was counted as one individual (= same criterion as for cereals). Nevertheless, most wild plant taxa seed fragments had to be counted separately as one individual, the result of high seed fragmentation in the assemblage. As most diaspores are significantly smaller in size and, at the same time, highly variable compared to cereal grains, it is not always possible to identify related parts of broken seeds (as this is already problematic in the case of cereals). At the same time, the seeds of several taxa break down into the pericarp and endosperm, in which case it is nearly impossible to identify fragments of cores and coats that could belong to the same seed also to the same species. The latter relates particularly to indeterminable fragments of wild plant taxa seeds.

In the case of bulrush/reed culm internode fragments (*Typha*/*Phragmites*), their weight was recorded to the nearest thousandth of a gram. The reason for record-ing the weight, not the number of finds, was the high dimensional variability of the fragments and their high number. Fragments specified as culm nodes (nodium) were counted as one, even in the incomplete state, and at the same time, it was not possible to determine an exact node.

From other types of material, molluscs shells (whole and fragments), bones (whole and fragments), fish scales (whole and fragments) and eggshells (fragments) were sorted out and counted. Non-carbonised insect finds were recorded as a presence and not further sorted out or counted. The information was recorded in the case of carbonised insect remains, and the selection of finds was sorted out. This situation occurred in the case of the carbonised eggs of unspecified insects.

4.2.3 Documentation of finds

The selection of plant macro-remains was photographically documented using a Keyence VHX-5000 digital microscope with a magnification of x20 to x200 and the HDR and Fine composition functions (Appendix Pl. 1–19). The laboratory analysis also recorded the metrical parameters of cereal grains. The processing of these data and their evaluation is not part of the introduced work and will be the subject of a separate study.

4.3 Analysis methods

4.3.1 Selection, standardisation and transformation of archaeobotanical data

The initial database contained all finds obtained by archaeobotanical analysis, including conversion of NISP to MNI. A specific group of fragments was not further converted, such as straw fragments and similar. The database of determined plant macro-remains with contextual information about the samples was created in the MS Office Excel and Access programs. In the final database, the MNI values are indicated. However, to compare such an extensive variable set more properly, ubiquity (frequencies), densities, grams and kilocalories were also used. Finally, ratios (shares), percentages, the absence/presence method, and values added by idealised (modelled) volumes of features and layers were employed. The data were also relativised in calculating values from total numbers (e.g. percentages or densities for the entire assemblage) and individual categories (e.g. percentages or densities for taxa, samples, sites, etc.).

4.3.2 Descriptive statistics

Descriptive statistics represent a summary data overview of fundamental statistical values. It is a total, percentage, mean, median, standard deviation etc., visualised in the form of various graphic outputs (box, pie, column, combined, scatter charts, etc.), which enable a summary overview of the data of essential statistical values. This type of statistic was used throughout the work.

4.3.3 Multivariate statistics

Jana Apiar, Peter Apiar

Multivariate statistical analyses are increasingly becoming established in archaeology due to their ability to work with large amounts of data. Their conceptual and mathematical starting points have been presented several times in the archaeological and archaeobotanical literature (e.g. Baxter 2015; VanPool, Leonard 2011; Drennan 2009; Shennan 2004; Smith 2014; Orton 1980). For illustration, their essence is the reduction of a multidimensional space, often into a two- or three-dimensional (Euclidean) space. Thanks to this reduction, searching for different latent structures (or new variables) in the data is possible. These are often a springboard to further research, while they might not be noticeable using traditional methods. There is currently a considerable amount of literature on each analysis (and its various modifications). Thanks to these analyses, it was possible to look at the entire archaeobotanical assemblage and try to identify potential archaeological or archaeobotanical structures or patterns.

Due to its scope and structure, several statistical analyses were used in the assemblage originating from the dissertation (Hlavatá 2017, 51–57). In the case of new data from Jevišovka, the following analyses were mainly used:

Correspondence analysis (CA) belongs to the family of ordination-weighted methods and is quite often used in ecological (Lepš, Šmilauer 2003; Greenacre, Primocerio 2013, chapter 13; Legendre, Legendre 2012, 464–482; McCune, Grace 2002, 152–158), but also archaeological (e.g., Gauthier, Choulakian 2015; Lockyear 2013; Alberti 2013; Baxter, Cool 2010; de Leeuw 2013; Shennan 2004, chapter 13) and archaeobotanical studies (Reed 2016; Smith 2014, 187; Bogaard 2004; van der Veen 1992; Jones 1991). Archaeobotanical assemblages are often accompanied by a lot of different types of data (counts – with a lot of zero values, presence/absence), which CA can handle quite well (Smith 2014, 188–189; Borcard, Gillet, Legendre 2011, 132; Jongman, ter Braak, van Tongeren 1995, 96–97). This simply means it connects the most numerous categories of finds with the samples (locations, features/contexts) in which they were most represented. In the presence of outliers, this results in structures that are obvious at first sight ("the most numerous") being covered by less contrasting ones. In some instances, removing these outliers (categories) is possible. However, this also equates to a loss of information (Gauthier, Choulakian 2015, 77).

Linear discriminant analysis (LDA, DA) is widely used in archaeology and related sciences (Kovarovic et al. 2011, 3006–3007). It found its place in archaeobotany mainly thanks to G. Jones (1984; 1987; 1991) and gradually spread to other studies (cf. van der Veen 1992; Bogaard 2004; Hajnalová 2012; Látková 2017; and many more). Analyses such as PCA, NLPCA, CA and CLA are primarily aimed at uncovering potential structures, often in the form of different groups. Unlike them, LDA works with data that already contains information about the existence of certain groups. The goals of LDA include confirming whether the division of individual observations (e.g. samples) into these groups is relevant (proper). These groups should be mutually exclusive. LDA identifies those variables that best distinguish (discriminate) individual groups and assign individual cases (samples) to the correct groups – classification (Baxter 2015, 169). Accordingly, it is possible to divide LDA into two variants: descriptive LDA and predictive LDA (Huberty, Olejnik 2006, 4–12, Table 7.8; McGarigal, Cushman, Stafford 2000, 132). The work primarily used predictive LDA to identify the processes of post-harvest treatment of crops.

An alternative to PCA is *non-linear principal component analysis* (NLPCA). This lesser-known method works similarly to PCA or multiple correspondence analysis. PCA is a linear technique that, by a linear combination of the principal components, tries to reduce and, at the same time, preserve the variability of the original variables (Linting et al. 2007, 344–345; de Leeuw 2006, 108–110). NLPCA does not assume linear relationships and, in addition, offers several advantages over classic PCA. It can include mixed measurements – ordinal, nominal and numerical – in the calculations and work with missing values. That is why it is sometimes called categorical PCA (de Leeuw 2006, 108–110, 132; Linting et al. 2007, 344–345). This was one of the main reasons for the given method application since several categorical (nominal) variables were available. The second main reason was the way PCA works with zeros. Ecological (also archaeobotanical) data often contain a lot of zeros, as well as the examined set. When PCA is used, the mutual covariance or correlation of two variables with a pair of zeros can be disturbed. In case of frequent occurrence of such "double zeros", it is therefore recommended to use non-metric multidimensional scaling (NMDS; Greenacre, Primicerio 2013, 114–118; Legendre, Legendre 2012, 512–520; Lepš, Šmilauer 2003, 89–91; McCune, Grace 2002, chapter 16) or correspondence analysis, or the use of transformation (Jolliffe 2002, 371–372; Legendre, Legendre 2012, 271–272; Legendre, Galagher 2001; Jongman, ter Braak, van Tongeren 1995, 130–131; Baxter 1995; cf. Jones 1991). Among other things, PCA is sensitive to atypical values and outliers, which can artificially increase the variance in an unwanted direction, while an uninformative component can arise (Filzmoser, Todorov 2011, 8–10). The NLPCA was created using the R statistical program, using the homals package (de Leeuw, Mair 2009a, 2009b).

5. Evaluation of the Jevišovka results in the context of the current archaeobotanical research in broader region

Jana Apiar

The chapter summarises the results of the Jevišovka archaeobotanical analysis (2021, 2022) in the context of the author's dissertation research conducted in 2014–2017. At this point, the main Jevišovka assemblage results are presented together with the conclusions of the dissertation study's analysis and are further compared to the literature.

The results are evaluated and presented using simple descriptive statistics. The presented finds are essential for the subsequent taphonomic analysis described below.

After completing the botanical determination of Jevišovka material and before the analysis itself, the assemblage was evaluated in terms of the archaeological contextual information about the samples. Samples from identical situations were combined into so-called elements (cf. Lee 2012, with additional refs.).

A total of 271 archaeobotanical samples were collected from the fills of the features at the Jevišovka site, of which 207 samples came from features dating back to the Roman period and superpositions from the La Tène/Roman period. It represents more than 75% of all samples collected from the site, although the Roman period features and superpositions of La Tène/Roman period features represented only 34% of all features discovered in the excavation area (34 out of 100 features; Fig. 5). Also, the whole assemblage has a clear sampling preference for residential settlement structures (pithouses) over other types of features, where more than 61% of the samples were collected from the pithouses fills, while these represented only 11% of all features discovered (11 out of 100 features; Fig. 6). Sample volumes were inconsistent, in the range of 0.5 to 32 l. Most samples (79%) were of low volume (less than or equal to 10 l; Fig.7); the greatest variance was in the volumes of storage pit samples (Tab. 1). In addition, overall variability and probable effort to sample slightly higher volumes from thicker layers (fills) is visible with a more detailed dividing of samples according to their contextual origin (samples from pithouse floors and variable fills; Fig. 8, Tab. 2). However, samples collected from pithouses (incl. postholes inside) represent only 1.5% of the ideal sediment fill of discovered and excavated pithouses

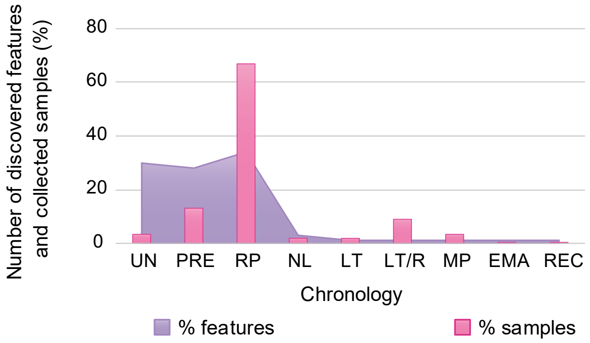


Fig. 5. Jevišovka. Percentages of collected samples from archaeological features according to the site chronology. UN – unspecified; PRE – Prehistory; RP – Roman period; NL – no labels; LT – La Tène period; LT/R – La Tène/Roman period; MP – Migration period; EMA – Early Middle Ages; REC – recent. Author: J. Apiar, ARÚB.

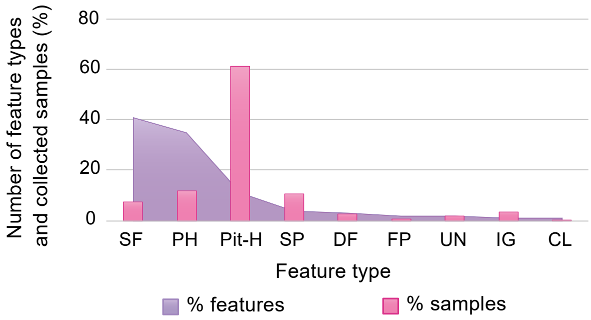


Fig. 6. Jevišovka. Percentage of collected samples from all discovered archaeological features according to the feature type. SF – settlement feature; PH – posthole; Pit-H – pithouse; SP – storage pit; DF – disturbed feature; FP – fireplace; UN – unspecified; IG – inhumation grave; CL – cultural layer. Author: J. Apiar, ARÚB.

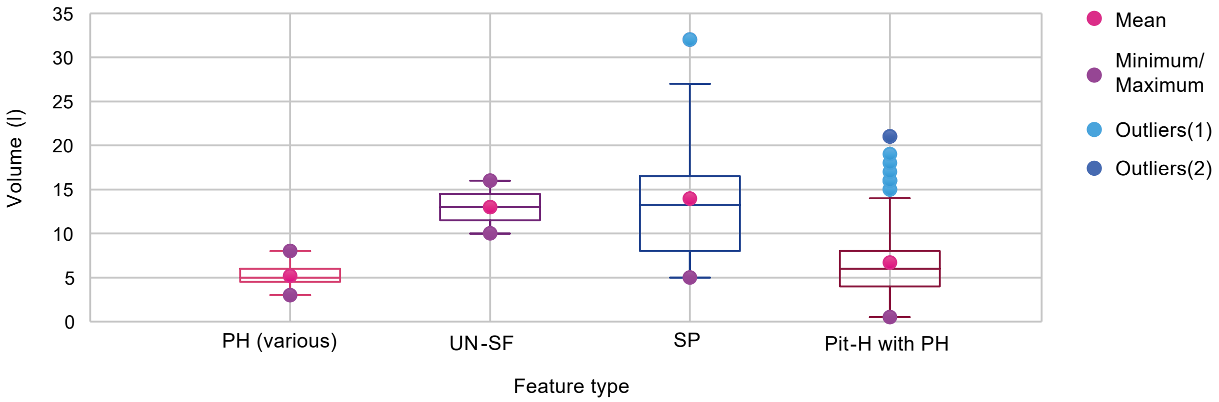


Fig. 7. Jevišovka. Box plot of sampled volume (l) from Roman and La Tène/Roman period features according to the feature type. PH (various) – postholes (various); UN-SF – unspecified settlement features; SP – storage pits; Pit-H with PH – pithouses with postholes. Author: J. Apiar, ARÚB.

Statistic	volume | postholes (various)	volume | unspecified settlement features	volume | storage pits	volume | pithouses with postholes
Nbr. of observations	17	2	24	164
Minimum	3.000	10.000	5.000	0.500
Maximum	8.000	16.000	32.000	21.000
1st Quartile	4.500	11.500	8.000	4.000
Median	5.000	13.000	13.250	6.000
3rd Quartile	6.000	14.500	16.500	8.000
Mean	5.176	13.000	13.958	6.674
Variance (n-1)	1.561	18.000	49.063	17.891
Standard deviation (n-1)	1.249	4.243	7.005	4.230

Tab. 1. Jevišovka. Statistic of sampled volume (l) from Roman and La Tène/Roman period features according to the feature types. Author: J. Apiar, ARÚB.

residues (Fig. 9). In terms of sampling pithouses, when comparing numbers and volumes of samples (Appendix Fig. 78), considering their specific deposition within the pithouse, most of them came from postholes (Fig. 10, Tab. 3). In absolute numbers, the sampled volume ratio of pithouse postholes to other fills is 1 : 1.3 (Fig. 11 : 2), while the ratio of the number of collected samples is 1.2 : 1; the modelled volume of all excavated interior postholes represented only 5.06 % of the total modelled excavated volume of all pithouses (Fig. 11).

Of the 207 samples collected from the Jevišovka site (Appendix Tab. 18–20), 108 were combined into 41 elements. This also applied to situations where the sample did not contain any information on the origin. One element consisted in most cases of two to three samples; in one case, it was seven samples. The situations in which it was necessary to combine the samples into elements are shown in Appendix Table 21. It was due to proper analysis and evaluation. Since the aim is to evaluate the macro-remains in the archaeological situation, it is more representative to assess the archaeological situation as a sample, i.e. not the individual volume of sediment taken in one archaeobotanical sample. The remaining 99 samples were individually evaluated, as they contained different archaeological information and should not be combined. Thus, a total of 140 units entered the further analysis.

In terms of the origin of the comparative assemblage data (Fig. 12), 39.5 % of the archaeobotanical finds came from Slovak archaeobotanical reports obtained in printed and digital form in 2014/2015. Another 13.5 % came from Czech reports obtained in digital form in 2013/2014, 20.5 % of the finds came from literature, and the remaining 26.5 % were obtained by the author's determination of as yet unprocessed, or unfloated plant macro-remains. The primary comparative database contains data from sites analysed up to 2017 (including part of the Jevišovka assemblage) and which were made available to the author within the dissertation project.

The archaeological determination is rather general. In several cases, it was limited only to the feature or context without further description. There is a noticeable methodological and terminological difference when comparing descriptions from Slovak and Czech sites. At the lowest level of archaeological determination, there was an undetermined archaeological entity, which could be of any type. It was also common to specify the type as a "feature", "layer", or just the

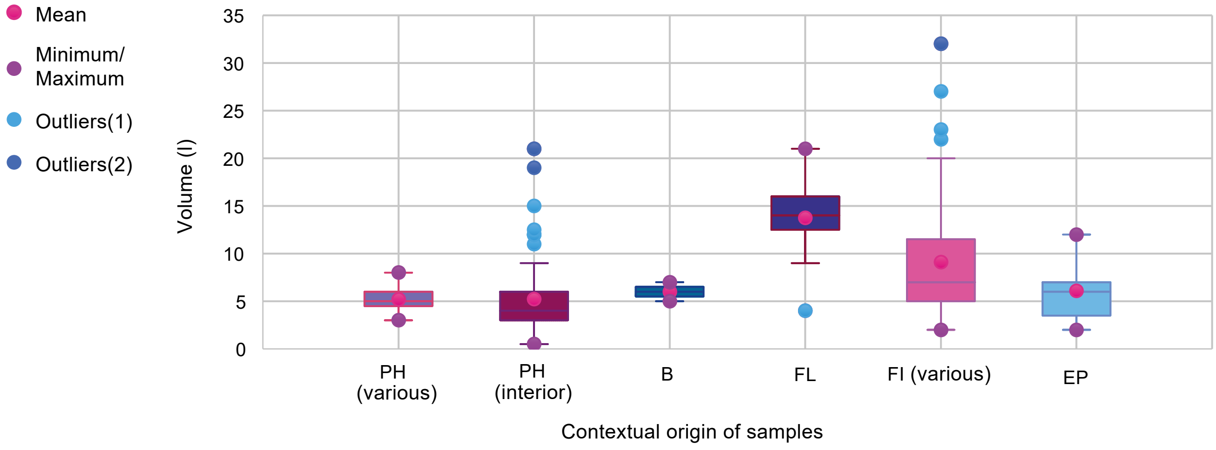


Fig. 8. Jevišovka. Box plot of sampled volume (l) from Roman and La Tène/Roman period features according to the contextual origin of samples. PH (various) – postholes (various); PH (interior) – postholes (interior of a pithouse); B – bottom; FL – floors; Fl (various) – fills (various); EP – entrance pits. Author: J. Apiar, ARÚB.

Tab. 2. Jevišovka. Statistic of sampled volume (l) from Roman and La Tène/Roman period features according to the contextual origin of samples. Author: J. Apiar, ARÚB.

Statistic	volume | postholes (various)	volume | postholes (interior)	volume | bottom	volume | floors	volume | fills (various)	volume | entrance pits
Nbr. of observations	17	79	2	16	82	11
Minimum	3.000	0.500	5.000	4.000	2.000	2.000
Maximum	8.000	21.000	7.000	21.000	32.000	12.000
1st Quartile	4.500	3.000	5.500	12.500	5.000	3.500
Median	5.000	4.000	6.000	14.000	7.000	6.000
3rd Quartile	6.000	6.000	6.500	16.000	11.500	7.000
Mean	5.176	5.209	6.000	13.750	9.085	6.091
Variance (n-1)	1.561	14.164	2.000	16.467	30.882	10.891
Standard deviation (n-1)	1.249	3.764	1.414	4.058	5.557	3.300

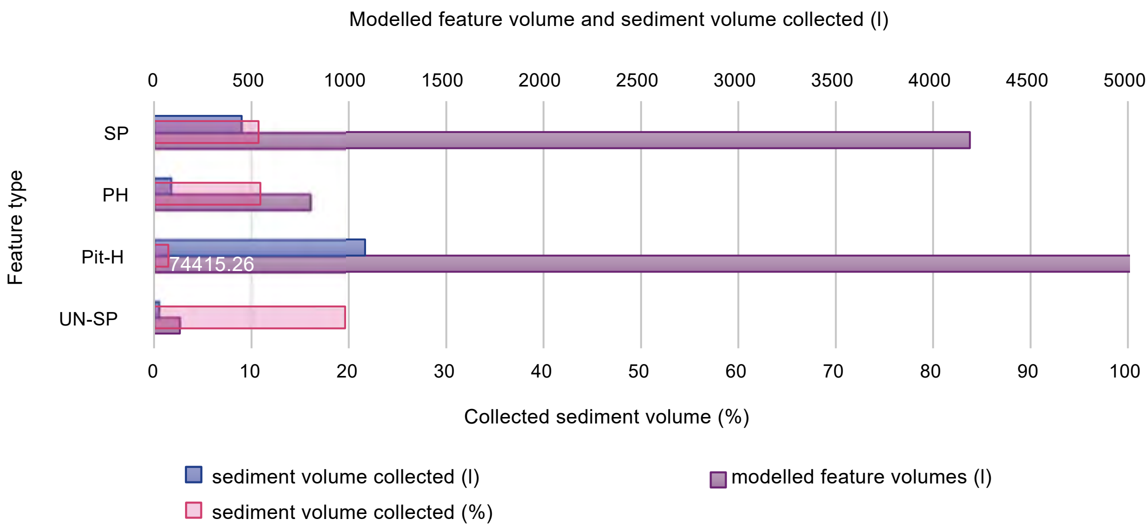


Fig. 9. Jevišovka. Modelled feature volumes (l) and collected sediment volumes (l and %) according to the feature type. SP – storage pits; PH – postholes; Pit-H – pithouses; UN – unspecified. Modelled feature volumes data after A. Szabová, Z. Porubčanová, Appendix Tab. 16, 17. Author: J. Apiar, ARÚB.

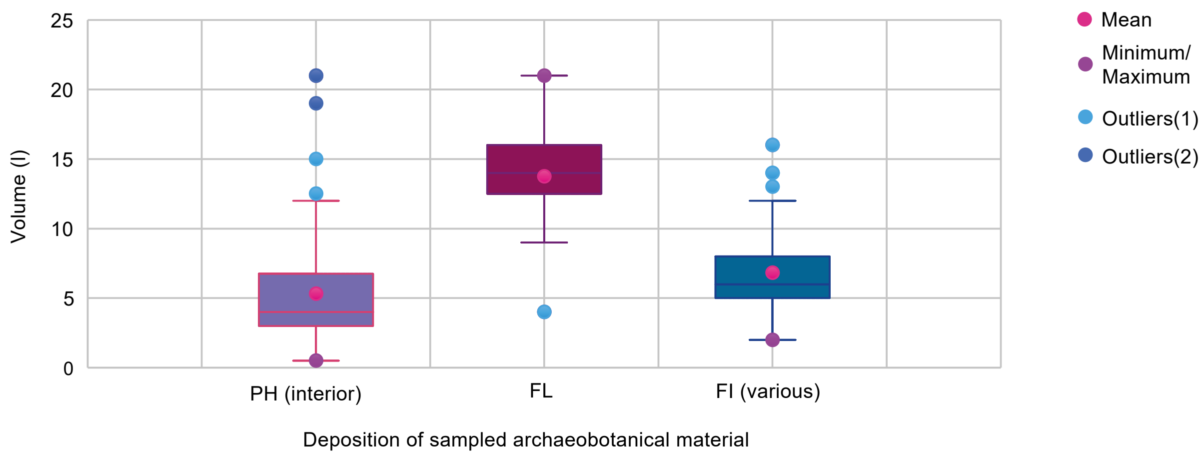


Fig. 10. Jevišovka. Box plot of sampled volume (l) from Roman and La Tène/Roman period pithouses according to the deposition of sampled archaeobotanical material. PH (interior) – postholes (interior); FL – floors; Fl (various) – fills (various). Author: J. Apiar, ARÚB.

Tab. 3. Jevišovka. Statistic of sampled volume (l) from Roman and La Tène/Roman period pithouses according to the deposition of sampled archaeobotanical material. Author: J. Apiar, ARÚB.

Statistic	volume | postholes (interior)	volume | floors	volume | fills (various)
Nbr. of observations	90	16	58
Minimum	0.500	4.000	2.000
Maximum	21.000	21.000	16.000
1st Quartile	3.000	12.500	5.000
Median	4.000	14.000	6.000
3rd Quartile	6.750	16.000	8.000
Mean	5.317	13.750	6.828
Variance (n-1)	13.722	16.467	8.417
Standard deviation (n-1)	3.704	4.058	2.901

sector or square number (according to the selected method of uncovering). Figure 13 presents the percentage of generally-defined and undefined samples by types of features or contexts. The undefined group does not make up a very significant share. Still, in this group, the maximal description was the "part of the trench", possibly sectors or the general designation "feature" or "layer". The remaining generally-defined samples were divided into groups (Fig.14). At the highest level, there was the determination of the feature precisely according to its number, type, function and part, followed by the designation and specification of the context and its spatial localisation within the research area.

Other archaeological information, such as depth, part of the feature, and spatial differentiation within the sampled feature, also occurred irregularly. The depth was rather exceptional information about the sample (for example, the well from the Pasohlávky U vodárny site Kočár, Kočárová 2011; Komoróczy 2011). In the case of several sites, there was information on the sampled postholes, differentiated according to whether they occurred in the building or were "independently standing" (hypothetical pole above-ground structures/granaries, except for Jevišovka, for example, Beckov or Veľký Meder, Hajnalová, Varsik 2010). In several cases, however, only the "posthole" designation was given without further specification. These facts significantly influence the interpretation of the data, and it is, therefore, necessary to consider the method of sampling in the analysis of archaeobotanical material (Hlavatá 2017; Apiar, J., Apiar, P. 2021). At the same time, many of the samples could not be used in the advanced analyses because of the lack of required information.

Among all the determinations of archaeological entities (Fig.14), the most numerous within all investigated sites were pithouses, which significantly prevailed over all other types of features and contexts. In this situation, the subjectivity of archaeological research and, thus, archaeobotanical sampling is manifested. Based on the given situation, archaeological research and sampling were targeted at residential buildings. Of course, in several cases, we can assume that the archaeological field research could capture only these features (or was focused on them, cf. Hajnalová, Varsik 2010). Therefore, it was also impossible (or not needed) to sample other features in those cases.

The comparative assemblage represents 1,187 archaeobotanical samples from 42 archaeological sites (Appendix Tab.15). The total number of macro-remains that are part of the database is 77,168 remnants. The primary evaluation of individual species of cultivated, exploited and other plants and their ratios are presented here in absolute numbers of MNI, in ubiquity, grams and kilocalories, and subsequently also standardised in percentages.

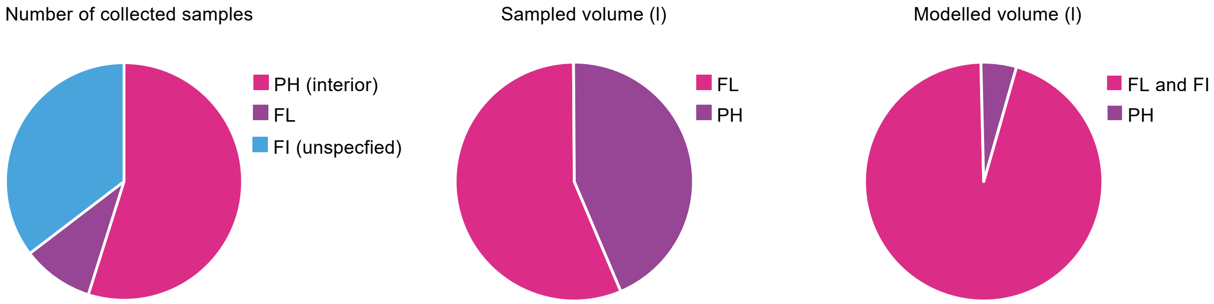


Fig. 11. Jevišovka. Roman and La Tène/Roman period pithouses and interior postholes. 1 (left) – number of collected samples per postholes and fills; 2 (middle) – sampled volume (l) per postholes and fills; 3 (right) – modelled volume (l) per postholes and fills. PH (interior) – postholes (interior); FL – floors; FI (unspecified) – fills (unspecified). Modelled feature volumes data after A. Szabová, Z. Porubčanová, Appendix Tab. 16, 17. Author: J. Apiar, ARÚB.

Fig. 12. Comparative assemblage. Total numbers of analysed macro-remains according to their origin in different data sources. After Hlavatá 2017. Author: J. Apiar, ARÚB.

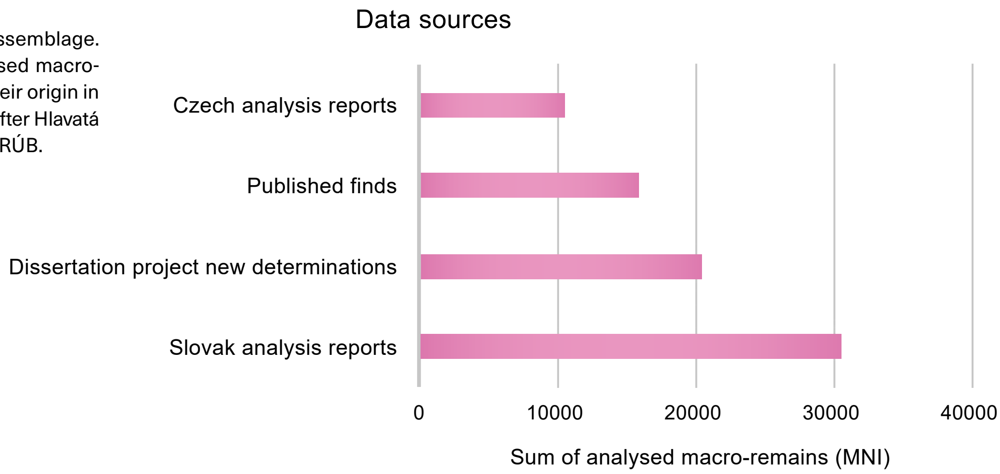
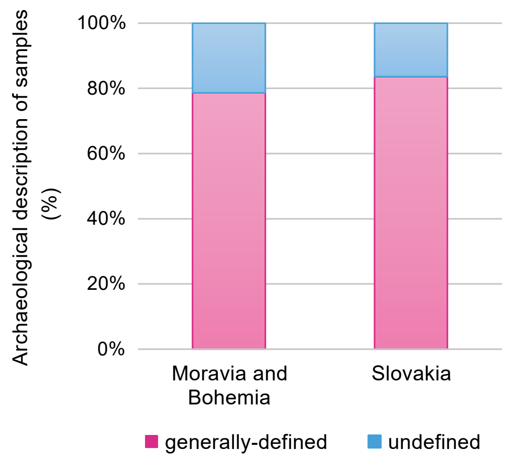


Fig. 13. Comparative assemblage. Archaeological description of samples according to precision level in different geographical regions (%). After Hlavatá 2017. Author: J. Apiar, ARÚB.



In our geographical area, plant macro-remains are preserved mainly through the process of imperfect carbonisation (cf., for example, Boardman, Jones 1990, 4, 5; Hubbard, al Azm 1990; Hajnalová 1993; 1999; van der Veen, Jones 2006, etc.). For the purpose of this study, carbonised macro-remains were analysed (for Jevišovka see Appendix Fig. 79, Appendix Tab. 20). Namely, these were mainly cereal grains, glume residues, cereal straw, legume seeds, and probable porous cereal material. Furthermore, weed seeds, occasionally gathered fruits, vegetables, spices and condiments were preserved in a carbonised state. Indeterminated finds also represented a part of the assemblage.

Among all the macro-remains, indeterminate cereals (Cerealia indet., Appendix Fig. 81) and grains of determined cereal species made up the majority at the Jevišovka site. Converted to whole grains (MNI), it was almost 7,000 pieces, which means

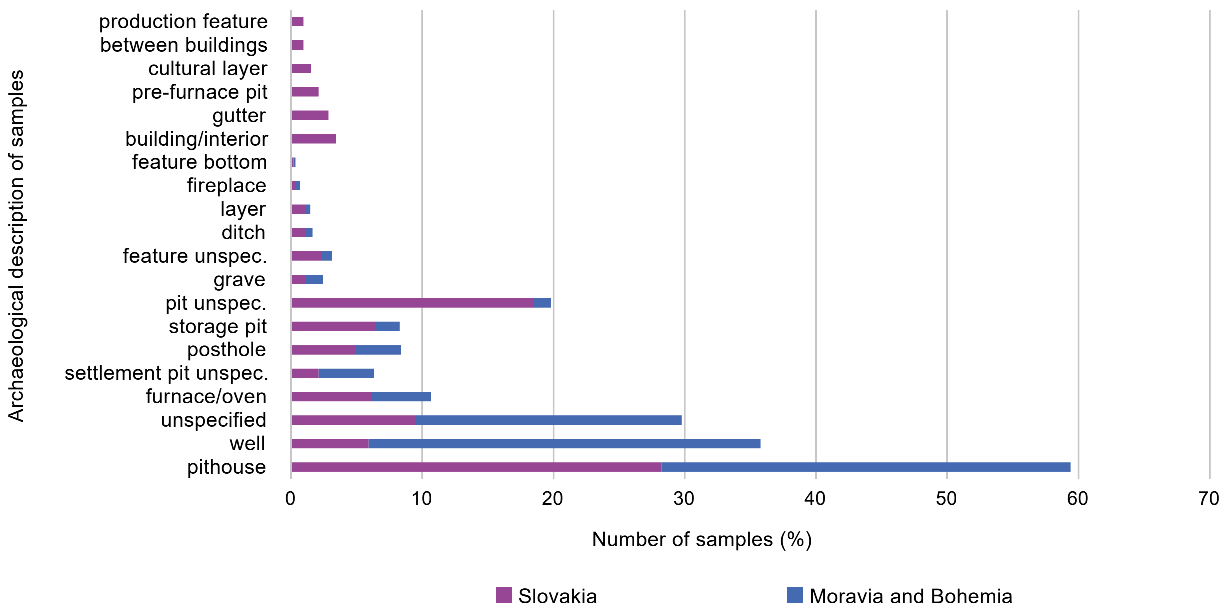


Fig. 14. Comparative assemblage. The number of collected and analysed samples (%) according to their archaeological description in different geographical regions (%). After Hlavatá 2017. Author: J. Apiar, ARÚB.

Tab. 4. Jevišovka. Total numbers of finds and ubiquity of macro-remain categories in elements and samples. Author: J. Apiar, ARÚB.

	Total number of finds (n=11587)	Ubiquity in elements/ samples (140)
Cerealia indet.	4175	135
Cereal grains	2717	109
Wild flora	999	97
Cereal chaff	760	66
Organic mass indet. frag.	941	54
Indeterminate	194	47
Cereal culms and straw	1390	42
Legumes	105	37
Organic mass cf. food frag.	271	28
Fruits and nuts	20	13
Oil, fibre plants and condiments	8	8
Coniferous plant seeds	7	5

more than 59% of all macro-remains found at the site (Tab. 4). It also applies to the ubiquity in samples of these two categories. In terms of number, finds of cereal culms, straw and chaff, as well as seeds of wild plants (Appendix Fig. 87) and charred fragments of organic mass (Appendix Fig. 85, 86), were relatively high represented. Other types of finds, such as leguminous seeds, fruits, and condiments (Appendix Fig. 84, 88, 89), including indeterminate categories (Appendix Fig. 90), were found in smaller numbers (less than 300, respectively, less than 50 pieces).

When looking at the macro-remain composition of individual features (Appendix Fig. 79–90), the described ratio of find categories (especially the first two in Tab. 4) prevails, but this does not apply to all features. The differences are primarily in the case of features from which only a minimal number of samples and (or) macro-remains come (Fig. 15, 16; Appendix Fig. 78, 79). The most different is the number of macro-remains found in Roman period features compared to La Tène period features, or features in superposition (Appendix Fig. 79). The highest number of macro-remains comes from pithouse 039 (Fig. 15), with almost 6,000 pieces, and then from pithouse 080 (Fig. 16), with nearly 2,000 pieces. Samples from storage pit 062 (784 pieces; Fig. 16) contained the highest number of macro-remains among the Roman period features. As mentioned above, the number of samples taken from individual features is variable. Still, in the case of feature 039, the number of samples alone is probably not the reason it had highest number of macro-remains. It also applies to feature 080, where 1,947 macro-remains were found in only four analysed samples. Considering the number of samples taken and the number of macro-remains obtained, the study is evaluating several features in terms of composition to a limited extent. These concerns feature 083 and several postholes belonging to the above-ground pole structure.

The overall composition of macro-remains from Jevišovka does not deviate from the composition at other sites known from this period. Cultivated, gathered, and wild plants are present in the comparative assemblage. The cultivated ones include mainly cereals (grains, glumes, parts of the spike, straw and porous organic material), with a small number of legumes. Those in the wild species category are mainly field weeds seeds. In percentages, cereals predominate at Slovak archaeological sites, specifically cereal grains in absolute num-

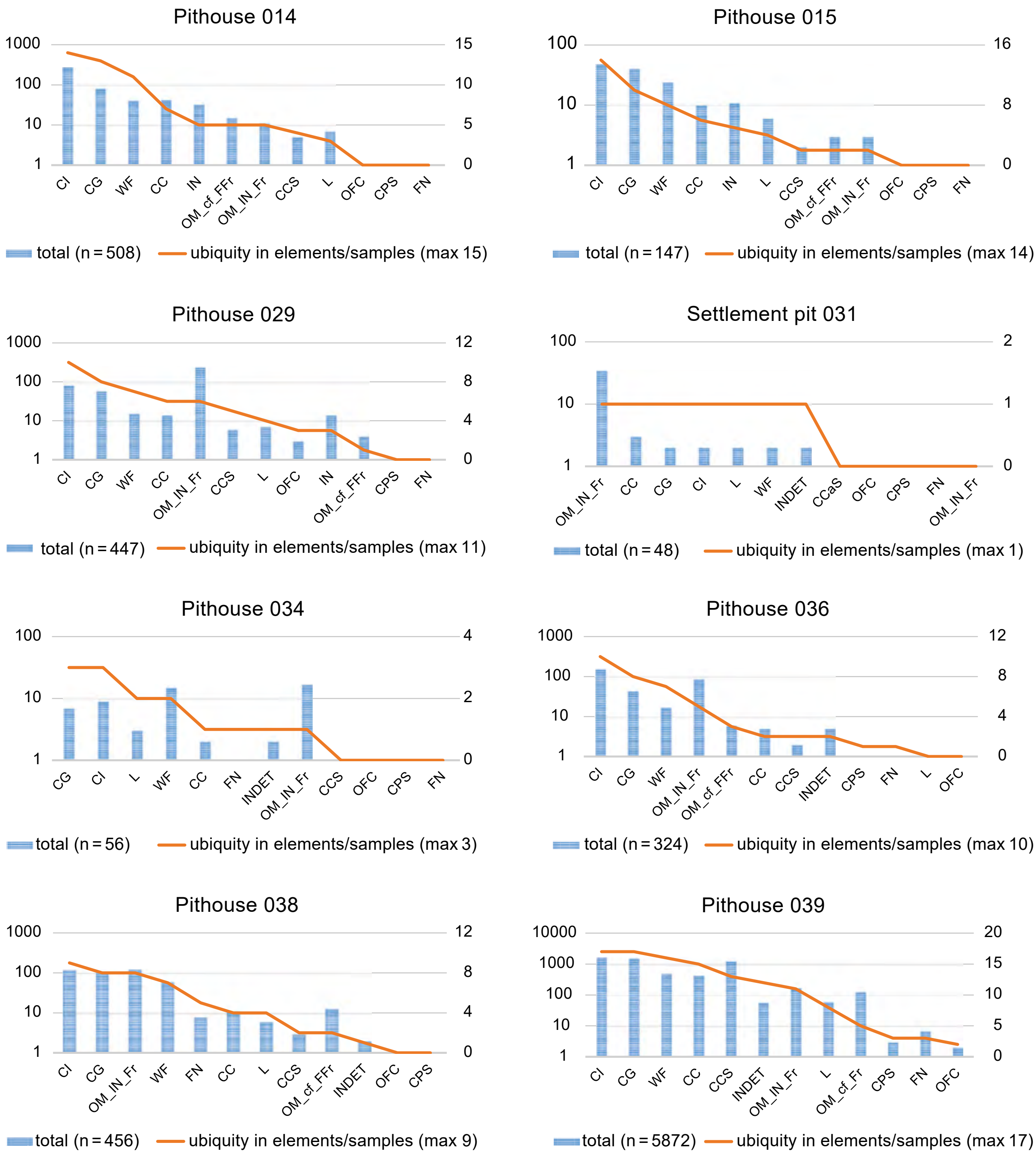


Fig. 15. Jevišovka. Features 014–039. Total numbers and ubiquity of analysed carbonised plant macro-remains in Roman and La Tène/Roman period features on a logarithmic scale. CI – Cerealia indet.; CG – cereal grains; WF – wild flora; CC – cereal chaff; IN – indeterminate; OM_cf_FFr – organic mass cf. food frag.; OM_IN_Fr – organic mass indet. frag.; CCS – cereal culms and straw; L – legumes; OFC – oil, fibre plants and condiments; CPS – coniferous plant seeds; FN – fruits and nuts. Author: J. Apiar, ARÚB.

bers. It is the largest group of finds in the entire assemblage. The Slovak finds represent a 69% share of all macro-remains in the comparative assemblage. In addition to cereals, there are numerous finds of fruits, weed seeds, and fragments of reed or bulrush culms. The Bohemian and Moravian finds represent 31% of the total amount of macro-remains in the database. Cereal grains and carbonised weed seeds are also the most numerous. However, the group is significantly poorer than the Slovak finds.

5.1 Cultivated plants – cereals

The most extensive part of the study is the evaluation of cereal finds, as these are the most frequently preserved at sites in our geographical conditions. At the same time, a general evaluation of crop finds is a fundamental step for further taphonomic analysis.

As can be seen from the overall composition of the macro-remains from Jevišovka, more than three-quarters of the finds of cultivated crops were grains (cereals

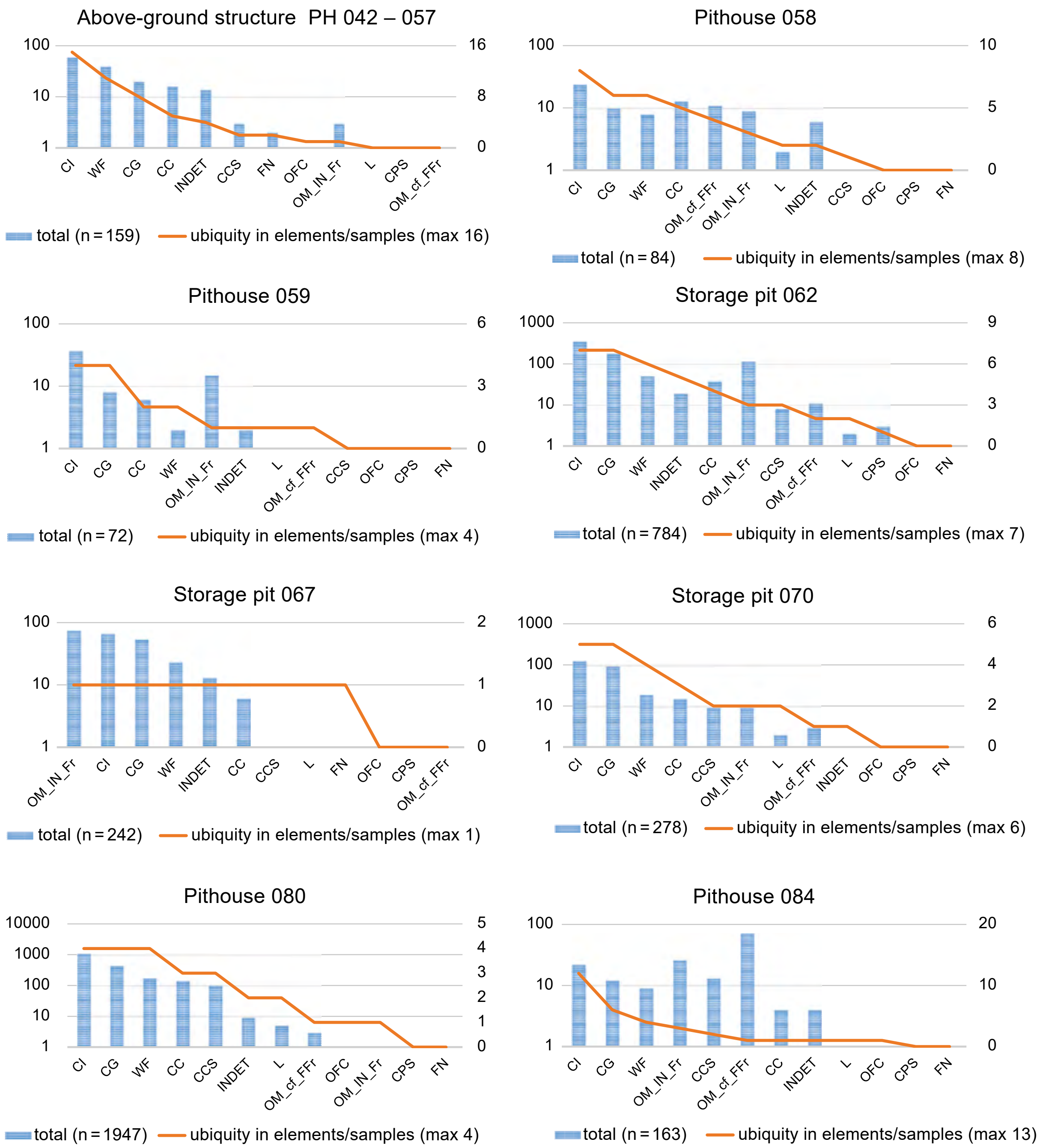


Fig. 16. Jevišovka. Features 042–084. Total numbers and ubiquity of analysed carbonised plant macro-remains in Roman and La Tène/Roman period features on a logarithmic scale. CI – Cerealia indet.; CG – cereal grains; WF – wild flora; CC – cereal chaff; IN – indeterminate; OM_cf_FFr – organic mass cf. food frag.; OM_IN_Fr – organic mass indet. frag.; CCS – cereal culms and straw; L – legumes; OFC – oil, fibre plants and condiments; CPS – coniferous plant seeds; FN – fruits and nuts. Author: J. Apiar, ARÚB.

and legumes, Appendix Fig. 80, 81, 84). The remaining part consisted of cereal straw and chaff (Fig. 17: 1; Appendix Fig. 82, 83). In this comparison, however, it is necessary to consider that while the numbers of grains and chaff fragments could generally be converted to whole individuals (MNI), this could not be done in the case of straw fragments (see the section on quantification). Therefore, the ratio of straw finds to other cereal finds is only relative. The group of crop grains and chaff was composed of 90% grains and 10% chaff. When comparing the finds of cultivated crops and wild-growing plants, cultivated crops (grains and chaff) made up 89% and the seeds of wild flora (weeds) 11% (Fig. 17: 2).

Among the finds of cereals which could be determined by genus, not free-threshing (hulled) and free-threshing (naked) cereals were distinguished. Based on this, we can say that not free-threshing cereals predominated in the finds from Jevišovka, making up

Fig. 17. Jevišovka. Percentages of carbonised plant macro-remain categories. 1 (left) – cereal grains, chaff, culms and straw; 2 (right) – cereal grains, chaff and weed seeds. Author: J. Apiar, ARÚB.

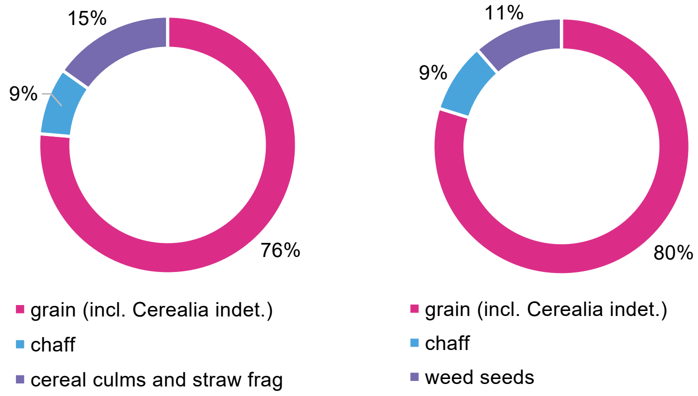
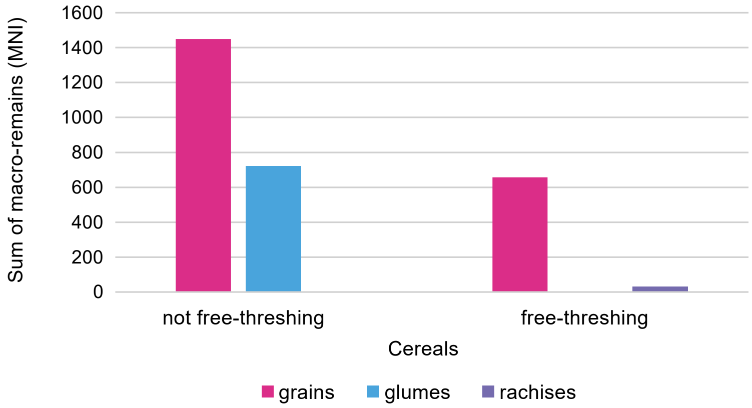


Fig. 18. Jevišovka. Total numbers of cereal grains and chaff (glumes and rachises) in the assemblage according to the cereal grain separation from the chaff during the threshing process. Author: J. Apiar, ARÚB.



two-thirds of all the finds of determinable cereal grains (Fig. 18). Almost exclusively, the glumes of hulled cereals are preserved versus the rachises of naked cereals. It is, to some extent, expected, since grains of hulled cereals are threshed out of the ears in spikelets/with the glumes still attached and can be stored together (Hillman 1984; 2001; Hajnalová 2012). Therefore, they may have a higher chance of getting into the archaeobotanical sample, unless another treatment is applied. The second possibility is the very physical prerequisites of specific species and types of grain chaff to survive pre- and post-depositional processes (cf. Boardman, Jones 1990; Braadbaart 2008; Walsh 2017).

Regardless of the number of samples, cereal grains had a higher percentage representation than chaff in the vast majority of sampled features (17 out of 32). In four features, numbers of chaff prevailed over grains. In one case, the values of grains and chaff reached approximately the same percentage (50% – 50%, Fig. 19). In the features with the superposition of La Tène and Roman period settlement components, the ratio of grains and chaff finds was almost the same, approximately 80% of grains in both.

Concerning determined cereal species themselves and their representation at the Jevišovka site, millet (*Panicum miliaceum*) grains were found in the largest number (almost 50%, Fig. 19). Other cereals were represented in the following order: barley (*Hordeum vulgare*), bread wheat (*Triticum aestivum*), spelt (*T. spelta*), emmer (*T. dicoccum*), einkorn (*T. monococcum*), in lower numbers Italian millet (*Setaria italica*), oat (*Avena* spp., *A.* cf. *sativa*), rye (*Secale cereale*) and sporadically new glume wheat (*T.* cf. *timopheevi*).

Regarding the specification of features based on the composition of cereals, differences in the representation of individual species can be seen. However, the unequivocal representativeness of these differences cannot be confirmed because the number of finds is deficient in several cases. A precise quantitative difference is visible between the features from the Roman period and those belonging to the La Tène period, i.e. those disturbed by Roman period features (039 and 080). The only Roman period feature that comes close to features 080 and 039 in terms of the number of finds, albeit still with a significant distance, is storage pit 062 (Fig. 20). At the same time, it should be noted that only four analysed samples (so far) from feature 080 could relatively reduce the total number of cereals found in this feature (cf. Fig. 16, 20, 22). Due to the feature type, there is no significant difference in the composition of cereals. Probably the most striking composition marker is the higher representation of millet grains, which occur in finds from pithouses but also in storage pits.

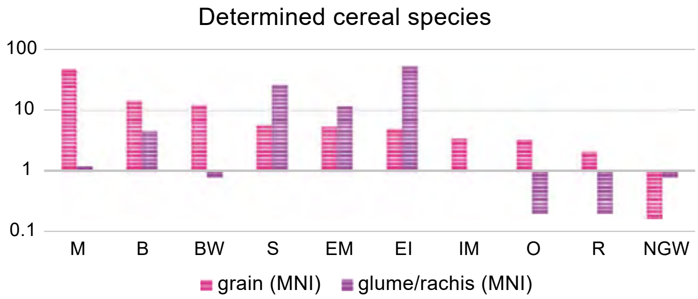


Fig. 19. Jevišovka. Total numbers (MNI) of cereal grains and chaff according to species determined in the assemblage on a logarithmic scale. M – millet; B – barley; BW – bread wheat; S – spelt; EM – emmer; EI – einkorn; IM – Italian millet; O – oat; R – rye; NGW – new glume wheat. Author: J. Apiar, ARÚB.

According to the archaeological situation, La Tène pithouse 039 appears to have been heavily disturbed by a later Germanic pithouse, while a subsequent disturbance of the Germanic pithouse can also not be ruled out. On the other hand, only a small part of La Tène pithouse 080 was disturbed. The cereal composition from these two features is also significantly different. In addition to the mentioned relative quantitative difference, millet is the most abundantly represented in pithouse 039 (Fig. 20, 21), followed by the other cereals in this order: einkorn (glumes), bread wheat and barley grain, emmer (grain and glumes), spelt (glumes and grain), einkorn (grain), rye and oats. In feature 080 (Fig. 22), the most abundant grains are barley and bread wheat, followed by spelt glumes and grain, millet, einkorn (glumes and grain), rye, emmer and oats. No other Germanic feature from Jevišovka has a cereal grain composition in the proportion found in feature 080. In contrast, the ratio of cereals in feature 039 is similar to the ratio in Germanic features 036, 029, 015 (Fig. 21), above-ground structure PH 42-57 (Fig. 22), or pithouses 084 (Fig. 22), 034 (Fig. 21) and storage pit 067 (Fig. 22).

Except for oats, emmer, and spelt, the most significant numbers of the determined cereal species macro-remains were found in feature 039 and then in 080. In the case of rye, this order was reversed (080 - 039). The second highest number of emmer finds occurred in storage pit 062 (Fig. 20, 22), and the highest numbers of oat appeared in storage pits 062 (Fig. 20, 22) and 070 (Fig. 20, 22). The number of oat finds is not high. In the first case, it was 23 and in the second, 19 grains. Oats were found in other features in small numbers (up to 10 pieces). Spelt grains were determined in equal numbers in features 080 and 070 (Fig. 20); more spelt glumes were found in feature 080. Of the cereals determined by species, millet occurred in the highest total amount per feature in 636 pieces (MNI) in pithouse 039 (Fig. 20). The einkorn glumes reached the next highest amount (190 MNI) and were found in the same feature (Fig. 20).

Of the cereals in the comparative assemblage, bread wheat (*Triticum aestivum* s.l., *Triticum aestivum-compactum*), barley hulled and naked (*Hordeum vulgare, H. vulgare* var. *nudum*), einkorn (*T. monococcum*), emmer (*T. dicoccum*), spelt (*T. spelta*), millet (*Panicum miliaceum*), rye (*Secale cereale*) and sporadically oat (*Avena sativa, Avena* spp.) are represented in the studied area (Fig. 23, 24). The assortment is increased by Italian millet (*Setaria italica*; cf. Kreuz 2004, 127) and "new glume" wheat (cf. *T. timopheevi*). This last species of wheat was identified only in newly processed samples from Slovak sites and Moravian Jevišovka (as mentioned above). All of these species were determined in whole grains and their fragments. The remnants of grain spikelets are represented by the glumes of hulled wheat and occasionally millet, as well as the rachises of naked wheat, barley and rye. Cereal culms and fragments of unspecified cereal grains also represent an extensive collection (Fig. 25, 26).

Several mutual differences can be observed in the archaeobotanical material in the comparative assemblage (Fig. 23, 24). From the overall point of view, the different macro-remains quantities in Slovak, Moravian, and Bohemian samples are visible, as described above. However, such a comparison might correspondingly reflect the dependence of macro-remains numbers on the number of analysed samples, which is the lowest at the Bohemian sites (cf. Fig. 12; cf. Apiar, J., Apiar, P. 2021). Thus, in direct proportion to the low number of samples, we can also observe a relatively low number of macro-remains at Bohemian sites. More significant is comparing the ratio of individual cereal species within each current geographical region separately. When comparing the proportions of individual species, a relatively increased proportion of bread wheat at Slovak sites can be observed (Fig. 23), which is several times higher than the number of other cereal finds. The high number of fragments of unspecified cereal grains and, at the same time, higher numbers of fragments of cereal culms and glumes carry dual information (Fig. 25, 26). First of all, the higher proportion of grain fragments may point to the higher fragmentation of the entire Slovak assemblage (Fig. 25). On the other hand, this is partly in contrast to the higher proportion of preserved glumes and grain ears, as the most vulnerable to burning first (Boardman, Jones 1990). Therefore, the situation might reflect the different origins of the samples and

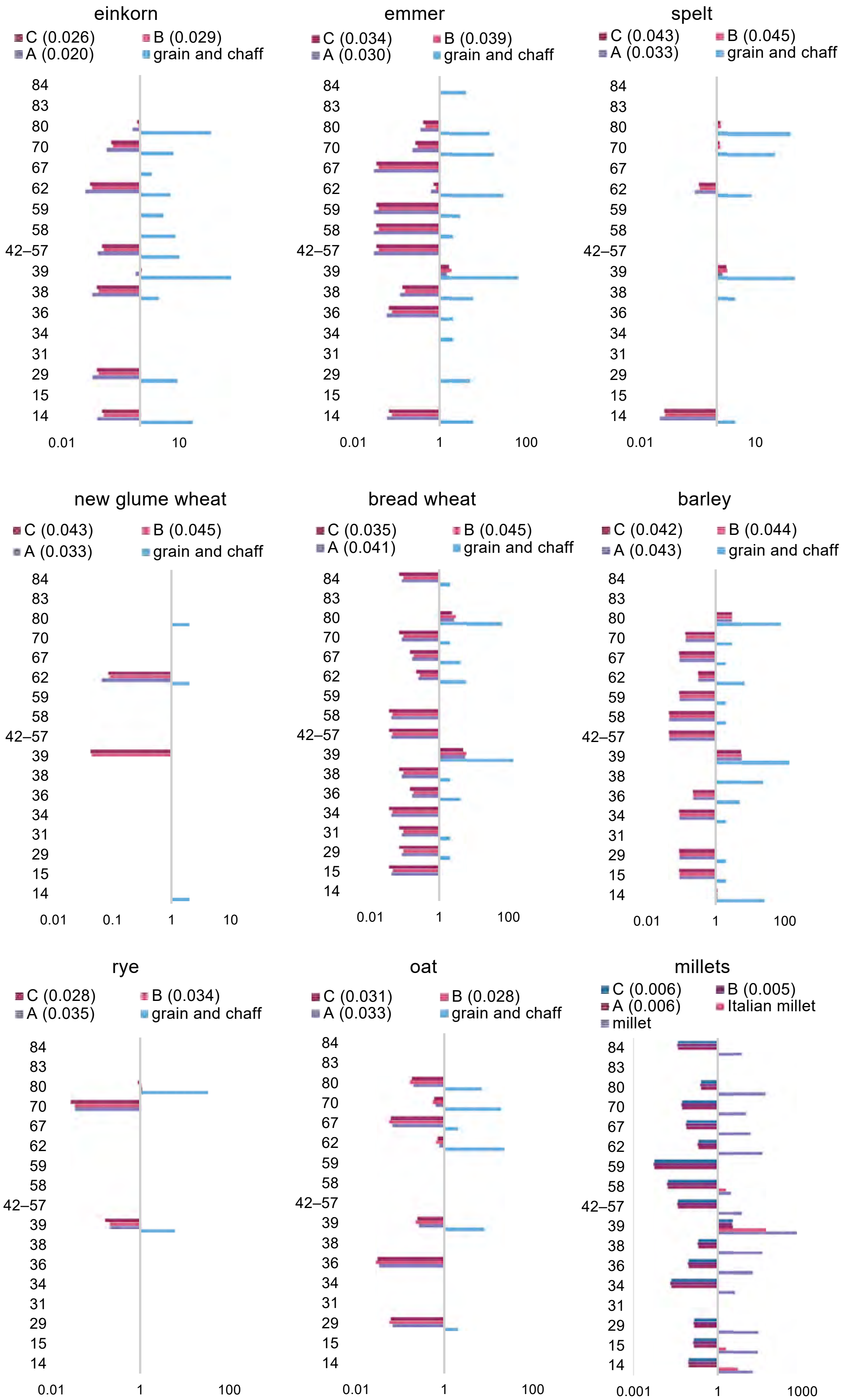


Fig. 20. Jevišovka. Total numbers of finds (MNI) and weight of cereal grains (g) according to cereal species determined in Roman and La Tène/Roman period features on a logarithmic scale. Weights calculated from "TGW" after Hajnalová 2012 (A); "TKW" after Hejcman et al. 2016 (B); "HTS" after Kočár in Kuna et al. 2013 (C). Author: J. Apiar, ARÚB.

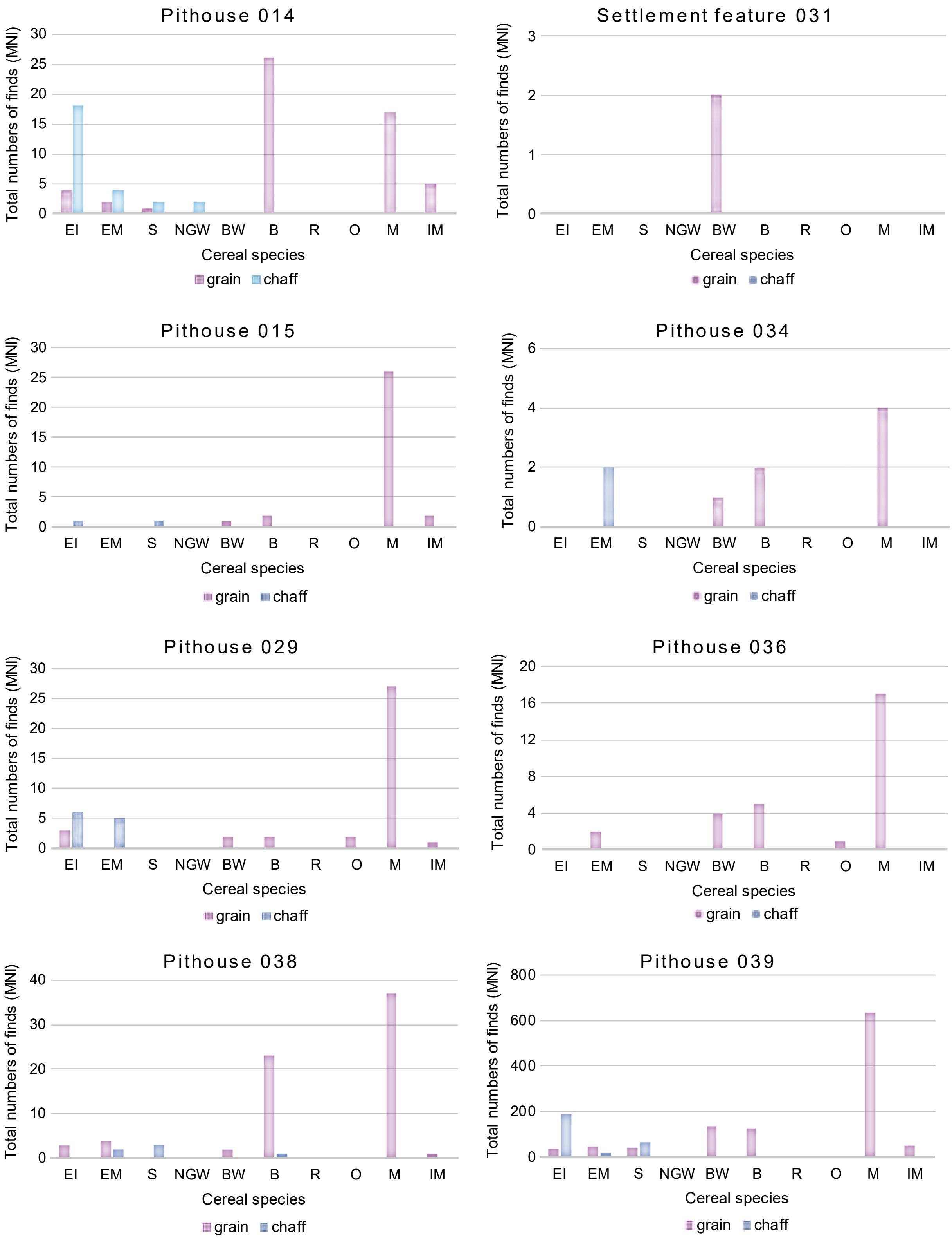


Fig. 21. Jevišovka. Features 014–039. Composition of cereal species (grains and chaff) found in particular Roman and La Tène/Roman period features. EI – einkorn; EM – emmer; S – spelt; NGW – new glume wheat; BW – bread wheat; B – barley; R – rye; O – oat; M – millet; IM – Italian millet. Author: J. Apiar, ARÚB.

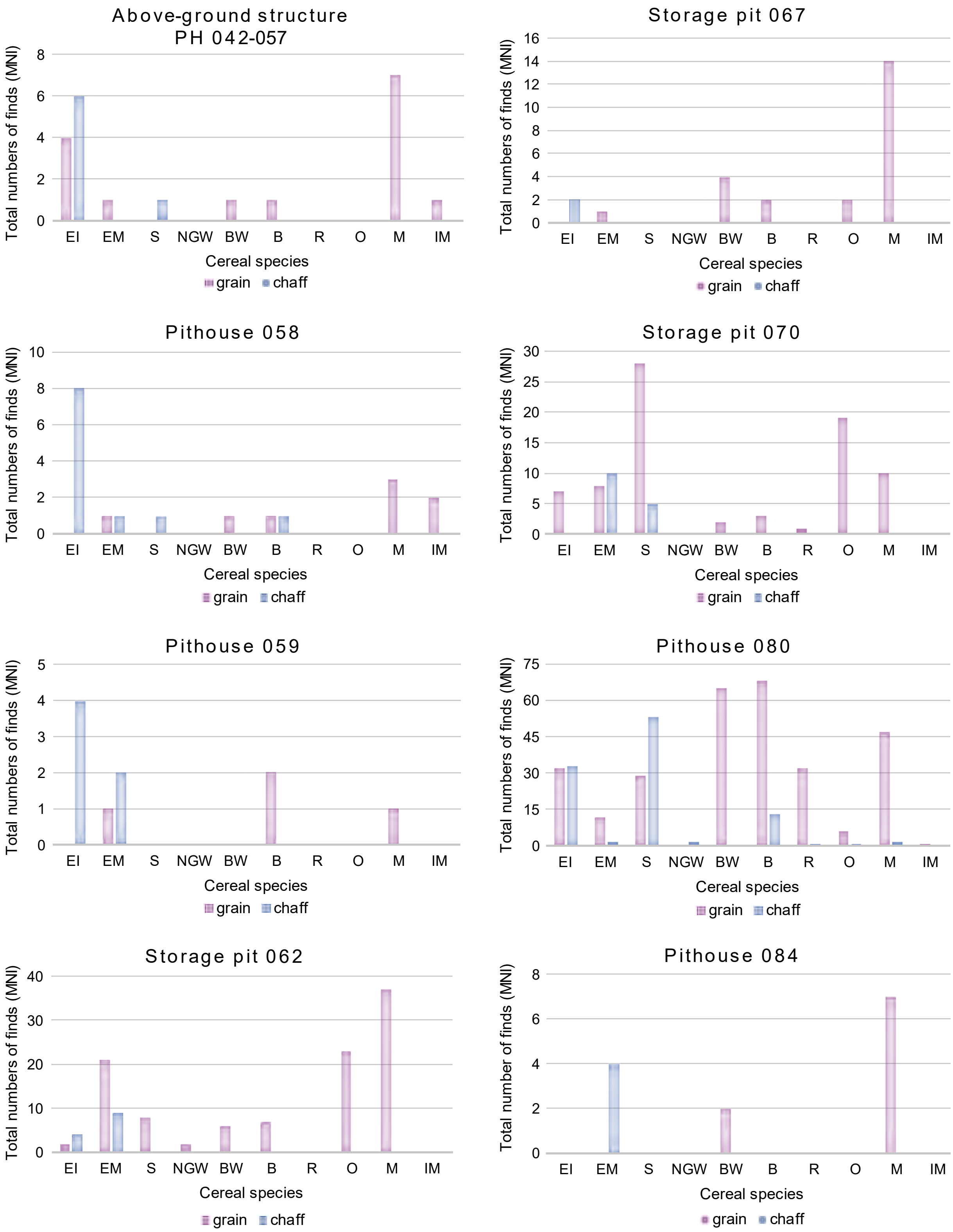


Fig. 22. Jevišovka. Features 042–084. Composition of cereal species (grains and chaff) found in particular Roman and La Tène/Roman period features. EI – einkorn; EM – emmer; S – spelt; NGW – new glume wheat; BW – bread wheat; B – barley; R – rye; O – oat; M – millet; IM – Italian millet. Author: J. Apiar, ARÚB.

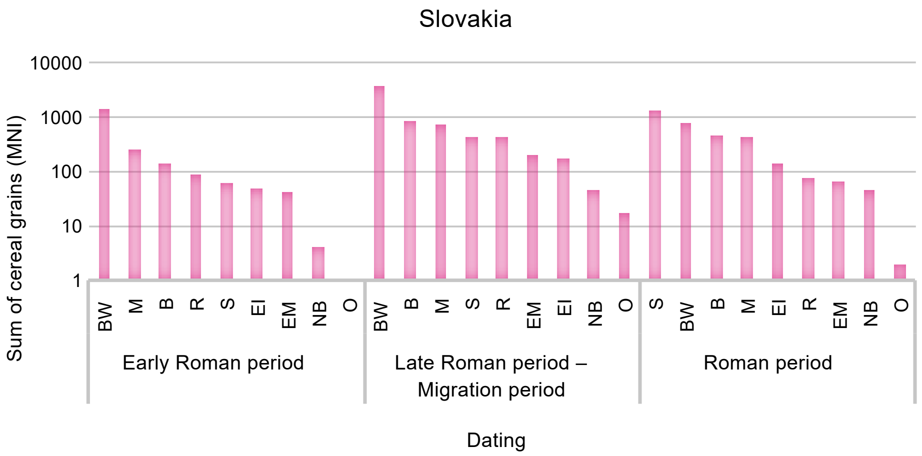


Fig. 23. Comparative assemblage. Slovak sites. Total numbers of cereal grains according to the species determined and chronology on a logarithmic scale. BW – bread wheat; B – barley; NB – naked barley; R – rye; EM – emmer; EI – einkorn; S – spelt; O – oat; M – millet. Roman period – sites dated generally to the Roman period further unspecified. After Hlavatá 2017. Author: J. Apiar, ARÚB.

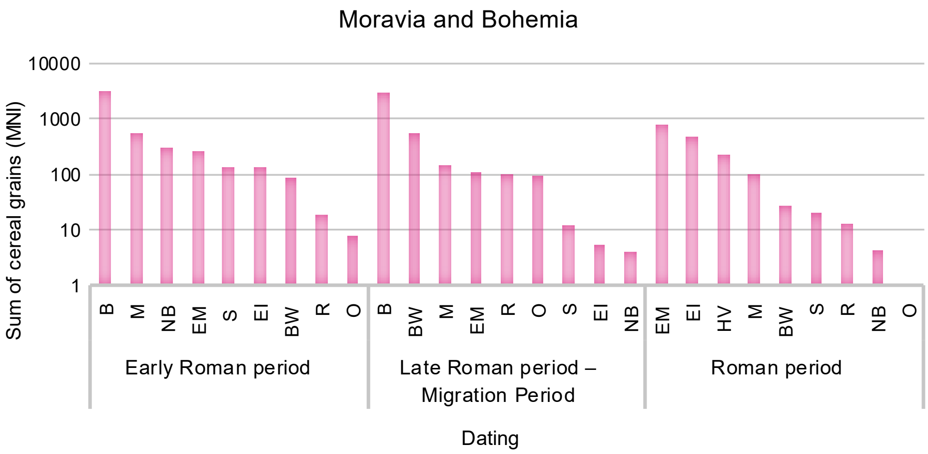


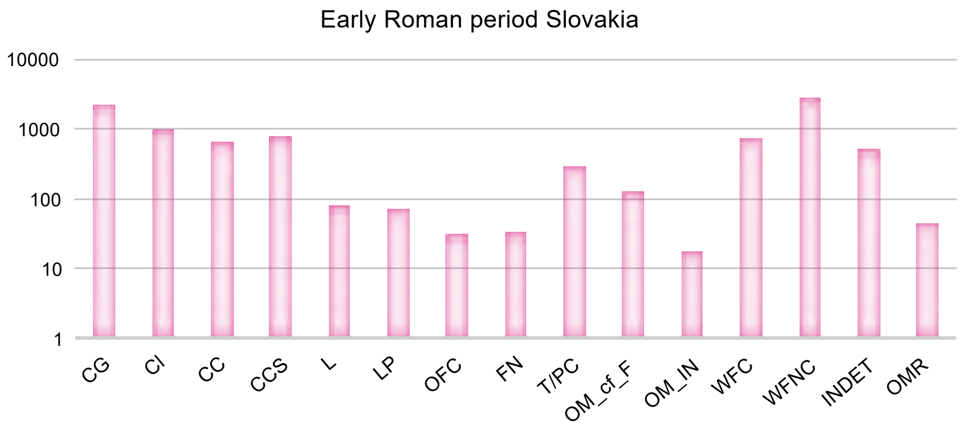
Fig. 24. Comparative assemblage. Moravian and Bohemian sites. Total numbers of cereal grains according to the species determined and chronology on a logarithmic scale. BW – bread wheat; B – barley; NB – naked barley; R – rye; EM – emmer; EI – einkorn; S – spelt; O – oat; M – millet. Roman period – sites dated generally to the Roman period further unspecified. After Hlavatá 2017. Author: J. Apiar, ARÚB.

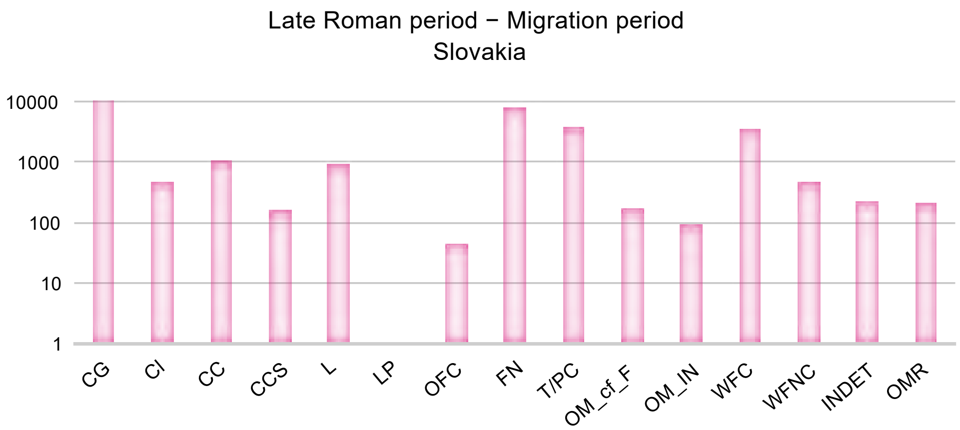
the different archaeological contexts from which they arise. However, the reason for such different proportions of grain fragments could be caused simply by the different standard procedures used by several archaeobotanists analysing various samples (e.g., the manner and level of detail in the quantification of such finds).

The barley grains predominate at the Moravian and Bohemian sites (Fig. 24). Another richly represented cereal, but at a significant distance from barley, is millet, followed by wheat (naked and hulled) and chaff. Very simply, according to the number of MNI, bread wheat predominates in Slovak finds from the Early Roman period, hulled and naked barley in Moravian and Bohemian finds.

The situation is partly different at sites dating to the Late Roman period, or to the beginning of the Migration period. First, the situation is problematic due to the dating of the sites. It is impossible to determine whether the assortment (or crop ratio) known from the Roman period differs from the crop assortment at the beginning of the Migration period. Fewer sites were dated only to the later stage of the Roman period, while none of the Moravian sites dated only to this stage (Hlavatá 2017, Tab. 6.2.1 compared with Prílohy Tab. 5.3.1). Of those that could be dated in this way, bread wheat from Slovakia was highly prevalent, and the proportion of rye increased slightly (Fig. 23). Grains of barley are represented almost exclusively at the single Bohemian site (cf. Hlavatá 2017, 73). Millet predominates at Slovak sites dated to a broader stage (Late Roman period to the beginning of the Migration period). However, the situation changes after excluding sites with a high concentration of finds (Fig. 23, more than 1,000 finds per litre of sediment, Hlavatá 2017, 73). Bread wheat, barley and millet have the highest number of finds, followed by spelt wheat; the proportion of rye also decreased, and oats are recorded in a small number. Barley still predominates at the Moravian and Bohemian sites, followed by bread wheat and millet (Fig. 24). The smallest number of cereal finds comes from sites dated only to the beginning of the Migration period.

A total of 30% of all sites are dated to the Roman period in general (Hlavatá 2017, Tab. 5.3.1). In Slovakia, the range of cereals consists of spelt wheat, bread wheat, barley and millet (in order), followed by the rest of hulled types of wheat, rye and barley (Fig. 23). The composition is a bit different at the Moravian and Bohemian sites dated to this stage, with emmer and einkorn represented in the highest numbers, followed at a distance by barley and millet (Fig. 24).





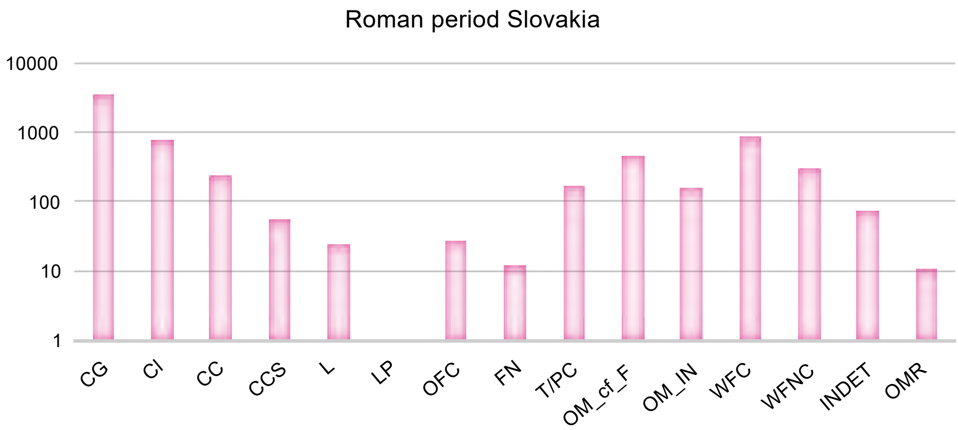


Fig. 25. Comparative assemblage. Slovak sites. Total numbers of all finds according to the categories determined and chronology on a logarithmic scale. CG – cereal grains; CI – Cerealia indet.; CC – cereal chaff; CCS – cereal culms and straw; L – legumes; LP – legume pods; OFC – oil, fibre plants and condiments; FN – fruits and nuts; T/PC – *Typha*/*Phragmites* culms; OM_cf_F – organic mass cf. food; OM_IN – organic mass indet.; WFC – wild flora carbonised; WF NC – wild flora non-carbonised; INDET – indeterminate; OMR – other macro-remains. Roman period – sites dated generally to the Roman period further unspecified. After Hlavatá 2017. Author: J. Apiar, ARÚB.

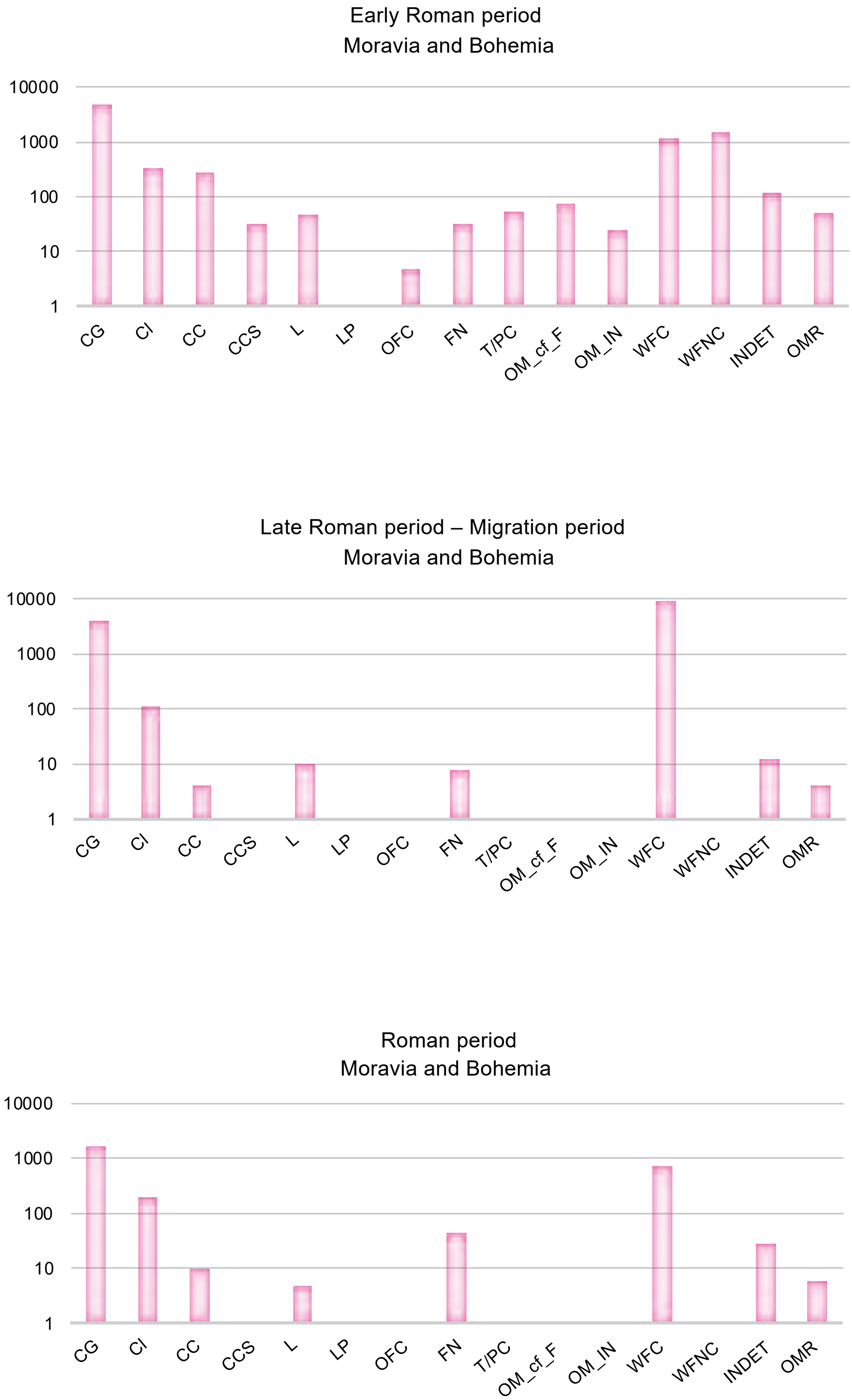


Fig. 26. Comparative assemblage. Moravian and Bohemian sites. Total numbers of all finds according to the categories determined and chronology on a logarithmic scale. CG – cereal grains; CI – Cerealia indet.; CC – cereal chaff; CCS – cereal culms and straw; L – legumes; LP – legume pods; OFC – oil, fibre plants and condiments; FN – fruits and nuts; T/PC – *Typha/Phragmites* culms; OM_cf_F – organic mass cf. food; OM_IN – organic mass indet.; WFC – wild flora carbonised; WF NC – wild flora non-carbonised; INDET – indeterminate; OMR – other macro-remains. Roman period – sites dated generally to the Roman period further unspecified. After Hlavatá 2017. Author: J. Apiar, ARÚB.

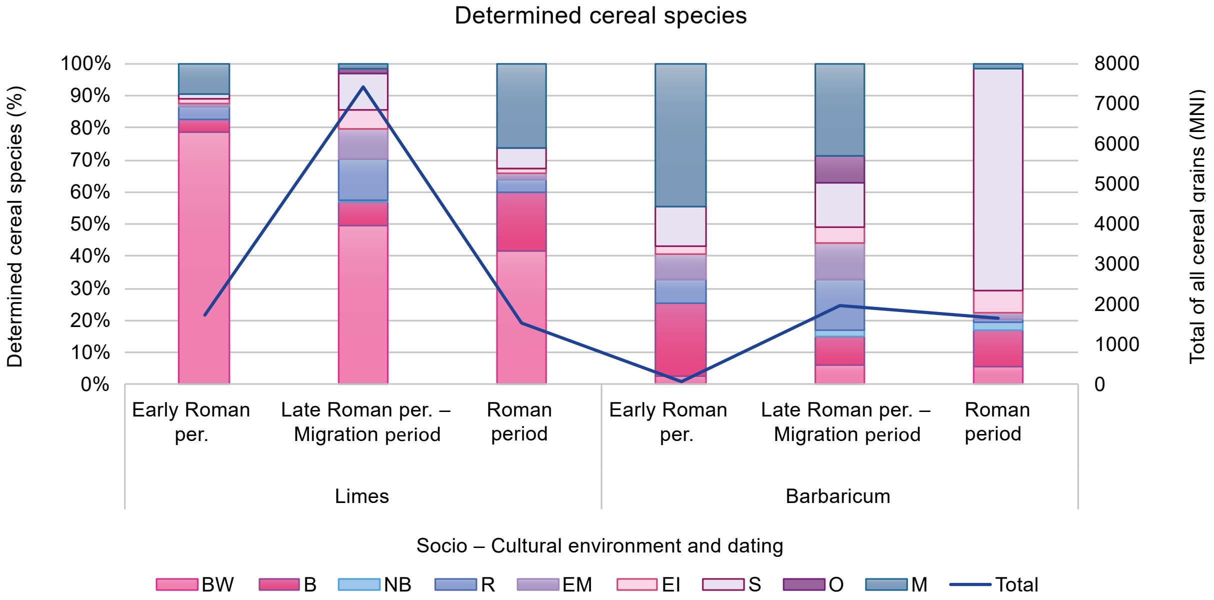


Fig. 27. Comparative assemblage. Slovak, Moravian and Bohemian sites. Total numbers of finds and percentage of determined cereal species according to socio-cultural environment and chronology. BW – bread wheat; B – barley; NB – naked barley; R – rye; EM – emmer; EI – einkorn; S – spelt; O – oat; M – millet. Roman period – sites dated generally to the Roman period further unspecified. After Hlavatá 2017. Author: J. Apiar, ARÚB.

Finds of Italian millet (*Setaria italica*) were also included in the comparison, as in some published studies it is compared with other cultivated cereals (e.g. Kreuz 2004, 127; Kočár 2017, personal communication). In the comparative assemblage, these finds were greatly underestimated (in the whole set, a total of 30 MNI; Hlavatá 2017, Obr. 6.2.6), as were other wild species of foxtail (*Setaria pumila/glauca, Setaria pumila/viridis/verticillata*). Increased numbers for comparative assemblage were recorded only in the newly analysed samples (by the author Hlavatá 2017; Jevišovka first analysis in 2014/2015 and 2021/2022 above). However, they were in a very poorly preserved state, and it was difficult to determine them with complete certainty. Based on such a modest sample of finds, it is impossible to assess the proper share and importance of Italian millet in the group of remaining cereals.

In the comparative assemblage, regardless of the distance of sites from the Limes, there is no demonstrable difference between the composition of cereals concerning individual stages of the observed period.

We see that the most significant difference in the assortment of cereals between the sites located at the Limes (or in its immediate vicinity) and in barbarian territory is mainly in the representation of bread wheat (Fig. 27). The most balanced numbers of finds of individual species come from the later Roman period to the beginning of the Migration period. The Limes is also dominated by rye and wheat in this chronological stage. Still, in addition to bread wheat, hulled wheat is almost equally represented with archaic einkorn and emmer are among them, approximately in the same quantity as barley. Oats and millet are low compared to other species. In contrast, millet is the most frequently found at barbarian sites (in sense of ubiquity or frequency of finds), followed by rye and hulled wheat, barley, oat and bread wheat (in order).

These results are supported by previously published findings, with the authors pointing to different shares of cereals at Pannonian/provincial sites and at barbarian sites (cf. Hajnalová, Varsik 2010, 214, 215; Hajnalová 2011a; Hartyányi, Nováki 1975, 56ff; Gyulai 2010). In the literature published so far, even outside Slovakia (e.g. Germany), certain amounts of einkorn and emmer occur in archaeobotanical samples. The occurrence of einkorn in this period is, in published literature, associated with winter cultivation (bread wheat and spelt), where it should form an admixture (Kreuz 2004, 127, 128, 192, Abb. 18, Tabelle 19). M. Hajnalová points out a similar situation at Slovak barbarian sites, where einkorn occurs in samples together with spelt and bread wheat (Hajnalová, Varsik 2010, 214). At barbarian sites in Germany, emmer was one of the main summer cereal crops (Kreuz 2004, 128). Its representation in the studied material is also slightly higher than in the case of einkorn (Fig. 18, 20, 23, 24, 27 compared with Hlavatá 2017, Obr. 6.2.7).

5.1.1 Recalculation of MNI to weight, nutritional value and ubiquity

The cereal grain finds evaluated above express the totals for all samples originating from Jevišovka (analysed in 2021/2022) and the studied sites in the comparative

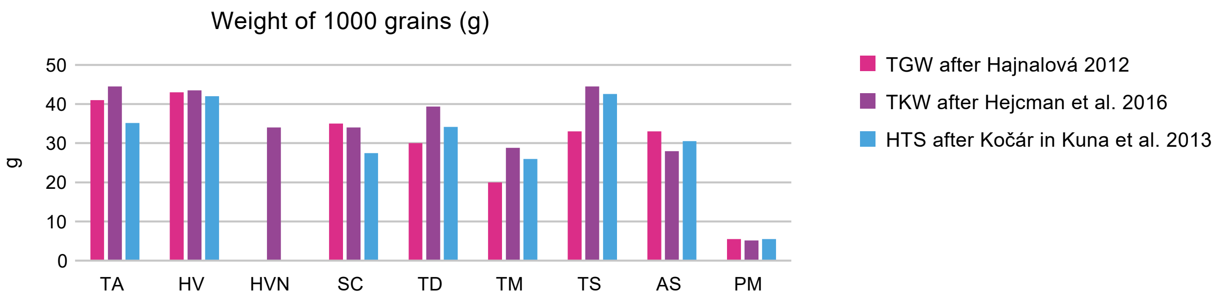


Fig. 28. Weight of a thousand grains (g) for a particular cereal species according to "TGW" after Hajnalová 2012, "TKW" after Hejcman et al. 2016 and "HTS" after Kočár in Kuna et al. 2013. TA – *Triticum aestivum* (bread wheat); HV – *Hordeum vulgare* (barley); HVN – *Hordeum vulgare* var. *nudum* (naked barely); SC – *Secale cereale* (rye); TD – *Triticum dicoccum* (emmer); TM – *Triticum monococcum* (einkorn); TS – *Triticum spelta* (spelt); AS – *Avena sativa* (oat); PM – *Panicum miliaceum* (millet). Author: J. Apiar, ARÚB.

Tab. 5. Comparative assemblage. The weight of a thousand and one grain (g) calculated for cereal finds in comparative assemblage, after cited sources. Author: J. Apiar, ARÚB.

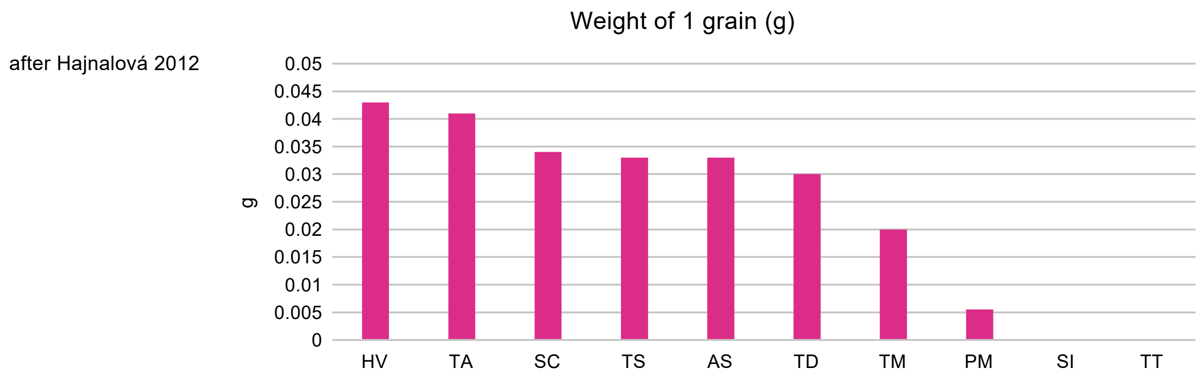
Weight of 1000 grains (g)	TA	HV	HVN	SC	TD	TM	TS	AS	PM
TGW (Hajnalová 2012)	41.00	43.00	_	35.00	30.00	20.00	33.00	33.00	5.50
TKW (Hejcman et al. 2016)	44.50	43.50	34.00	34.00	39.35	28.80	44.50	28.00	5.17
HTS (Kočár in Kuna et al. 2013)	35.20	42.00	_	27.50	34.20	26.00	42.60	30.50	5.50
Weight of 1 grain (g)									
A (calculated after TGW)	0.041	0.043	_	0.035	0.03	0.02	0.033	0.033	0.0055
B (calculated after TKW)	0.045	0.0435	0.034	0.034	0.03935	0.0288	0.0445	0.028	0.00517
C (calculated after HTS)	0.035	0.042	_	0.0275	0.0342	0.026	0.0426	0.0305	0.0055

assemblage (cf. Hlavatá 2017, Tab. 6.2.2). The results are comparable to the state of research published so far. Nevertheless, absolute finds on their own do not have to objectively reflect the potential importance of individual species. Therefore, the weight and nutritional value of cereal grains are also considered in archaeobotany (cf. Hajnalová 2012; Kuna et al. 2013; Látková 2015; Hejcman et al. 2016).

To determine if and to what extent variations can occur in individual cereal percentage ratios, the values of cereal finds first needed to convert from MNI to grams and kilocalories. The conversion to grams was based on the published archaeobotanical literature in which the method was applied (Hajnalová 2012; Kočár in Kuna et al. 2013; Hejcman et al. 2016). The weight of particular cereal grain in grams was obtained from the mentioned literature, calculated from 1000 grains (Thousand grain weight – TGW, s.s. Hajnalová 2012, Tab. 5.1.; Weight of a thousand seeds/*hmotnost tisíce semen* – *HTS*, s.s. Kočár in Kuna et al. 2013, Tab. 15b.; Thousand kernel weight – TKW, s.s. Hejcman et al. 2016, Table 1., median).

Different values of the weight of 1000 cereal grains appear in the cited literature; first, the individual conversions to grams obtained from the three sources were compared. The results are shown in Figure 28 and Table 5. Although the values for 1 grain differ depending on the conversion, this did not cause significant differences in the resulting ratios (Fig. 28) Similarly, the caloric value of 1 grain (Fig. 29) was obtained and calculated according to published values (Hajnalová in Kuna et al. 2013, Tab. 15a.), from the caloric value of grains in 100 g. Based on the values for one cereal grain of a particular species, recalculated were the MNI values of each cereal crop to their weight and nutritional value for the whole assemblage (Hlavatá 2017, Obr. 6.2.8b) and separately for each site. In addition to these recalculations, developed were frequencies (ubiquity) of cereal crops for the whole assemblage and also for each site separately. The individual categories of percentages express as follows:

1. the *Minimum Number of Individuals* (*MNI*) expresses the absolute number of plant macro-remains after their conversion into whole individuals (grains/seeds). The counts of cereal grains are converted into percentages. The MNI values were obtained in the manner described above (Quantification of macro-remains).
2. *the weight of grains in grams calculated from MNI* (*g/MNI*) values, converted to percentages. The grain weight (g) of each crop varies. Ultimately, the overall ratio of individual cereal species will get different values than in the case of the first category (MNI).



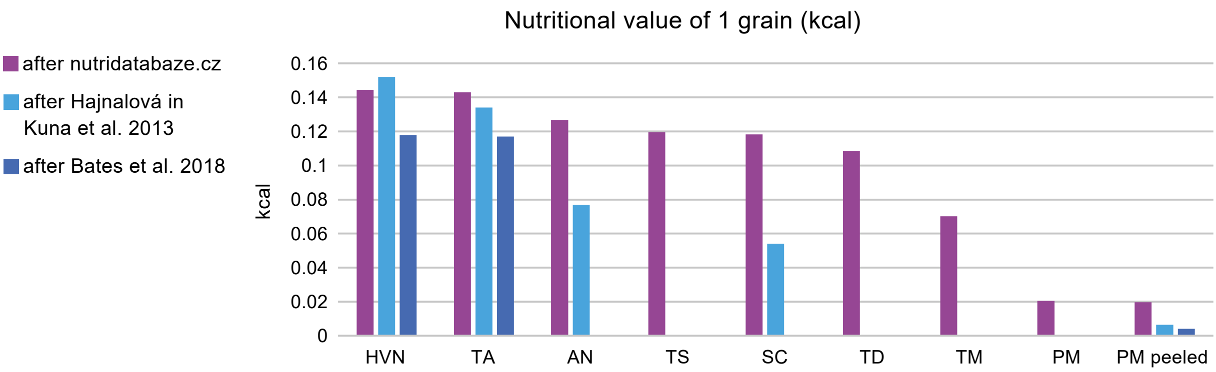


Fig. 29. Weight (g) and nutritional value (kcal) of one grain for a particular cereal species HV – *Hordeum vulgare* (barley); HVN – *Hordeum vulgare* var. *nudum* (naked barely); TA – *Triticum aestivum* (bread wheat); SC – *Secale cereale* (rye); AS – *Avena sativa* (oat); AN – *Avena nuda* (naked oat); TS – *Triticum spelta* (spelt); TD – *Triticum dicoccum* (emmer); TM – *Triticum monococcum* (einkorn); PM – *Panicum miliaceum* (millet); PM – *Panicum miliaceum* peeled (millet). After sources cited. Author: J. Apiar, ARÚB.

In this case, for example, millet, when converted to weight, acquires a lower percentage than in MNI; barley and bread wheat, on the other hand, gain a higher percentage than the MNI values. The grain weight for each cereal crop was calculated according to the following formula:

$$g/MNI = \frac{TGW}{1000} \times n$$

or

$$g/MNI = A \times n$$

3. the *caloric value of cereal grains calculated from MNI* (*kcal/MNI*) values converted to percentages. As in the case of weight, the caloric value of individual cereal crops varies. By converting the MNI to kilocalories, a percentage ratio of cereals is obtained, which is similar to the values of the grain weight ratios. In this case, the differences described in category two are further deepened. Calculations for grain weight and nutritional value are used in the archaeobotanical literature for their (hypothesised to be) more suitable potential in interpreting the presumed importance of individual crops (e.g. Kuna et al. 2013, 90). The caloric value of the grains of each cereal species was calculated according to the following formula:

$$kcal/MNI = \frac{\text{kcal in 100 g}}{\Sigma \text{ grains in 100 g}} \times n$$

or

$$kcal/MNI = \text{kcal 1 grain} \times n$$

4. the *frequency/ubiquity* of individual cereal crops in the whole assemblage. The value expresses the percentage of individual cereal species in all samples, according to the number of occurrences of the particular species separately. 100% represents the total number of samples in the set, where the set, in this case, is the whole examined assemblage or each site. Thus, the frequency/ubiquity represents the number of samples in the studied set where the crop was present. By comparing the number of samples for all cereals, we obtain the proportion of cereal frequencies at the site (in the set).

Figure 30 (cf. Hlavatá 2017, Obr. 6.2.8b) shows how the percentage of cereals fluctuates depending on the type of conversion. Among all cereal species MNI values, barley, millet and bread wheat react significantly to the change, followed by einkorn, rye and other cereals. The first three mentioned cereal crops react in the same way when converted to the weight and nutritional value – the values of barley and wheat are rising in line

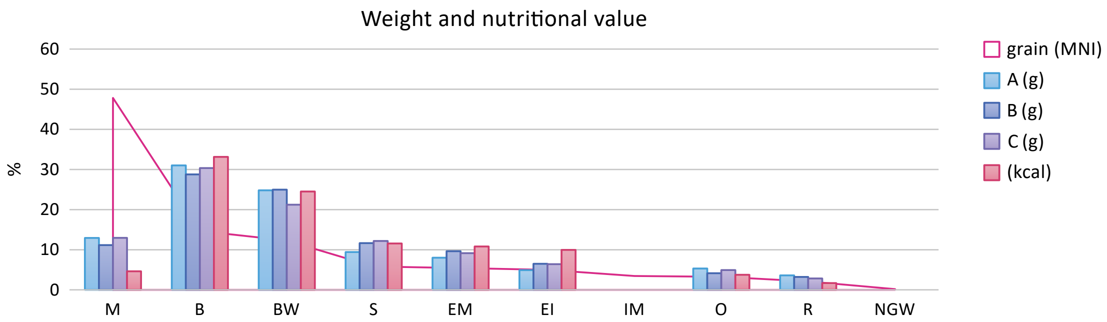


Fig. 30. Jevišovka. Weight (g) and nutritional value (kcal) of grains (MNI) found in samples for a particular cereal species, in percentage. Weights calculated from "TGW" after Hajnalová 2012 (A); "TKW" after Hejcman et al. 2016 (B); "HTS" after Kočár in Kuna et al. 2013 (C); nutritional value (kcal) after Hajnalová in Kuna et al. 2013. M – millet; B – barley; BW – bread wheat; S – spelt; EM – emmer; EI – einkorn; IM – Italian millet; O – oat; R – rye; NGW – new glume wheat. Author: J. Apiar, ARÚB.

(almost identical values), and millet values are falling. However, the situation is interesting for rye and einkorn. While the weight of rye increase slightly, einkorn is represented by only about half the MNI value (this is slightly different when comparing results to Jevišovka assemblage, Fig. 30). In kilocalories, the two crops behave pretty the opposite, meaning that rye values fall below half the MNI value, and the proportion of einkorn increases slightly. If the ubiquity comparison is added, on the contrary, the representation of barley and bread wheat is reduced; millet, oat and rye have the exact percentages as in MNI. Still, hulled kinds of wheat are more strongly represented in the examined group than in the MNI (Fig. 30). As the comparison shows that the method brings different values of the proportions of cereal species.

In comparison with published conclusions (cf. Hajnalová, Varsik 2010, 189, 214–216) the difference appears when comparing the frequencies/ubiquity of cereal crops in individual Slovak sites. In particular, the situation is not so clear-cut as to allow us to unequivocally confirm the trend that, in the provincial sites, „*... the primary importance was on bread wheat, rye, barley and millet; in Barbaricum on barley, millet and spelt...*" (Hajnalová, Varsik 2010, 215).

The trend was accurate, but only when the values for individual cereals were obtained by calculating them for the whole assemblage (cf. Hlavatá 2017, Obr. 6.2.9). When the sites were compared to each other, the grain ratio varied. At the provincial sites, there were bread wheat, rye, barley and millet, but in very different proportions; in some sites, particular crops were missing. According to the frequencies/ubiquity, it could not be said that in all provincial sites individually, the primary importance was on bread wheat and rye, while barley and hulled kinds of wheat are relatively high in some of them.

Hulled barley (e.g. Hlavatá 2017; Hlavatá, Varsik 2019) reaches a balanced or higher value than bread wheat and rye. In total, it is the most stable cereal in Roman-provincial and at the same time the most numerous in barbarian-Germanic sites (cf. Hlavatá 2017, Obr. 6.2.9). Einkorn could form an admixture in winter cereals, so its common occurrence with bread wheat is not surprising but makes up a high proportion. In barbarian-Germanic sites, we again look at the relatively high representation of bread wheat and partly rye in samples.

5.1.2 Summary

Compared with the crop proportions converted into kilocalories, the share of barley in particular and secondly of bread wheat increased significantly. The ratio of individual cereals was similar to the ratio in MNI. In kilocalories, rye had lower values than the actual MNI or frequency, but it is nevertheless clear that it was often represented in barbarian-Germanic sites. In the total sum, according to ubiquity in samples, the most represented is bread wheat in the Roman-provincial sites, then in a low but very balanced ratio of hulled barley and spelt, supplemented with emmer and einkorn – only then does rye. The most represented in barbarian-Germanic sites from todays Slovakia is hulled barley, then spelt, emmer, einkorn and bread wheat in a lower ratio. Millet and rye have the lowest values. In barbarian-Germanic Moravian and Bohemian sites, the hulled barley is the most stable and at the same time the most numerous (also in kilocalories and grams) crop. However, specifically in Jevišovka, the millet is the most numerous and the most ubiquitous cereal in samples (Fig. 31).

Very similar results were obtained by comparing individual sites by the weight of cereal grains. Here the order of spelt and barley in the Roman-provincial sites changes (cf. Hlavatá 2017, Obr. 6.2.13, 7.1.5b), thus changing the overall order to bread wheat, spelt, barley and rye (with rye rising more markedly). The ratio, obtained by the totals from the whole assemblage, differs from the ratio in individual sites.

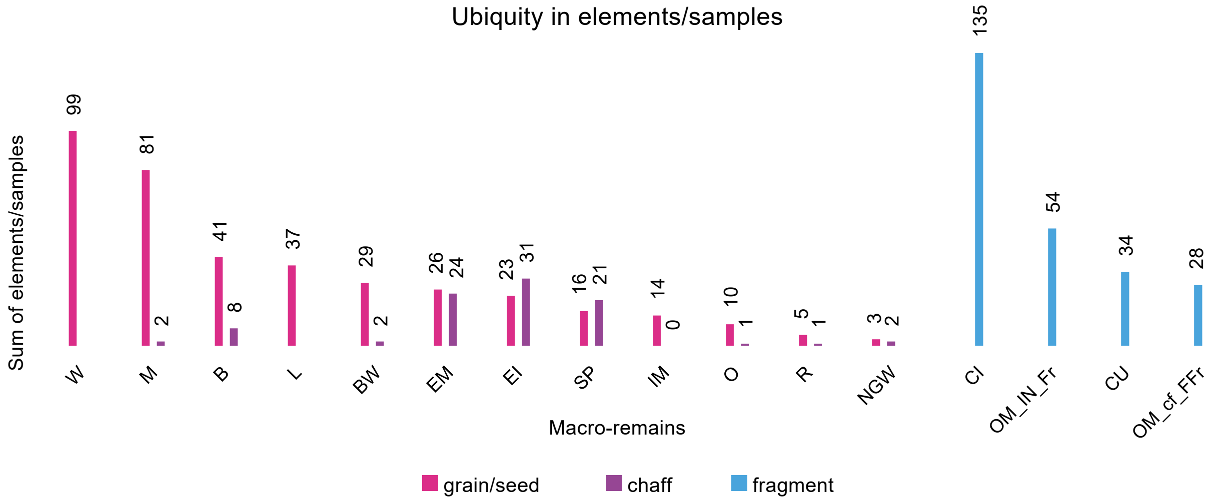


Fig. 31. Jevišovka. The ubiquity of finds in elements and samples according to particular macro-remain category. W – wild flora seeds; M – millet; B – barley; L – legumes; BW – bread wheat; EM – emmer; EI – einkorn; SP – spelt; IM – Italian millet; O – oat; R – rye; NGW – new glume wheat; CI – Cerealia indet.; OM_IN_Fr – Organic mass frag. indet.; CU – culms; OM_cf_FFr – Organic mass cf. food frag. Author: J. Apiar, ARÚB.

Thus, the total MNIs do not give a completely objective (unbiased) picture of the importance of cereal crops in the Roman period and at the beginning of the Migration period. The total ratio of cereals (especially according to the distance from the Limes) does not agree with the ratios of cereals in individual sites. Such a ratio can be taken into account only for guidance and it is important to evaluate the sites separately. The evaluation must include (at least in part) the information of archaeological research, or the extent of archaeobotanical sampling. It is only partly possible by recalculating the taxa densities in the samples/sites and the arithmetic average of these densities (cf. Bates et al. 2018, 3). The densities in detail are discussed in the next chapter.

5.2 Cultivated plants – legumes

In Jevišovka, the finds of cultivated leguminous seeds had only a small share (Appendix Fig. 84). Together 105 seeds were found in total, including the indeterminable fragments (0,9% of all macro-remains). In 50% of the cases, the seeds could be determined down to the species (also 0,9% of all determined macro-remains), and almost 43% were indeterminable fractions. The remaining finds were classified into transitional categories, for example, *Pisum/Vicia* etc. Lentils (*Lens culinaris*, 30 MNI) followed by peas (*Pisum sativum*, 14 MNI) occurred in the highest number of the determined species. The last determined legume was bitter vetch (*Vicia ervilia*), and it was possible to detect it in 9 seeds. In total, legumes were found in 26 % of the samples. Up to 57% of the legume finds come from the superposition of features 039. In contrast, more than half of this amount (33 MNI) comes from a single sample that was collected from the upper part of this archaeological situation.

In a comparative assemblage, finds of legume seeds or their fragments formed a relatively small part (cf. Hlavatá 2017, Obr. 6.2.1) of the total assemblage (only 1.5%, n = 1158), which is equivalent to the Jevišovka finds. Among all sites, 95% of legume finds were from Slovak sites, and the remaining 5% came from Moravian and Bohemian sites. Lentil was the highest number (more than 90%). Seeds of pea, faba bean and bitter vetch have been rare. Other finds were determined only in transitional categories and in indeterminate fragments (Leg. Sat. indet.). In some samples, lentil seeds also occurred in the fragments of burned uneven mass of seeds, pure or combined with other crops (e.g. *Panicum/Setaria*, wheat). Finds of burned material of probably cereal food with an admixture of lentils probably indicate a porridge-like dish.

The distribution of legume finds is as follows. The most significant numbers of legume seeds (= 866 MNI) come from two Slovak sites (Hlavatá 2017, 86). After omitting these finds, the ratio and number of finds in the MNI from barbarian-Germanic and Roman-provincial sites are almost identical (cf. Hlavatá 2017, Obr. 6.2.14 – third columns in order, G-S-M).

Regarding legume finds from the surrounding countries, the absolute numbers of legumes in the studied assemblage are comparable to Hungarian sites. F. Gyulai (2010, 394ff) presents a slightly broader species spectrum, especially concerning pea and lentil cultivars. The most represented legumes are lentils and bitter vetch, of which the second was found in only a small number in the analysed assemblage. Still, it is represented in Roman-provincial and barbarian-Germanic sites. In Hungarian barbarian sites from the 1st to the 5th century bitter vetch absents.

Lentils are also the most numerous legume in German barbarian sites (Kreuz 2004), while peas are found in the most significant quantity in Roman-provincial sites. Regarding the ubiquity of legume species, this is problematic to quantify, as compared to cereal finds, legumes were present in only a minimum number of samples.

The sporadic occurrence of legumes in archaeobotanical samples, compared to cereals, is known from the literature, regardless of the chronological period (cf. Hajnalová 1989; 1993; 1999; 2012; Hajnalová, Varsik 2010; Hlavatá 2008; 2013; 2015; Hlavatá, Varsik 2019; Kočár, Dreslerová 2010; Dreslerová, Kočár 2013; Látková 2017; Krčová 2016). The situation is mainly due to two reasons. The first is how the legumes are prepared immediately before consumption. It is well known that legumes are being bathed in water and cooked for longer before consumption. That is caused by the high content of oligosaccharides, indigestible for the human body. By water-bathing and cooking, they increase their volume (similar to millet). They come into possible contact with "fire" only in the case of cooking in water (cf. Hajnalová 1999, 53; 2012, 81), in contrast to cereals, which are also being roasted and dried during processing or preparation before consumption. Also, due to variable size and structure, they burn differently and for different lengths of time (cf. Bates et al. 2018, 11). Thus, they have a lower chance of entering the archaeobotanical sample through post-harvest treatment processes than cereals (cf. Bates et al. 2018, 3; Fuller 2000; Fuller, Harvey 2006). At the same time, the way legume seeds respond to soaking is directly related to the possibility of their extraction from the archaeobotanical sample taken. During the flotation of the newly analysed samples, a significant number of the legume seeds was extracted only by wash-over or sorting the heavy residues (HR). Legume seeds are, therefore, susceptible to the method of extraction used and the method of carrying out this extraction.

5.3 Fruits, nuts, fibre and oil plants, vegetables and condiments

The macro-remains of a given group of plants tend to be unique in archaeobotanical finds, even compared to legumes (cf. Kočár, Dreslerová 2010, 206). It also applies to the studied assemblage and published information on finds from the Roman period and the beginning of the Migration period (cf. Hajnalová 1999; Kočár, Dreslerová 2010; Hajnalová, Rajtár 2009; Hajnalová, Varsik 2010; Hlavatá, Varsik 2019; Krčová 2016). The assemblage includes cultivated, gathered and exotic (imported) crops/fruits/plants. The most common finds of gathered fruits were elder seeds (carbonised and non-carbonised *Sambucus ebulus*, occasionally S. *nigra* and *S. racemosa*). The remaining species appeared only sporadically. From the Jevišovka site also come few carbonised fragments of elder seeds, and one seed of pear or apple (*Pyrus/Malus*). Altogether, mentioned seeds and several indeterminable fragments of fruit stone or nutshell represent only 0.2% of all macro-remains in Jevišovka assemblage (Appendix Fig. 88; cf. Tab. 4).

In the comparative assemblage, from the Rusovce-Tehelný hon site, is known one seed of wild or common grapevine (*Vitis sylvestris/vinifera*; Hlavatá 2017, 88; cf. Látková et al. 2017) and several fragments of unspecified grapevine seed (not clear whether it is a seed of a cultivated form; Hlavatá 2017, 88). From other Slovak sites, come three seeds of musk strawberry (*Fragaria moschata*) and two seeds of unspecified strawberry (*Fragaria* sp.). The range of new finds is supplemented by one seed of probable European crab apple or apple (cf. *Malus sylvestris/domestica*), one seed of probable pear or apple (cf. *Pyrus/Malus*), isolated seeds of unspecified caneberry (*Rubus* sp.), whitebeam or cane berry (*Sorbus/Rubus* sp.), several seeds of European dewberry (9 MNI, *Rubus caesius*). In addition to these finds, the studied assemblage also contained seeds of wild strawberry (*Fragaria vesca*), apple (*Malus domestica*), raspberry (*Rubus idaeus*), common grapevine (*Vitis vinifera*), fragments of stones and kernels of the seed (*Prunus domestica*, *Prunus* sp.) and Cornelian cherry (*Cornus mas*) – known from the literature (cf. Hajnalová 1989; 2001; Hajnalová, Rajtár 2009; Krčová 2016).

Of the nuts, only fragments of unidentifiable shells and a fragment of acorn (*Quercus* sp.) were present in the newly analysed material. Other species were represented by fragments of beech (*Fagus sylvatica*). To this are added the previously determined fragments (Hajnalová 1989; 2001) of the probable common walnut shell (cf. *Juglans regia*) and hazelnuts (*Corylus avellana*).

The following assortment of oil and fibre crops is known from the Roman period and the beginning of the Migration period. These are isolated poppy, hemp and flax seeds. The assortment is supplemented by previously determined camelina seeds (*Camelina* cf. *sativa*, Hajnalová 1989; 1991; cf. Hlavatá 2017, 89). Added to this is the rare find of carbonised cumin (*Cuminum cyminum*, Appendix Pl. 16: 1, 5, 6) found in Jevišovka (analyses 2021/2022) and few possible medicinal or other use plants – vitex or monk's pepper (cf. *Vitex agnus-castus*, Appendix Pl. 17: 1), one seed of poison hemlock (*Conium maculatum*, Appendix Pl. 17: 3) and bearberry/kinnikinnick (*Arctostaphylos uva-ursi*, Appendix Pl. 17: 2).

Carbonised porous organic mass was found in Jevišovka in all features except unspecified pit 083

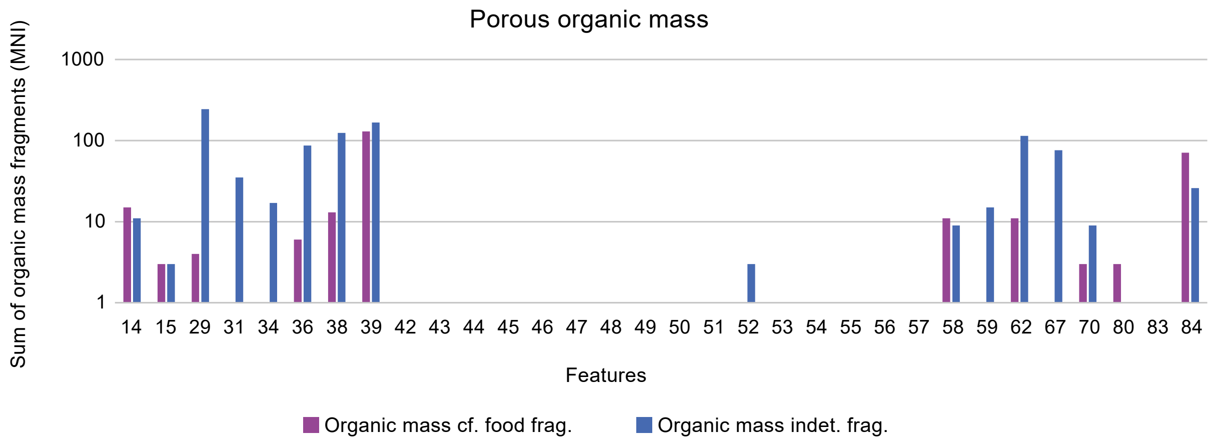


Fig. 32. Jevišovka. Total numbers of carbonised organic mass fragments (MNI) found in Roman and La Tène/Roman period features on a logarithmic scale. Author: J. Apiar, ARÚB.

and postholes belonging to the above-ground structure (except PH 52, Fig. 32, Appendix Fig. 85, 86). In most of them, both types of organic mass were found, i.e. 1) cereal, which could represent food remains, and 2) organic matter without further specification. The second could be the remains of mixed burnt cereal products with charcoal, bone remains, or another plant, animal or inorganic, unspecified mass. These fragments and the set from the comparative assemblage must be subjected to specific analysis. Therefore, they cannot be further analysed in this study.

5.4 Composition of macro-remains

Knowledge of the composition of macro-remains in samples in terms of the main categories of the plant finds is a fundamental prerequisite for the elaboration of taphonomic analysis and the sites economic evaluation according to the classification of samples for products and by-products. It is also necessary to monitor each sample (element) composition separately and evaluate the composition of the components at the sites.

According to the overall proportions of the components in most sites, cereal grains predominate and are supplemented with weed seeds. In some sites, the ratio of cereal grains and weed seeds is balanced, or weeds predominate. At 5% of sites, it is relatively high, respectively, a higher proportion (more than 20% of all macro-remains) of all indeterminate macro-remains, including fragments of cereal and other organic material and fragments of reed/bulrush culms. In general, it can be said that the composition of components in the sites is diverse. Still, in 2/3 of the sites, cereal finds make up more than 40%; in about 7% of sites, weed seeds exceed the finds of cereal grains; in 8% of sites, the finds are chaff and cereal straw. More than 10% of the components and only seven sites make up pulses (legumes) about 5% and more of all macro-remains.

A preliminary comparison of the samples showed that crop products can be partially or entirely cleaned (min. 80% of cereal grains and more, cf. Hillman 1984; Jones 1984; Hajnalová 1993, 102; 2012, 89, 106; Látková 2015, 91) or may consist of the remnants of several mixed products. Rarely, there may be residues of gathered fruit and oil plant seeds in the assemblage. In a comparable number to the crop products, the samples also represent crop processing wastes that may come from cleaning the grain product or may consist of several mixed wastes or degraded food and kitchen waste. Based on the composition of individual samples, it is not possible to state unequivocally that the examined material shows a connection between the number of macro-remains and their affiliation to crop processing waste or product (grain storage). In the case of material from the Bronze Age, M. Hajnalová found (2012) that in samples with the number of finds up to 50: "...*there are more frequent crop processing wastes*..." (weed seeds and chaff fragments), and samples with the number of finds over 50 represent: "...*especially crop products*" (Hajnalová 2012, 89). Such a similar result is not reflected in the examined samples from the Roman period and the beginning of the Migration period in comparative assemblage (Hlavatá 2017, Obr. 6.3.2, 4), or in Jevišovka (Fig. 33). Regardless of the number of macro-remains, the composition of all examined samples is diverse. Paradoxically this is the common feature of both sample sets. There are possible products and wastes in both sets. The composition in samples is very mixed, but it is impossible to claim that wastes are more common in samples with up to 50 finds. Therefore, to evaluate the examined samples in terms of products of the post-harvest crop treatment process, it is necessary to define the individual samples or elements. The following taphonomic analysis defines crop products and wastes in the studied assemblage.

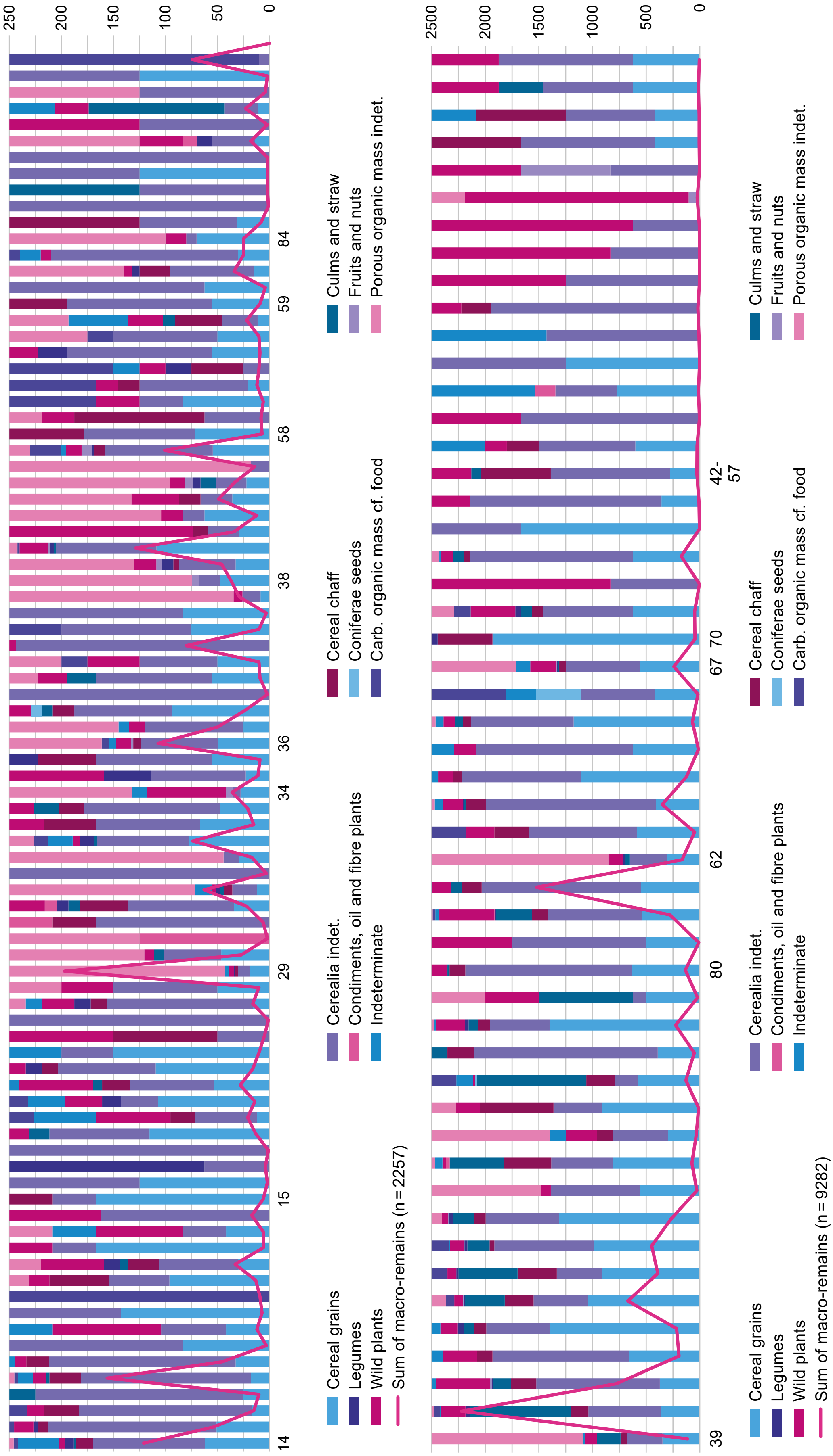


Fig. 33. Jevišovka. Composition of samples collected from archaeological features. Percentages of individual macro-remain categories found determined in samples. Top – Roman period pithouses; bottom – from left to right, La Tène/Roman period pithouses (039, 080), Roman period storage pits (062, 067, 070), Roman period above-ground structure (042–057). Secondary axis (right) – sum of macro-remains (MNI). Author: J. Apiar, ARÚB.

6. Pre- and post-deposition processes affecting the composition of the samples

Jana Apiar

The evaluation of archaeological material is influenced by several processes that directly or indirectly affect its composition, form and range. According to the usual terminology (Payne 1972; Körber-Grohne 1991; Greenwood 1991, 141–169; Lyman 1992; Jacomet, Kreuz 1999, 69–94; Hajnalová 1999; 2012, 95–97; Pearsall 2000; 2004; Lityńska-Zając, Wasylikova 2005, 37–51; cf. van der Veen 1992, 81, 82; Neustupný 2010; Kuna et al. 2013; etc.), these processes are divided into pre-depositional (including cultural), depositional and post-depositional.

These processes can be separated into the following three groups (cf. Orton 2000, 40–66; Marston, d'Alpoim Guedes, Warinner 2015, 116, 117; etc.):

1. The first group includes processes that affect plants and their fruits during their functional life. All steps related to the cultivation and harvesting of crops, their processing and consumption can be listed here. In this group of processes, a person or the population that comes into contact with plant material more or less daily plays an important role. Plants – crops and their harvest can be affected by the method of sowing, soil and vegetation care, fertilisation, weeding, harvesting method, post-harvest processing of crops and preparation of products for storage and direct consumption (biocenosis, partially necrocenosis).
2. In the second group, there are processes related to the very creation of archaeobotanical material, in its essence, in an anthropogenic soil horizon/sediment. In archaeological terminology, it can be called context, layer, or deposit, including waterlogged sediments (e.g. a well) and the like. It is partly necrocenosis, thanatocenosis and taphocenosis, during which decomposition of the deposited material occurs. The deposit can be moved multiple times, either by the action of natural conditions or with the help of fauna, but also by humans. Here, the abilities and needs for preservation of specific plant macro-remains play a significant role (cf. Boardman, Jones 1990).
3. The third group is represented by processes that are research-influenced. Precisely, by the sampling method, the extraction method, processing (from basic sorting to completion of documentation), analysis (applied methods and their appropriate use) and, finally, interpretation of the results. Since the archaeobotanist or archaeologist can be a direct part of only the last group of processes, it is crucial to choose suitable methods of obtaining and evaluating the material. Only then it is possible to reveal, at least partially, the processes of the first two groups.

The number of archaeobotanical samples taken, the volume of each sample, the possible loss of fragile plant remains during the flotation, and the methods of evaluating the remains recovered, result from the method and possibilities of research. Therefore, the relativising differences between the archaeobotanical samples, possibly caused by the research method, are first described below (e.g. density of macro-remains). Subsequently, standard archaeobotanical methods of taphonomic analysis are used to reveal the origin of the archaeobotanical samples.

6.1 Density of macro-remains

Using macro-remain density values in assemblage evaluation allows another critical factor to be included in the interpretation. By converting the MNI to the density of finds per litre of sediment, the information on the size of the archaeobotanical sample is taken into account, which can significantly impact the concentration of the recovered finds. Of course, it is impossible to claim that only the size (volume) of the sample fundamentally affects the amount of plant finds extracted from the sediment. The primacy belongs to the taphonomic processes of the first and second groups described above. However, it is one of the ways to relativise the differences resulting, for example, from the non-constant volume of individual samples. Another factor that is included in the analysis through the density of finds is the formation and deposition of anthropogenic sediment (cf. Kuna et al. 2013, 95, 96; Kuna, Němcová et al. 2012, chapters 5 and 6; Hajnalová 2012, 95) and the processes that take place in it until the archaeobotanical sample is collected. To understand these processes is necessary to distinguish between genetic and non-genetic soil horizons – that is, a sediment of fossil or relict character (J. Sobocká 2017, personal communication; cf. Bedrna, Košťálik 1999). According to the newer system of soil genetics and diagnostics, we are talking about soil sediment (horizon) affected by anthropogenic activity, i.e. with the artefact content or anthroposol (J. Sobocká 2017, personal communication; SPS-MKSP SR 2014, 22; TKSP ČR). All archaeological finds and situations (including archaeobotanical ones) are more or less equally influenced by the processes occurring in the soil horizon, where they are deposited. At the same time, it can differ from processes related to the genetic soil horizon (cf. Kuna et al. 2013, 87ff; Hajnalová 2012, 45, 95).

Density can be used in several ways. The density of finds per litre of sediment and the arithmetic average of the individual site densities were determined. The density of all finds was calculated, as well as the density of particular groups of finds (e.g. cereals, weeds, individual cereal taxa, etc.). The density or the arithmetic mean of the densities has already been used in the literature (e.g., Lee 2012, with additional refs.; Kuna et al. 2013, 95, 96; Látková 2015, 94–97; 2017; cf. Lyman 1992). The use of the weighted arithmetic average of the densities was also considered. Still, for this calculation, the same values must be found in a frequency higher than 1 (Hendl 2006, 94). The value of the arithmetic mean entirely fulfils the purpose for which the density of finds was calculated. The value of the density of finds of the entire assemblage and the arithmetic mean of the density is the same if the evaluated volumes are also the same (constant). However, this situation occurs exceptionally in archaeological material. Since the sample volumes in the studied assemblage are very different (variation from 0.1 litres to tens of litres per sample or missing volume), it was impossible to compare the samples without recalculating the density of finds per litre of sediment. While the density relativised the differences between the samples, the arithmetic mean of the densities represents a value that could characterise the whole assemblage (or site). It was used in the case of the comparative assemblage. The sites from the dissertation research could thus be compared more objectively (more or less without the consequences of different finds MNI).

The density value was obtained by dividing the total number of macro-remains by the total volume of sediment in litres. The density of each sample from the investigated site was calculated when calculating the arithmetic average of the site. Then the sample density values were added and divided by the total number of samples.

In the same way, the density of individual cereal taxa at the sites is determined.

6.1.1 The density of finds on the sites and the average densities of cereal species

The densities of all macro-remains and individual cereal taxa at the sites were calculated for the entire comparative assemblage and the Jevišovka. The Univariate plots function in the XLSTAT Addinsoft 2016, Evaluation version 18.07 40123, Free Trial & Free Version, and the Descriptive statistics function in the XLSTAT Addinsoft 2022, Free version 2022.4.1., which is an add-on to the Microsoft Office Excel program, was used, with the possibility of creating a multiple box plot.

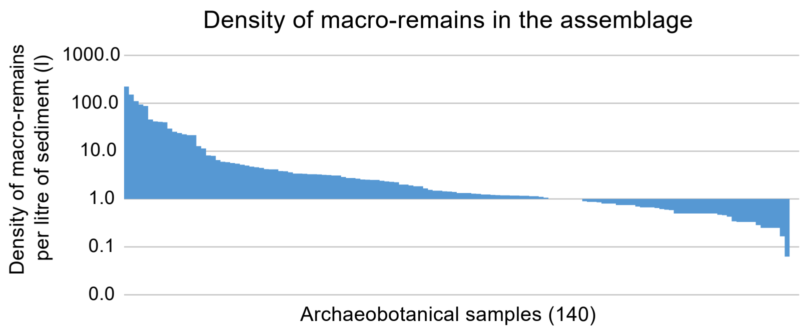
6.1.1.1 Density of macro-remains in Jevišovka

Since the Jevišovka assemblage was not entirely analysed in 2014–2017, a selection of samples was made. The choice of samples considered each type of context to be represented in approximately the proportion in which it was sampled in the entire set. To verify the distribution of macro-remains in both analyses, a comparison of find densities from these different analyses was first performed to avoid misinterpretation. However, it is clear from the results of descriptive statistics (Tab. 6) that there is no significant difference between the densities of the two assemblages. Consequently, the previous selection of samples from Jevišovka represented the assemblage more or less sufficiently. However, as can be seen from Table 6, the density of carbonised macro-remains variance is more than 650 (730) in both sets. This is also shown in Figure 34. Out of the 140 elements (samples) analysed or revised by 2022, up to 45 have a density per litre of sampled sediment lower than 1. Another 78 elements (samples) have a density lower than 10. The remaining 17 elements have a density of 11.3 to 223 carbonised macro-remains per litre of sediment (Appendix Fig. 91). At the same time, the last group causes the highest variance and standard deviation in the set (Fig. 35). Specifically,

Tab. 6. Jevišovka. Statistic of macro-remain density in different years of analysis. Diss.2017 – analysis during dissertation project in 2014–2017; 2022 – analysis during the processing of this work in 2021, 2022. Author: J. Apiar, ARÚB.

Statistic	Nbr. of observations (samples)	Minimum density	Maximum density	1st Quartile	Median	3rd Quartile	Mean	Variance (n-1)	Standard deviation (n-1)
Carbonised macro-remains_diss.2017	91	0.03	244.78	0.77	1.85	3.08	5.42	658.25	25.66
Non-carbonised macro-remains_diss.2017	84	0.09	13.00	1.00	1.58	4.14	2.90	8.04	2.84
Carbonised macro-remains_2022	140	0.00	223.00	0.75	1.33	3.46	8.82	738.18	27.17

Fig. 34. Jevišovka. The density of macro-remains per litre of sediment (l) in samples collected from the site on a logarithmic scale. Author: J. Apiar, ARÚB.



these are samples from features 039 and 080 (Fig. 36, Appendix Fig. 91). In the density variance, in the distance behind the mentioned superpositions, there are samples from features 036, 070 and 084. Nevertheless, they had an average density per litre of sediment lower than 10. Regarding the localisation of the highest densities within individual feature parts or fillings (Appendix Tab. 22), despite the high number of samples coming from the postholes, they do not appear to have the highest densities in the assemblage (cf. Apiar, J., Apiar, P. 2021, 140). However, it is true that among the interior postholes (inside pithouses), there are several outliers (Fig. 37, left, PH interior). Overall, unspecified feature fillings (that is, layers except for the bottom and floor) have the highest densities and variance, and then the entrance pits (Fig. 37, left, FL, EP). Considering the percentage of the sampled volume of features, interior postholes in pithouses were the most representative sampled (Fig. 37, right, PH interior). The mentioned bottoms, floors and unspecified fillings (interior layers) were, with exceptions, sampled absolutely minimally in terms of the percentage of sampled sediment.

6.1.1.2 Density of macro-remains in the assemblage

The diagrams arrange the total densities of finds, also displayed as boxes, chronologically. This display of descriptive statistics plots the individual values of the sample density (or the specified input value) on the graph. The dispersed densities of the sites processed so far are graphically displayed in Figures 38 and 39.

The densities of finds of older archaeobotanical assemblages (mainly before 2010) vary widely. There are significant differences between individual sites and between individual samples. The differences described are primarily related to the samples or sites from which mass finds or high concentrations of macro-remains originate. The reason is also the incredibly different numbers of samples taken (cf. Apiar, J., Apiar, P. 2021; Hlavatá 2017, chapter 11). The average density of sites without mass finds ranged from 0.2 to 25 seeds per litre of sediment. The densities' average and median values are lower than the newly analysed samples, processed by the author herself in 2014–2017 (cf. Hlavatá 2017, Obr. 7.1.36a, b, 7.1.9, 7.1.10). Taking into account the location of the sites concerning the Limes Romanus, it is impossible to assess the connection between the higher density and the proximity of the Limes, through the display as boxes (Fig. 38, 39). Among the sites with a higher average density and median, there are predominantly those located in the Limes area. Still, there are also sites located in Barbaricum.

Regarding chronology, at the current state of research, it is also problematic to clearly define the different densities of finds at the sites, primarily due to inconsistent dating. Based on this analysis, it is impossible to say unequivocally whether the density of finds at the sites depends on the chronological or cultural-chronological situation in the studied region (cf. Hlavatá 2017, Obr. 7.1.9, 10, Tab. 7.1.14, 15).

By comparing the density of cereals and the total density, it is possible to trace the share of cereal finds

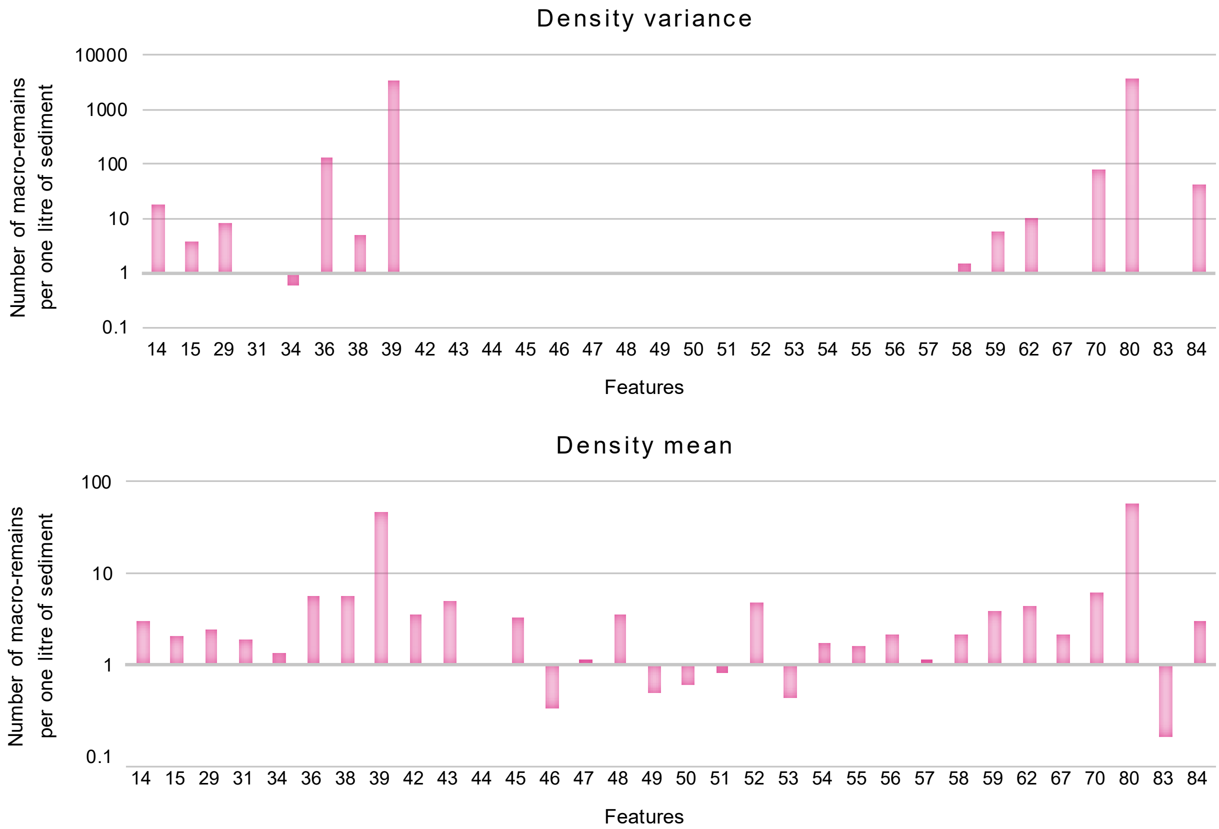
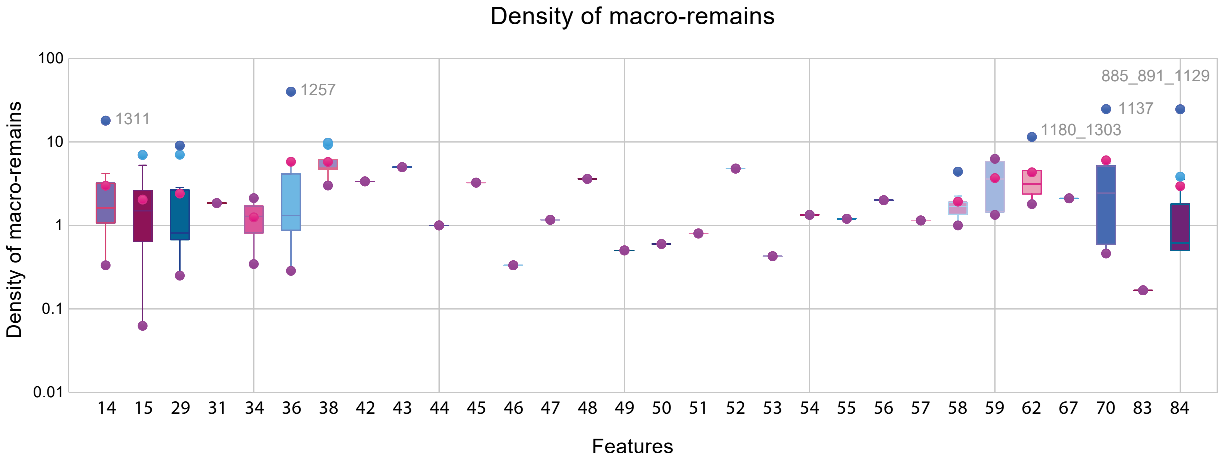


Fig. 35. Jevišovka. Density variance (top) and mean (bottom) of macro-remains per litre of collected sediment from Roman and La Tène/Roman period features on a logarithmic scale. Author: J. Apiar, ARÚB.



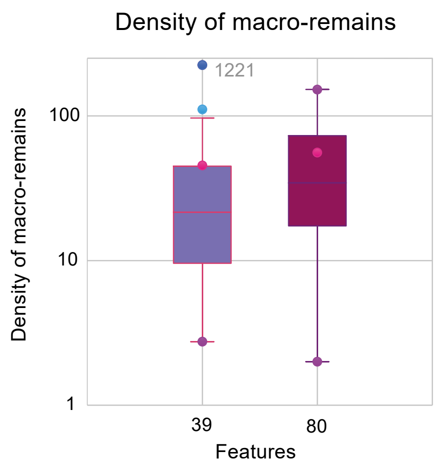


Fig. 36. Jevišovka. Box plots of the density of macro-remains per litre of sediment samples collected from Roman (top) and La Tène/Roman period features (left) on a logarithmic scale. Author: J. Apiar, ARÚB.

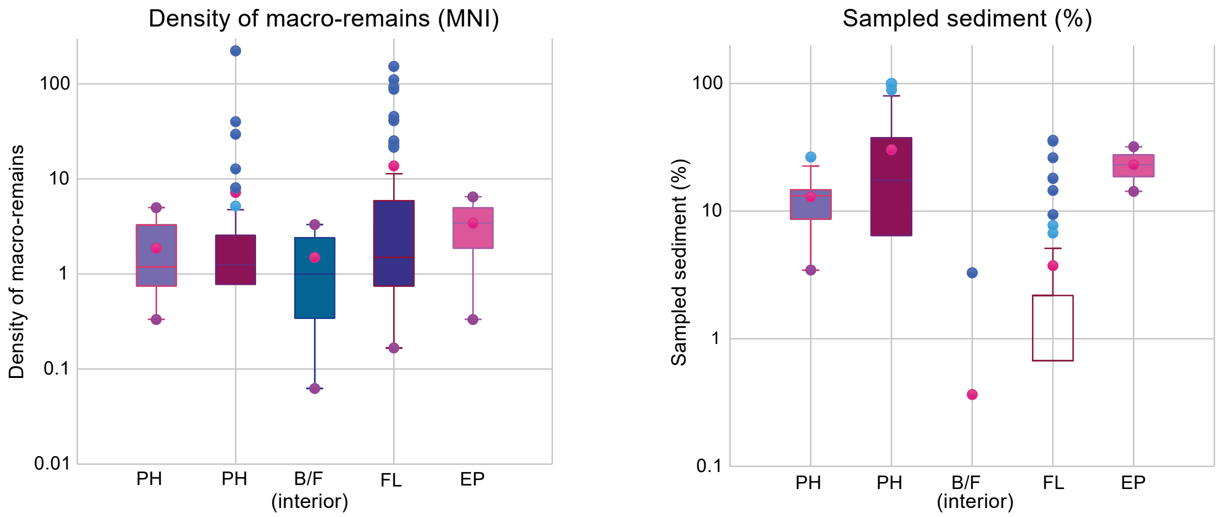
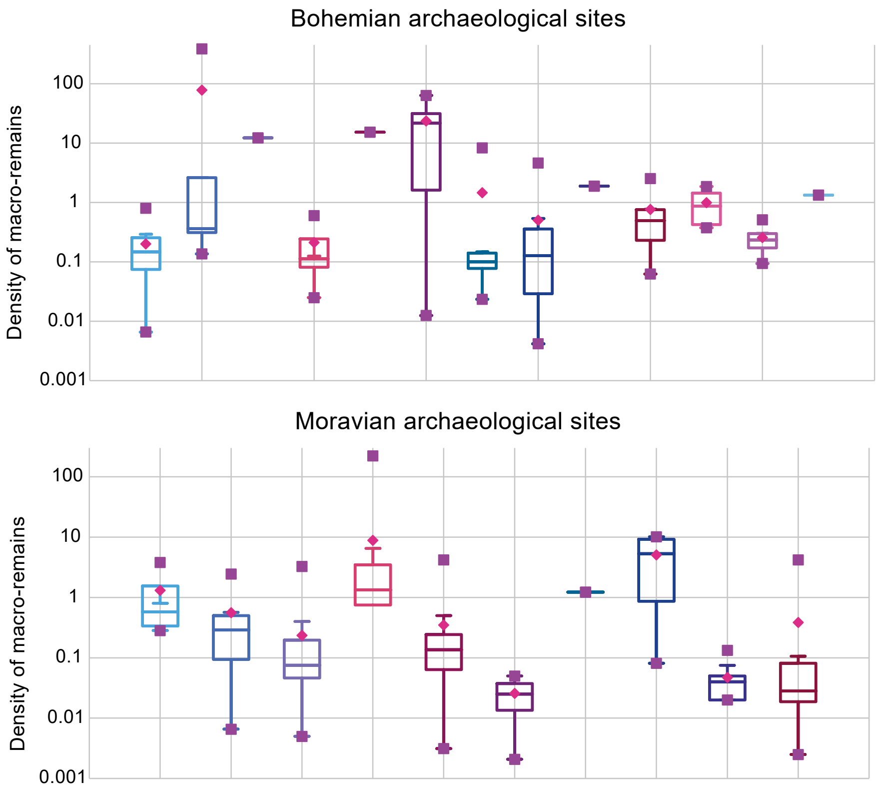


Fig. 37. Jevišovka. Box plots of the density of macro-remains per litre of sediment (left) and percentage of sampled sediment (right) according to the contextual origin of samples from Roman and La Tène/Roman period features on a logarithmic scale. PH – postholes; PH (interior) – postholes (interior of a pithouse); B/F – bottoms/floors; FL – unspecified fills; EP – entrance pit (in a pithouse). Author: J. Apiar, ARÚB.

Fig. 38. Comparative assemblage. Bohemian and Moravian archaeological sites. Box plots of the density of macro-remains (MNI) per litre of sediment on a logarithmic scale. Each box represents one archaeological site. After Hlavatá 2017. Author: J. Apiar, ARÚB.



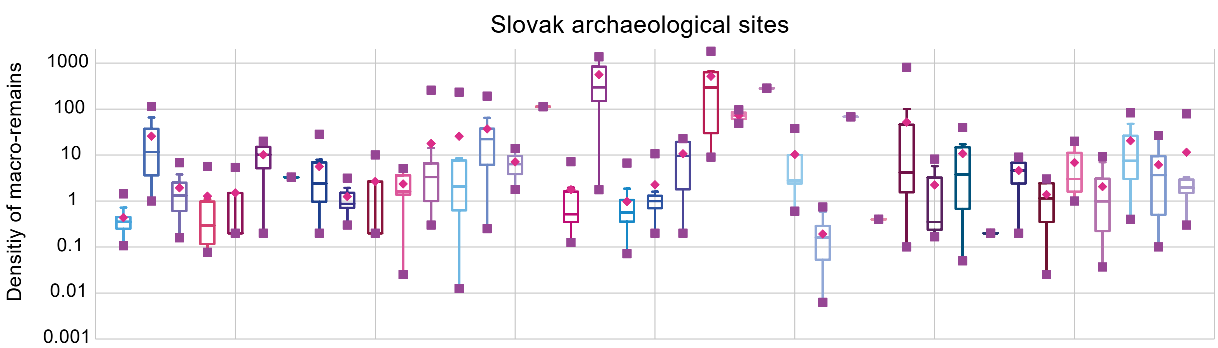


Fig. 39. Comparative assemblage. Slovak archaeological sites. Box plots of the density of macro-remains (MNI) per litre of sediment on a logarithmic scale. Each box represents one archaeological site. After Hlavatá 2017. Author: J. Apiar, ARÚB.

in the total density of finds at the site. Sites with mass or highly concentrated finds have the highest densities of cereal grains, which in many cases also results from the sampling method. Also, in this case, the variance of the densities is very high. For example, for bread wheat from Slovak sites, the minimum densities range from 0.045 to 40 grains per litre of sediment and the maximum from 0.05 to 128 grains per litre of sediment (cf. Appendix Tab. 23). The differences between the variances are noticeable, both within the geographical location and in the distance from the Limes.

The average densities of individual cereal species, divided by groups of sites separately in regions, by distance from the Limes and by chronology, were used for correspondence analysis (Fig. 40, Appendix Tab. 23). In addition to the basic geographical regions (Bohemia, Moravia, Slovakia), a division into three groups were used as descriptive characteristics: 1) Limes (sites in the Limes Romanus area), 2) Barbaricum (sites far from the Limes Romanus, approximately from the Central Považie region; central, northern and eastern Slovakia; from the approximate line Brno – Hodonín and beyond, and Bohemia), and 3) Unspecified (sites located between the first two zones, i.e. the broader vicinity of Nitra towards the southwest and the vicinity of Pasohlávky together with Jevišovka). In Figure 40, top, the Limes and Barbaricum zones have separated, with an Unspecified zone between them. The first two zones are linked to Dimension 1, which explains up to 92.1% of the variability. According to this result, based on the average densities of cereal species on the sites, it is possible to connect Limes primarily with the finds of wheat (mainly bread wheat, but also glume wheat) and Barbaricum with millet and barley. The Unspecified zone is also related to Dimension 1 but has the lowest contribution[10] (Fig. 40, contrib) of all zones. Figure 40, in the middle, shows the average densities of cereals at sites by zone and geographic region. On this graph, it is more evident that the Slovak sites in Barbaricum are primarily associated with millet and the sites in Barbaricum in Bohemia with barley. Among these sites, a group of Moravian Barbaricum was separated, which is surprisingly more similar to the sites of the Limes zone in Slovakia. The unspecified sites remained more or less unchanged. Still, the Moravian and Slovak sites of this zone are slightly separated from each other – while the Slovak ones are closer to Limes in the graph, the Moravian ones are somewhat further away.

The chronology was also involved in the last correspondence analysis (Fig. 40, bottom). Specifically, it was possible to divide the sites into three main groups according to dating, with Pasohlávky and Jevišovka sites more specified (Appendix Tab. 23). The graph (Fig. 40, bottom) shows a somewhat detailed distribution of sites. Here it is evident that the Moravian Barbaricum sites, which were previously associated with wheat and the Limes zone sites, belong to the later stage of the Roman period up to the beginning of the Migration period. This also includes a group of sites that have not been dated in more detail (short RPU). They are therefore marked generally as the Roman period, and there can be earlier and later stage sites among them. Limes zone sites are associated with higher wheat densities, as in all three graphs. The Bohemian Barbaricum sites continue to be associated with barley. Unspecified Moravian sites are now related to the sites of Slovak Barbaricum, linked to millet. The proximity of the Slovak Barbaricum sites with millet is due to the mass find of millet, which comes from one Slovak site. However, when testing the correspondence analysis of grain densities for individual sites, both unspecified Moravian sites, dated to the end of the Marcomannic Wars and the beginning of the 3rd century – Pasohlávky and Jevišovka – were associated with millet. Almost all sites from the Unspecified zone clustered around the centre on each graph as if related to multiple cereal species, and none of them were particular to them. In contrast to the previous set of graphs (boxplots by sites), here it is shown that there is a "third" zone in-between the Limes and Barbaricum area, which, due to the composition and density of the grain assortment, is specific and forms a kind of intermediate zone. The site of Jevišovka also belongs to this zone.

6.2 Products, by-products and crop processing waste

The previous subchapter analysed data and cereal species proportions according to the macro-remain density. To better understand the origin of individual samples (cf. Hillman 1981a; 1981b; 1984; Jones 1984; Köhler-Schneider 2001; van der Veen 1992; van der Veen, Jones 2006 and others), their composition is also evaluated in terms of the stages of the post-harvest crop treatment process.

The post-harvest crop treatment process has several stages during which different products and by-products are produced. In archaeobotany, it represents a long-term debate. The economic models (see the eighth chapter) applied in studying archaeobotanical remains are based mainly on the mentioned issue (Hillman 1981a; 1981b; 1984; Jones 1981; 1983; 1984a; 1984b; 1985; van der Veen 1992; Bogaard 2004; Haj-

10 The contribution of individual rows (in this case, zones) to the overall inertia (Greenacre 2007, 8–10, 25–32; cf. Hlavatá 2017, 52).

nalová 2012; Reed 2016 and others). It is possible to divide them into crop products (e.g. cereals, legumes or other crop stores) and waste from processing these products. According to ethnographic studies (G. Jones, G. Hillman), each stage produces a more or less typical composition of products (long/broken straw, ears, spikelets, weed seeds of various physical characteristics, glumes, clean grain). In archaeobotanical material, capturing two groups of processes is most often possible. The first group is represented by earlier phases – threshing or winnowing, and the second by later ones – coarse and fine sieving or hand sorting. The samples must be subjected to a taphonomic evaluation to identify the process phases and reserves or wastes. The main components in the process stages are cereal or legume grains, glumes (glume bases and ears) and weed seeds.

In this subchapter, samples are evaluated in terms of their composition, the presence/absence of components and their mutual proportions employing taphonomic analysis methods. In the particular methods, stores/grain reserves, wastes, or their types are separately identified in the examined assemblage (i.e. in samples), the phases of the post-harvest crop treatment process. At the end of the chapter, the results are evaluated.

6.2.1 Main component proportions

The method of proportions of the main components monitors the relative proportions of cereal grains, glumes (glume bases and ears) and weeds (Hillman 1981a). The main components are the direct components of the crop, in this case, cereals (and legumes), which can be harvested from the field and enter the archaeobotanical sample. The individual component proportion is calculated from their absolute number to define the grain stores and wastes in the samples (cf. Hillman 1981a). The method is suitable for naked and hulled cereals (cf. Hajnalová 2012, 97–100).

Based on the published literature, several proportions were calculated to analyse both assemblages. First, proportions (p) no. 1, 2 and 3 were used (Appendix Tab. 24, p4–p6 are given in Appendix Tab. 28, 29). The first proportion (p1) expresses the ratio of glume bases to grains of hulled cereals (e.g. spelt, emmer and einkorn). The second proportion (p2) represents the ratio of rachises to grains of naked cereals (bread wheat, barley and rye). The third proportion (p3) expresses the ratio of weed seeds to the total number of cereal grains (or legume seeds). The original methodology developed by G. Hillman (1981a; 1984), described by M. Hajnalová (2012, 97, 98), was followed in calculating proportions. It means that the resulting values of

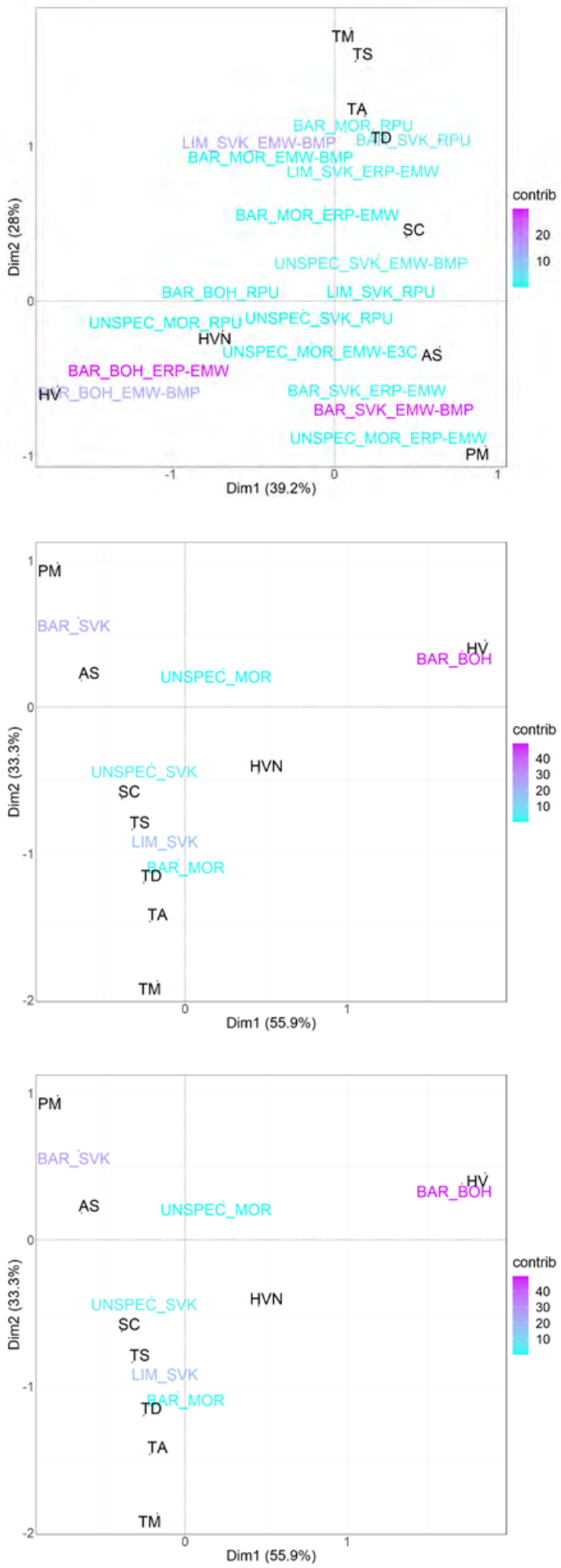


Fig. 40. Comparative assemblage. Correspondence analysis of the average macro-remain density of sites. Top – assemblage divided according to the zones (Limes, Barbaricum and Unspecified); middle – assemblage divided according to the zones and geographical region (Bohemian, Moravian and Slovak sites); bottom – assemblage divided according to the zones, geographical region and chronology (see Appendix Tab. 23). After Hlavatá 2017. Author: P. Apiar, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

individual shares were interpreted according to the key (Hajnalová 2012, 97, 98), where a particular numerical value is significant for each share. In the case of the first proportion of p1, the monitored values were equal to, lower and higher than 1, or 0.5; values equal to, lower and higher than 0.3 were observed for the p2 ratio, and a level of 0.5 was significant for p3 (cf. Reed 2016, Table 10).

The values of the proportions p1 and p2 determined in this way are the number of glume bases and grains of hulled kinds of wheat (p1, value 1 or 0.5) and the number of rachises and grains of naked cereals (p2, value 0.3).

In the first two proportions, in samples where only chaff without grain was present, the zero in the grain column was replaced by 1 (Hajnalová 2012, 97, 98). Since, based on knowledge of the morphology of cereal species, botany can determine the composition of cereal spikelets in terms of the number of glumes per grain ratio, archaeobotany models the state in which the spikelets could be preserved. It may be the remnants of whole unthreshed ears, partially cleaned grain, or thoroughly cleaned grain (Reed 2016, 214–219). 1 to 3 proportions were calculated for each sample. This method applied fourteen categories of crops and weeds to the comparative assemblage. For the Jevišovka assemblage, it was eleven categories (Tab. 7: 1). In the case of different forms/varieties of bread wheat, the share calculated from the total category of these cereals was taken into account. The reason is mainly the need to supplement the metric analysis and more detailed morphological characteristics of bread/club wheat grains (*T*. cf. *aestivum*/*compactum*) and tetraploid wheat (*T*. cf. *durum*/*turgidum*). The same procedure was followed for einkorn and new glume wheat.

In several cases, millet has been preserved with glume remnants attached. For this reason, millet (also Italian millet) was included in the analysis. The proportions were calculated for all samples. However, for the final interpretation, only samples containing at least 50 (or ten) finds of cereal grains, legume seeds, glumes (cf. Hajnalová 2012, 98; Reed 2016, 213) and weed seeds.

The primary assemblage for this analysis consisted of 140 (Jevišovka) and 1187 samples (comparative assemblage), of which 78 samples (39 from Jevišovka) contained at least 50 finds or 420 samples (97 from Jevišovka) with at least ten finds.

The tested assemblage from Jevišovka consisted of all analysed samples (140) to show the numbers of particular crop finds (for individual samples ratios from Jevišovka, see Appendix Tab. 24). It is clear from the results that an unambiguous interpretation of the samples based on this method is problematic. Under "ideal" conditions, the main crop in the sample is that which represents at least 80% of the finds in the sample (Hajnalová 1993, 102).

Most of the samples contained a mixture of cereal species in comparable percentages. In such cases, when all three (or two of the three) shares indicated a different interpretation of the final product, it was difficult to interpret the sample differently than a mixture of several reserves and a processing waste (cf. Hajnalová 2012, 100, subchapter 6.1.3). Therefore, the main crop was interpreted at the end of the whole taphonomical assessment after evaluating the results of all analysis methods. In addition, using the criterion of at least 50 finds, bulk finds, or highly concentrated cereal finds were included in the final interpretation.

In Table 7: 2, the results of p1 are summarised for samples with a minimum of 50 finds. Specifically, the proportions of grains and glumes of einkorn, emmer, spelt, and new glume wheat was calculated.

Most samples were identified as a reserve of cleaned dehusked grain, eventually a reserve of grain or ears. Some samples were identified as spikelet storage and waste. The remaining samples belonged to the transitional categories – various waste mixed with grain and spikelets, kitchen waste, etc.

The final interpretation of the samples according to the proportion of p2 is shown in Table 7: 3. Absolute numbers of rachises and grains of bread wheat, and barley entered this calculation. The rye and oat finds were also included. Of all the determining samples, more than 80% were classified as reserves of cleaned dehusked grain, and some were classified as waste and unthreshed ears. The remaining samples could be classified as unthreshed ears, waste or cleaned grain reserves.

Finally, a summary of the results of the p3 ratio is given in Table 7: 4. In this case, the proportion of weed seeds to the grains/seeds of all crops, including legumes, was calculated. Based on this proportion, it was possible to classify 100% of samples with at least 50 finds. Seventy-eight samples from the comparative assemblage and thirty-eight from the Jevišovka assemblage were classified as reserves of cleaned grain. The resulting value of the ratio was in the range of 0.4 to 0. Seven samples were identified as a mixed waste of various kinds with remnants of secondarily moved or kitchen supplies (all from the comparative assemblage). The remaining samples consisted of processing waste (from Jevišovka, one sample; Appendix Tab. 24).

During the overall evaluation of the final values of individual proportions, it was problematic to decide which classification of the sample (crop reserve/waste/specific product or by-product type) should be included. These are mainly samples of a mixed nature, i.e., several crop species, plant segments (grains, glumes, ears, legume

Tab. 7. Jevišovka. Cereal and weed categories for which the proportions of p1–p3 were calculated. Results for the proportions in comparative assemblage samples containing at least 50 finds, with a comparison of the final product classification after Hajnalová 2012, 96, 97. ∑ spl – the total number of samples; ∑ sts – the total number of sites, ∑ pdc – the total number of a particular product type determined; (JV) – the original calculation for the Jevišovka site (after Hlavatá 2017, Tab. 7.2.2.). Author: J. Apiar, ARÚB.

PRODUCT CATEGORIES FOR THE JEVIŠOVKA ASSEMBLAGE

English name	Latin name	
einkorn	*Triticum*	*monococcum*
emmer		*dicoccum*
spelt		*spelta*
new glume wheat		cf. *timopheevi*
bread wheat		*aestivum* s.l.
hulled barley	*Hordeum*	*vulgare* subsp. *vulgare*
rye	*Secale*	*cereale*
oat	*Avena*	cf. *sativa*
millet	*Panicum*	*miliaceum*
Italian millet	*Setaria*	*italica*
weeds		---

RESULTS FOR PROPORTION CALCULATIONS

	Final product type	M. Hajnalová 2012	Slovakia ∑ spl	∑ sts	∑ pdc	Moravia ∑ sts	∑ pdc	Bohemia ∑ sts	∑ pdc
p1	clean grain	P6	47	2	10	1	2	5	9
	clean grain/unthreshed ears	P6/P1-P4	7	5	6	1(JV)	1		
	unthreshed ears	P1-P4	1	1	1				
	unthreshed ears/processing waste/clean grain	P1-P4/P6/o10-12/P6	5	2	5				
	unthreshed ears/processing waste	P1-P4/o10-12	2	1	2				
	processing waste	o10-12	2	2	2				
	mixed, kitchen waste, unprocessed cereal reserve		7	3	5	1(JV)	2		
p2	clean grain	P6	76	12	43	2	3	7	27
						1(JV)	3		
	clean grain/unthreshed ears	P6/P1-P4	5	2	5				
	unthreshed ears	P1-P4	1	1	1				
	unthreshed ears/processing waste/clean grain	P1-P4/P6/o10-12/P6	2	1	1	1(JV)	1		
	unthreshed ears/processing waste	P1-P4/o10-12	2	1	1	1(JV)	1		
	processing waste	o10-12	1	1	1				
p3	clean grain supplies	P5, P6	78	10	43	3	7	8	28
	mixed, kitchen waste, unprocessed cereal reserve		7	3	6	1(JV)	1		
	processing waste	o5-13	4	3	4				

and weed seeds, etc.) and indeterminate cereal grains occurring together. Almost 80% of the evaluated archaeobotanical samples showed such attributes (two or more crops, a mix of three or more crops), except for mass or rich cereal finds. The dominant crop (but not with certainty) could be identified in more than 30% of all samples. If the criterion of 80% of the main crop share were strictly adhered to (Hajnalová 1993, 102), the determined samples would be even less than 34% (see the proportions of p4-p6). The number of samples classified for crop product reserve and waste types depends significantly on the number of crop seeds/grains. While in the assemblage with at least 50 finds, it was possible to classify 80% or more, in the extended set with at least ten finds, it was approximately 50–60% of samples. There were cleaned grain stores for each cereal species, and for most species, there were also unthreshed or partially cleaned ears or spikelets in the assemblage. There were also samples consisting of several types of waste and stores.

The main components' percentage ratios method of triangular diagrams is also known from the literature (Jones 1981; 1984b). Initially applied at the site level, the method has been relatively criticised (van der Veen, Jones 2006, 222, with additional refs.). As developed, it primarily summarises the composition of the finds together throughout the site and is particularly suitable for mass or highly concentrated cereal finds (Jones 1981; cf. van der Veen, Jones 2006, 222). As M. van der Veen and G. Jones rightly pointed out (2006, 222): "... *rather than using a triangular diagram to summarise the botanical composition of a whole site, methods are first applied to determine the origin of individual samples*..." Nevertheless, the application of this method was tested on the comparative assemblage in 2016 (Hlavatá 2017). Still, the evaluation was more than problematic – the method proved unsuitable for assessing whole sites because it considers the total number of components.

In contrast, the previous method showed that each sample consisted of cereal grains and glumes of several species. The authors also argue that in the case of weed seeds – without a more detailed categorisation, it is not possible (if at all) to find out to which cereals (product/waste) weeds may belong (van der Veen, Jones 2006, 222). Therefore, this method is no longer used in this study. Methods for categorising weed seeds according to their physical properties were applied to interpret weed and product types in the assemblage.

6.2.2 Physical properties of the weed seeds

Classifying samples into individual stages of the crop treatment process is based on categorising weed seeds according to their physical properties (Jones 1984a developed the method; cf. Hillman 1984, 24–26). This analysis method is one of the standard methods of the archaeobotanical evaluation of samples (cf. van der Veen 1992; Bogaard 2004; van der Veen, Jones 2006; Kuna et al. 2013; Hajnalová 2012; Látková 2015; Reed 2016). Compared to the previous method, the presence/absence of crop seeds and grains (cereals and legumes) is not evaluated here. Still, it is possible to classify the samples as cereal products (grain storage). The reason is the weed seeds present in the examined samples, whose physical properties are associated with the individual stages of the post-harvest crop treatment process (Jones 1984a, 54; van der Veen 1992, 84; van der Veen, Jones 2006). Weed seeds are categorised according to their size, the tendency to remain in the head (i.e. multiple fruit, lat. fructus congregatus), and aerodynamic properties, or weight,[11] according to the following criteria by G. Jones (1984a; 1987, 313):

Size:	small (S) or big	(B)
Tendency to remain in head:	free (F) or headed	(H)
Aerodynamic/weight:	light (L) or heavy	(H)

However, as the authors have pointed out in the application of this method (van der Veen 1992, 86; Stevens 2003, 69–71; van der Veen, Jones 2006, 222, 223, Table 2), several problems are related to the size of seeds. The results presented below are based solely on the original research by G. Jones (1984a; 1987, 313) and the data provided by her and A. Bogaard, as well as through the method application by M. Hajnalová (2012).

Combining the values of the three criteria always results in six categories of seeds, which are characteristic of individual phases of the process, as follows:

Small-free-light	SFL
Small-headed-light	SHL
Small-headed-heavy	SHH
Big-headed-heavy	BHH
Small-free-heavy	SFH
Big-free-heavy	BFH

This method makes it possible to identify samples from *winnowing* (stage 1 with SFL), *coarse sieving* (stage 2 with SHL, SHH, BHH), *fine sieving* (stage 3 with SFH), and *hand sorting* (stage 4 with BFH).

According to the original model, the original data and their classifications were used to predict the process phases for the samples contained in the primary database (Jones 1984a).[12] The criterion of weed species occurrence in at least 10% of samples and a minimum occurrence of 10 weed seeds in the sample was used (G. Jones, A. Bogaard, instructions; cf. Jones 1984a, 48, 49; 1987, 312, 313; 1991, 67–71; van der Veen 1992, 25– 27). However, several variants of data matrices have been created for a reason given above. The distinguishing mark of the matrix variants was the different degrees of the standard described above (10%, 5%, without using this criterion). Considering the problematic categorisation of some weed species, matrix variants with different categorisations of specific weed species were created. For example, seeds of *Galium* can exhibit high size variability. Thus, the resulting categorisation of bedstraw seeds can be SFH (small, free, heavy

11 Terminology used after the author of the method G. Jones (1984a; 1987, 313).

12 I sincerely thank the model's authors, G. Jones and A. Bogaard, for their provision and M. Hajnalová for consulting the instructions for editing the input data.

Tab. 8. Jevišovka. Predictive discriminant analysis results (after Jones 1984a) for the prediction sample (the Jevišovka assemblage). Predicted class – stage of the crop treatment process (1–4); Pr – prediction; F1–3 – observation axes (see Fig. 41, 42). Author: J. Apiar, ARÚB.

Sample	Feature	Predicted class	Pr(1)	Pr(2)	Pr(3)	Pr(4)	F1	F2	F3
835_893_896	34	3	0.000	0.000	1.000	0.000	0.370	-3.684	-0.831
1268_1270_1319	38	3	0.006	0.000	0.994	0.000	0.432	-3.257	2.255
1328	38	3	0.003	0.000	0.997	0.001	0.674	-2.142	0.260
1122_1215	39	3	0.014	0.000	0.678	0.308	1.889	-0.914	2.953
791	39	4	0.006	0.000	0.009	0.985	1.749	0.884	2.700
785	39	3	0.331	0.000	0.349	0.320	1.685	-0.806	5.664
844	39	1	0.958	0.000	0.030	0.012	0.958	-0.800	7.039
1133	39	1	0.831	0.000	0.112	0.057	0.933	-0.562	5.280
1216	39	1	0.999	0.000	0.001	0.000	0.049	-0.879	8.536
1221	39	1	0.967	0.000	0.032	0.000	-0.024	-1.943	6.557
1131	52	3	0.003	0.000	0.997	0.001	0.674	-2.142	0.260
1180_1303	62	3	0.000	0.000	0.933	0.067	1.900	-1.213	-0.550
832_898_802_839_845_847_1186	67	1	0.904	0.000	0.096	0.000	-0.019	-2.821	7.035
892	80	3	0.001	0.000	0.999	0.000	1.267	-3.702	3.084
1174	80	1	0.430	0.000	0.187	0.383	0.860	0.092	2.944

seeds) or BFH (large, free, heavy seeds). In the process, 26 matrix variants were tested. For the Jevišovka assemblage, the resulting seed categories used and the specific taxa included in the categories are presented in Appendix Tab. 25. The matrices of the Jevišovka assemblage presented in Appendix Tab. 26, 27 were used to interpret the results (Tab. 8).

The analysis was performed in XLSTAT 2016, version Evaluation 18.07 40123, Free Trial & Free Version and XLSTAT Addinsoft 2022, Free version 2022.4.1., using the function Analysing Data/Discriminant Analysis (DA).

The diagram (Fig. 41) shows the results of predictive discriminant analysis, where data were used as qualitative variables on the Y-axis (dependent variables) to classify the phase of the crop treatment process in the range 1–4. Quantitative variables on X-axis (explanatory variables) represented weed categories according to the physical properties of the seeds described above. The original model data (Jones 1984a; G. Jones, A. Bogaard instructions) were entered as the main variables (grey symbols), and the examined data from the matrices were entered as predicted variables (coloured symbols). The diagram (Fig. 41) shows that the individual groups differentiated sufficiently.

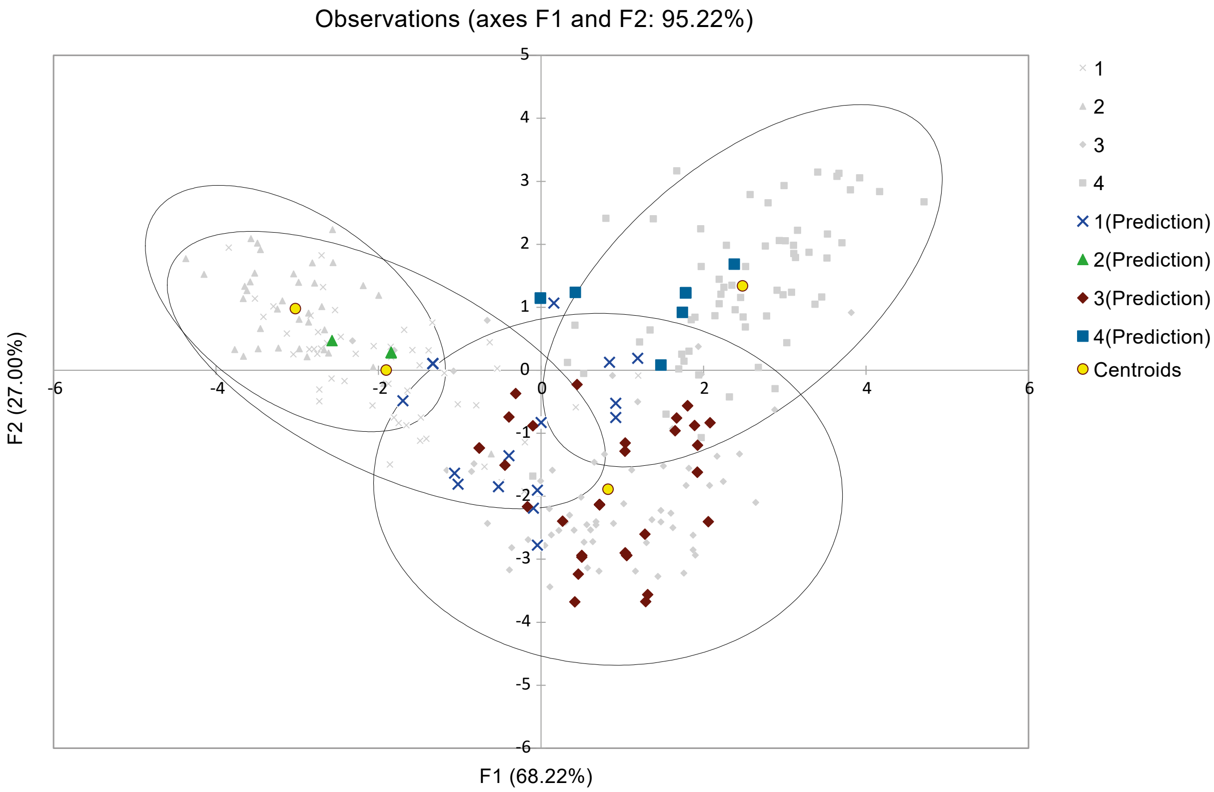
Among the original four product groups, all four were identified in the discriminatory analysis of the Jevišovka assemblage (Fig. 41, top), namely winnowing waste, coarse sieving waste, fine sieving waste and fine sieving product. However, using the second variant of the matrix (Fig. 41, bottom), the analysis did not find the waste from coarse sieving (stage 2). In the first matrix (Fig. 41, top) and the second matrix (Fig. 41, bottom) analyses, observation axes F1 and F2 explained more than 95% of the variability.

Figure 41, top, shows that stages 1 and 3 overlap. The difference between samples of stage 1 (winnowing waste) and 3 (fine sieving waste) is better visible in graphs by display on secondary axes F2 and F3 or F1 and F3. But in the first case, they explain only 31.7% (Fig. 42, top) of variability and in the last, 72.96% (Fig. 42, bottom).

A similar situation to Jevišovka assemblage occurred in the comparative assemblage analysis (Fig. 43) regarding winnowing waste (SFL category weed seeds, group 1) and coarse sieving waste. The most significant decrease in the identified samples is visible between the matrices in all crop processing stages (Fig. 41, top and bottom).

The second matrix with the highest criterion used did not include under-represented taxa, mainly in stages 2 and 4 (weed seeds bound to coarse sieving waste and fine sieving product). It was the SFL category (bound to winnowing waste) for comparative assemblage. The last mentioned represents a group of weed seeds that are so fine to "fly away" when winnowing and burn first. Their presumption to be preserved is lower than for seeds of other categories (cf. Bowmann 1966 and Wilson 1984 cited according to Boardman, Jones 1990, 1, 2; Hajnalová 2012, 100). For this reason, their presence in the assemblage may be lower (less than 10 % and less than ten seeds) than in the case of other categories.

A comparison of the individual analyses (matrices) shows that the use of the criterion directly impacts the identification of the process in the assemblage. Using the highest standard only indicates the presence of



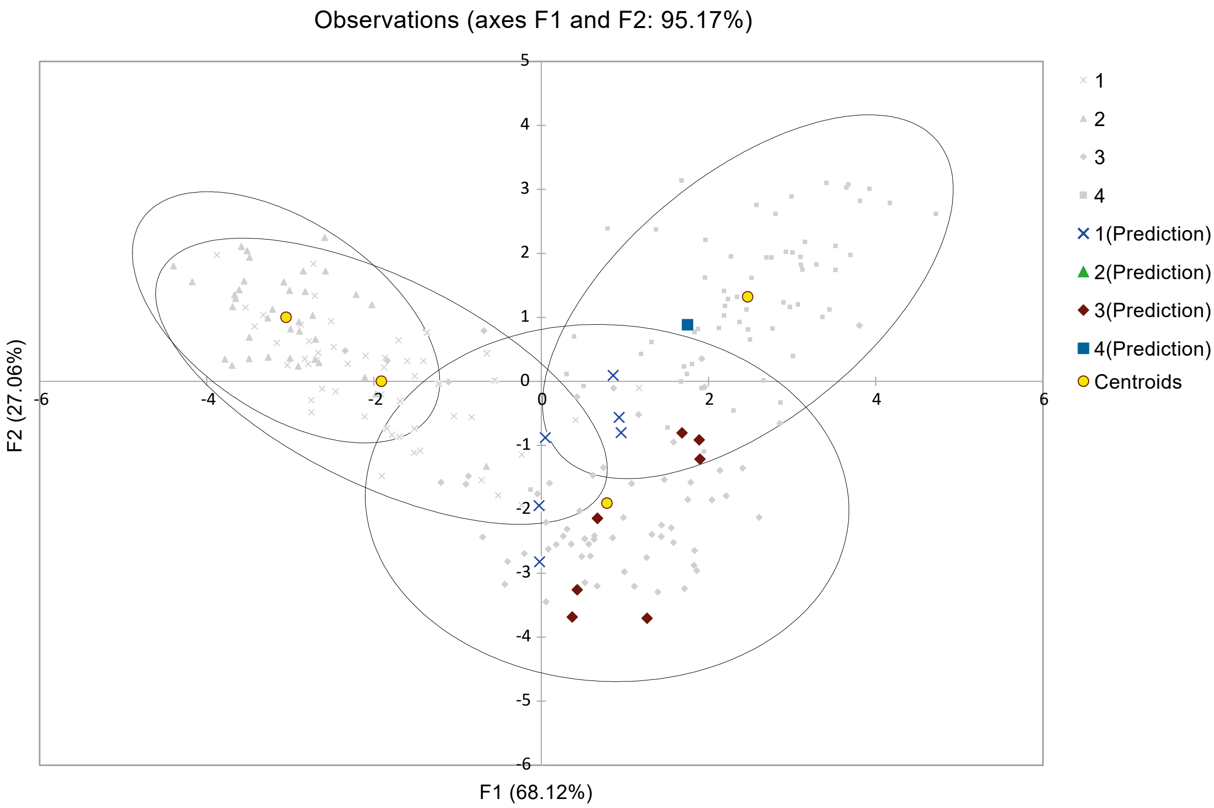
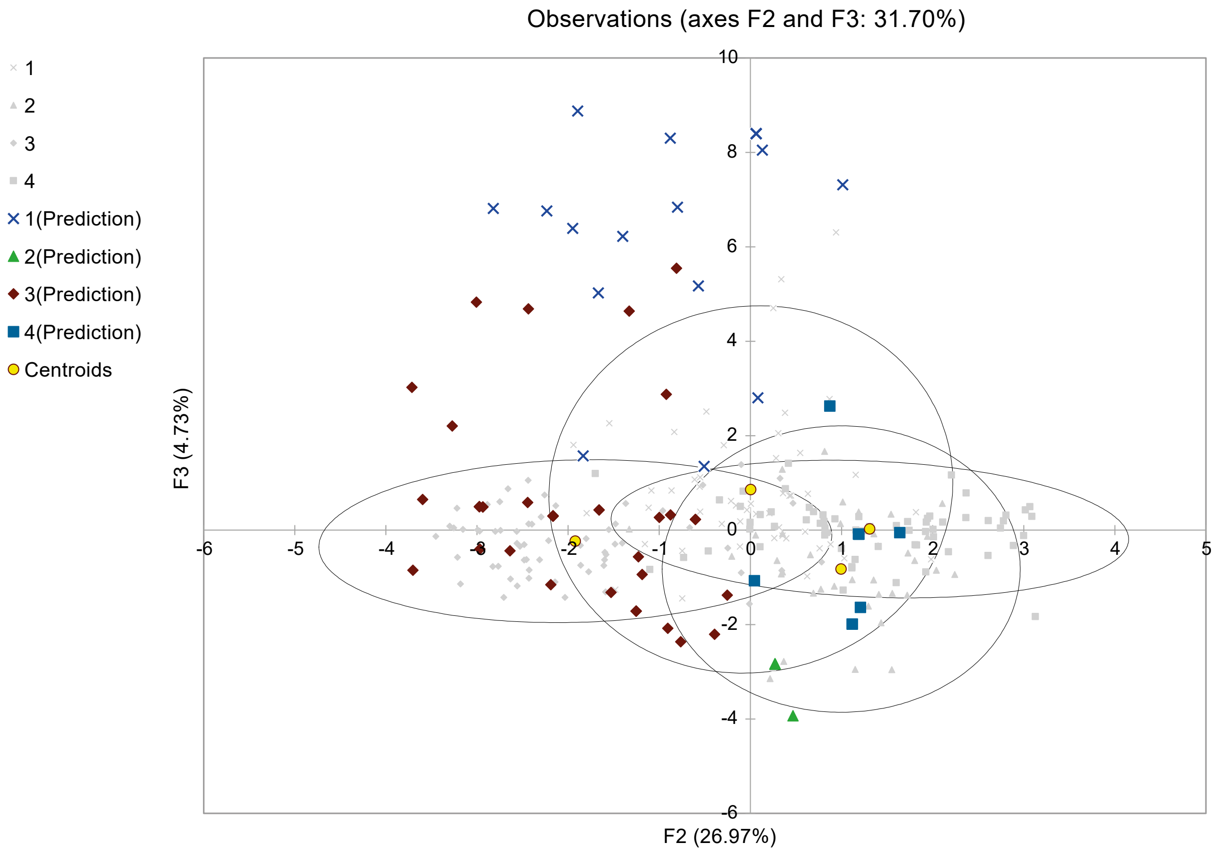


Fig. 41. Jevišovka. Predictive discriminant analysis, observation axes F1, F2, after Jones 1984a; G. Jones and A. Bogaard instructions. Top – first matrix variant; bottom – second matrix variant. Grey symbols – original data after Jones 1984a; G. Jones and A. Bogaard instructions; Prediction, coloured symbols – predicted stage of the crop treatment process (1–4) for Jevišovka assemblage. Author: J. Apiar, ARÚB.



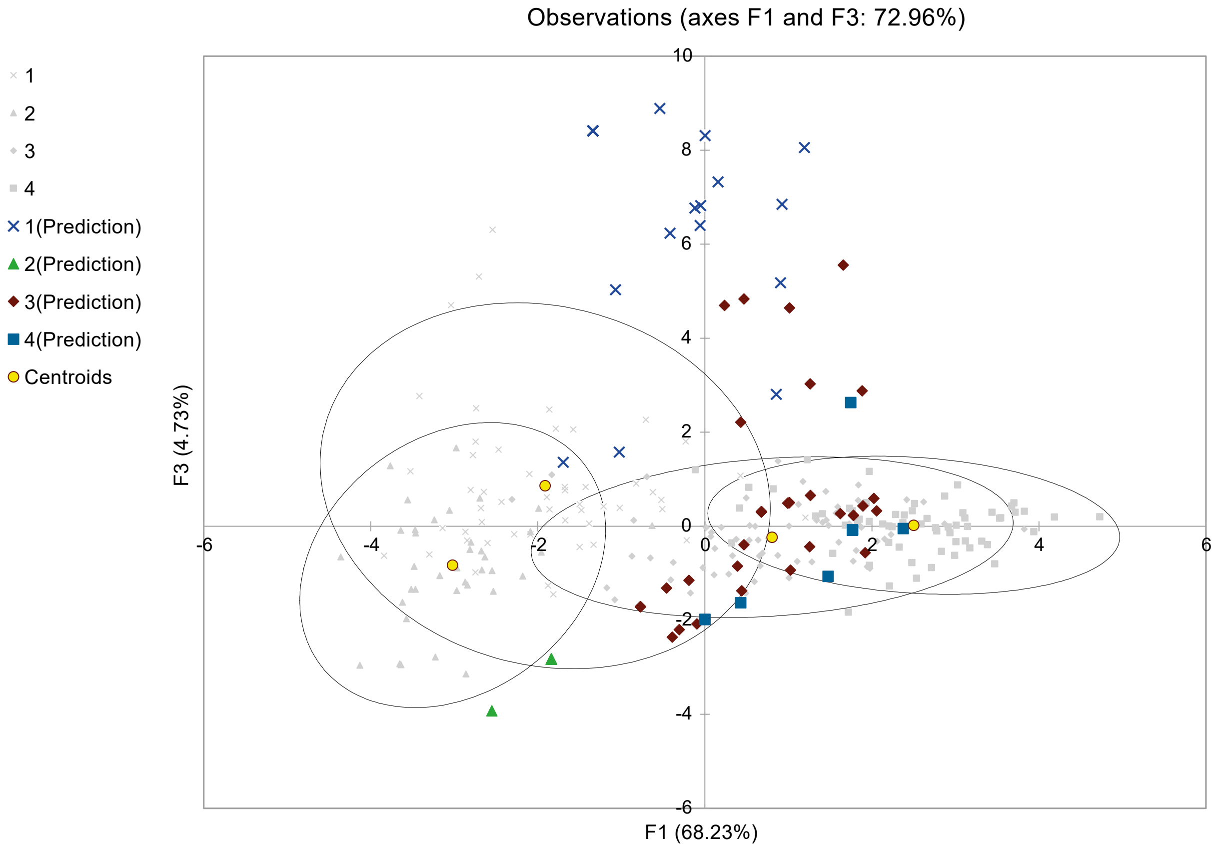


Fig. 42. Jevišovka. Predictive discriminant analysis, observation axes F2, F3 (top) and F1, F3 (bottom), after Jones 1984a; G. Jones and A. Bogaard instructions. Grey symbols – original data after Jones 1984a; G. Jones and A. Bogaard instructions; Prediction, coloured symbols – predicted stage of the crop treatment process (1–4) for Jevišovka assemblage. Author: J. Apiar, ARÚB.

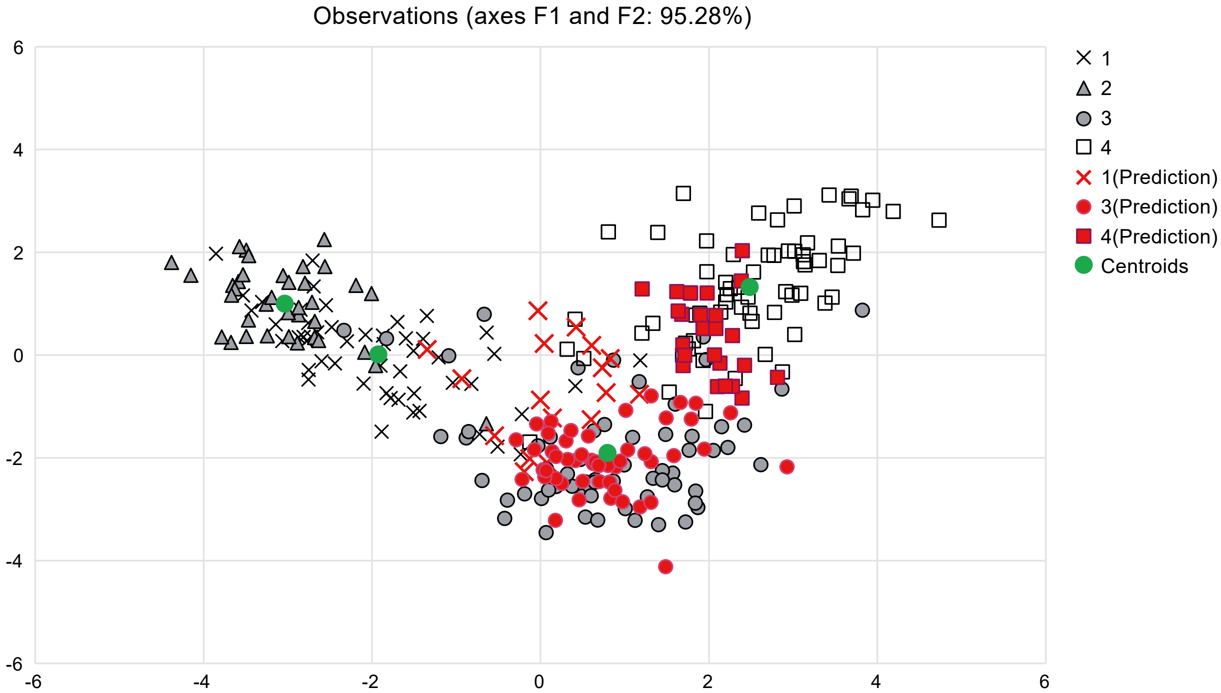


Fig. 43. Comparative assemblage. Predictive discriminant analysis, observation axes F1, F2, after Jones 1984a; G. Jones and A. Bogaard instructions. Grey symbols – original data after Jones 1984a; G. Jones and A. Bogaard instructions; Prediction, coloured symbols – predicted stage of the crop treatment process (1–4) for comparative assemblage, after Hlavatá 2017. Author: J. Apiar, ARÚB.

some phases (stages) of the crop treatment process. However, the analysis also reveals other phases when using the lower standard. The interpretation for a particular sample macro-remains is the same in most cases. In the summary results of the analysis, compared with all variants of the matrix, the exact determination of most samples is visible. The conclusion varies when particular weed taxa categorisation is changed and due to the standard used. The standard, in this case, causes the exclusion of the mentioned heavy seeds and SFL category seeds; thus, the sample has a different composition of weed taxa than without the criterion used and can therefore be classified in another phase of the process (stage).

Within the original model data (Jones 1984a; G. Jones, A. Bogaard instructions) and subsequently also in the assemblage of comparative data, it is clear that groups 1 and 2 overlap. They are not solidly determined on the first two axes, and groups 3 and 4 are unambiguously determined. The display on the secondary axes showed that groups 1 and 2 of the original data (in black) partially overlap. In contrast, the studied comparative data (Fig. 43, in red) were differentiated from group 2 of the original data. Within group 1, they accumulated in the right part of the diagram. At the same time, group 1 (original data and the investigated sites) gathered closer to group 3 (Hlavatá 2017, Obr. 7.2.4, below). It explained the variability in the determination of some samples using the higher criterion, where the absence of SFL taxa caused the samples to group together, with SFH taxa predominating. In the same way, part of the samples is temporarily determined between groups 3 and 4.

The method made it possible to detect three (or four) phases of the post-harvest treatment process in the standard sample. The whole comparative assemblage is dominated by samples characterised as waste and products from fine sieving. On the other hand, in the Jevišovka assemblage, winnowing and fine-sieving waste dominate (in both matrices). This trend is noticeable when using any of the input data adjustment criteria. A relatively large group of comparative data consisted of samples characterised as winnowing waste. Together with sporadic samples representing coarse sieving waste, these samples are sensitive to applying a higher criterion or standard for adjusting the input data. Using the highest criterion level, some samples behave as fine-sieving waste (which follows the winnowing) due to the exclusion of SFL (winnowing) taxa from the input data matrix. In Jevišovka, applying the highest criterion caused an absolute reduction of coarse sieving waste samples (= to zero) and fine sieving product (from six to one sample). Comparing the analyses of the Jevišovka and the comparative assemblage confirms the following assumption. When analysing individual sites, each will behave differently or may not prove the overall trend found when analysing the set as a whole. This conclusion is not surprising if we assume that there were differences between sites in the Roman period (both geographically and chronologically), which should reflect the coexistence of several cultural-political elements to varying extents. To what extent individual sites in the same period and zone differ is questionable. In the case of Jevišovka, it would be possible to compare it with an assemblage from Pasohlávky (Komoróczy et al. 2007; Komoróczy 2011; Kočár, Kočárová 2011; Hajnalová 2011b), or other such sites. However, for the given sites, similar analyses (i.e. as presented taphonomic) do not yet exist or were impossible to perform due to the sampling extent. For example, a total of 33 samples come from features from the Roman period at Pasohlávky U vodárny (Hajnalová 2011b; in addition to samples from the well, Kočár, Kočárová 2011).

6.2.3 The proportion of weed seeds of different physical properties

Subsidiary variables, which can be used to define grain stores and waste in more detail, are the proportions of different components and categories of weed seeds described in the previous analysis. The method became based on the need to distinguish between the products of the earlier and later stages of crop processing and the problematic categorisation of weed seeds (described above; in summary, Reed 2016, 212, 213). Following the application of main component methods (Hillman 1981a; 1981b; 1984; Jones 1981; 1985) and methods for the physical properties of weed seeds (Jones 1984a; Hillman 1984) by several authors (e.g. van der Veen 1992; Bogaard 2004; Stevens 2003); M. van der Veen and G. Jones (2006, 222, 223, Table. 2) created another three ratios to reveal types of weeds accompanying cereals in samples (cf. Hillman 1984, 19–31, Figure 7). The ratio of small to large weed seeds is essential for this method. Based on this, D. Fuller and J. Stevens (2009, 41, 42) developed a model that used the proportion of large weed seeds to small and all weed seeds to cereal grains. The model sought to reveal: "*... variation between assemblages not by the role of the sites as consumers or producers, but rather through the processing stage at which the crop was stored*" (Fuller, Stevens 2009, 41). The authors distinguished (Fuller, Stevens 2009, Fig. 6.4, 6.5, 6.8) that, based on these proportions, wastes and reserves of previously stored partially threshed ears were placed in the left diagonal part of the diagram. Waste and reserves of previously stored partially cleaned spikelets (grains in glumes) are placed in the right diagonal part. The method was used in Slovak and Czech archaeobotanical literature by M. Hajnalová (2012, 104ff; Kuna 2013, 98), M. Látková (2015, 124ff; 2017, 93ff) and J. Hlavatá (2017, 126ff; Hlavatá, Varsik 2019, 437ff, Obr. 9). M. Hajnalová also used the ratio of light weed seeds and seeds remaining in the head to all weed seeds in the method (Hajnalová 2012, 107, Obr. 6.9; cf. Hillman 1984, 19–31, Figure 7).

The method was applied to the studied assemblage. The results were interpreted in terms of the original method (Fuller, Stevens 2009) and its use in domestic literature (partly the first and the second step, Hajnalová 2012, 105–108). The proportions p4, p5 and p6 were used to apply the method (Appendix Tab. 28, 29). For the primary analysis (first step), the proportions p4 and p5 were used.

The scatter diagram X-axis (Fig. 44 and Hlavatá 2017, Obr. 7.2.6) shows the proportion of p4 – small weed seeds (all categories marked as S) from the total number of small and large weed seeds (all categories marked as B). The Y-axis shows the proportion of p5 – all weed seeds from the total number of weed seeds and seeds of cultivated plants (cf. Fuller, Stevens 2009, Fig. 6.4; Hajnalová 2012, Obr. 6.7., 6.8., subchapter 6.4.3). According to the cited literature, the types of products are shown along the X-axis. Those can be either a) formed by whole unthreshed ears (cf. Hajnalová 2012, 106, Obr. 6.7, group 1) or b) partially cleaned dehusked grain or spikelets (Hajnalová 2012, 106, Obr. 6.7, group 3, cf. Fuller, Stevens 2009, Fig. 6.4). Along the Y-axis, the basic types of final products are shown, which can be either a) grain stores (groups 1 and 3 cited above according to M. Hajnalová) or b) waste (cf. Fuller, Stevens 2009, 6.4; Hajnalová 2012, 106, Obr. 6.7, groups 2 and 4). Four types of final products can be identified by arranging the samples in the diagram space.

In the second step of the analysis, the proportions p4 and p6 were used. The diagram (Fig. 45 and Hlavatá 2017, Obr. 7.2.12), the X-axis, again shows the proportion of p4 (in the same wording described above). The Y-axis shows the proportion of p6 (s.s. Hajnalová 2012, 107), which expresses the ratio of small, free and light seeds (SFL) to small light seeds with a tendency to remain in heads and heavy seeds (SHL, SHH, BHH). M. Hajnalová (personal communication 2017; cf. 2012, 107, 108, Obr. 6.9) used this analysis step to distinguish the degree to which the stored products were cleaned and thus used only product samples in this step.

The second step of the method was chosen due to the possibility of further description of samples according to the type of final product, i.e. store product (grain storage) or waste. Using this method, it might be possible to define the ratio of individual categories of weed seeds for each sample separately directly in the diagram (based on graphical output and mathematical proportion). In the previous method, this ratio is not visible in the diagram (unless the reader is more familiar with the method). Together with the results achieved in previous steps, it is possible to assume the distribution of types of products and wastes within site, i.e. from which phases

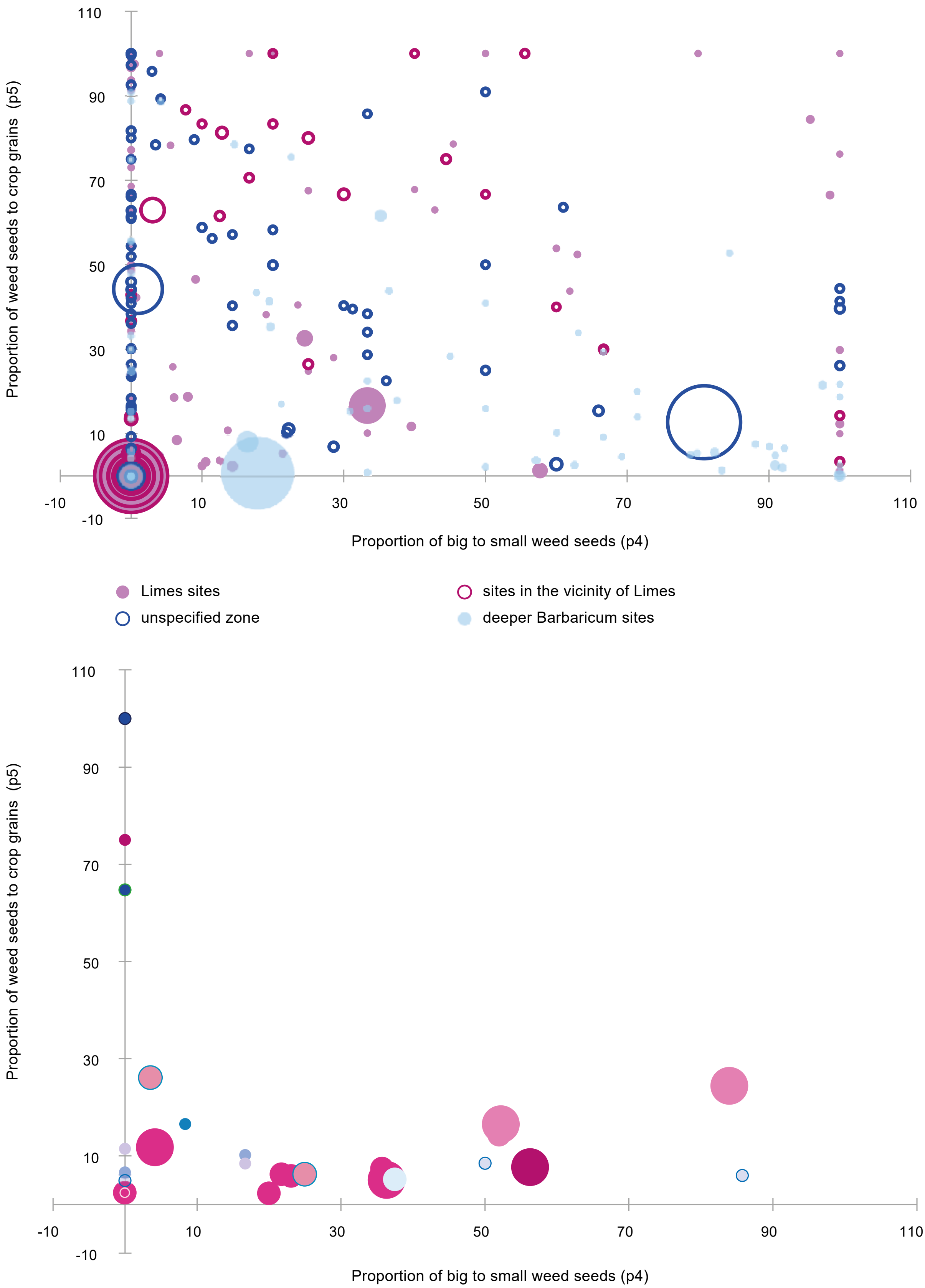


Fig. 44. Scatter diagrams of samples designated according to the proportion of weed seeds of different physical properties, after Fuller, Stevens 2009 and Hajnalová 2012. Proportions p4 and p5 in samples of comparative assemblage (top, after Hlavatá 2017) and Jevišovka assemblage (bottom). Circle width represents the density of macro-remains per sample. Bottom – blue shades represent samples from Roman period features; rose shades represent samples from La Tène / Roman period features (039 and 080). Author: J. Apiar, ARÚB.

of the post-harvest crop treatment process the samples come. It makes it possible to create a hypothesis about the economic character of sites or regions. Of course, to complete the last step, it is necessary first to evaluate the individual samples and sites (s.s. van der Veen, Jones 2006, 222, 223, 226), and especially to know the contextual conditions from which the samples come, how they were collected and to what extent they might be contaminated (cf. Apiar, J., Apiar, P. 2021).

The original and reduced data matrices were inserted into the analysis for the comparative assemblage. In the case of reduction, the density of the samples was followed. Thus, the reduced matrix does not contain samples with a density lower than one macro-remain per litre of sediment and contains less than 60 macro-remains (cf. Hajnalová 2012, 106, subchapter 6.4.3). The method was applied to the whole comparative assemblage to define differences between grain stores and wastes, and in the crop post-harvest treatment process stages, between the analysed samples at the sites and between the sites themselves.

For the Jevišovka assemblage, the method was also applied, and in the second step analysis (p4, p6), the samples were divided by stages previously predicted (1–4), sample numbers and particular settlement features.

6.2.3.1 Grain reserves and wastes

When comparing the results of the whole and reduced matrix, a significant data loss was visible when using the minimum occurrence of the macro-remains criterion. From the comparative data set (1,187 samples), 63% represented samples with a density of fewer than one macro-remains per litre of sediment. The remaining 37% had high density-variability (ranging from 1 to 1,800 macro-remains per litre of sediment). This is similar also to the Jevišovka assemblage. More than 32% represented samples with a density lower than one macro-remain per litre, and 45% of samples varied in density range between one and three-point-eight macro-remains per litre of sampled sediment. The remaining 23% represented a set of samples with the most significant variance (density range 4.2 to 223 macro-remains per litre).

For the comparative assemblage, in Figure 44, top (Hlavatá 2017, Obr. 7.2.8) is possible to observe a trend in products between archaeological sites located at the Limes or in its vicinity and sites situated deeper in the Barbaricum. While samples from the Roman-provincial sites of the Limes area are concentrated mainly in the lower-left half of the diagram and go to the upper-right part, samples from the Barbaricum sites are set from the left part of the diagram to the lower-right part. It means that the products from the Roman-provincial sites include, in particular, products and by-products from the earlier stages of the crop processing, which may consist of the uncleaned ear or spikelet stores and wastes from the cleaning of these products.

The most significant difference between the samples can be seen in the right part of the diagram (Fig. 44, top). There are no samples with large weed seeds, which would be formed exclusively by weed seeds (containing cereal grains). Samples with a 100 % weed content (in the upper-left part of the graph) contain small weed seeds. In applying the method by M. Hajnalová (2012, Obr. 6.7), they can therefore represent wastes from treating threshed ears. According to the analysis results, samples from the sites in deeper Barbaricum represent uncleaned and partially cleaned reserves and wastes from the treatment of both types of products.

Samples from sites close to the Limes mainly represent reserves of partially (un)threshed ears and wastes from cleaning such reserves. The Germanic sites in the Limes zone show similarities to the Roman-provincial sites. Reserves and wastes of both types come from Germanic sites deeper in the Barbaricum, with an overall predominance of reserves (below 20% in the graph).

According to this analysis, most of the samples from the later stages of the process (especially well-cleaned reserves) belong to Germanic sites in Moravia and Bohemia. The types of products from the Germanic settlement zone are more balanced in the Slovak material, but samples of both reserves (ears/spikelets, grains) still predominate.

By including information on archaeological dating, it was possible to observe partial differences between reserves and waste only in the Limes area in Slovakia and in samples dated to the Late Roman period (cf. Hlavatá 2017, Obr. 7.2.10). When dividing the samples to the earlier and later phases of the Roman period the situation was clearer. The samples from the Early Roman period were not evidently distinguishable. However, there was a visible difference between the individual sites (Hlavatá 2017, 132–134).

In the results of the Jevišovka assemblage (Fig. 44, bottom), there is a significant difference compared to the assemblage above (Fig. 44, top). Most samples are set in the graph under 20% of the p5 proportion (Y-axis). Two samples (from features 080 and 039) are situated between 20 and 30% of the p5 proportion on the opposite ends of the X-axis. Only three low-density samples are set higher than 60% of the p5 proportion directly on the Y-axes, meaning not including seeds of the B category and only a small or no proportion of cereal grains. Of samples, which could be analysed in this method, most represent grain reserves of unthreshed ears, and three or four could represent partly cleaned dehusked grain.

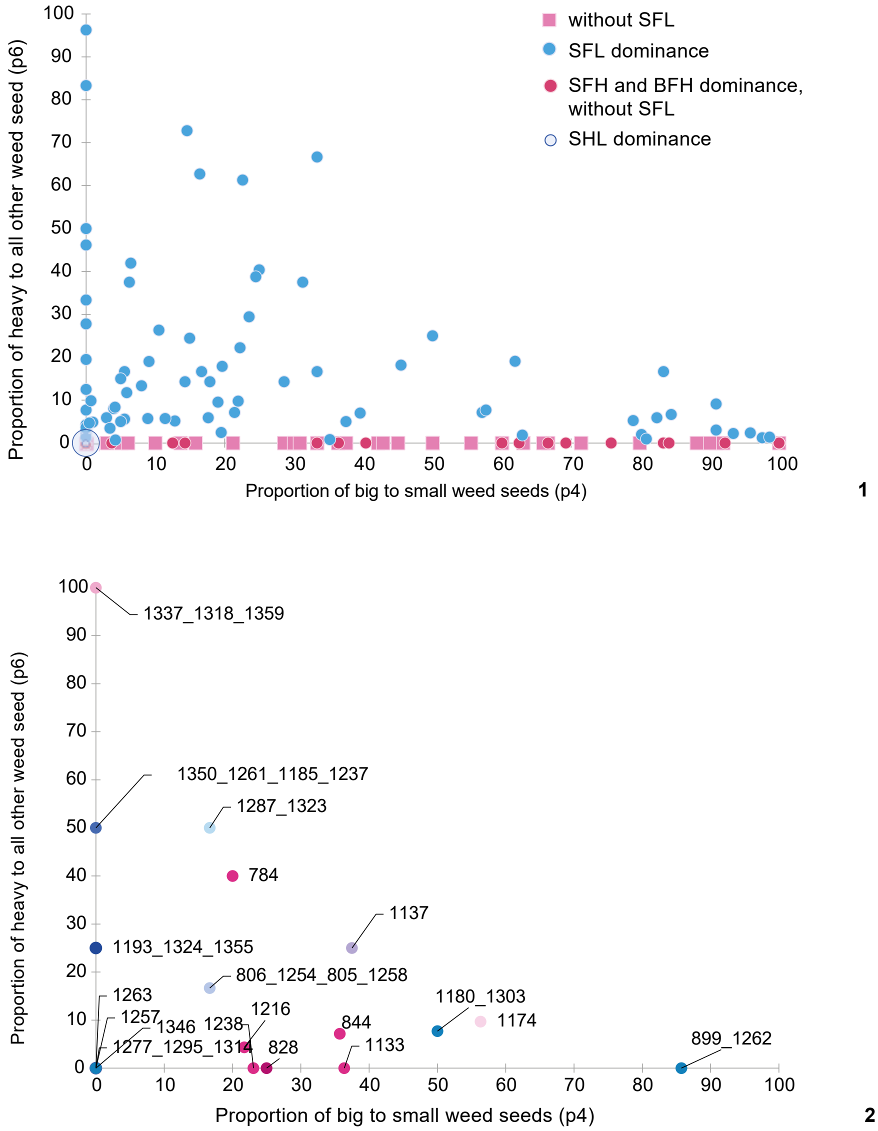


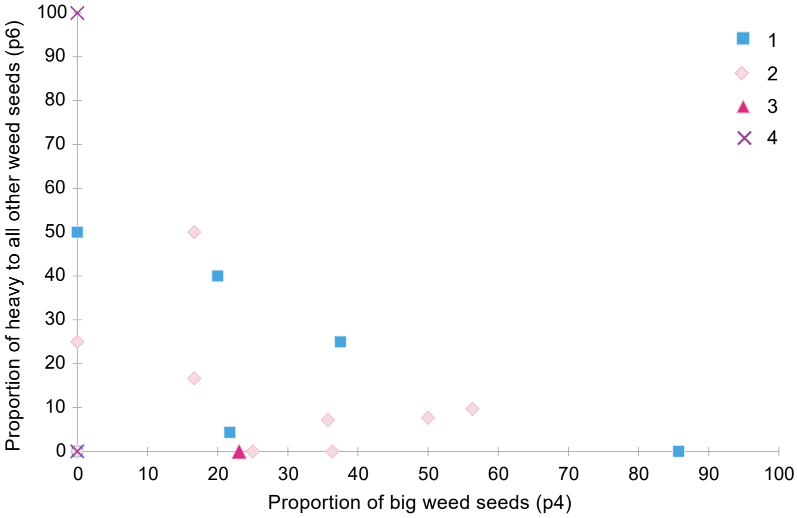
Fig. 45a. Scatter diagrams of samples designated according to the proportion of weed seeds of different physical properties, after Fuller, Stevens 2009 and Hajnalová 2012. Proportions p4 and p6 in samples of comparative assemblage (1, after Hlavatá 2017) and Jevišovka assemblage (2). 1, 2 – the proportion of weed seeds in samples, blue shades represent samples from Roman period features; rose shades represent samples from La Tène/Roman period features (039 and 080). Author: J. Apiar, ARÚB.

The result partly corresponds with the result for Germanic sites from the analysis above, where multiple finds of different, more or less clean reserves can be found on these sites. Partly opposite is due to the predominance of unthreshed ears reserves in Jevišovka (Fig. 44, bottom). Still, only a small part of the samples could be determined in this method. There is a large group of the Jevišovka samples, which could change the interpretation in case of more macro-remains, or more samples collected from the interpreted archaeological element (context).

Nevertheless, the Jevišovka samples are similar partly to those from the deeper Barbaricum and simultaneously from the Limes area (Hlavatá 2017, 130–132, Obr. 7.2.8, 7.2.9.).

6.2.3.2 The proportion of weed seed categories in reserves and wastes

Employing the p6 ratio, samples of reserves and wastes were plotted and divided in the area according to the percentage of SFL weed seeds. In the first diagram (Fig. 45a: 1), the samples are graphically divided according to the presence of weed seeds of different categories. The X-axis shows samples that do not contain SFL (small, free, light) seeds and in which SFH (small, free, heavy) and BFH (large, free, heavy) seeds predominate. According to M. Hajnalová (2012, 107), "*... free and light seeds are eliminated during winnowing, and therefore the reserve in which they are still present has not been winnowed. Similarly, seeds that tend to remain in the heads (small and large) are eliminated during coarse*



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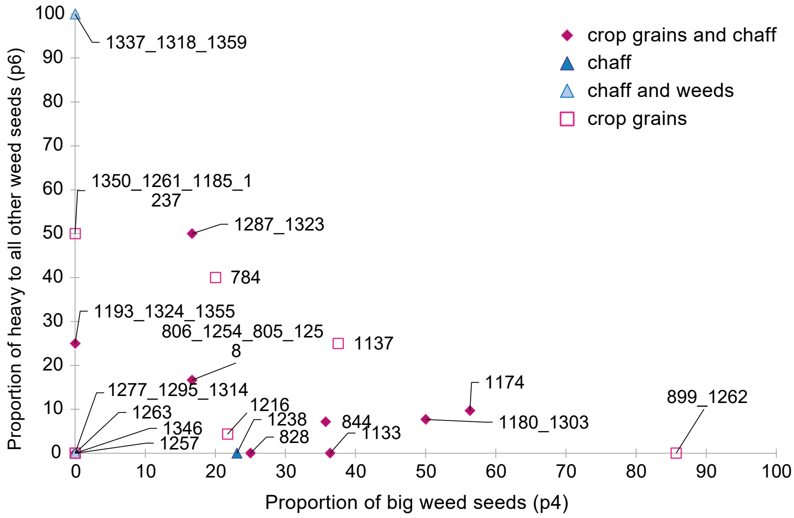

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Fig. 45b. Scatter diagrams of samples designated according to the proportion of weed seeds of different physical properties, after Fuller, Stevens 2009 and Hajnalová 2012. Proportions p4 and p6 in samples of Jevišovka assemblage. 3 – predicted stage of the crop treatment process (1–4) from Fig. 41, 42, after Jones 1984a; 4 – cereal grains, chaff and weed seeds content in samples. Author: J. Apiar, ARÚB.

sieving. Therefore, the reserve, with the seeds that tend to remain in the heads and free light seeds are no longer present, might be winnowed and coarsely sieved. If the samples do not contain weed seeds from the first two categories, they have been cleaned further, i. e. finely sieved."

In simple terms, this means that:

1. Reserves containing SFL should be unwinnowed = during the initial stages of the process; they may or may not be threshed.
2. Reserves without SFL but with SHH, SHL, and BHL should be winnowed and coarsely sieved = at earlier stages of the process.
3. Samples without SFL, SHL, SHH, and BHH should be sieved through a fine sieve = at later stages.

When the samples were divided according to the identified product types, the SFL-free weed samples were concentrated only directly on the X-axis. In contrast, reserve samples were scattered in space. However, most of them, plus part of the waste samples, were set on the X-axis (Fig. 45a: 1).

The results for the Jevišovka assemblage are presented in Figure 45a : 2, 45b: 3 and 4. The samples consisting of the cereal grain and chaff are scattered in space, but also some of them, consisting of cereal grain without chaff, are set right on the X-axes. The reserves from Jevišovka represent a combination of clean dehusked grain and clean reserves of unthreshed ears. Except those both types are also found in the assemblage in the not-yet-completely cleaned stage.

Based on the ratios shown in the diagrams (Fig. 45) and also based on the first part of this analysis (Fig. 44), the situation can be summarised as follows:

1. in the Early Roman period, the samples from the Roman-provincial sites did not represent a united group but differed from each other; overall, the sites located in the Limes area correspond more with Germanic sites during this period
2. in the Late Roman period, samples from Roman-provincial sites in the Limes area contained mainly residues of unthreshed ears/spikelets reserves and processing waste from the treatment of these reserves
3. in the Late Roman period, samples from Germanic sites in the deeper Barbaricum area contained residues of reserves and waste of all types
4. the Jevišovka assemblage, at least the samples which could be analysed, show signs of similarity with the both – Limes area and deeper Barbaricum sites based on the determined product types. This result surprisingly corresponds with the results of the main component analysis method and also with the correspondence analysis of average densities of cereal species presented above
5. some samples did not contain any seeds of SFL category weeds; therefore, they come from the later stages of the post-harvest crop treatment process = they were threshed and winnowed
6. samples containing seeds of SFL category weeds probably come from earlier stages of the post-harvest crop treatment process. They could have been threshed or threshed and not winnowed; in the case of samples just above the X-axis and containing very few weeds of the SFL category, these may be unfinished but still winnowed products.

6.2.3.3 Summary

Through the analysis of the proportions of the main components, it was more likely to determine the main (single) crop in the products, but only in the case of a minimal number of samples (19% = 59 of the total number of samples with at least ten finds in the comparative assemblage). The remaining samples were also classified according to the main crop. Still, it is necessary to consider a lower degree of probability, as the samples contained two or more crops (Appendix Tab. 24). In a large group of samples was impossible to determine the main crop or the mix of crops, as these were unidentifiable cereals, heavily damaged by burning and preserved mainly in fragments. These samples could only be classified based on ratios p3 to p6.

In the comparative assemblage at the sites taphonomically evaluated, it was possible to document the early and late stages of the post-harvest crop treatment process. Plant macro-remains that indicate the presence of earlier stages of the process – threshing and winnowing – were present at several sites. However, an analysis of weed seed proportions (according to Fuller, Stevens 2009 and Hajnalová 2012) showed that these process phases might be specific to some Roman-provincial sites in the Limes area in the Late Roman period. The later stages of the post-harvest treatment process – i.e. coarse and fine sieving – were present in almost all sites. Regardless, the ratio of products from the process's later and earlier stages seem decisive. While in Germanic sites, the proportion of products from all phases is more or less balanced, the earlier stages of the process predominate in Roman-provincial sites.

At the same time, the last-mentioned phases from these sites were identified within higher-density samples and with a higher total number of macro-remains contained. In the Jevišovka assemblage, more samples indicated the process's first and third stages- threshing, winnowing, and fine-sieving. Some also cleaned dehusked grain as the fine-sieving product, but still with the predominance of the unthreshed ears/spikelets reserves. It depicted the result of the Jevišovka analysis as partly different from the other Germanic sites. Perhaps even belonging in-between the Limes and Barbaricum area sites.

It should be emphasized that although it was possible to evaluate the samples taphonomically and interpret the products and stages of the crop processing, the samples examined are very heterogeneous. With a few exceptions, in the form of some mass or highly concentrated cereal finds, most samples contained several crops. In such samples, if one crop was highly overrepresented (e.g. 80% or more), the remaining crops could be attributed to admixture, contaminants or, rather, waste. However, in the examined samples, the crops occurred in very similar proportions – even though they were several in one sample (e.g., four crops of 20% each = the cereal grain accounted for 80% of the macro-remains in the sample, e.g. Jevišovka, feature 039). These samples are most likely to be interpreted as remnants of several (mixed) degraded kitchen reserves or waste while mixing with residual waste (or reserve) from different stages of the crop processing process is not excluded.

7. Evaluation of results by analysis of ecological attributes of wild plants

Jana Apiar

Multivariate statistical methods were used for this analysis. As far as the comparative assemblage is concerned, the following issues were primarily investigated:

1. the occurrence of wild plant species, crops, grain products and waste in the samples; and
2. a comparison of the indicative values of wild plant species (autecological analysis).

The indicative values for light (L), temperature (T) and continentality (K) were used according to H. Ellenberg (1979; Ellenberg, Leuschner 2010). The values for soil moisture (Pv), soil reaction (Pr), and soil nitrogen (Pd) were used according to A. Jurko (1990). The aim was to identify similarities and differences between:

a. crop samples, and
b. grain product and waste samples, both according to and regardless of distance from the border of the Roman Empire.

The choice of analysis methods, variables, classification of sample groups and procedure in the case of the comparative assemblage was inspired by the ecological analysis used in Slovak and Czech archaeobotanical publications (e.g., Hajnalová 2012, chapter 9; Hajnalová, Varsik 2010, 209; Látková 2017). The reason for the high use of multivariate statistics of a comparative assemblage is the high heterogeneity of the collection in terms of species composition, number of PMRs (plant macro-remains), coverage of the investigated region, chronological period and the number of archaeobotanical samples. The main outputs of the analysis for the comparative assemblage are presented here. Full graphical and tabular results can be viewed in the original manuscript of the dissertation project (Hlavatá 2017, chapter 10, Prílohy).

For comparison with similar studies, the analysis would require a broader investigation of several factors (phytosociological analysis, cf. van der Veen 1992, 107–109; Bogaard 2004; Hajnalová 2012, 139–150; Látková 2015, 175–182), for example, the height of crop growth and weeds, germination time, weed life cycle. Due to the comprehensiveness and heterogeneity of the comparative assemblage and the scope of the work, it was not applied at that time (Hlavatá 2017, chapter 10). However, in the case of the new analysis of the Jevišovka assemblage, the ecological indicator values (Ellenberg 1979; Ellenberg et al. 1991; Ellenberg, Leuschner 2010; Chytrý et al. 2018; 2021; Wild et al. 2019; www.pladias.cz) were checked and corrected/supplemented. The given information was added to the ecological evaluation. Ellenberg's value for continentality (K) was, in the case of Jevišovka, replaced by the value of moisture (M). Reaction (R), nutrients (N) and salinity (S) values were added to the originally used Ellenberg values. Values were obtained from the internet database Pladias (www.pladias.cz) and specific published source literature (see below subchapter 7.3.).

7.1 Preliminary analysis

After the taphonomic analysis and in the context of archaeological information, the aim was to determine if and how the interpreted types of products, wastes and main types of crops correlate with the species composition of weeds. The methods of analysing the physical properties of weed seeds indeed work with the weeds, but in a modified (relativised) form. There, weed seed categories were analysed, i.e. not individual botanical taxa (cf. Hlavatá 2017, chapter 7). In statistical modelling (cf. Apiar, J., Apiar, P. 2021; Hlavatá 2017, chapter 8, 11), the category of the total number of seeds/macro-remains in each sample (without division into taxa) was used. In the following analysis, in addition to crops, individual types of wild plants were included in the calculations. The goal of the analysis was to define the quality or weight shaping the samples to be divided into groups visible in the ordination space of the graphs.

Creating the matrix from the comparative assemblage, applying the criterion of minimum occurrence of 50 crop finds, out of all the samples (1,187), only 90 remained in the primary matrix. This was evaluated as an unrepresentative number concerning the studied set. Therefore, the standard was moved to 30 finds, but remained the same. The primary matrix thus still consisted of only 124 samples.

When using the criterion of the minimum occurrence of weeds in 10% of the samples, 14 taxa remained in the matrix from the original 129 (after selecting the samples for 30 crop finds). Therefore, this criterion was also reduced to the taxon occurrence in 5% of the samples. As in the case of the criterion mentioned above, the numbers have mostly stayed the same. Thus, 23 weed taxa remained in the matrix.

Three variants of the matrix were created in the described way:

1. samples with at least 30 crop finds. In the samples, crop finds were left together with weed taxa found in 5% of them.
2. samples with at least 30 crop finds. Only weed taxa found in 5% of the samples were left. Crop finds were not evaluated.
3. all weed taxa found in samples with at least 30 crop finds. Crop finds were not evaluated.

The analysis was carried out in the CANOCO program, version 4.5 (Lepš, Šmilauer 2003), in which the samples were classified as follows:

a. by main crops;
b. by types of products (grain storage/waste).

In the analysis of ecological data, classical correspondence analysis (CA, cf. Bogaard 2004; more in Hlavatá 2017, chapter 8) and detrended correspondence analysis (DCA; e.g. Jongman, ter Braak, van Tongeren 1995, 105–108; Lepš, Šmilauer 2003, chapter 4.5; Jones 1991; Bogaard 2004; Hajnalová 2012, chapter 8; Smith 2014, 187–192; Látková 2015, 33, chapter 10) are applied. Both analyses (CA and DCA) were initially used for the assemblage. Both gave good visually interpretable results for matrices with taxa occurring in 5% of samples. When applied to a non-standardised matrix of comparative assemblage, it proved more suitable to use the DCA analysis. Without applying the 5% criterion, weed species were represented in a minimal number of samples and species with a large number of seeds remained in the examined samples. These outliers distorted the graph space and caused the concentration of other values into one cluster. With DCA, this problem is eliminated precisely by using data segmentation, causing the variability of the sample scores to decrease, and thus the outliers will become comparable (Hlavatá 2017, chapter 4). Graphically, it manifests itself in a more readable visual.

7.1.1 Results

Analysis of the non-standardised matrix showed (Fig. 46) that some samples in the set are similar and clearly separated from the others. Only in this single case did the analysis combine the samples into more specific groups. However, these groups were only definable when classifying the samples according to the main crops revealed during the taphonomic examination. Millet and bread wheat samples are separated from hulled wheat samples. The sample groups disappeared when reclassified by product type (products and waste). Figure 47 shows that the composition of weeds is not characteristic of products or wastes or individual types of these products (GS1, GS2) and waste (W1, W2).

Nevertheless, combining the results of the first (Fig. 46) and the second analysis (Fig. 47), it is possible to see which samples of the main crops from the first diagram represent products and wastes in the second diagram. Although products and wastes largely overlap, wastes are more concentrated in the right part of the graph (Fig. 47, circled points). Waste is defined primarily by bread wheat, barley, mixed samples of these two crops, and spelt. The products are samples primarily of millet, einkorn and emmer wheat.

The results of matrix no. 2. showed that, despite their classification, whether according to crops (Fig. 48) or products (Fig. 49), the samples that no longer contain crop finds are not clearly divided and react similarly to both classifications, and also in the analysis of matrix no. 3 (Fig. 50, 51). While in Figure 48, the crop-classified weed samples overlap, in Figure 50, the non-standardised samples are partially divided into groups.

Even when crop finds are removed from samples, but only using a non-standardised assemblage (not 5% occurrence), weed species are partially characteristic of sample groups classified by crop – but not by product. However, the groups are divided differently in the first and third analyses. While in the first analysis, hulled types of wheat are visibly different from bread wheat, barley and millet, in the last analysis, only barley is more clearly separated, partly millet – in this case, bread wheat is interspersed with all crops.

Since samples with the occurrence of both hulled and naked barley were evaluated together in these analyses, and it is these samples that form concentrated groups in the first and third analyses, this fact may reflect a spe-

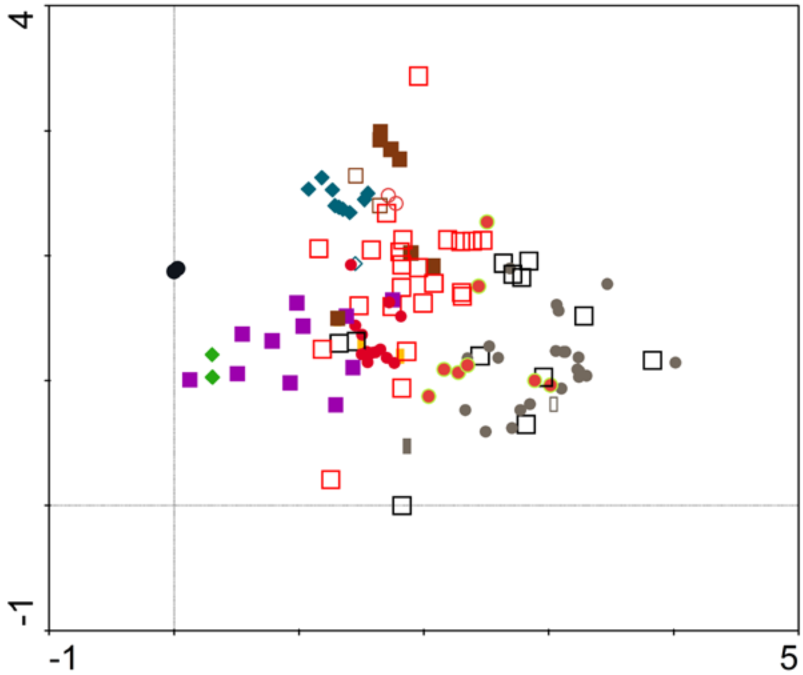


Fig. 46. Comparative assemblage. Detrended correspondence analysis of matrix 1. Classification by dominant crops. TA – *Triticum aestivum* (bread wheat); HV – *Hordeum vulgare* (barley); HVN – *Hordeum vulgare* var. *nudum* (naked barley); TS – *Triticum spelta* (spelt); TD – *Triticum dicoccum* (emmer); TM – *Triticum monococcum* (einkorn); SC – *Secale cereale* (rye); PM – *Panicum miliaceum* (millet); TT – *Triticum timopheevi* (new glume wheat); LC – *Lens culinaris* (lentil). After Hlavatá 2017. Author: J. Apiar, ARÚB.

Samples

unspecified
mixed
TA
HV
TA_HV
TS
TD_TM
SC
LC
PM
PM_LC
HV_HVN
TS_TA
TS_TD
cfTT
TA_SC

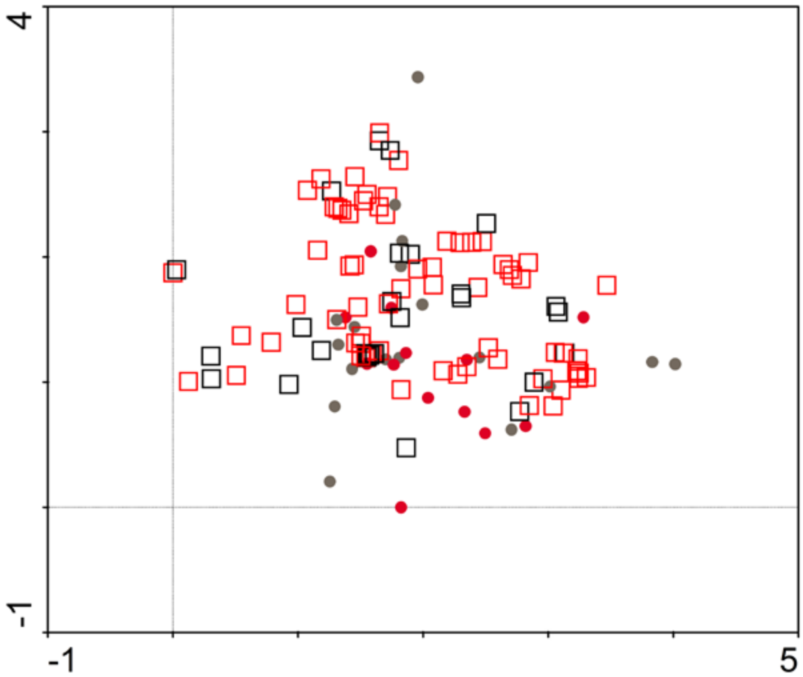


Fig. 47. Comparative assemblage. Detrended correspondence analysis of matrix 1. Classification by product types. GS1 – grain storage unthreshed, threshed but unwinnowed and winnowed; GS2 – grain storage winnowed, unsieved, and sieved and cleaned; W1 – waste from threshing and winnowing; W2 – waste from coarse and fine sieving. After Hlavatá 2017. Author: J. Apiar, ARÚB.

Samples

GS1
GS2
W1
W2

cific difference among the samples. Such a combination of the main crops (naked and hulled barley) occurred more often at Bohemian sites.

7.1.2 Summary

A previous analysis revealed that the samples are divided into groups when classified according to the main crops, and this is especially true if the analysis includes crop finds (grains). Samples thus classified, but without crop finds, were more clearly divided into groups only if all weed species were included, i.e. non-standardised samples, which means that the weed species are, to some extent, specific to the sample groups divided by the main crops.

In the case of classification according to product and waste, the sample groups overlap up to 80%, which means that there are no weed species in the set that would be specific to individual reserves or wastes.

To verify whether the given situation can reflect the presence of different weed species in the samples and whether there is a difference between archaeological sites, the assemblage was subjected to an autecological analysis of weed species.

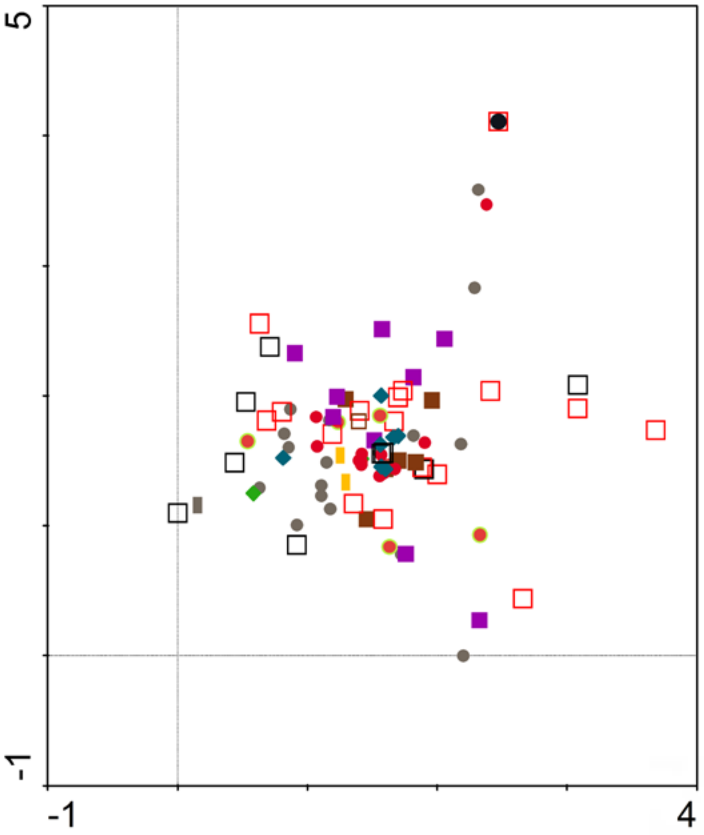


Fig. 48. Comparative assemblage. Detrended correspondence analysis of the matrix 2. Classification by dominant crops. TA – *Triticum aestivum* (bread wheat); HV – *Hordeum vulgare* (barley); HVN – *Hordeum vulgare* var. *nudum* (naked barley); TS – *Triticum spelta* (spelt); TD – *Triticum dicoccum* (emmer); TM – *Triticum monococcum* (einkorn); SC – *Secale cereale* (rye); PM – *Panicum miliaceum* (millet); LC – *Lens culinaris* (lentil). After Hlavatá 2017. Author: J. Apiar, ARÚB.

Samples
- unspecified
- mixed
- TA
- HV
- TA_HV
- TS
- TD_TM
- SC
- LC
- PM
- PM_LC
- HV_HVN
- TS_TA
- TS_TD

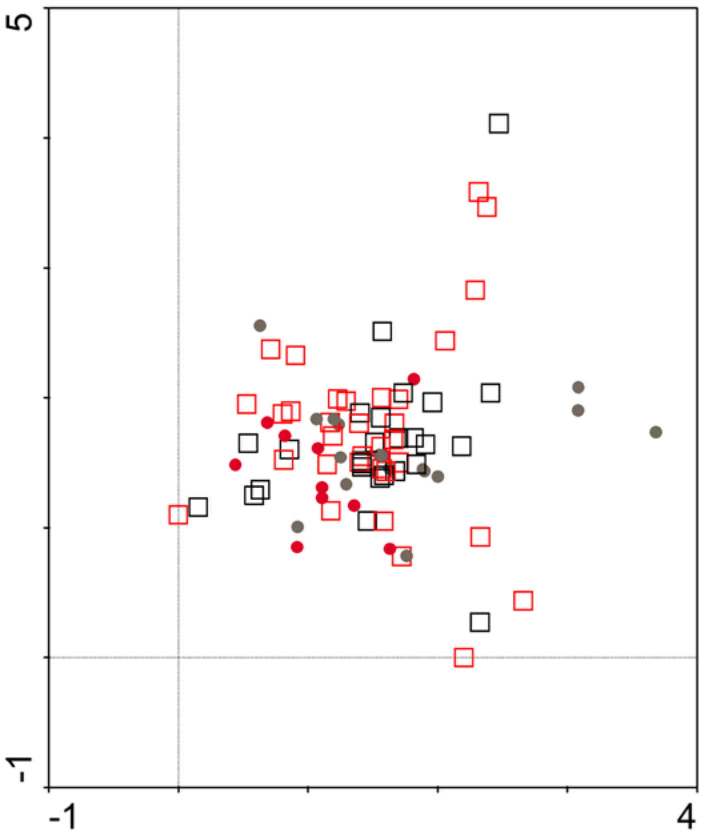


Fig. 49. Comparative assemblage. Detrended correspondence analysis of the matrix 2. Classification by product types. GS1 – grain storage unthreshed, threshed but unwinnowed and winnowed; GS2 – grain storage winnowed, unsieved, and sieved and cleaned; W1 – waste from threshing and winnowing; W2 – waste from coarse and fine sieving. After Hlavatá 2017. Author: J. Apiar, ARÚB.

Samples
- GS1
- GS2
- W1
- W2

Fig. 50. Comparative assemblage. Detrended correspondence analysis of the matrix 3. Classification by dominant crops. TA – *Triticum aestivum* (bread wheat); HV – *Hordeum vulgare* (barley); HVN – *Hordeum vulgare* var. *nudum* (naked barley); TS – *Triticum spelta* (spelt); TD – *Triticum dicoccum* (emmer); TM – *Triticum monococcum* (einkorn); SC – *Secale cereale* (rye); PM – *Panicum miliaceum* (millet); LC – *Lens culinaris* (lentil). After Hlavatá 2017. Author: J. Apiar, ARÚB.

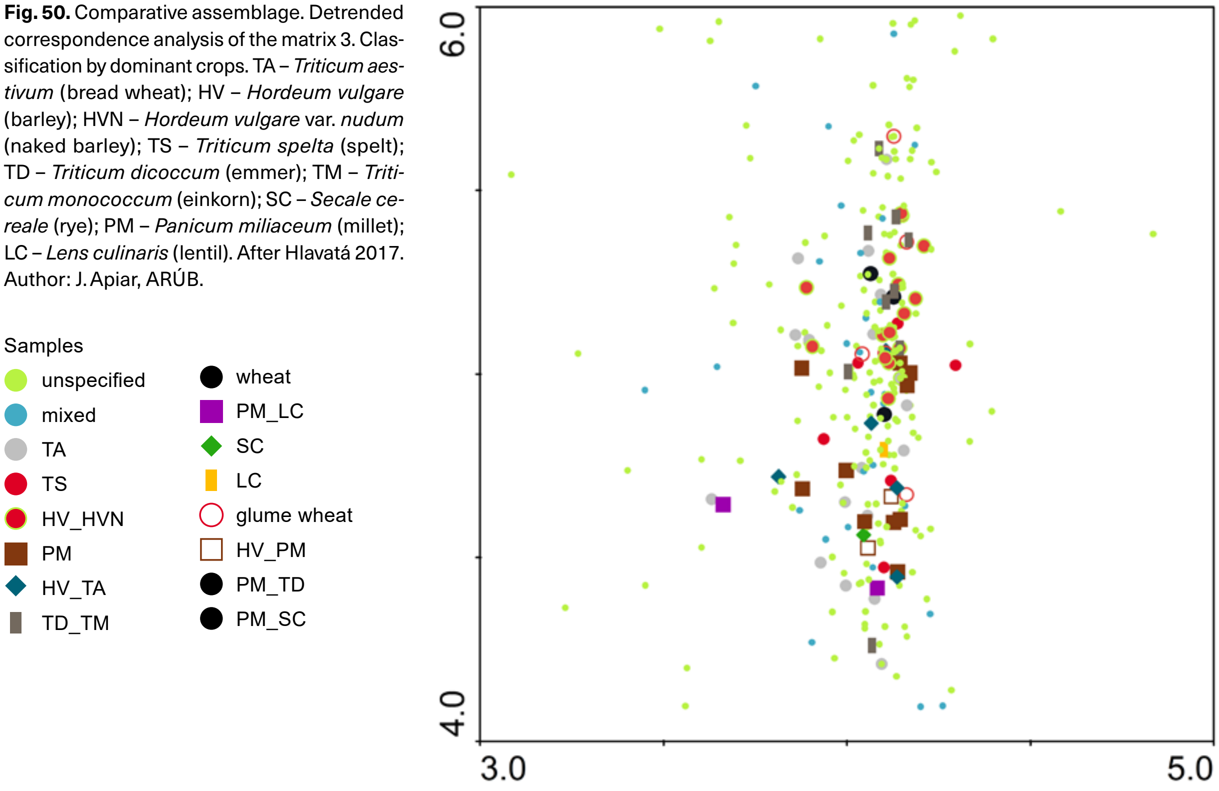
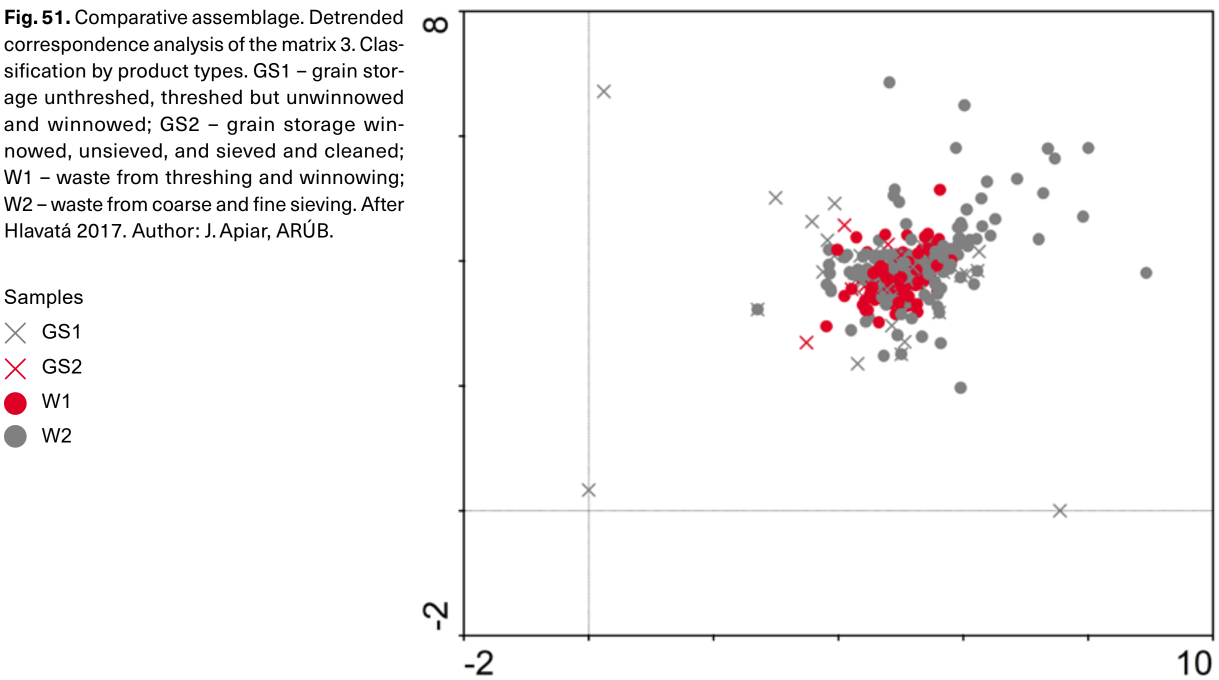


Fig. 51. Comparative assemblage. Detrended correspondence analysis of the matrix 3. Classification by product types. GS1 – grain storage unthreshed, threshed but unwinnowed and winnowed; GS2 – grain storage winnowed, unsieved, and sieved and cleaned; W1 – waste from threshing and winnowing; W2 – waste from coarse and fine sieving. After Hlavatá 2017. Author: J. Apiar, ARÚB.



7.2 Autecological analysis

An autecological analysis is used to research the demands of weed species on climatic and soil conditions. In archaeobotany, it is used together with phytosociological analysis (cf. van der Veen 1992, 101–105, with additional refs.; Kreuz 2004, 163–188; Hajnalová, Varsik 2010, 209–214; Hajnalová 2012, chapter 8.; Kuna et al. 2013, 99, 100; Látková 2015, chapter 10; Kroll, Reed 2016, 240–281; Charles et al. 1997; Weide et al. 2021). Since it should be necessary to use local values in the analysis (cf. van der Veen 1992, 108; Hajnalová 2012, 137; Látková 2015, 148), the soil indicator values (Jurko 1990) were applied for the comparative assemblage. The remaining values (light, temperature, continentality) were acquired from H. Ellenberg (1979; Ellenberg, Leuschner 2010).

Nevertheless, it should be noted that from the latter source, it is not entirely clear how the authors created the applied codes and on what basis they made decisions when assigning individual values of the indicator factors (F. Štiglic 2017, personal communication). Several botanical studies and applications of ecological indicators for local conditions have recently been created. In the case of the Czech Republic e.g. Chytrý et al. 2018.

For the interpretation of agrotechnical procedures as well as ecological conditions, the examined samples must contain multiple occurrences of weeds with given indicator values (cf. van der Veen 1992, 109; Kroll, Reed 2016, 241, 242; Hajnalová 2012, 135; Látková 2015, 148). The autecological analysis in archaeobotany is often used to interpret fields or agrotechnical procedures. For such interpretation based on autecology, it would first be necessary to develop a more detailed analysis of samples (and entire sets of sites – cf. Jevišovka below) and several local experimental studies focused on this issue (F. Štiglic 2017, personal communication). Therefore, it was impossible to interpret those for the comparative assemblage. The analysis was used primarily for comparison with other and similar studies (Hajnalová, Varsik 2010; Hajnalová 2012; Látková 2017), and hence, similar steps were taken.

Two primary matrices were investigated. The first was identical to the matrix from the previous analysis, i.e. it consisted of 124 samples with at least 30 crops and 129 weed taxa (without using the percentage of weeds in the samples). All weed taxa were used. It was determined by the number of weed species to which ecological indicator values could be assigned. Since not all species present in the matrix with 5% occurrence were included in the ecological tables (Ellenberg 1979; Ellenberg et al. 1991; Ellenberg, Leuschner 2010; Jurko 1990), an extended matrix was used to include as many weed species as possible.

The second variant of the matrix worked with all samples in which crops were found – without the minimum occurrence criterion (850 samples and 196 weed taxa). For the analysis of both described matrices, exploratory discriminant analysis was used in the XLSTAT Addinsoft 2016, Evaluation version 18.07 40123, Free Trial & Free Version, with principal component analysis of variables. Both results were comparable; thus, the non-standardised matrix with the occurrence of crops was used.

Subsequently, the matrix was adjusted for the presence (1)/absence (0), thus relativising the differences between the samples based on different numbers of seeds. A matrix was created that contained 1,008 columns, or each sample had a value of 1 or 0 written in 1,008 columns. The number of occurrences of individual ecological indicators was subsequently calculated for each sample. Since different weeds have the same ecological indicators, each sample always contained one or more presences for individual indicators. Finally, a matrix with 144 columns was created. Since the matrix created in this way was very comprehensive and consisted of 122,400 cells with indicative values (cf. Jurko 1990, 82–181; Hlavatá 2017, Prílohy, Tab. 10.2.1–7), the data was worked with in two ways (methods). The first method divided all samples according to the main crop. It was problematic to determine the main crops for the investigated samples because they were very heterogeneous and contained reserves and waste residues of different crops and different stages of the crop treatment process. For this reason, up to 15 or 16 groups of crops were used (Tab. 9), which represented either the main crop (if it could be specified) or groups of predominant crops.

Since discriminant analysis also works with qualitative variables, adding "quality" to samples is possible based on arbitrarily chosen values. This quality was the dominant crop type (cf. Hajnalová 2012, chapter 9). At the same time, it is a condition of the analysis that it must contain the given quality at least twice. Otherwise, excluding or relabelling the given sample is necessary. In addition to quality, it is possible to enter variable and sample labels. The analysis also included unclassifiable (mixed) samples. Table 10 shows the groups of samples according to the distance from the Limes. The given matrix was used to discriminate samples based on indicative values according to the distance of archaeological sites from the border of the Roman Empire (Limes Romanus). In the second method, a non-reduced matrix was used, with samples not combined according to crops. A statistical weight for the distance from the Limes was still kept. In addition, the first variant of the matrix was subjected to analyses, in which the data were tested by the so-called permutation test of the MonteCarlo type (Lepš, Šmilauer 2003, 40, 41).

The redundancy analysis (RDA), canonical correspondence analysis (CCA) and detrended canonical correspondence analysis (DCCA) in the program CANOCO 4.5 (Lepš, Šmilauer 2003) were tested. In addition to the possibility of using permutation, the advantage of analyses is the possibility of working with two matrices, which can be inserted into the analysis simultaneously. The results can be seen in Hlavatá 2017, chapter 10. It was applied as follows:

1. Species matrix, where rows represented archaeobotanical specimens and columns represented botanical species, together with
2. a matrix of environmental variables, where rows represented archaeobotanical samples (identical to the species matrix), and columns contained ecological indicator values.

The results of discriminant analysis are presented here.

Tab. 9. Comparative assemblage. Groups of dominant crops according to taphonomical assessment. After Hlavatá 2017. Author: J. Apiar, ARÚB.

Group No.	Dominant crop(s)
1	bread wheat
2	bread wheat and second crop (legumes, lentil, rye)
3	hulled barley and bread wheat
4	hulled and naked barley
5	hulled barley and second crop (millet, einkorn, emmer)
6	millet
7	millet and second crop (lentil, rye, emmer)
8	spelt
9	spelt and second crop (emmer, bread wheat)
10	emmer and einkorn
11	wheats and barley
12	rye
13	legumes, lentil
14	mixed
15	unspecified
16 (11)	probable new glume wheat

7.2.1 Reduced matrix and grouped samples

In the case of the matrix analysis adjusted according to the first method, it turned out that there were no significant differences in the indicator values in the set. More minor differences noticeable between groups are structured by dominant crops. When discriminating according to light, temperature and continentality indicators, only the group without determination (unspecified 15) was clearly separated (Hlavatá 2017, Obr. 10.2.1.). Upon a closer look (on the zoomed-in axis), it was visible that within individual groups of crops, the values of different regions (A–D) were grouped and did not separate significantly. The centroids of the groups were cumulated within one concentration, except for group 15 (unclassified samples). Unclassified samples were separated from the rest due to the low density of finds and a small number of macroremains and taxa.

Based on climatic indicators, the sample with predominant new glume wheat (16C) was discriminated within the einkorn and emmer group (10). In the case of climatic factors, it seems that the values of weed species from Germanic sites in Slovakia, Moravia and Bohemia (groups C, D) were partially separated from Roman-provincial sites or those located near the Limes (groups A, B).

Similarly, groups were classified within the discrimination based on soil indicator values (moisture, reaction and nitrogen, Hlavatá 2017, Obr. 10.2.2.). All groups reacted almost identically, except for group 3 (samples with predominant bread wheat and barley)

Tab. 10. Jevišovka. Growth form groups of wild taxa (%) in the assemblage after Dřevojan 2020; Klimešová et al. 2016; 2017; Ottaviani et al. 2017; www.pladias.cz. Author: J. Apiar, ARÚB.

Growth form group (after www.pladias.cz)	Taxa in the assemblage (%)
annual herb	68.18
polycarpic perennial non-clonal herb	13.64
clonal herb	11.36
monocarpic perennial non-clonal herb	4.55
dwarf shrub	2.27

and partially group 1 (bread wheat). In the case of soil factors, these were more distinctly separated. In group 1, the samples from Roman-provincial sites (1A) were most distinctly separated, which may be due to the disproportionately higher number of finds of bread wheat at these sites (and storage of its ears); at the same time, there was an increased number of weed seeds. PCA analysis showed the values of soil reaction Pr4-3b, Pr4/5, Pr3a, Pr4-2a (Jurko 1990, 75, 76; Hlavatá 2017, Prílohy Tab. 10.2.3.) and soil nitrogen Pd2-5, Pd3/4 (Jurko 1990, 76; Hlavatá 2017, Prílohy Tab. 10.2.4.) are separated from the group. In this discrimination, sites were no longer isolated.

From the graphs described above, there are differences in the assemblage. Still, they are not structured by the distance of the sites from the Limes area or by different regional natural conditions, manifested in the ecological demands of the weeds in the examined samples.

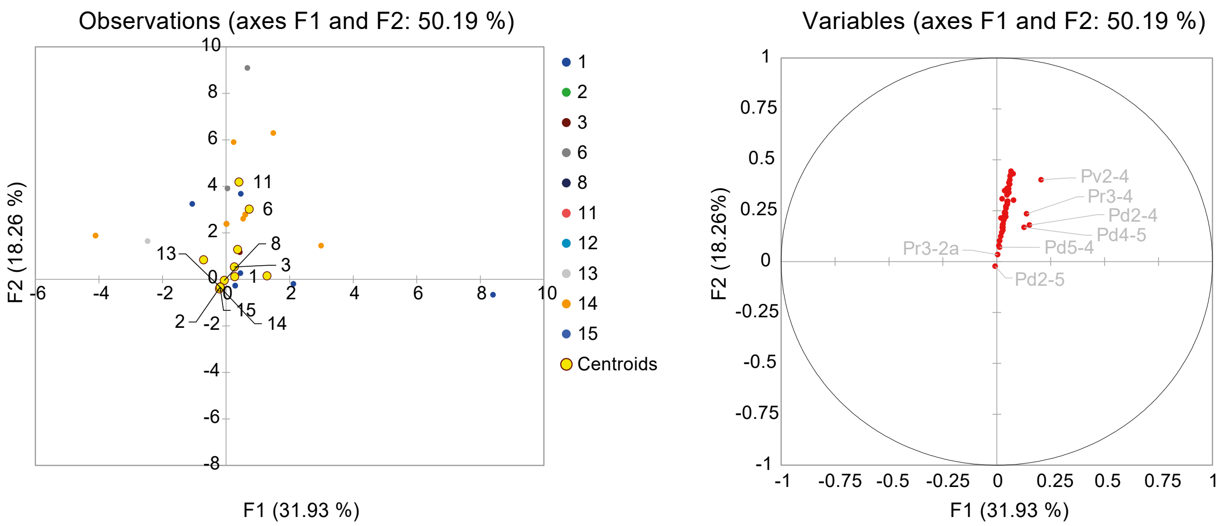


Fig. 52. Comparative assemblage. Ecological indicator values for soil moisture (Pv), reaction (Pr) and nitrogen (Pd, after Jurko 1990) in samples discriminated by dominant crops. Left – discrimination of samples; right – PCA analyses of variables. After Hlavatá 2017. Author: J. Apiar, ARÚB.

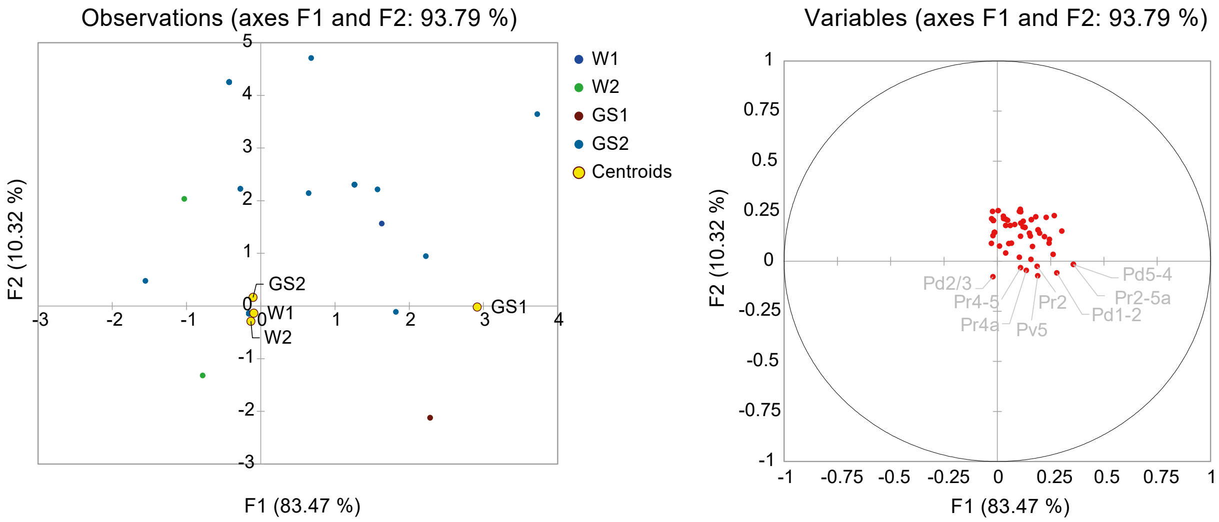


Fig. 53. Comparative assemblage. Ecological indicator values for soil moisture (Pv), reaction (Pr) and nitrogen (Pd, after Jurko 1990) in samples discriminated by product types. Left – discrimination of samples; right – PCA analyses of variables. After Hlavatá 2017. Author: J. Apiar, ARÚB.

7.2.2 Non-reduced matrix and individual samples

Similar to the case of the first discriminant analysis (Hlavatá 2017, Obr. 10.2.1, 2), the results are comparable.

On the PCA graph of the indicator values analysis (Fig. 52, right), it can be seen that the values for light (L), temperature (T) and climate (K) are very concentrated, even after adjusting the axes (F1 and F2). The values of the indicators scatter very vaguely into two groups. However, this dispersion is not confirmed when looking at the discriminant analysis (Fig. 52, left). Within samples, those containing several cereal species in comparable proportions (= mixed samples) differ from others. The situation appears similarly on the graph of discriminant analysis (Fig. 53, left) and PCA analysis (Fig. 53, right) for samples discriminated by product type. Only two values are separate from the main cluster of indicators: K6 – subcontinental and T8 – between warm and extremely warm climates (Ellenberg, Leuschner 2010, 1, 2; Hlavatá 2017, Tab. 10.2.1).

There are no differences in the ecological demands of weed species on the climate between Roman-provincial and Germanic sites at the site group analysis level. As in the case of climatic factors, analysis of soil factors did not show differences between sample groups or sites using multivariate statistics. It was possible to evaluate the most represented weed species regarding soil requirements. The assemblage contains the most common species growing on dry to fresh soils, indifferent to soil pH (weakly acidic soils to neutral/basic soils) and on medium to rich soils.

Except for the isolated indicators of soil moisture and the soil reaction (some Germanic sites around

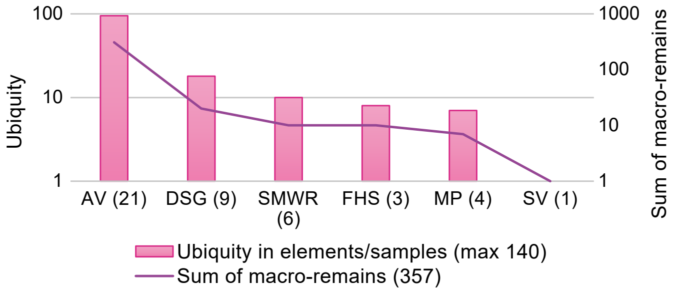


Fig. 54. Jevišovka. Broadest habitats identified in the assemblage of wild plants in ubiquity and sum of macro-remains (MNI) on a logarithmic scale. Taxa grouped after Sádlo et al. 2007, Appendix 1; cf. Chytrý, Rafajová 2003; www.pladias.cz; for original nomenclature, see List of abbreviations. AV – anthropogenic vegetation; DSG – dry and sand grasslands; SMWR – springs, mires, wetlands, riverine herbaceous vegetation; FHS – forests, heathlands, and scrub; MP – meadows and pastures; SV – saline vegetation. The number in brackets represents the number of determined taxa. Author: J. Apiar, ARÚB.

Prague – a possible reflection of regional natural conditions?), it is not possible to find apparent differences between groups of sites and more or less not even between the sites themselves.

7.3 Autecological evaluation of the Jevišovka assemblage

Jana Apiar, Peter Apiar

Among all the analysed archaeobotanical samples from the Jevišovka site, it was possible to assign ecological indicator values to 43 taxa of wild plants (Appendix Tab. 30).

Through the Pladias Database of the Czech Flora and Vegetation, www.pladias.cz (Chytrý et al. 2021), the taxa were assigned Ellenberg-type indicator values (L, T, M, R, N, S; modified and extended for Czech flora by Chytrý et al. 2018; Ellenberg et al. 1991), also occurrence in habitats (Sádlo et al. 2007, Appendix 1; cf. Chytrý, Rafajová 2003), growth (Dřevojan 2020; Klimešová et al. 2016; 2017; Ottaviani et al. 2017) and life form (Kaplan et al. 2019; Raunkiaer 1934), height (Kaplan et al. 2019), taxon origin in the Czech Republic and geographic origin (Pyšek et al. 2012; Richardson et al. 2000), flowering phase (Trefflich et al. 2002; cf. Dierschke 1995) and flowering period (Kaplan et al. 2019).

As mentioned earlier (Pv, Pr, Pd), the values published by A. Jurko (1990) were also used for comparison.

7.3.1 Habitats in assemblage

Approximately six habitats can be defined on the general (broadest) level for 43 taxa of wild plants (Fig. 54). These are 1) anthropogenic vegetation; 2) dry and sand grasslands; 3) springs, mires, wetlands, riverine herbaceous vegetation; 4) forests, heathlands and scrubs; 5) meadows and pastures and 6) saline vegetation.

These six groups were created based on optimal to constantly dominant occurrence in the given biotope, according to J. Sádlo (et al. 2007, Appendix 1; cf. Chytrý, Rafajová 2003; www.pladias.cz). These groups are only for illustrative purposes. Taxa occur in multiple habitats, some being dominant, some optimal, and some only occurring. In the case of the assemblage from Jevišovka, some taxa occurred in several habitats simultaneously. For example, *Galium aparine* is optimum in 17 out of 88 possible habitats (Sádlo et al. 2007, Appendix 1), and it has a rare occurrence in 40 habitats. *Lotus corniculatus*, *Plantago lanceolata*, *Rumex acetosella* and *Vicia cracca* also belong to taxa with a wide optimum (more than ten habitats).

The non-linear principal component analysis graph (Fig. 55, top; Appendix Tab. 30; de Leeuw 2006; 2009a, 2009b) shows the relationships of individual habitats in terms of 43 taxa from Jevišovka and their ubiquity (with values: no occurrence, rare, optimum, dominant, constant dominant – after Sádlo et al. 2007, Appendix 1). The rare value prevails – 635 and then the optimum 177, the dominant and the constant dominant form a total of only 12 occurrences. The graph illustrates well that reconstructing the natural environment using only (current) taxon occurrences is not a clear-cut matter. The individual habitats are more or less correlated with each other and form certain groups, but also due to their large number, i.e. the wide occurrence of these taxa, their relationship to the natural environment in Jevišovka in the Roman period is problematic. The number of different habitats for individual plant species varies from two to 42 in Jevišovka, with an average of about 16 habitats per plant species. Within the Jevišovka assemblage, regarding the number of taxa, the broader habitat of Anthropogenic vegetation was the most represented as a rare occurrence. It included habitat 13D Perennial thermophilous ruderal vegetation (55.8% taxa), 13A Annual vegetation of ruderal habitats (53.5% taxa). Within the optimal occurrence was habitat 13B Annual vegetation of arable land (44.2% rate). In the graph (Fig. 55, top), ubiquity has an illustrative function. Still, the occurrence of taxa in the samples shows a particular relationship between the taxon ubiquity in samples from Roman (ub_R) and La Tène/Roman period features (ub_LR) and 10G Continental vegetation of annual halophilous grasses, 4C Eutrophic vegetation of muddy substrata and 4H Vegetation of low annual hygrophilous herbs (Appendix Tab. 30; after Sádlo et al. 2007).

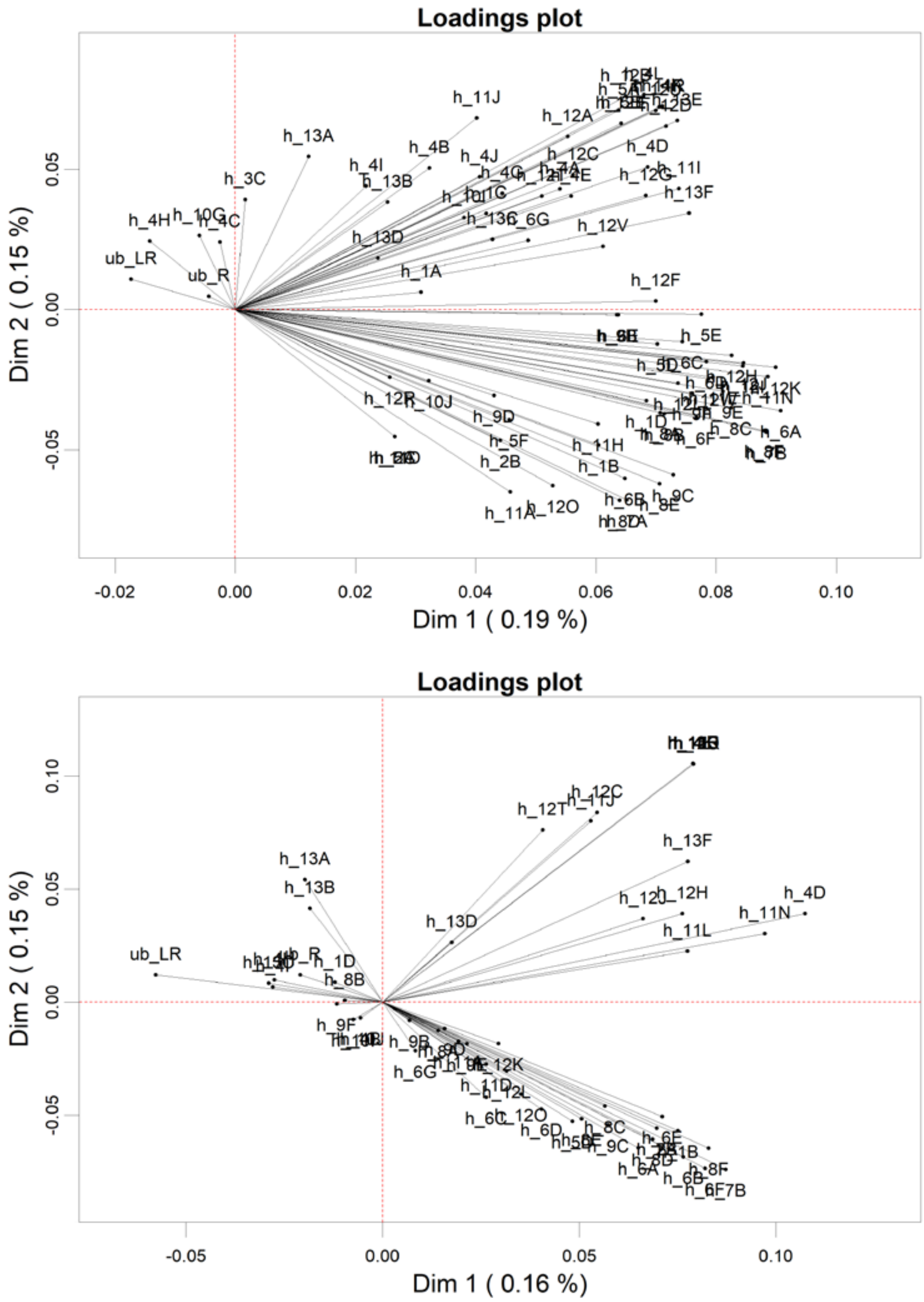


Fig. 55. Jevišovka. Non-linear principal component analysis of habitats identified in the assemblage of wild plants with taxa ubiquity in samples from Roman (ub_R) and La Tène / Roman (ub_LR) period features. Top – all taxa occurrences; bottom – "optimum" and higher criteria of taxa occurrence. Taxa grouped after Sádlo et al. 2007, Appendix 1; cf. Chytrý, Rafajová 2003; www.pladias.cz; for original nomenclature, see List of abbreviations. Author: P. Apiar, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

After removing rare occurrences in habitats (Fig. 55, bottom; Appendix Tab. 30), the taxa *Bromus arvensis* and *Bromus secalinus* were also removed, as their occurrence in habitats is rare (after Sádlo et al. 2007, Appendix 1). In this case, the mutual correlations of the habitats were somewhat better profiled. This is mainly about broader habitat 11 (Heathlands and scrub), 12 (Forests), 13 (Anthropogenic vegetation) in the upper right part of the graph. In the lower right corner (Fig. 55, bottom) it is mainly broader habitat 6 (Meadows and mesic pastures), accompanied by habitats 7 (Acidophilous grasslands) and 8 (Dry grasslands). On the opposite side of the graph, annual species of anthropogenic vegetation were divided (habitats 13A, B, C after Sádlo et al. 2007, Appendix 1). The number of taxon habitats (optimum, dominant, constant dominant) varies from 1 to 12, and the average is approximately 4.5 different habitats per taxon.

Fig. 56. Jevišovka. The broadest habitats identified in the assemblage of wild plants in ubiquity and sum of macro-remains (MNI) found in Roman period features on a logarithmic scale. Taxa grouped after Sádlo et al. 2007, Appendix 1; cf. Chytrý, Rafajová 2003; www.pladias.cz; for original nomenclature, see List of abbreviations. AV – anthropogenic vegetation; DSG – dry and sand grasslands; SMWR – springs, mires, wetlands, riverine herbaceous vegetation; FHS – forests, heathlands, and scrub; MP – meadows and pastures; SV – saline vegetation. The number in brackets represents the number of determined taxa. Author: J. Apiar, ARÚB.

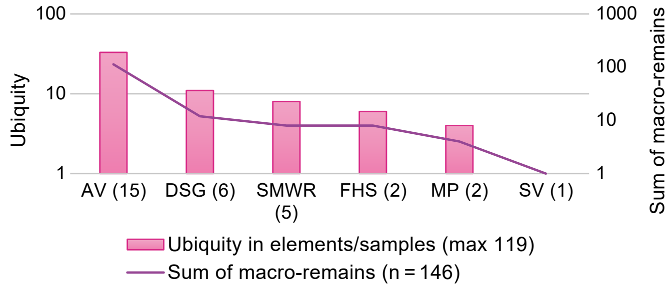
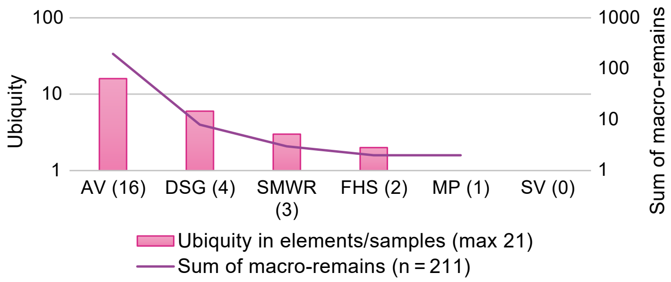


Fig. 57. Jevišovka. The broadest habitats identified in the assemblage of wild plants in ubiquity and sum of macro-remains (MNI) found in La Tène/Roman period features on a logarithmic scale. Taxa grouped after Sádlo et al. 2007, Appendix 1; cf. Chytrý, Rafajová 2003; www.pladias.cz; for original nomenclature, see List of abbreviations. AV – anthropogenic vegetation; DSG – dry and sand grasslands; SMWR – springs, mires, wetlands, riverine herbaceous vegetation; FHS – forests, heathlands, and scrub; MP – meadows and pastures; SV – saline vegetation. The number in brackets represents the number of determined taxa. Author: J. Apiar, ARÚB.

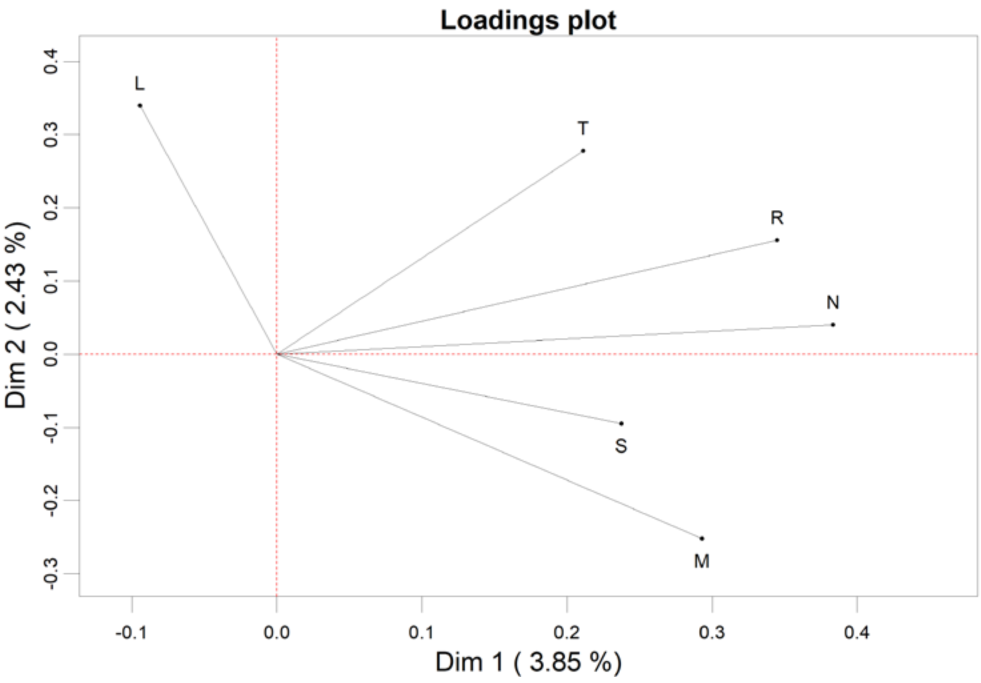


When dividing the assemblage into samples from Roman period features (Fig. 56) and La Tène/Roman period features (Fig. 57), taxa of anthropogenic vegetation predominate in both groups according to occurrence optimum and above. Overall, however, the assemblage of wild plant macro-remains is small. This is a total of only 357 wild taxa seeds that could be characterised in this way.

7.3.2 Ecological indicator values

The situation is as follows when evaluating the samples according to climatic and soil requirements of taxa. Figure 58 shows the NLPCA of ecological indicator values (after Chytrý et al. 2018; Ellenberg et al. 1991) in the Jevišovka assemblage. While Figure 58, top, shows ecological values without generalists, Figure 58, bottom, shows the output of the analysis with generalist values. Generalist values indicate the broad conditions range of taxa. In the case of non-generalist values (Fig. 58, top), indicator L (according to data specifically L7; Appendix Tab. 30) has the highest occurrence of taxa counts in the number of samples. These are "*half-light plants, mostly occurring at full light, but also in the shade up to about 30% of diffuse radiation incident in an open area*" (after Chytrý et al. 2018). This indicates that the light-loving nature of the plant species from Jevišovka could have played a specific role. Since the L indicator generally has the highest values in the assemblage of plant species, it can be assumed that the space where these species originally grew was more open and had sufficient sunlight. The remaining indicators correlate to a greater or lesser extent with Dimension 1 (Fig. 58, top).

Regarding generalist values (Fig. 58, bottom), the soil reaction (specifically indicator R6x) has the highest representation in the assemblage of taxa in samples. It indicates a transition between values 5 and 7 (generalist) – that is, between "*moderate acidity, rarely occurring in strongly acidic as well as in neutral to alkaline conditions*" and "*slightly acidic to slightly basic conditions, never occurring in very acidic conditions*" (generalist; Chytrý et al. 2018). From the point of view of taxa (Fig. 59), these are types of anthropogenic vegetation, primarily 13C habitats (for soil reaction). No habitat was explicitly singled out for the light indicator in the analysis. The indicator light (L) and salinity (S) relationship to the taxa wetland and riverine herbaceous vegetation (4H, 4I) and meadows and mesic pastures vegetation (6D) is weak but present (Fig. 59). These taxa were moderately represented within the samples. In the case of samples from Roman period features, it was a total of 10 taxa (Fig. 56). Six taxa together represented the La Tène/Roman period features (Fig. 57). When dividing the assemblage according to dating (Fig. 60: 1–6), the situation is more visible. The primary intent of such a division was to trace possible differences between the two subsets of samples. However, it is impossible to say such differences are present at first glance. In both subsets, there is a significant presence of anthropogenic vegetation. Based on the NLPCA analysis (Fig. 55, top), the arable land plants are more likely to be associated with finds from the Roman period features. However, the result also shows a striking difference in the number of samples from the Roman period features and superpositions (119 to 21). Figure 60 shows the maximal occurrences



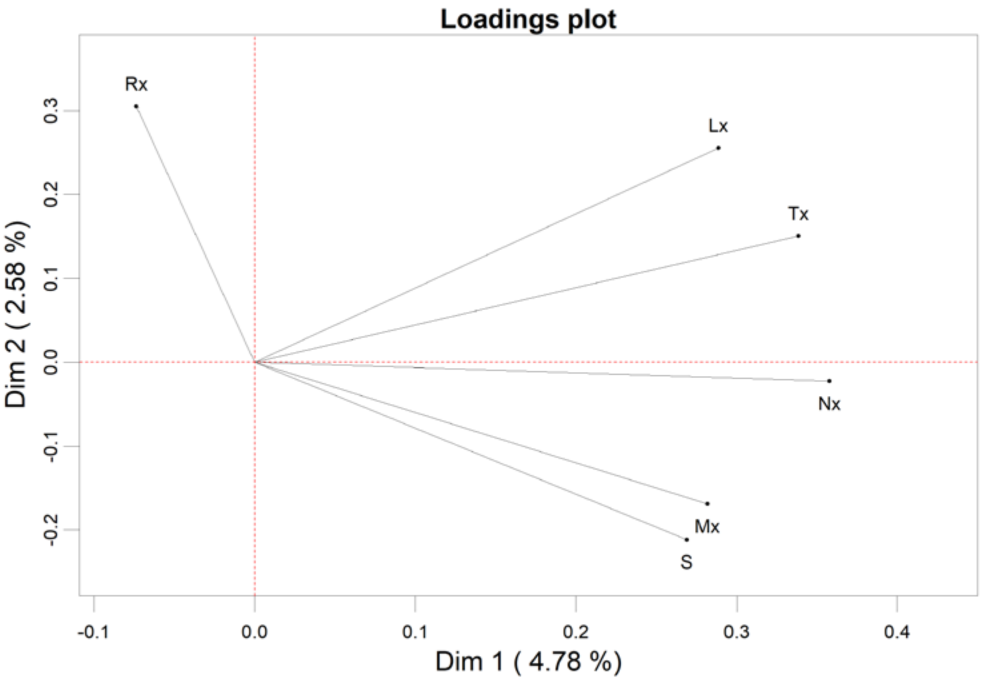


Fig. 58. Jevišovka. Non-linear principal component analysis of ecological indicator values of wild plants. Top – indicator values; bottom – generalist indicator values. Indicator values after Chytrý et al. 2018; Ellenberg et al. 1991; www.pladias.cz; for original nomenclature, see List of abbreviations. Author: P. Apiar, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

in both subsets similarly. A small difference is in the representation of other than the highest occurrences of indicator values. For the light, it is the value L7 or generalist L7x, for temperature T6 or T6x, in La Tène/Roman period features also T5x. For the moisture, M5, M4 and there is a difference for the Roman period features, it is M5x, and for La Tène/Roman period ones, it is M4x. The reaction, R7 and R6x, as stated above, nutrients N7, N6 and N8 in order, also N5x for the Roman period and N6x for the La Tène/Roman period. The last indicator – salinity, shows the highest S0 and S1. There is a bit higher representation for S2 in samples from La Tène/Roman period features. The light values show the highest representation for half-light and full-light habitats and indicate an open area with diffuse light up to 30%.

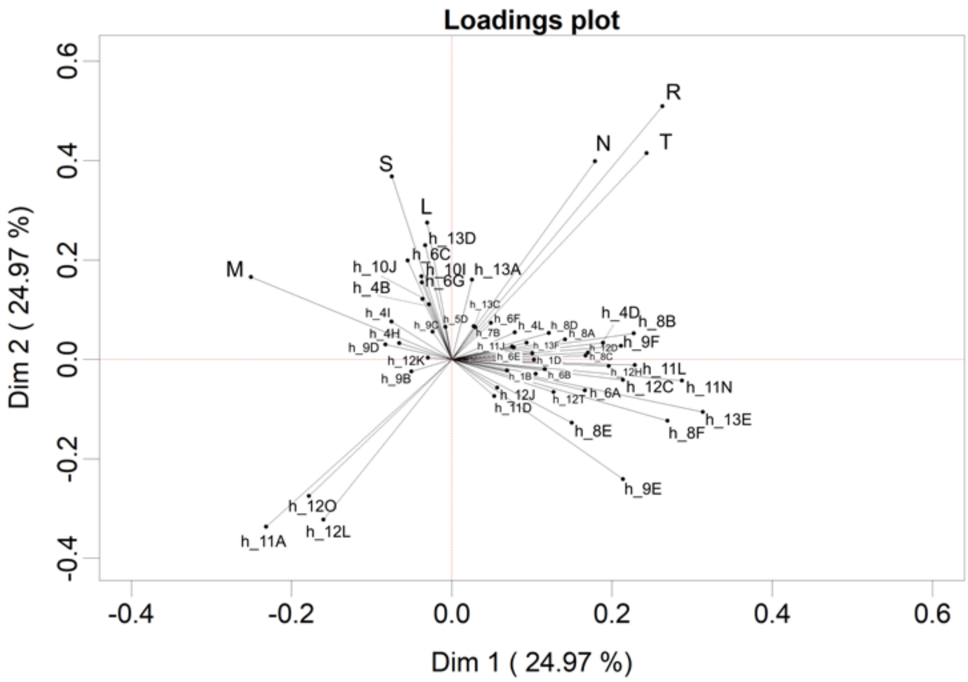


Fig. 59. Jevišovka. Non-linear principal component analysis of ecological indicator values and habitats of wild plants (occurrence criteria "optimum" and higher). Taxa grouped after Sádlo et al. 2007, Appendix 1; cf. Chytrý, Rafajová 2003; indicator values after Chytrý et al. 2018; Ellenberg et al. 1991; www.pladias.cz; for original nomenclature, see List of abbreviations. Author: P. Apiar, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

Figure 61, top, (so-called joint plot) shows the relationships of taxa to individual dimensions and the relationships between taxa, habitats and ecological indicators. Although at the cost of a higher degree of generalisation, habitats were merged into broader categories for the sake of comprehensibility and evaluation of further analysis. The most significant difference is observed in dimension 2, which correlates most (both positively and negatively) with light values (L), which also defines this dimension. Four taxa with a low light value and a closer relationship to habitats h11 (Heathlands and scrub) and h12 (Forests) were separated in the lower part. This group of plants prefers places with a transition between semi-shade and half-light. A positive correlation to light is represented on the opposite side by the taxon *Teucrium* cf. *botrys*, which in turn requires full light in fully irradiated places. In the most remote part of the graph is *Rumex acetosella*, with a strong positive correlation to dimension 1. Low values mainly define this taxon for soil or water reaction (R) and nutrient value. At the same time, it has its optimum in up to seven habitats, which makes it an outlier with a lower explanatory value in terms of a more accurate description of the closest natural environment of Jevišovka. These seven taxa were removed from the further analysis to look closely at the remaining relationships and correlations.

Similar to the previous graph, the greatest differences can be observed along dimension 2 (Fig. 61, bottom). In the lower part of the graph (Fig. 61, bottom), a grouping of taxa correlated with higher lightness indicators (8, 9), which like sunlight and therefore grow mainly in areas exposed to sunlight. To a lesser extent, they associate with temperature, moisture, soil reaction and salinity (zero value). They are not significantly correlated with any habitats, but they are closely related to anthropogenic vegetation (h13), sand grasslands, and rock-outcrop vegetation (h9). At the positive end of dimension 2, *Potentilla anserina*, *Vicca cracca* agg., *Rumex crispus* and *Lotus* cf. *corniculatus*, and most habitats are concentrated in the upper right part of the graph. The species in this part are often found in several habitats (cf. Kočár, Kočárová 2011; Hajnalová 2011b). At the same time, they correlate with average temperatures (T5) more typical for species broadly occurring from lowland to montane belt. Around the centre is a cluster of several species, primarily related to anthropogenic vegetation (h13). There is also h11 (Heathlands and scrub) well represented as rare habitat for the last species mentioned. These are species that like sunny and shady sites, warmer places and soils with moderate acidity to those more alkaline and rich in calcium.

7.3.3 Summary

Within the entire assemblage from Jevišovka, more than 68% of taxa were represented by annual

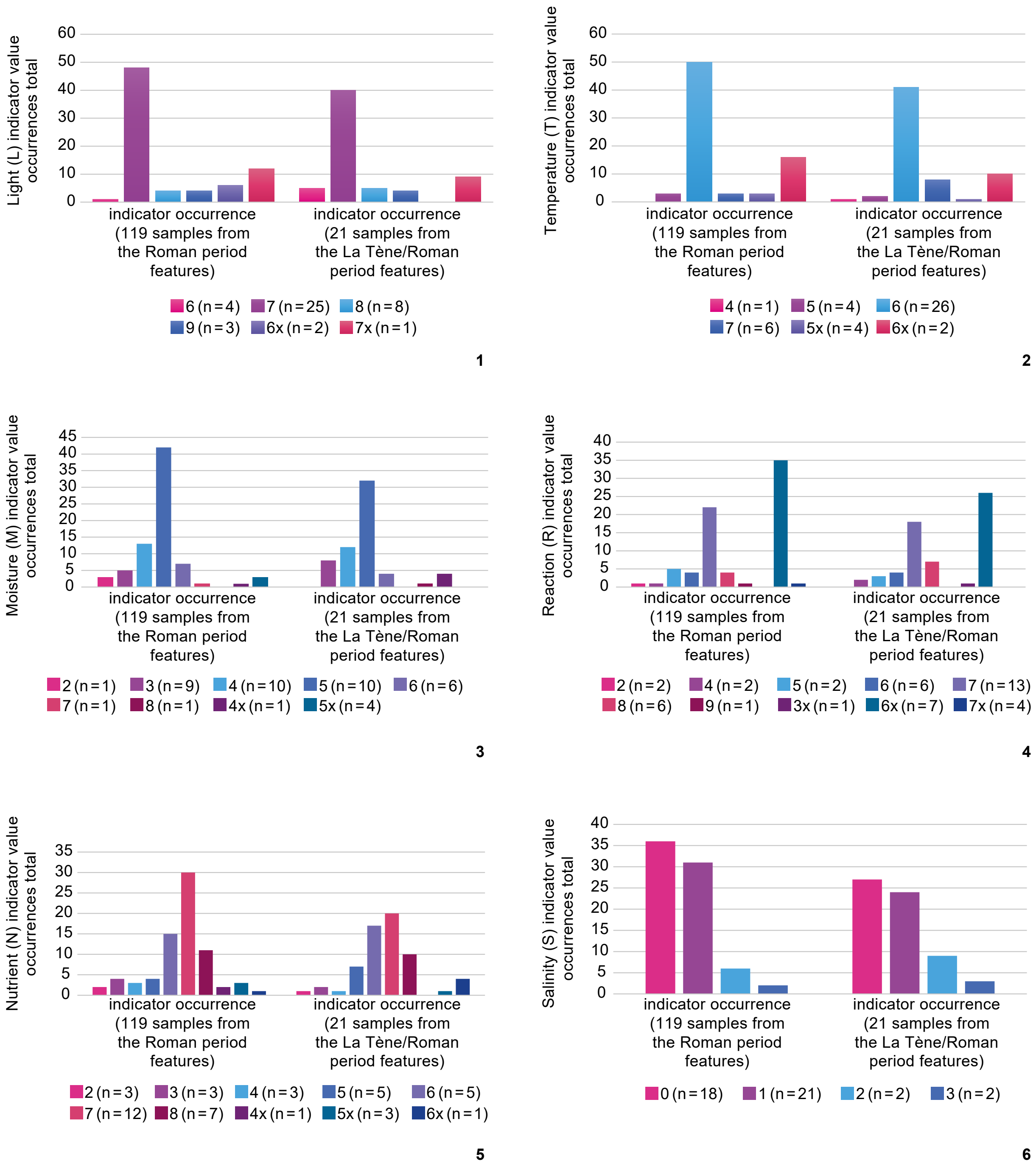


Fig. 60. Jevišovka. Ecological indicator values for taxa determined in samples from Roman and La Tène/Roman period features. The number in brackets represents the number of taxa with a particular indicator value. Indicator values after Chytrý et al. 2018; Ellenberg et al. 1991; www.pladias.cz; for original nomenclature, see List of abbreviations. Author: J. Apiar, ARÚB.

herbs (Tab. 10). In the life form, these taxa are therophytes (Tab. 11), i.e. summer- or winter annual herbs that survive the unfavourable season only as seeds germinating in autumn, winter or spring (after Kaplan et al. 2019). In the Jevišovka assemblage, this group of plants is associated with anthropogenic vegetation, which also includes agriculturally cultivated land (Tab. 12). However, they predominated in almost all habitat groups identified within the assemblage. Polycarpic and monocarpic perennial non-clonal herbs (after Dřevojan 2020) represented eight taxa, expressing more than 18% of the entire collection of wild plants. These plant species are hemicryptophytes, i.e. herbs with surviving buds on aboveground shoots at the ground level (after Kaplan et al. 2019).

In the group of plants belonging to anthropogenic vegetation, which is after J. Sádlo (et al. 2007, Appendix 1; cf. Chytrý, Rafajová 2003) broader habitat 13,

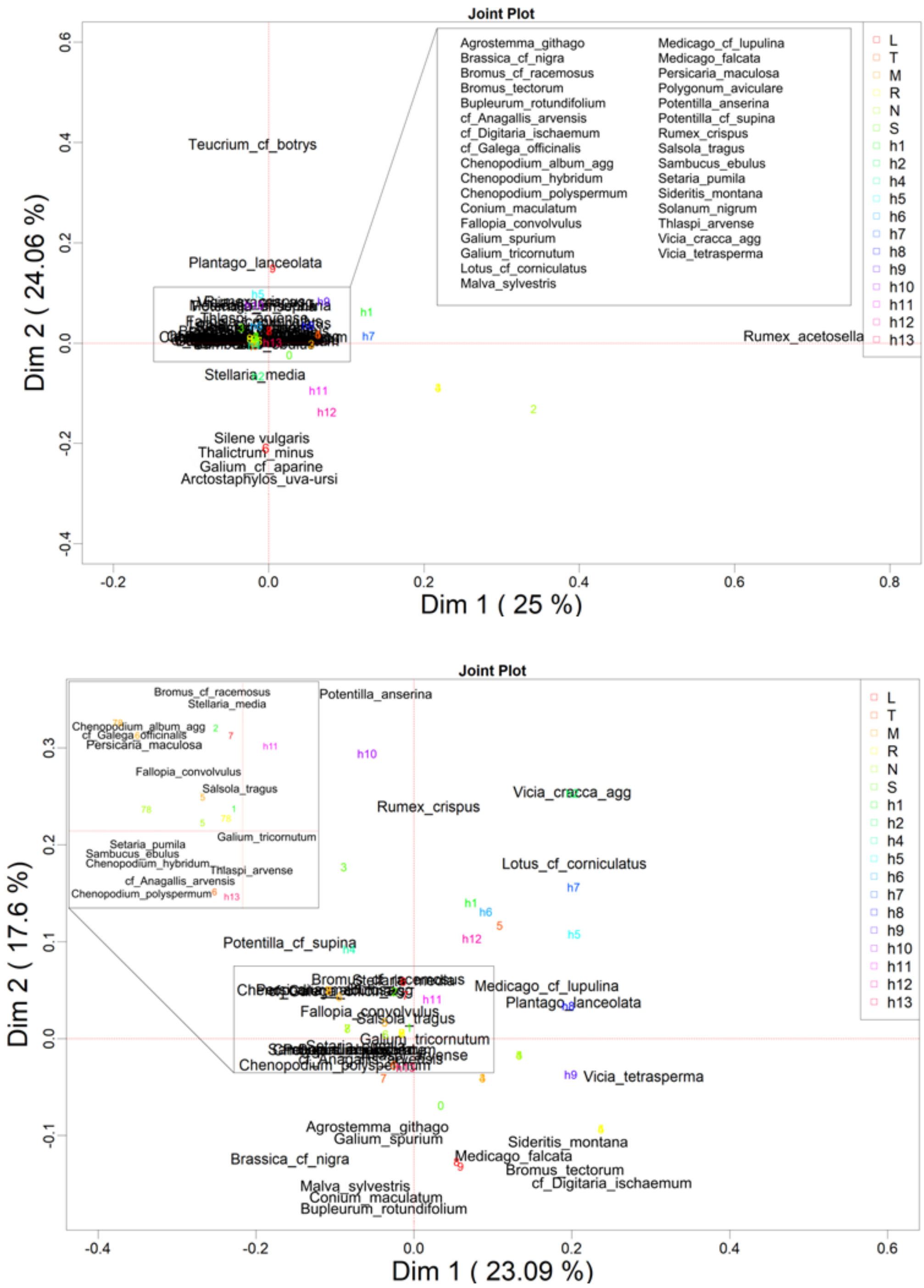


Fig. 61. Jevišovka. Non-linear principal component analysis joint plot of particular taxa, ecological indicator values and broader habitats of wild plants. Top – all taxa; bottom – taxa without outliers. Taxa grouped after Sádlo et al. 2007, Appendix 1; cf. Chytrý, Rafajová 2003; indicator values after Chytrý et al. 2018; Ellenberg et al. 1991; www.pladias.cz; for original nomenclature, see List of abbreviations. Author: P. Apiar, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

13 taxa were determined as 13B (Annual vegetation of arable land after Sádlo et al. 2007, Appendix 1; cf. Chytrý, Rafajová 2003). According to the life strategy (after Klotz & Kühn 2002 and Pierce method based on leaf traits after Guo, Pierce 2019), these are taxa with competitive/ruderal strategy (CR) or ruderal strategy (R). Both are suitable for conditions with sufficient resources and outside of extreme conditions (i.e. found around Jevišovka), but they differ in the degree of soil disturbance (e.g. agricultural activity). While a competitor has an advantage on soils with a low degree of disturbance, ruderal is advantageous on soils with a high degree of disturbance (after Klotz & Kühn 2002 and Pierce method based on leaf traits after Guo, Pierce 2019).

The soil reaction, together with moisture and nutrients indicator values, show the following interpretation for the most ubiquitous ecological values: plants growing at moderate heat to heat lowlands, fresh soils

Tab. 11. Jevišovka. Life form groups of wild taxa (%) in the assemblage after Kaplan et al. 2019; Raunkiaer 1934; www.pladias.cz. Author: J. Apiar, ARÚB.

Life form group (after www.pladias.cz)	Taxa in the assemblage (%)
therophyte	68.18
hemicryptophyte	27.27
geophyte (hemicryptophyte)	2.27
chamaephyte	2.27

Tab. 12. Jevišovka. Habitats and growth form occurrence in samples from Roman and La Tène/Roman period features, after Sádlo et al. 2007, Appendix 1; cf. Chytrý, Rafajová 2003; Dřevojan 2020; Klimešová et al. 2016; 2017; Ottaviani et al. 2017; www.pladias.cz. Author: J. Apiar, ARÚB.

Chronology	Habitat group (after www.pladias.cz)	Growth form group (after www.pladias.cz)	Growth form occurrence in group of taxa (%)	Growth form occurrence in group of samples and taxa total	Growth form ubiquity in samples	Growth form ubiquity in samples (%)
Roman period features (n=119 elements/samples)	Arable land constant dominant	annual herb	0	0	0	0
	Arable land optimum	annual herb	100	41	31	26.05
	Other	annual herb	50	2	2	1.68
		clonal herb	25	2	2	1.68
		monocarpic perennial non-clonal herb	25	1	1	0.84
La Tène/Roman period features (n=21 elements/samples)	Arable land constant dominant	annual herb	100	1	1	4.76
	Arable land optimum	annual herb	100	37	13	61.90
	Other	annual herb	71.43	9	6	28.57
		clonal herb	14.29	2	2	9.52
		monocarpic perennial non-clonal herb	14.29	1	1	4.76

of average moisture to well moistened but not wet and slightly acidic to slightly basic soils, nutrient-rich to moderately nutrient-rich, with some at pronounced nutrient-rich sites, non-salt tolerant or low-salt to salt-free soils (cf. Chytrý et al. 2018). This corresponds to the soils located in the present time in the immediate vicinity of the Jevišovka settlement (cf. Komoróczy et al. 2013, 2; Zelíková 2019, 11, 12). According to the pedological map of the Czech Republic (Appendix Fig. 92; after State Administration of Land Surveying and Cadastre, CUZK and Czech Geological Survey, CGS), even in comparison with the present classification (after Research Institute for Soil and Water Conservation, BPEJ), the settlement is located on the border between the modal chernozem and the gleyic and modal fluvisol sites (east of the extinct river tributary of the current Jevišovka River, cf. 2nd Military Mapping, Appendix Fig. 93; cf. Dreslerová et al. 2016).

The representation of those taxa in the samples from Jevišovka that are advantageous at the sites (habitats) located near or at the settlement predominate. These are mainly plants of agriculturally cultivated soil, and those growing in waste areas and other habitats affected by human activity. Based on the taphonomic analysis, since most of the samples show a mixed and waste character, it is a probable combination of plants coming from the surrounding fields and their edges, with those that could have grown directly on the settlement (ruderal habitats). To a lesser extent, there are plants growing in alluvial forests and thermophilous oak forests, on meadows, pastures, dry and sand grasslands, podsols and rendsinas, or low-salt tolerant habitats.

However, the ratio of taxa associated with anthropogenic and other habitats probably does not reflect the actual rate of use of the nearby and more distant surrounding landscape. This is mainly due to the small number of finds, which can be caused by a selective behavioural filter (pre- and post-depositional processes, handling of plant products and waste, selection of plant elements brought directly to the settlement), but also by insufficient sampling (amount of samples and method of sampling). From Jevišovka, for example, there are no samples originating from the closer or wider surroundings of the investigated features, which can considerably complicate the interpretation, as many activities related to the use of plant components took place outside the interiors of the features.

8. Economy

Jana Apiar

The chapter describes the findings from an economic point of view. First, a summary of the results achieved so far in the previous chapters:

1. the range of cereals present at the sites in the Germanic and Roman-provincial environments is almost identical; the proportion of cereals in the Germanic and Roman-provincial sites is partly different; the proportion of cereals in different sites is distinct
2. based on a density analysis, it is possible to trace groups of sites in the Germanic and Roman-provincial environments which are similar; however, the result dramatically affects the state of archaeological research and archaeobotanical sampling
3. types of products at sites in the Germanic and Roman-provincial environment are divided into two groups – the first with a predominance of larger reserves of unthreshed ears/spikelets (Roman-provincial environment), the second with a predominance of smaller reserves of almost cleaned grain (Germanic environment)
4. the Jevišovka assemblage, at least the samples which could be analysed, show signs of similarity with the both – Limes area and deeper Barbaricum sites based on the determined product types
5. based on the correspondence analysis of average densities of cereal species presented above it is shown that there could be a "third" zone in-between the Limes and Barbaricum area, which, due to the composition and density of the grain assortment, is specific and forms a kind of intermediate zone; the site of Jevišovka also belongs to this zone
6. identified phases of the post-harvest crop treatment process at sites in both environments also form two groups – the first with a predominance of earlier stages of the crop-processing (Roman-provincial environment), the second with a more balanced representation of earlier and later stages of the process (Germanic environment)
7. based on the types of products, several groups of sites are partly created according to chronology. The most significant is the group of sites in the Limes area in the Late Roman period; the similarity of Roman-provincial and Germanic sites in the Early Roman period is also remarkable
8. in terms of other archaeological information, the assemblage shows high heterogeneity; some previous conclusions are confirmed, others are only partially confirmed, or sites do not show clear differences

8.1 Economic models

In the 1980s, economic models based on ethnographic research (Jones 1984; 1985, 107; Hillman 1984) emerged in Anglo-Saxon archaeobotanical literature. The focus of the models was to interpret sites as productive or consumptive. Thus, in archaeobotany, economic interpretation means primarily the interpretation of the identified stages of the crop harvesting process, which could, in certain circumstances, indicate whether the inhabitants of the studied sites were "consumers" or "producers" of plant products (primarily grains and crop seeds). In this case, the production site means the one whose inhabitants were able to produce, respectively, grow crops on (their own) fields. A consumption site means one whose inhabitants procured crop products differently than self-help cultivation, such as trade. However, applying the given models to the archaeobotanical assemblages caused a long discussion in professional circles, which lasts practically today. A summary of interpretations and initial arguments is shown in Table 13.

However, by reassessing the existing models, M. van der Veen and G. Jones (2006) argued that each site produces a certain amount of crops for its own use (daily). Therefore, its inhabitants cannot be strictly described as "consumers" or "producers". Authors focused on the production scale – large (large reserves) and small (mostly waste in smaller volumes, cf. Tab. 13). Subsequently, D. Fuller and C. Stevens (2009) published a model that essentially supports the analysis of M. van der Veen and G. Jones (2006) but is based on other reasons (Tab. 13). It is the last of the models that include information which can be considered in the case of the studied assemblage.

8.2. The economy of the people in the Roman period

In Table 13 is visible that the latter economic model (Fuller, Stevens 2009) evaluates taphonomically interpreted samples from two perspectives, which may reflect the same "economic variant". Put simply, samples representing the early stages of the process can represent "large scale/large working groups" but also "small scale/small working groups", as well as samples representing the late stages of the process.

The taphonomic analysis showed that the samples in the Limes sites (cf. Hajnalová, Rajtár 2009; Hajnalová, Varsik 2010; Hlavatá, Varsik 2019) show similarities in the Late Roman period. The samples are mainly products of earlier process stages – reserves of (un)threshed ears/spikelets and wastes from their treatment. Simultaneously, the Germanic sites were characterised by samples that represent the earlier and later stages of the process with a predominance of later stages – almost thoroughly cleaned grain, but also ears/spikelets, together with waste from cleaning and treatment of these products.

Regarding the original interpretation in the first part of the model (Fuller, Stevens 2009, 46, 47), the presence of samples from earlier stages (i.e. with the presence of straw, ears, weeds and husks) may reflect "smaller work units" – in this case, at some of the Limes area sites in the Late Roman period. They, according to this, should store crop products in unprocessed form. Furthermore, samples from later stages (i.e. mainly with the presence of cleaned grain and large or small weed seeds) may reflect "larger working units" – in this case, the inhabitants of Germanic sites in the Barbaricum, who should store crop products almost cleaned. In the Early Roman period, the differences between the types of products in the Roman-provincial and Germanic environments are minor. Respectively, they characterise the processes described above in the Germanic environment. According to the model, they may instead reflect "larger work units" and storage of products in unprocessed form.

However, in the second part of the published model (Fuller, Stevens 2009, 48), the authors argue that the presence of unprocessed products – i.e. (un)threshed ears or spikelets – may indicate the ability to mobilise a larger workforce, which could be used to process the entire untreated crop. It means that samples with the presence of residues from the early stages of the process (winnowing waste, unwinnowed reserves) would thus reflect "larger work units" – counterproductive to the first part of the model but still logically. The logic of variable interpretation of the same samples lies precisely in synthesis with the analysis of archaeological features, and the corresponding finds (in context; cf. Fuller, Stevens 2009, 46). It follows directly from this that it is necessary to interpret the spatial distribution of the examined samples not only within the site but also within individual features/contexts or their groups.

An essential finding of the model used, is, that although several stages of crop processing may have taken place during crop treatment, they may not have been performed with absolute precision (Fuller, Stevens 2009, 47). To put it very simply, even within the winnowed products could still be fine glumes and weeds that refer more to the unwinnowed products. The studied comparative assemblage also contains samples that comprised light weed seeds (typical for unwinnowed products) but only in minimal quantities (compared to the taphonomical assessment). Therefore, these samples could be winnowed but not perfectly (considering that most of the samples analysed show a "mixed" character). Likewise, the interpretation based on "work unit size" is not very clearly applicable and provides rather diverse options for assessing the presence of earlier and later stages of crop processing.

It would be very bold to argue that the predominance of specific crop products refers to a particular rate/ability to mobilise the workforce. Although most of the available economic models (Tab. 13) were applied to archaeobotanical samples from Roman period sites, it is impossible to interpret their economic character unambiguously. It is mainly due to synthesising the remaining archaeological and environmental findings and their detailed analysis.

However, the surveyed population shows a potentially similar economic strategy (?) for the inhabitants of Roman-provincial and Germanic sites in the Early Roman period and different in the Late Roman period – but not entirely in all sites.

Yet, the situation is not as straightforward as it is described in the western part of the Barbaricum, where A. Kreuz (2004, 242) assumes: "… *Germanic agriculture in a simple subsistence system …. with missing imports from the Mediterranean …*". According to the author, Roman agriculture was: "… *completely different, focused on fewer cereal species, but those that provide high yields …*" (Kreuz 2004, 242).

Tab. 13. Overview of the economic models published in archaeobotanical literature, after M. van der Veen and G. Jones (2006, 219, Table 1). Edited and supplemented: J. Apiar, ARÚB.

Economic model after	Resulting economic designation of a site	Interpretation cause
Jones 1985	production or consumption site	grain loss during the harvest or grain carefully stored
Campbell 2000	fodder scarcity or sufficiency	chaff used as livestock fodder or a source of fuel
Stevens 2003	community or household storage	partly cleaned spikelets or partly threshed ears storage
van der Veen, Jones 2006	large-scale or small-scale	accidental burning of grain storage or daily crop processing waste
Fuller, Stevens 2009	large workgroups (workforce)	partly cleaned spikelets storage, later phases of the process or cleaning at the settlement, early phases of the process
Fuller, Stevens 2009	small workgroups (workforce)	unprocessed storage, early phases of the process or carelessly cleaned, later stages of the process

M. Hajnalová and V. Varsik (2010, 216, 217), considering Quadi/Germanic (agricultural) economy in southwestern Slovakia, stated that: "*Agriculture, which combines a wide range of more demanding crops, intensive and extensive cultivation techniques and management of small and larger areas can no longer be characterised as simple subsistence (so-called "small scale" and for own consumption). We think that it could have been able to create a "surplus product" above the own necessary consumption. Such an economy is characterised by periods of economic and social stability linked to the development of the social elite.*"

The differences based on documented cultivated cereals (crop assortment) between the Germanic and Roman-provincial environments are minimised in the context of the two studies cited and given the model used. Differences are visible in documented types of crop processing products, especially in the Late Roman period. The inhabitants of the Germanic sites may have been able to create a surplus but probably not all of them to the extent as it appears in the Roman-provincial sites (cf. Hajnalová, Rajtár 2009; Hajnalová, Varsik 2010; Hlavatá, Varsik 2019). There is also a probable difference in product storage (ears/spikelets – cleaned grain), respectively hypothetical difference in the scale of occasional processing of large crop quantities. Still, a detailed evaluation of more archaeological sites separately could show a more accurate or perhaps different picture, as the Jevišovka results suggest it.

9. Evaluation of sampled volume, number of samples and obtained macro-remains from Jevišovka site through statistical models

Peter Apiar, Jana Apiar

The results of the individual statistical models should be seen as additional arguments within the archaeobotanical interpretation, pointing primarily to the heterogeneity of the investigated group. However, it is necessary to notice this during the analysis and the subsequent synthesis of the acquired knowledge.

It is a simplification (generalisation) of the results based on few and disparate input data compared to the complexity of the investigated problem. There are also often missing (not documented) observations from a more detailed description and interpretation of archaeological situations and the samples taken from them through natural and cultural transformation processes to the very demonstration of the knowledge gained. However, the models show a particular trend, which can be used directly in practice during sampling, taking into account the research objectives. It would be a mistake and a waste not to extract as much information as possible from the available data.

By computing all statistical models here, the same workflow as in J. Apiar, P. Apiar (2021, 130–133) was followed. The so-called Generalised additive models employing the "mgcv" package (Wood 2022) in R software (RStudio Team 2019, R Core Team 2021) were used, which are an extension of generalised linear models (GLM), although GAM does not presume a normal distribution or linearity, or a parametric form of data (Faraway 2016, chapter 15; Wood 2017; Zuur et al. 2009). The words "influence" and "effect" (referred to as edf) are often used in the description. These can be taken as synonyms to a certain extent. Still, the effect refers more to the statistical aspect of the model, while influence refers to the archaeobotanical aspect. More precisely said, edf reflects the degree of non-linearity of a curve. An edf equal to 1 is equivalent to a linear relationship. As the edf increasingly exceeds 2, the degree of non-linearity progressively increases (Zuur et al. 2009, 53).

The volume of sediment collected from archaeological features and contexts (Appendix Tab. 18) has by its very nature a specific (fluctuating) effect on the number of macro-remains obtained. This conclusion is based on the assumption that the analysed dataset (Appendix Tab. 31) comes from several collected samples of different volumes, at least some containing carbonised macro-remains (a more or less common result of non-systematic sampling).

9.1 Model 1

Model 1 (Fig. 62) has a considerable effect (Tab. 14) of volume on the amount of carbonised PMRs (plant macro-remains). Regarding the smooth function (curve), the effect is not linear and explains only 29.6% of data variability. However, in this case, the effect is caused by a deliberate reduction of the gamma (Wood 2022) penalisation of the smooth function from the recommended 1 or 1.4 (Wood 2006, 227; Zuur et al. 2009, 242; Apiar, J., Apiar, P. 2021, Tab. 2) to 0.1. This is because, at the recommended gamma values, the volume effect almost disappeared (but remained statistically significant), indicating a linear relationship between volume and carbonised PMRs. By reducing the penalisation, it was possible to balance the complexity with the fit of the data, capture the nuances within the model and achieve smooths that are wiggly enough.

From model 1 (Fig. 62), it is apparent that the effect on the amount of obtained PMR is manifested in different volume categories. A smaller effect is mainly caused by small samples between approximately 5 and 10 litres. This is not surprising since they made up almost half of all samples collected from the site. A slightly more significant effect is seen in medium-sized samples with a volume of around 15 litres; the largest effect is seen in "large" samples of more than 20 litres. A certain

Tab. 14. Jevišovka. Results of individual models. Response – explained variable; Function – smooth function; k – node value for basis function; edf – effective degrees of freedom; p-value – probability value; k-index – the further below one this is, the more likely there is the missed pattern left in the residuals; R2 (adj) – coefficient of determination; Dev. expl. (%) – null deviance (percentage of explained variability); REML – p-likelihood maximisation method; AIC – Akaike information criterion; Disp./Dispersion – the value of dispersion; g/gamma – increases or decreases the degree of smooth wiggliness; n – number of observations. PMR_carb – plant macro-remains carbonised. Author: P. Apiar, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

Model	Response	Smooth function	k	edf	p-value	k-index	R2 adj	Dev. expl. (%)	REML	AIC	Disp.	g	n	Matrix
1	PMR_carb	s(volume)	10	8.5	<2e-16 ***	0.8	0.3	29.0	6940.9	1405.0	1.4	0.1	180	**Samples**
2	PMR_carb	s(volume)	10	2.1	0.000243 ***	1.1	0.5	53.0	92.0	191.5	0.9	1.0	15	**Features**
3	PMR_carb	s(volume) + s(sample)	5, 5	1.0 2.4	0.0272 * 0.0628 .	1.2 0.9	0.8	62.5	91.0	190.0	0.8	1.0	15	
4	PMR_carb	ti(volume, sample)	4	3.4	2.57e-07 ***	0.7	0.005	64.5	92.8	191.0	0.8	1.0	15	
5	samples	s(pottery)	10	2.2	<2e-16 ***	0.6	0.5	60.8	61.4	171.0	1.8	1.0	32	

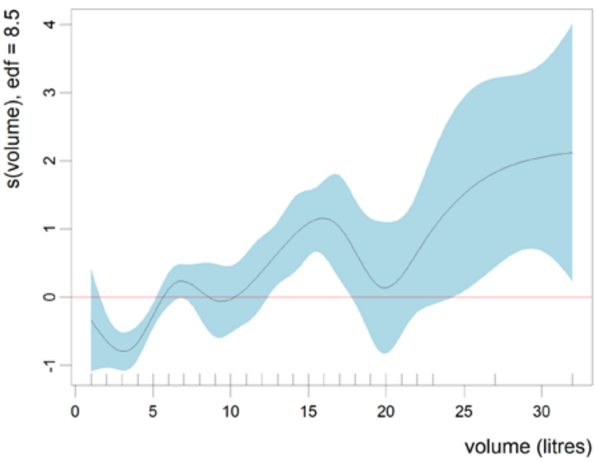


Fig. 62. Jevišovka. Model 1. The relationship between the number of carbonised macro-remains and the sample volumes. X-axis – volume in litres; edf – 8.5; blue colour – 95 % confidence interval for the mean shape of the effect. Author: P. Apiar. ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

linear trend emerges in model 1 (Fig. 62) and indicates that with "larger" samples, there is a chance to obtain a higher number of PMRs. However, this conclusion is somewhat misleading, especially because during the excavation in Jevišovka, only 7 of the total 207 samples were taken, the volume of which was 20 litres or more. This was also reflected in the highest degree of uncertainty (95% confidence interval for the smooth, coloured in blue), which limits their comparative possibilities with other volume categories.

Volume is the only input variable (predictor) in this model, so given the above assumption, it stands to reason that it will always affect the number of macro-remains obtained.

The same parameters were also used in modelling the relationship between sample volumes and numbers of determined plant species. This model largely copies model 1 both statistically and interpretively and is therefore not presented further here.

9.2 Model 2

Considering features (model 2, Fig. 63 – calculated feature sampled volumes), feature superpositions 039 and 080 were removed. Especially in feature 039, the superposition of La Tène and Roman period components (even perhaps multiple) was challenging to distinguish. However, the features in the superposition (039 and 080) are precisely those with the highest numbers of PMRs. In the case of feature 080, the situation was also distorted because the more significant amount of macro-remains came from the small number of samples analysed thus (4). This acted as an outlier in the model. Postholes 042 to 057 belonging to the above-ground structure were aggregated into one feature.

Model 2 (Fig. 63) shows a similar situation to model 1 (Fig. 62) in the sense of a particular upward trend, where a higher amount of sediment collected from the feature, the chance of capturing a larger amount of carbonised PMRs also increases.

This seems obvious at first glance, but before evaluating the feature, it is advisable to consider all available (not only) archaeological knowledge about the given feature and its surroundings. It is well documented that the numbers of preserved macro-remains and taxa in samples reflect, in a way, their handling before or the manner of their deposition. As both the origin of the sampled population (when we talk of "multiple event contexts"; cf. Hajnalová 2012, 33, 95; Kuna et al. 2013, 71–74; cf. Lityńska-Zając, Wasylikova 2005, 160–162), and the preservation of remains affect the resulting abundance of macro-remains.

The effect of this model is lower than that of model 1 (but still statistically significant; Tab. 14), taking into account the lower degree of penalisation (Tab. 14). It explains more of the data variability (52%) than the first model. It suggests that the total volume of sediment sampled from the site can substantially affect obtaining the abundance of PMRs.

9.3 Model 3

In the third model (Fig. 64), another variable was added to the volume equation – the number of samples taken from the feature (Tab. 14). This caused the total volume collected from the feature to completely lose its effect (Tab. 14). Thus seemingly does not at all affect the number of potentially recovered macro-remains from the feature. On the contrary, the number of samples taken becomes the main and only factor, explaining 63% of the variability, but statistically with a borderline p-value (Tab. 14). One of the reasons for this behaviour can be found in the direct relationship between the collected volume of sediment and the number of samples, into which it was divided, within the same feature. With more samples, the total volume collected from the same feature automatically increases so that one can exclude the other. It is all the more interesting that unlike the second model (Fig. 63), where higher volumes collected per feature have an increasing trend, higher numbers of samples taken per feature have a decreasing trend. The most significant effect is manifested by five up to 20 samples collected per feature. It is evident that while this direct relationship is valid in the same feature, it is not valid in a group of several features unless a constant sampling method is employed, including stable sample volumes.

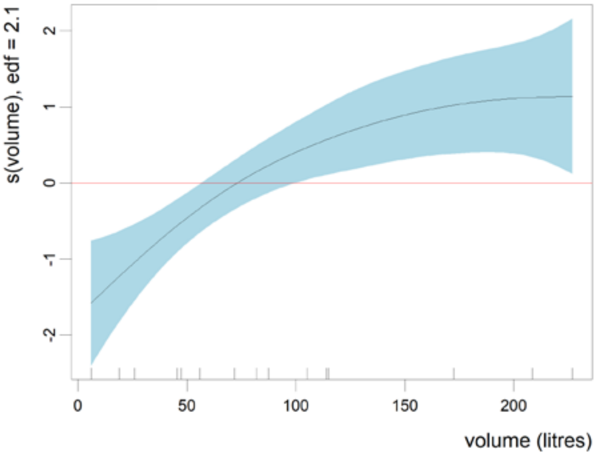


Fig. 63. Jevišovka. Model 2. The relationship between the number of carbonised macro-remains and the sample volumes. X-axis – volume in litres; edf – 2.1; blue colour – 95 % confidence interval for the mean shape of the effect. Author: P. Apiar. ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

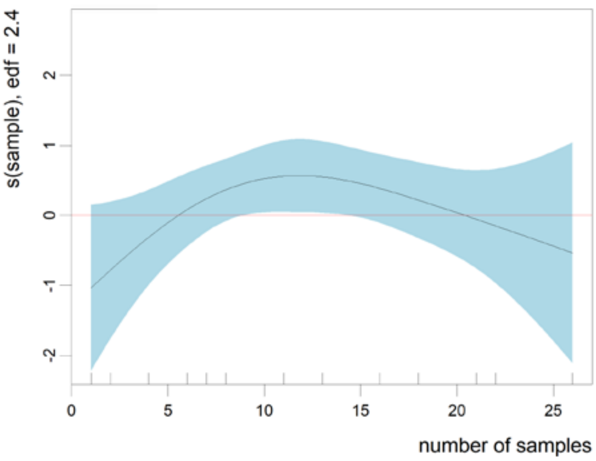


Fig. 64. Jevišovka. Model 3. The relationship between the number of carbonised macro-remains and the number of collected samples from features. X-axis – number of samples collected from features; edf – 2.4; blue colour – 95 % confidence interval for the mean shape of the effect. Author: P. Apiar, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

9.4 Model 4

The fourth model (Fig. 65), calculated using the ti tensor (Wood 2017; 2022), represents the mutual effect (interaction) of the number of samples and the amount of sediment volume taken per feature. It also illuminates the apparent contradiction between the second and third models.

It is clear from the model (Fig. 65) that the mutual interaction of the volume taken and the number of samples collected manifests itself in a higher number of samples per feature with a smaller volume per sample. Compared to models 2 or 3, this difference may take time to be noticeable. A similar percentage of the explained variability in all three models indicates that there is still a lot of room for additional, so far hidden variables that could refine the results of the models. One such variable, crucial in archaeology, is spatial information. Samples inertly contain spatial information, unfortunately, often only vaguely recorded. According to the find report (Komoróczy et al. 2013) and the chief excavation technician, the samples were taken from different places and levels (M. Lukáš 2014, personal communication). However, these data were not recorded more specifically during the research. The spatial distribution of samples within the features probably acts here as a hidden variable (among others), which can potentially impact the overall representativeness of the archaeobotanical collection (cf. Fig. 35; Appendix Tab. 16, 31, 32). However, this assumption could not yet be verified based on the analysed assemblage (or other available sets).

Within the excavated pithouses, 50% of samples were collected from interior postholes. The remaining samples were taken from other interior pithouse layers and, in one case, from a grave deposited inside a pithouse. The proportion of pithouses and other features at the Roman period settlement was 1 to 3. However, from the pithouses were collected three times more samples compared to the other archaeological

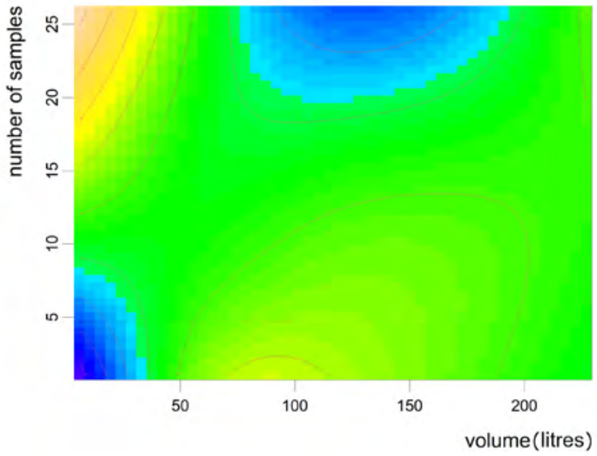


Fig. 65. Jevišovka. Model 4. The interaction (effect) between the collected volumes, number of samples and carbonised macro-remains. X-axis – volume in litres collected from features, Y-axis – number of samples collected from features. Yellow to white – strongest interaction, dark blue – weakest interaction. Author: P. Apiar, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

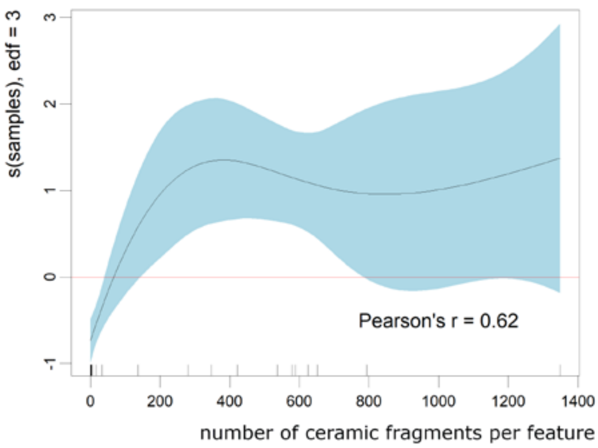


Fig. 66. Model 5. The relationship between the number of ceramic fragments and collected samples from features. X-axis – number of ceramic fragments collected from features; edf – 3; blue – 95 % confidence interval for the mean shape of the effect. Author: P. Apiar. ARÚB. Source archaeobotanical data: J. Apiar, ARÚB. The number of ceramic fragments after Zelíková 2019; Sofka in prep.

features. A partial subjectivity of sampling is visible due to preferences (or assumed potential) of features to be sampled. Still, the archaeobotanical analysis did not show a generally higher abundance of macro-remains in individual samples taken from pithouses than in those collected from other features. At the same time, it cannot be stated that the samples collected from interior postholes are significantly more abundant than samples taken from other interior layers of the pithouses.

It is not possible to compare it objectively because the ratio of the sampled volume to the total idealised volume of the pithouses fills is very low (cf. Fig. 35; Appendix Tab. 16, 17, 22, 31, 32). Considering pithouse fills, it was mostly less than 3 % or less than 1 % of the sampled volume.

The macro-remains amount differences are manifested primarily at the chronological level – features 039 and 080 (La Tène/Roman period superpositions) contained significantly higher numbers of macro-remains compared to features from the Roman period.

9.5 Summary

Overall, it can be summarised that the results of all four statistical models for the archaeobotanical assemblage from Jevišovka more or less correspond to the results of the models calculated for all sites (Apiar, J., Apiar, P. 2021, 141–143). Thus that the higher "archaeobotanical" representativeness of the site (feature or context) has a closer relationship to the number of samples taken of a "smaller" volume from a wider area of the site (feature or context, Apiar, J., Apiar, P. 2021, 143). Specifically, it shows the importance of the spatial distribution of samples within one feature or layer and the percentage of the coverage of this space by sampling.

More from curiosity, the fifth and final statistical model (Fig. 66, Tab. 14) was calculated to find a potential relationship between the number of collected samples per feature and the number of found ceramic fragments per feature (Appendix Tab. 32). Model 5 is statistically significant and even explains 60 % of the variability of data. It is nicely visible here that the number of collected pottery fragments from the features also affects the number of collected samples. This is a typical result of the judgmental sampling method, where the features with more finds would be more promising to gain some or more archaeobotanical material. However, this is at the expense of archaeobotanical representativeness at the site. Of course, other external reasons were omitted in this model, but this "trend" presents quite well the method of sampling at the Jevišovka site. It is just another reason to remain cautious before uncritically relating archaeobotanical results to a broader region.

Above all, these results are important regarding the interpretation of the archaeobotanical assemblage and its inclusion in the archaeological interpretation. It is necessary to consider the representativeness of plant species from Jevišovka, and the resulting plant production, subsequently reflected in the economic-ecological background of the site, is primarily conditioned by the sampling method. Also, increased caution is recquired when applying the results to the broader region. The example of Jevišovka shows how complicated it is to evaluate a single site if it is unsystematically investigated or provides a large amount of heterogeneous data. The broader the region the results are applied to, the more cautious we have to be with the generalisations of the results.

10. Conclusion and discussion to the interpretation of results

Jana Apiar

Thanks to extensive analysis, several results were achieved and can be interpreted in the context of the investigated issue. For better understanding, they are described in points:

1. Differences between the examined sets exist and can be observed to a different extent and at several levels (see below). The results for the Jevišovka assemblage suggest that the transitional zone in-between the Limes area and deeper Barbaricum might be traceable. It might manifest itself in the composition of macro-remains, their density, and the combination of products and by-products of the post-harvest crop treatment process.
2. Based on the assortment composition, the primary finding is that the Roman-provincial sites, i.e. sites from the Limes area in present-day Slovakia, differ from the Germanic sites from Slovakia, Bohemia and Moravia. However, these differences are not as clear-cut as stated in the literature published concerning investigated territory:
   a. Differences in assortment, as long as they are evaluated based on the ubiquity of cereal species in archaeobotanical samples and, in summary, for regions, are almost identical, as described by M. Hajnalová, V. Varsik 2010 and P. Kočár, D. Dreslerová 2010. The ubiquity of barley finds, which also prevail at Roman-provincial sites, changes slightly. For example, in northern England, barley could have been consumed by people more frequently or in larger quantities. That is suggested by archaeobotanical analyses of cereal food fragments in faecal material from several archaeological sites (Britton, Huntley 2011; cf. van der Veen 1992). Archaeobotanical remains also indicate that it "...*may have been grown locally and was being stored and eaten regularly at the Roman military as well as at civilian sites*..." (Britton, Huntley 2011, 42, with additional refs.) despite written sources, where barley is often depicted as an inferior crop.
   b. The differences in the proportions of plant species at the individual sites, based on various data conversions (MNI, density, ubiquity, nutritional value, weight), are unique. Consequently, it is problematic to determine wider regionally similar groups of sites (e.g. Roman-provincial group, group of Germanic sites; the so-called Simpson's Paradox).
   c. Differences in cereal and other crop production, i.e. from the existence of differences in the types of reserves and wastes, as well as their ratios, between some of the Roman-provincial and Germanic sites, are present.
   d. It was also possible to partially demonstrate differences in plant production between sites from the Early and Late Roman periods.
   e. In the Early Roman period, reserves and waste type differences between sites are less pronounced. Roman-provincial sites, based on product types and in this period, are more similar to Germanic sites. The difference is primarily the higher density of macro-remains in samples from Roman-provincial sites, i.e. sites in the Limes area (higher concentrations of cereal grains and macro-remains in general).
   f. In some sites, in the Limes area, stores of (un) threshed ears and waste from processing these products prevailed in the Late Roman period. At the Germanic sites from this period located further north of the Limes, several different types of reserves and waste were found in a more balanced ratio.
   g. At sites from both cultural environments, it was possible to document the earlier (winnowing or

threshing) and later (sieving or hand sorting) phases of the post-harvest treatment of crops.

h. In the Jevišovka assemblage, more samples indicated the process's first and third stages-threshing, winnowing, and fine-sieving. Some also cleaned dehusked grain as the fine-sieving product, but still with the predominance of the unthreshed ears/spikelets reserves. It depicted the result of the Jevišovka analysis as partly different from the other Germanic sites. Perhaps even belonging in-between the Limes and Barbaricum area.

The main aim of the research – to determine whether there are differences in plant production and the treatment of these products at Germanic and Roman-provincial sites – was achieved.

The above statements allow speculation on the possible manifestation of these differences in the economic sphere. The differences in the detected types of products, the stages of the crop processing and the density of macro-remains point to partially different economic strategies (?) of the studied environments.

Crop products in the Limes area sites demonstrate the presence of highly concentrated finds of cereal grains, chaff, straw and other crops. According to some economic models, along with defined types of products, they could refer to the presence of a population that may have been able to assemble a larger workforce, process a more significant amount of products, and potentially trade those products. However, such a claim, based on the presented state of research, would require more support from the sources.

Finds of products at Germanic sites in Slovakia, Moravia and Bohemia differ from products from Roman-provincial sites, i.e. the area on and near the Limes. The composition of product types – a more balanced representation of all kinds with a predominance of cleaned grain stores – can also point to a subsistence strategy (?) aimed at the production of low-volume – smaller but completely cleaned crop stores (cf. Fuller, Stevens 2009, 46–48), most often, probably right before consumption. It can further point to the ability or the need to assemble a smaller workforce (?) corresponding to, e.g., smaller social units – individual households or a smaller community (?). At the same time, however, this is in partial contradiction with already published interpretations (cf. Hajnalová, Varsik 2010, 216), but also with large-scale finds of cereals originating from the Barbaricum area. As with the Limes sites, similar hypotheses need more source support compared to the current state of research.

It is impossible to rule out that the economy of the Germanic population in Barbaricum in the territory of Slovakia and Moravia, or in the transitional ("third") zone, really differed from the more western areas of Barbaricum (cf. Kreuz 2004, 237; Hajnalová, Varsik 2010, 216). Some results of archaeobotanical analyses suggest that such differences may be present (e.g. Jevišovka).

Despite the overall similarity of Germanic sites, tracing smaller groups of sites in Barbaricum that differ from each other is possible. Based on the composition and ratio of individual crops and their products, Germanic sites from the Limes zone may be more similar to Roman-provincial sites. Germanic sites from the deeper Barbaricum region in Slovakia may be similar to more distant Germanic sites from the territory of the Czech Republic. However, the low number of these sites, including the samples taken, does not yet allow relevant comments on their similarities with other regions.

From a chronological point of view, there have been minor differences in handling plant products (treatment and storage) between Roman-provincial and Germanic sites in the Early Roman period. In the Late Roman period, these differences gradually deepened.

Based on the available archaeological information or with the help of statistical analysis, the association of particular feature or context types with specific types of macro-remains or products within the sites (e.g. a particular type of feature intended for storage, Jevišovka above-ground structure postholes 042–057) has not been proven. On the contrary, the analyses showed that the features or contexts are more or less unique in their species or product composition. Their detailed evaluation and other types of finds could bring more substantial interpretations.

Several foreign authors (in summary Fuller, Stevens 2009, with additional refs.; van der Veen, Jones 2006, with additional refs.) pointed out the importance of linking archaeobotanical with archaeological research (in the sense of feature analysis). Only with a comprehensive analysis of the archaeological site, i.e. the analysis of individual discovered archaeological features and finds, is it possible to comment comprehensively on economic activities, whether in connection with the production of plant food or other activities. In several archaeobotanical works from the observed region, related to the Roman period, the authors considered in more detail the reflection of proven archaeobotanical results in the archaeological manifestation of the investigated sites (cf. Hajnalová, Rajtár 2009; Hajnalová, Varsik 2010; Varsik 2011a; 2011b; Komoróczy et al. 2014; Krčová 2016; Hajnalová et al. 2018; Hlavatá, Varsik 2019; Komoróczy et al. 2019; Němcová et al. 2020; Šálková 2020 and others). However, it follows from them that there is still a lack of compatible information on the possibility of linking archaeobotanical and archaeological knowledge (summarised, for example, Krčová 2016; Apiar, J., Apiar, P. 2021). Here it is meant 1) the contextual origin of archaeobotanical samples about which there is little or often no information recorded; and secondly, 2) the scarcity of archaeobotanical finds from particular excavations caused by the judgemental "sampling" method of "picking out single finds and giving them to archaeobotanists to analyse". It is necessary to recognise that archaeobotanists were often pushed to the edge of interest during older excavations and thus only got access to material that was "selected" for them by the archaeologist. However, today, it is no longer considered sufficient to base interpretations of the environment with "individual grains" (Kočár, Dreslerová 2010, 205; Hajnalová 2012, 33–35; cf. Komoróczy et al. 2019, 15, 16, etc.).

There are only a handful of publications in which comprehensive information obtained from archaeological investigations of Roman period sites were evaluated. That includes a detailed description of situations, finds, detailed descriptive drawings and metric documentation, and a detailed description of the contexts from which the archaeobotanical samples were taken suitable for further analyses. In summary, several studies evaluated, for example, finds of agricultural tools or finds in storage pits at Roman period sites (both Hajnalová, Varsik 2010; Varsik 2011b; Krčová 2016; cf., e.g. Žaža 2015).

Sampling in Jevišovka, as described before, was partly systematic – in the sense of sampling more or less all discovered features, and partly judgemental – not sampling the fill of features representatively. Although the site is not the case of hand-picking archaeobotanical finds from the trench, it can be said it was sampled "standardly" – without paying special attention to obtain representative results from the archaeobotanical analysis. Until now, only some archaeological material collected from the site during excavation is processed. This is mainly pottery (Zelíková 2019; Sofka in prep.). Therefore, further synthesis of archaeobotanical finds with other archaeological finds from the site (cf. Jurkovičová et al. 2017; Sahulová 2019) will be necessary to complete in the future.

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Appendix

Figures

Tables

Plates

List of abbreviations

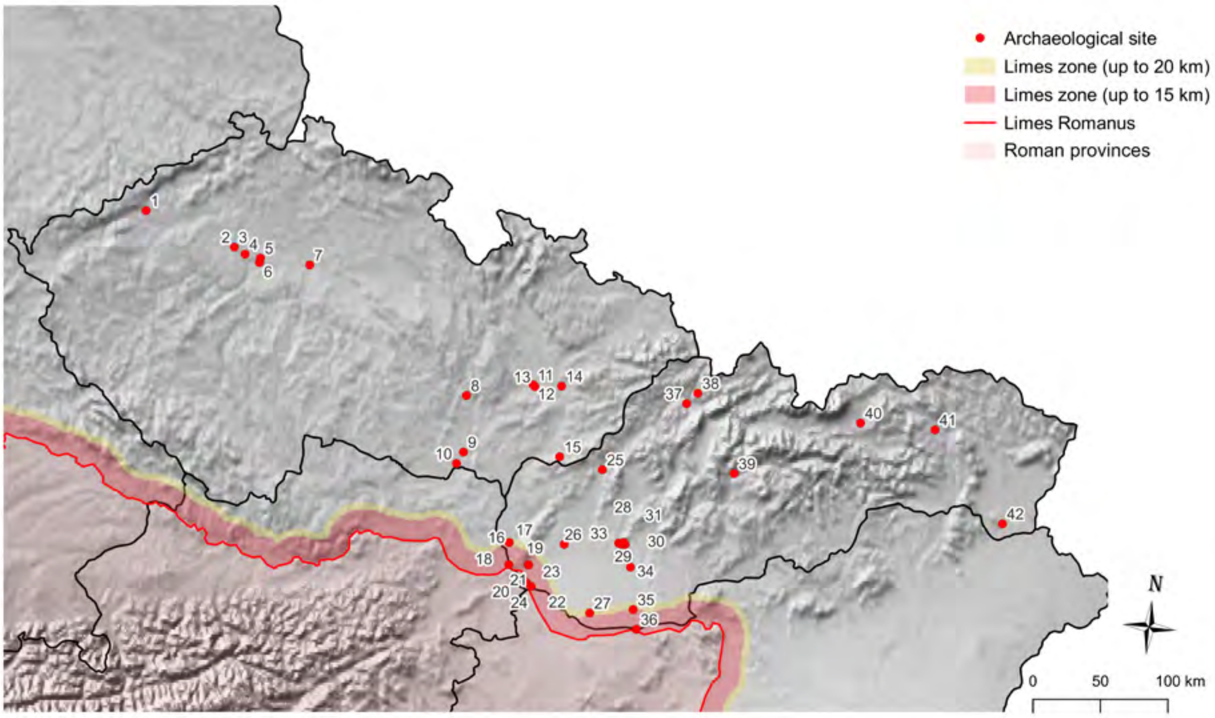


Fig. 67. Map of archaeological sites (the comparative assemblage) with collected archaeobotanical samples, from which the plant macro-remain determination results were made available and further analysed during the lead author's doctoral research. For authorship of particular primary analyses and additional info, see Appendix Tab. 15; cf. Hlavatá 2017. 1 – Droužkovice; 2, 3 – Holubice; 4 – Roztoky; 5 – Praha-Kbely; 6 – Praha-Hloubětín; 7 – Pečky; 8 – Ivanovice; 9 – Pasohlávky; 10 – Jevišovka; 11–13 – Vrchoslavice; 14 – Hulín-Pravčice 2; 15 – Hrubá Vrbka; 16 – Zohor; 17 – Bratislava-Devín; 18–20 – Bratislava-Trnávka; 21–23 – Bratislava-Rusovce; 24 – Bratislava-Čunovo; 25 – Beckov; 26 – Cífer-Pác; 27 – Veľký Meder; 28–33 Nitra; 34 – Komjatice; 35 – Hurbanovo; 36 – Iža; 37 – Žilina-Závodie; 38 – Lopušné Pažite; 39 – Banská Bystrica; 40 – Vrbov; 41 – Medzany; 42 – Zemplín. Authors. P. and J. Apiar, ARÚB.

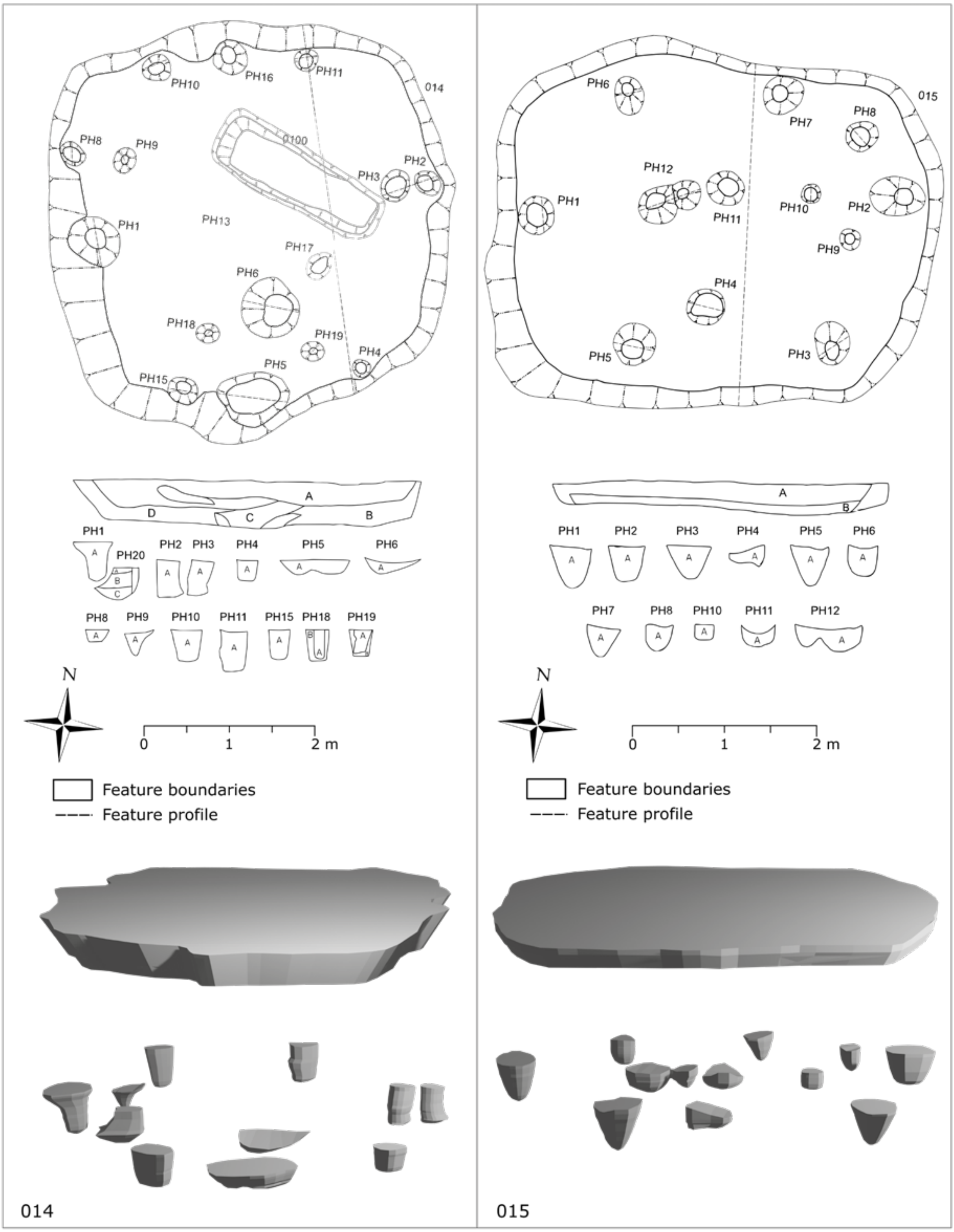


Fig. 68. Jevišovka. Features 014, 015. Top – layout of the excavated archaeological feature in a ground and section plan, after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Author: M. Kmošková, ARÚB. Bottom – 3D model of the excavated archaeological feature. Authors: A. Szabová, Z. Porubčanová, ARÚB.

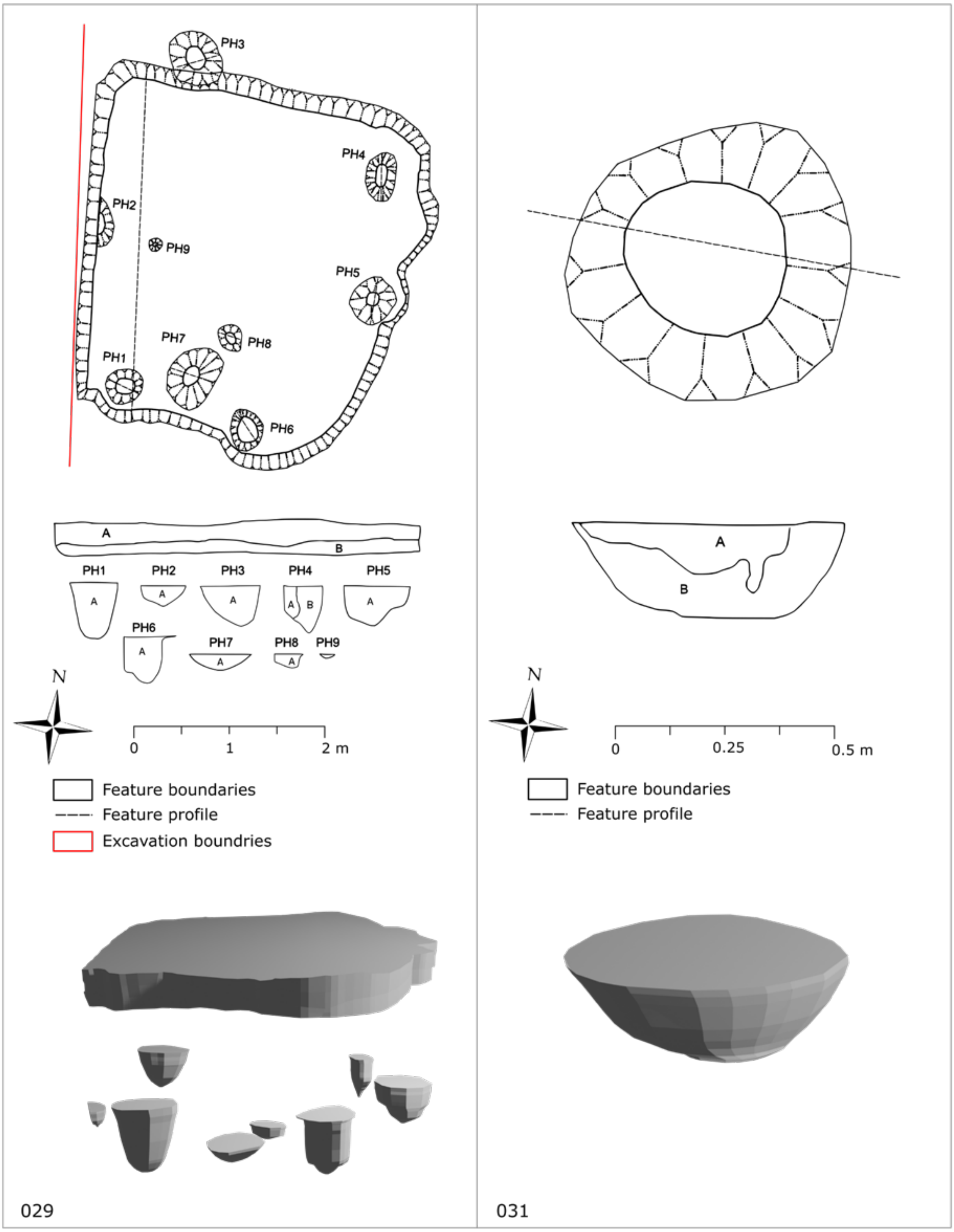


Fig. 69. Jevišovka. Features 029, 031. Top – layout of the excavated archaeological feature in a ground and section plan, after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Author: M. Kmošková, ARÚB. Bottom – 3D model of the excavated archaeological feature. Authors: A. Szabová, Z. Porubčanová, ARÚB.

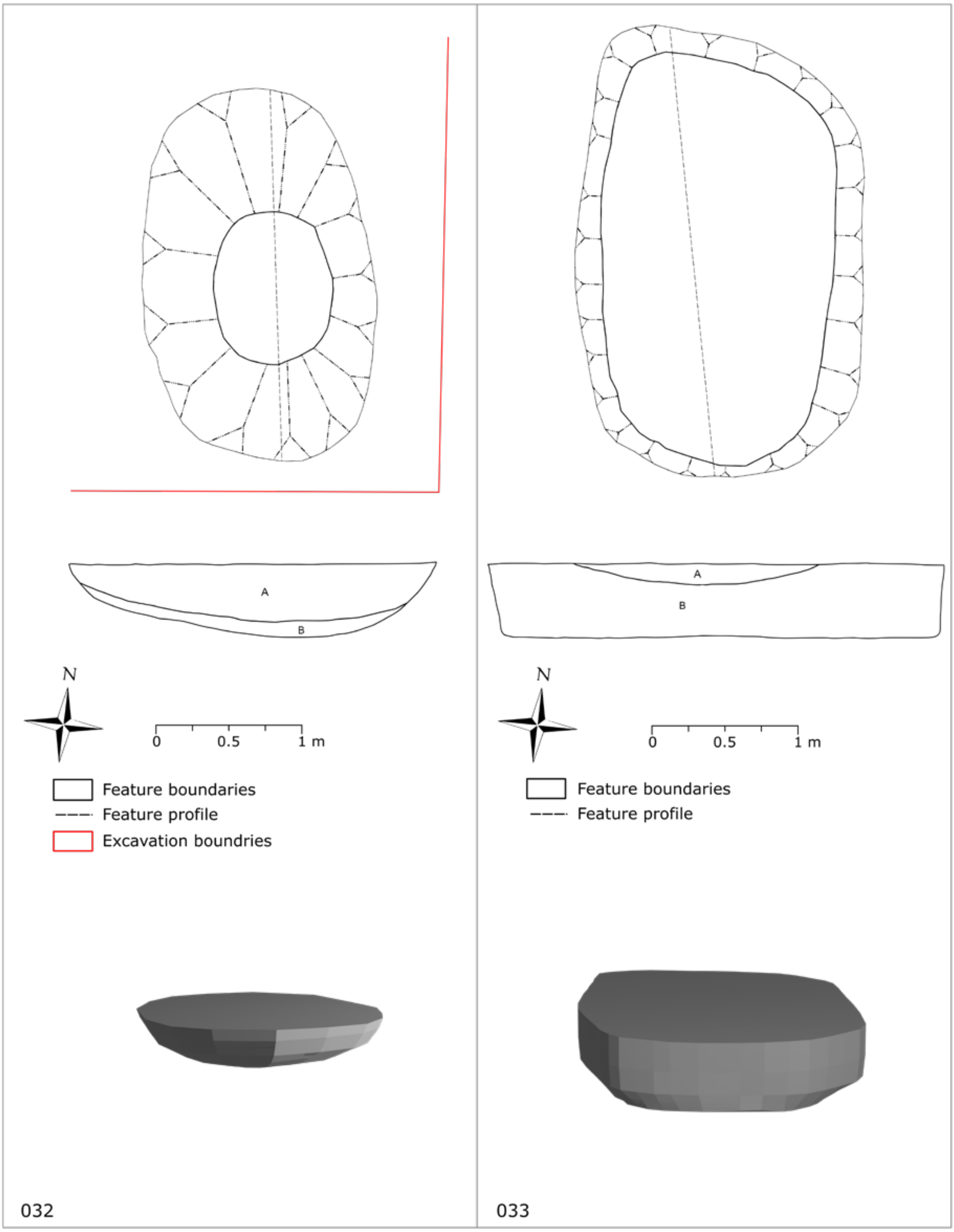


Fig. 70. Jevišovka. Features 032, 033. Top – layout of the excavated archaeological feature in a ground and section plan, after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Author: M. Kmošková, ARÚB. Bottom – 3D model of the excavated archaeological feature. Authors: A. Szabová, Z. Porubčanová, ARÚB.

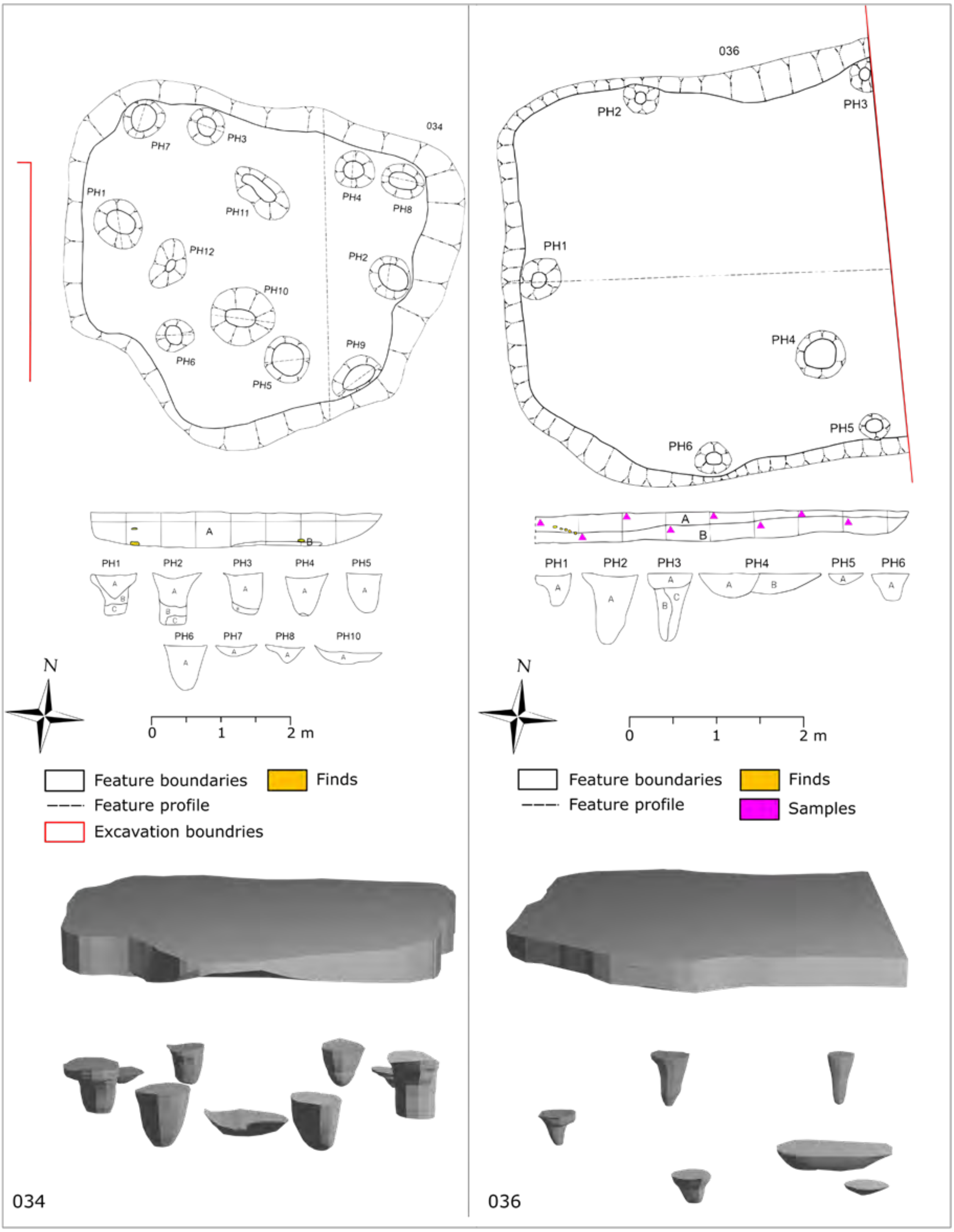


Fig. 71. Jevišovka. Features 034, 036. Top – layout of the excavated archaeological feature in a ground and section plan, after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Author: M. Kmošková, ARÚB. Bottom – 3D model of the excavated archaeological feature. Authors: A. Szabová, Z. Porubčanová, ARÚB.

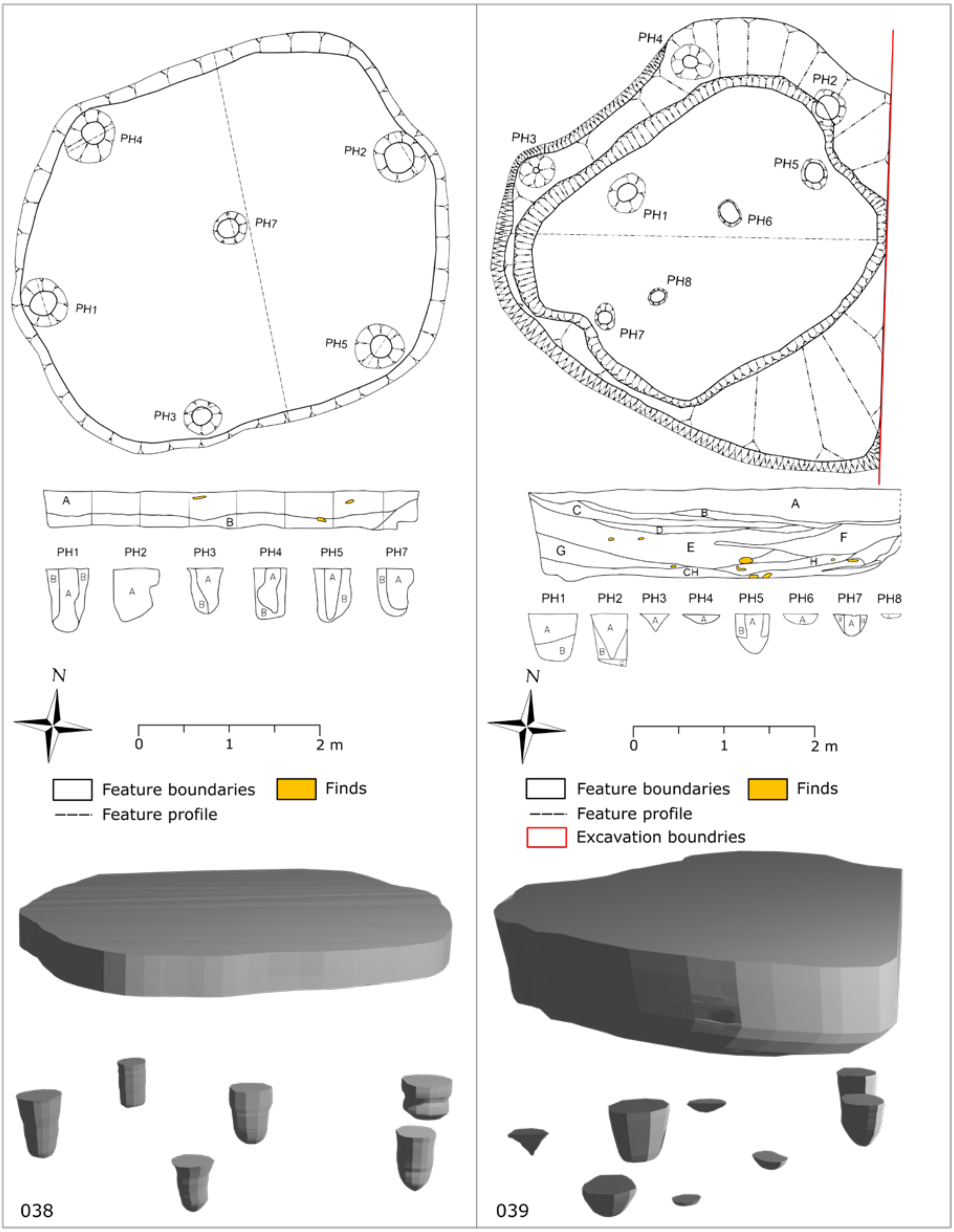


Fig. 72. Jevišovka. Features 038, 039. Top – layout of the excavated archaeological feature in a ground and section plan, after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Author: M. Kmošková, ARÚB. Bottom – 3D model of the excavated archaeological feature. Authors: A. Szabová, Z. Porubčanová, ARÚB.

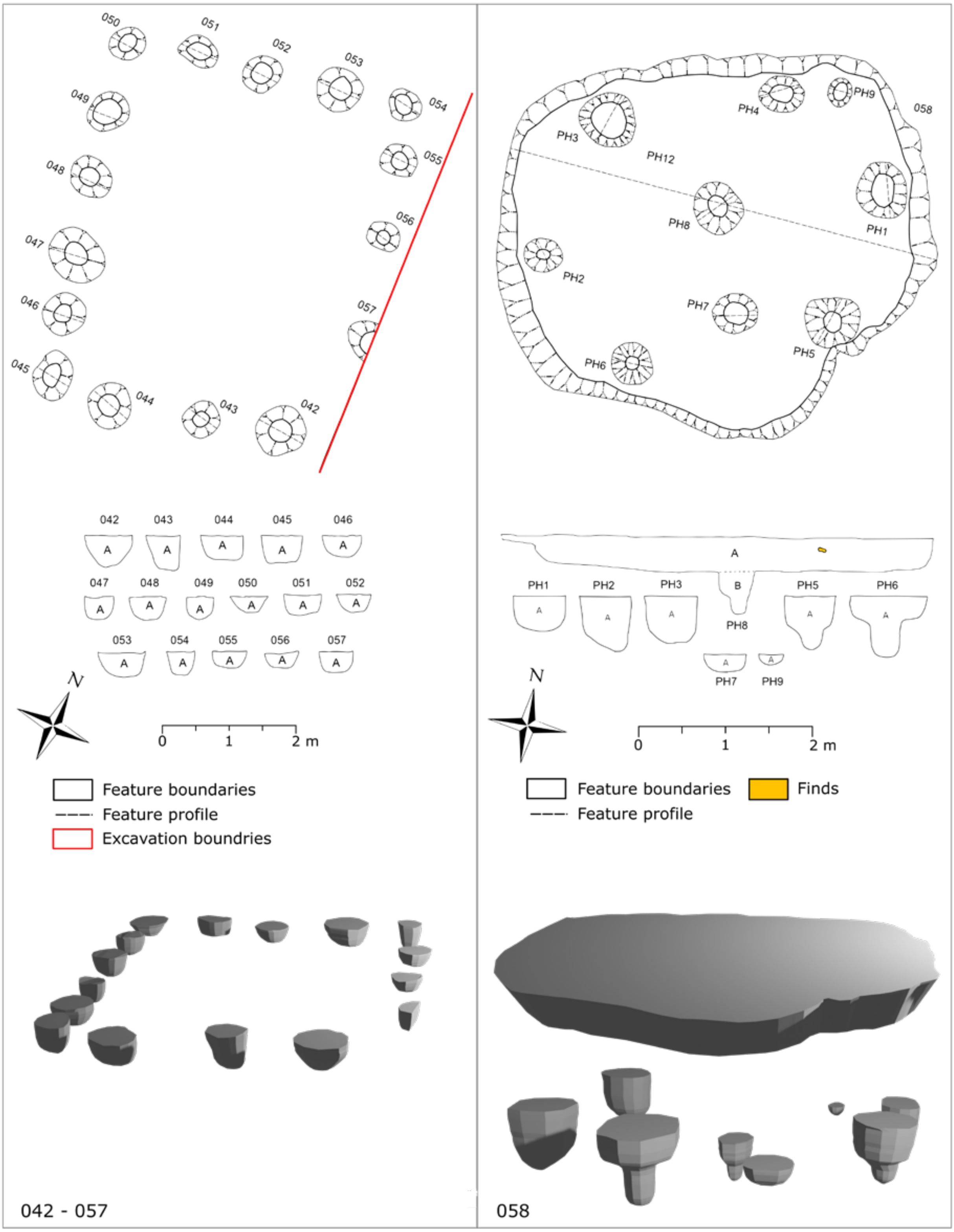


Fig. 73. Jevišovka. Features 042–057, 058. Top – layout of the excavated archaeological feature in a ground and section plan, after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Author: M. Kmošková, ARÚB. Bottom – 3D model of the excavated archaeological feature. Authors: A. Szabová, Z. Porubčanová, ARÚB.

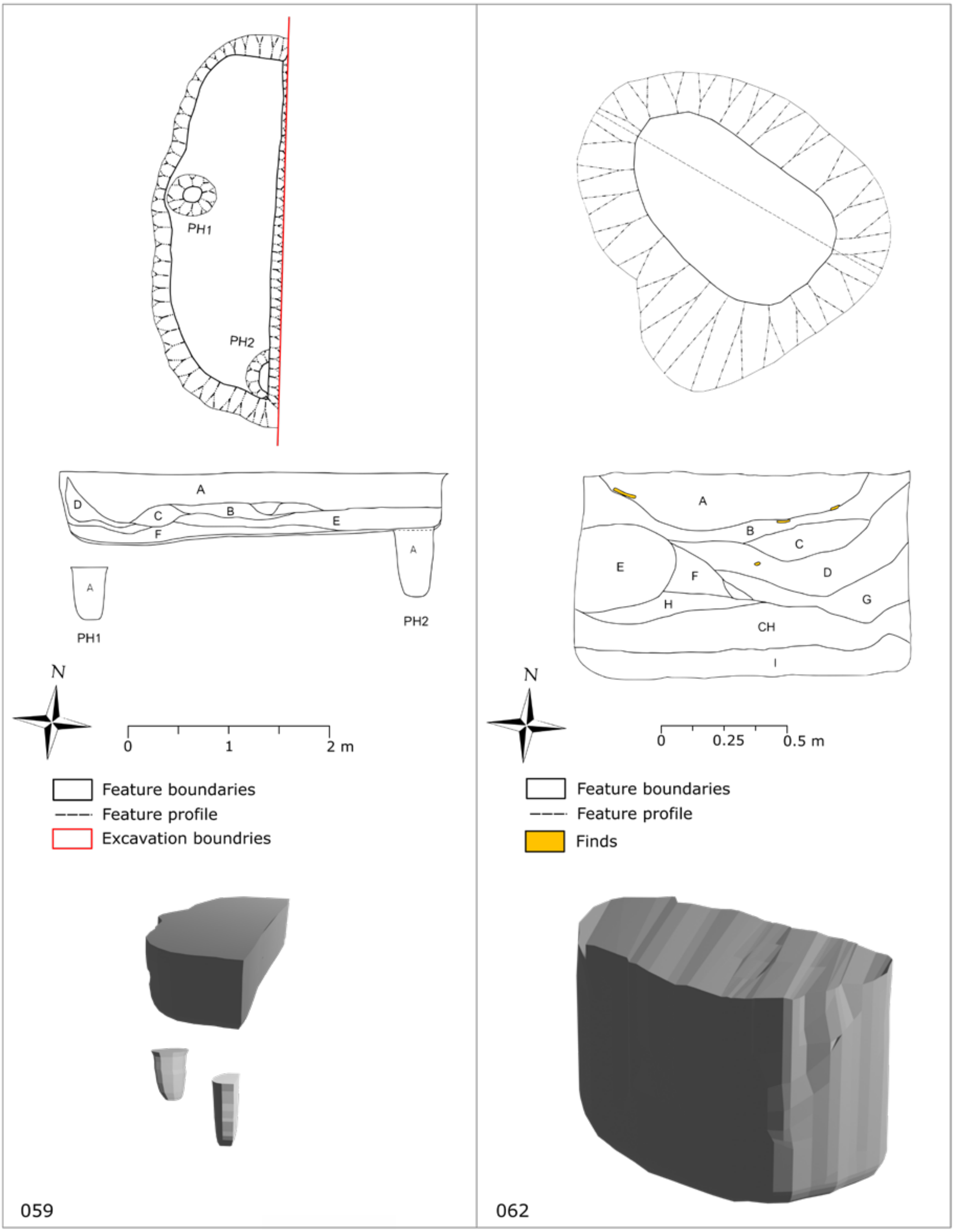


Fig. 74. Jevišovka. Features 059, 062. Top – layout of the excavated archaeological feature in a ground and section plan, after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Author: M. Kmošková, ARÚB. Bottom – 3D model of the excavated archaeological feature. Authors: A. Szabová, Z. Porubčanová, ARÚB.

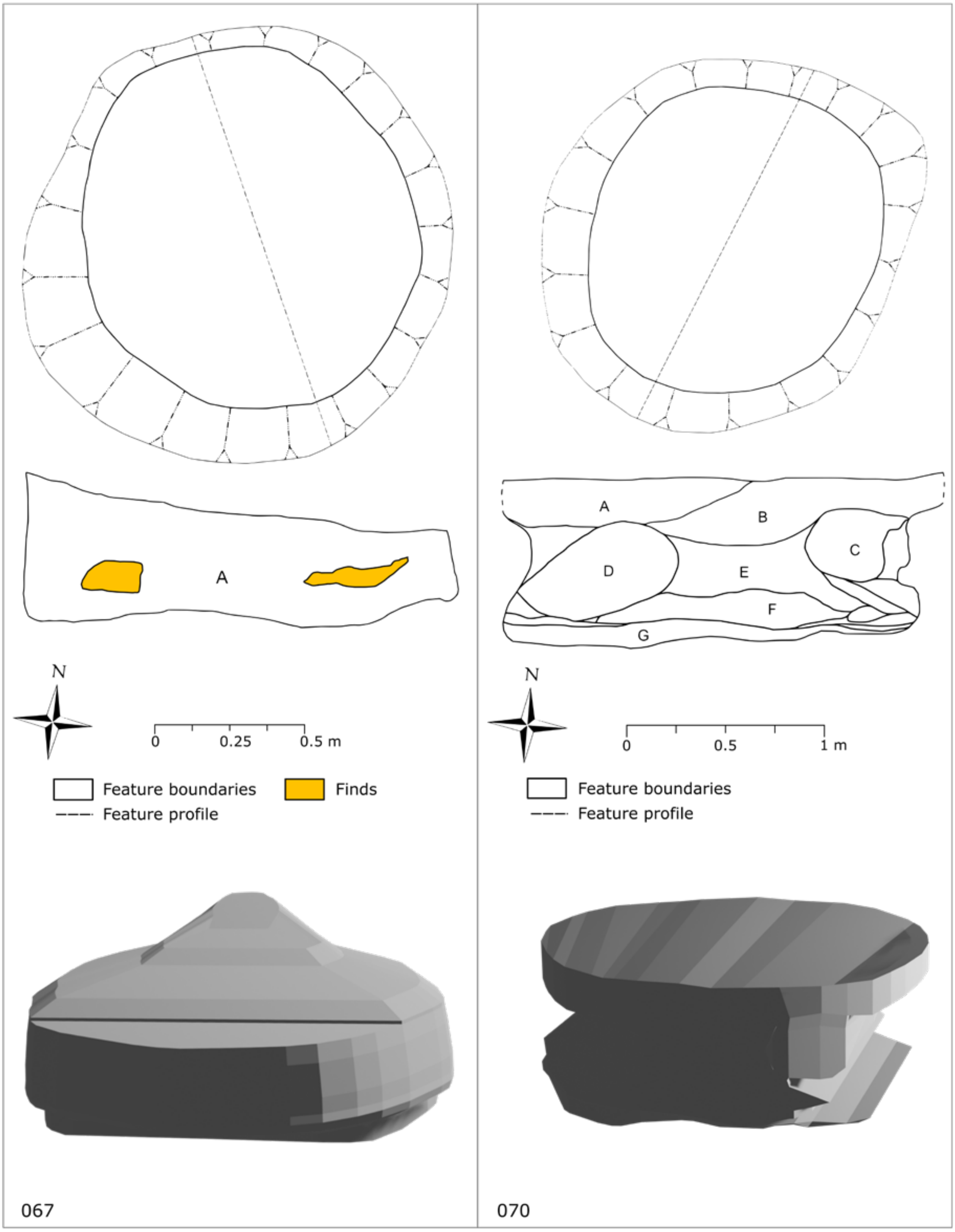


Fig. 75. Jevišovka. Features 067, 070. Top – layout of the excavated archaeological feature in a ground and section plan, after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Author: M. Kmošková, ARÚB. Bottom – 3D model of the excavated archaeological feature. Authors: A. Szabová, Z. Porubčanová, ARÚB.

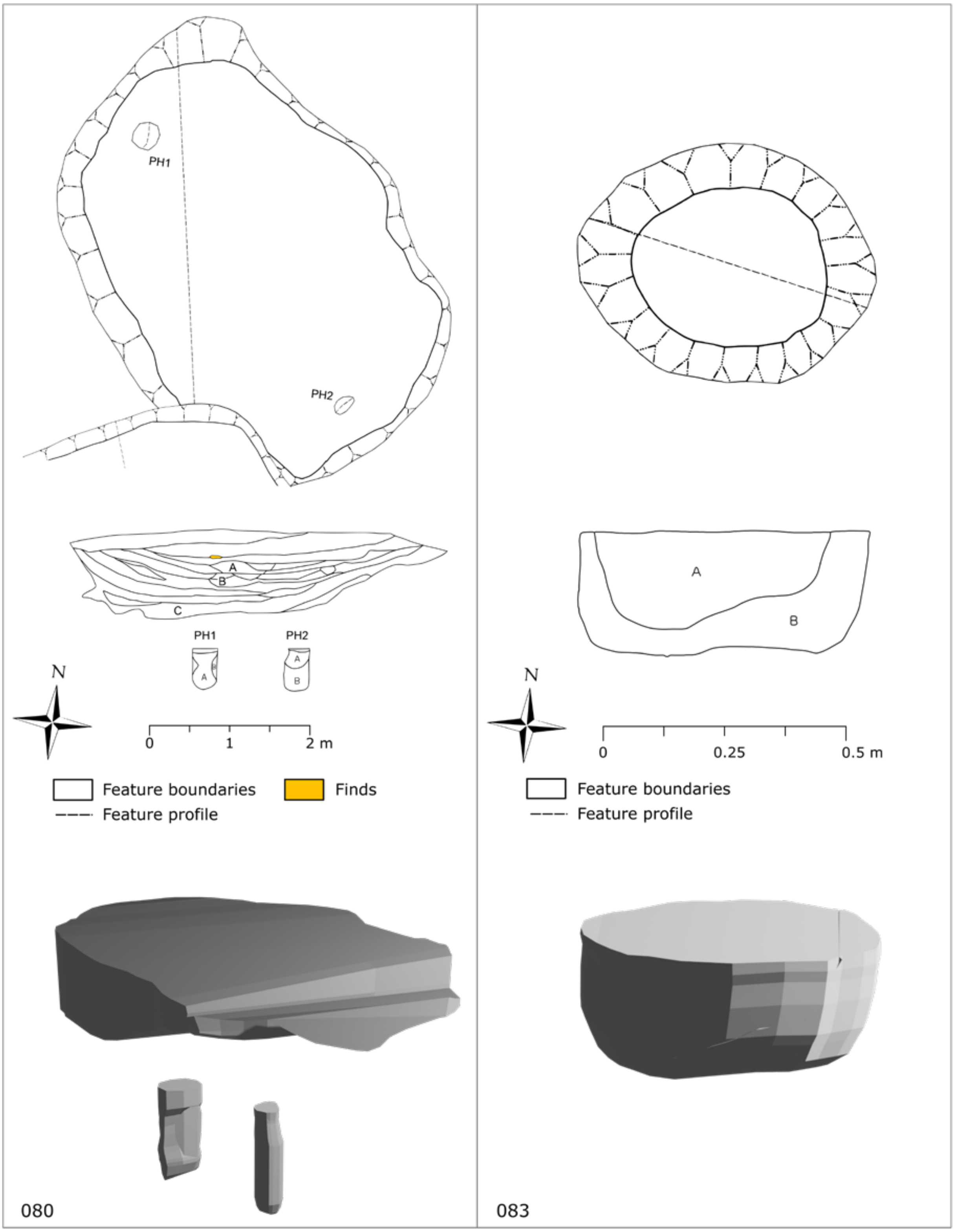


Fig. 76. Jevišovka. Features 080, 083. Top – layout of the excavated archaeological feature in a ground and section plan, after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Author: M. Kmošková, ARÚB. Bottom – 3D model of the excavated archaeological feature. Authors: A. Szabová, Z. Porubčanová, ARÚB.

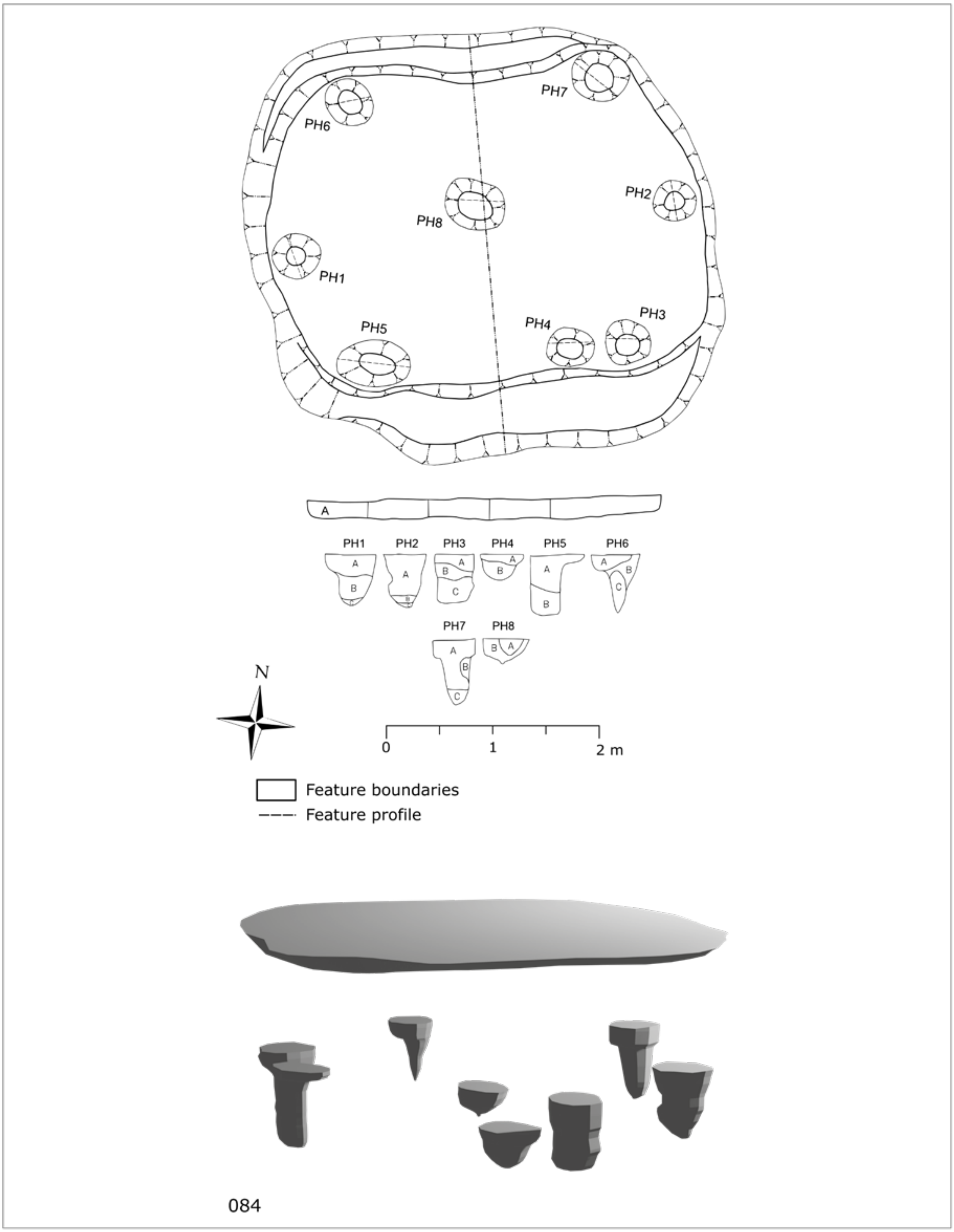
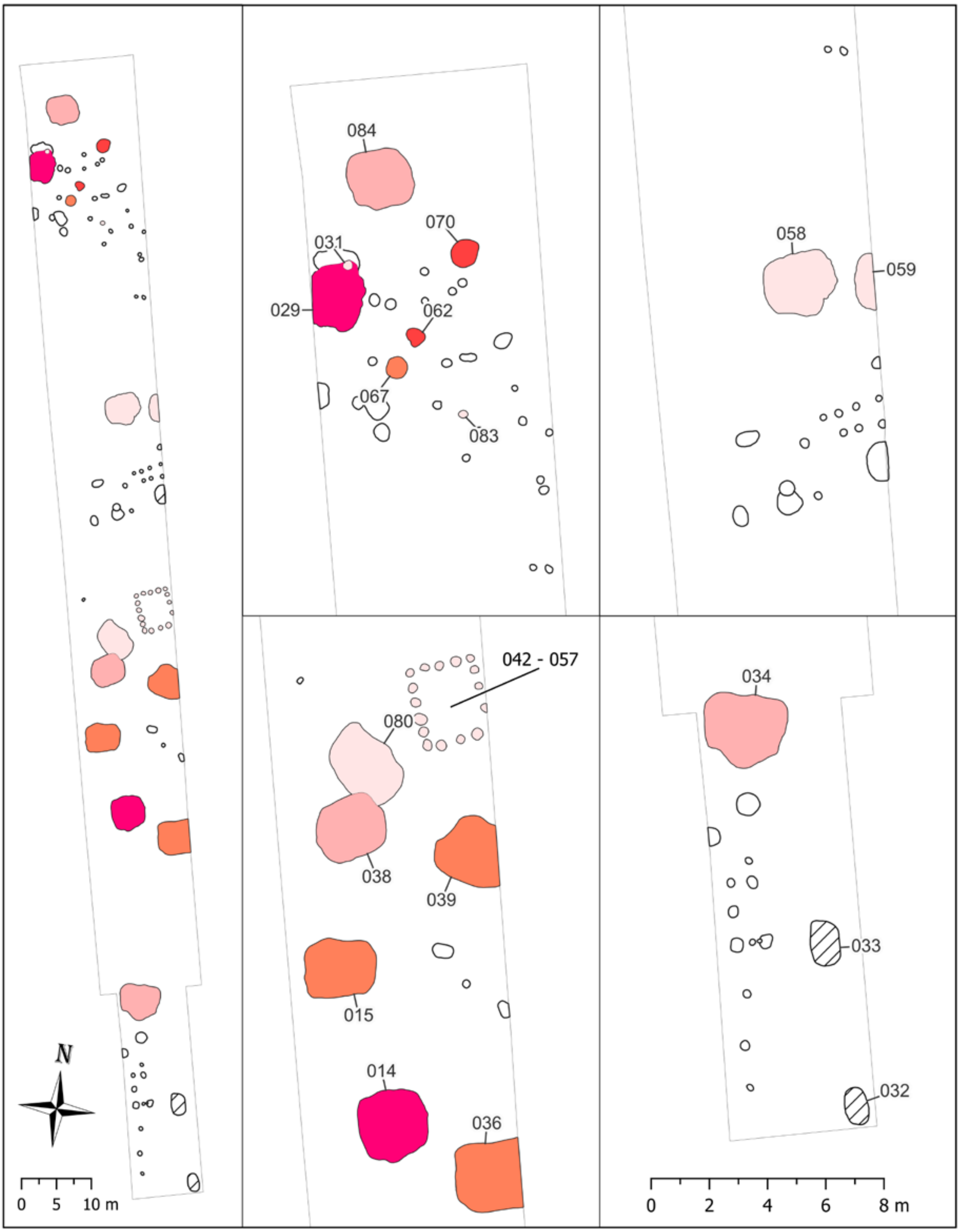


Fig. 77. Jevišovka. Feature 084. Top – layout of the excavated archaeological feature in a ground and section plan, after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Author: M. Kmošková, ARÚB. Bottom – 3D model of the excavated archaeological feature. Authors: A. Szabová, Z. Porubčanová, ARÚB.



The volume of sediment (litres) collected from features

1 - 50 | 51 - 100 | 101 - 150 | 151 - 200 | > 200 | no samples

Fig. 78. Jevišovka. Plan of the excavated area. The volume of sediment collected from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

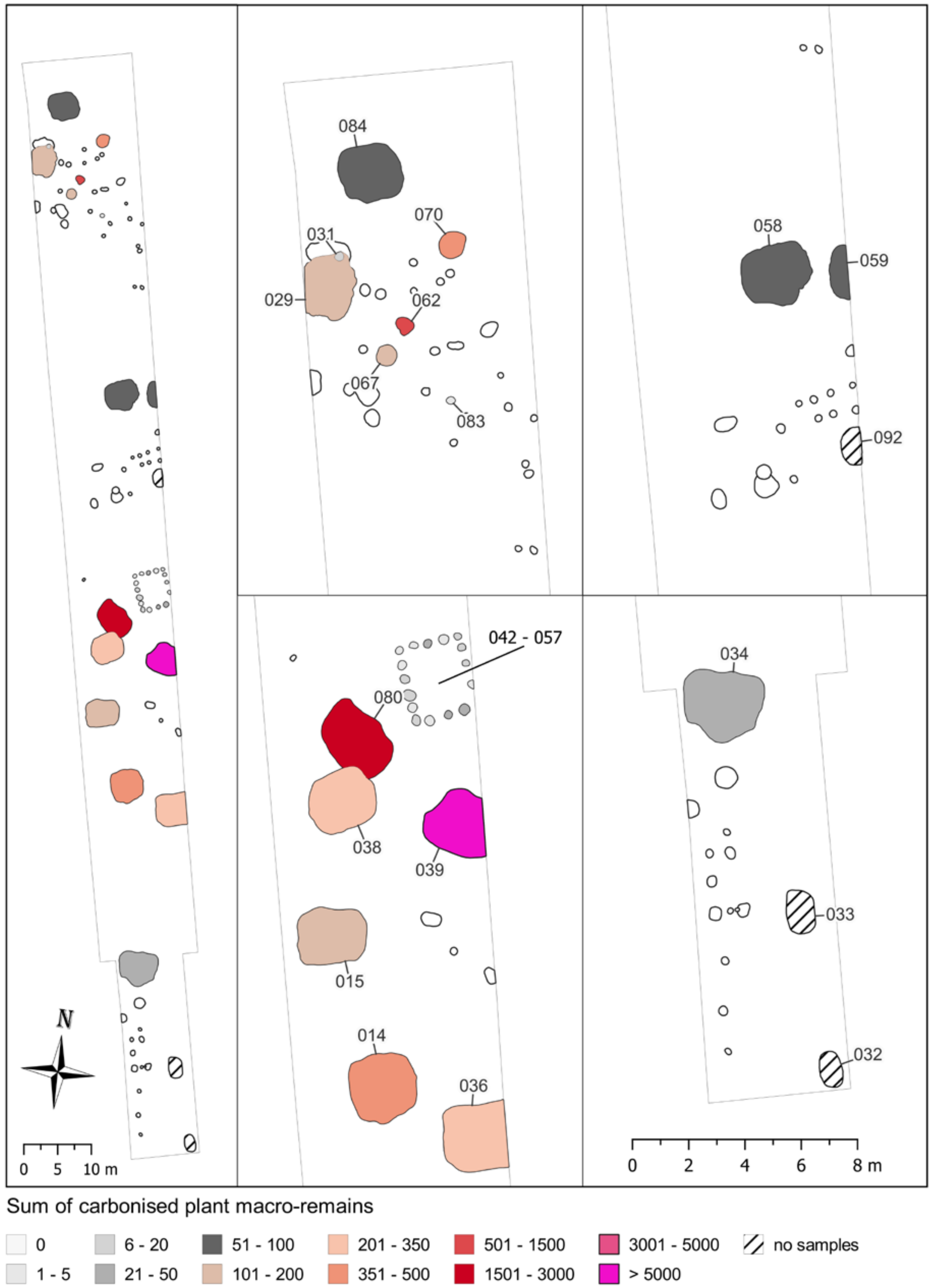


Fig. 79. Jevišovka. Plan of the excavated area. Total numbers of carbonised plant macro-remains found in samples from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

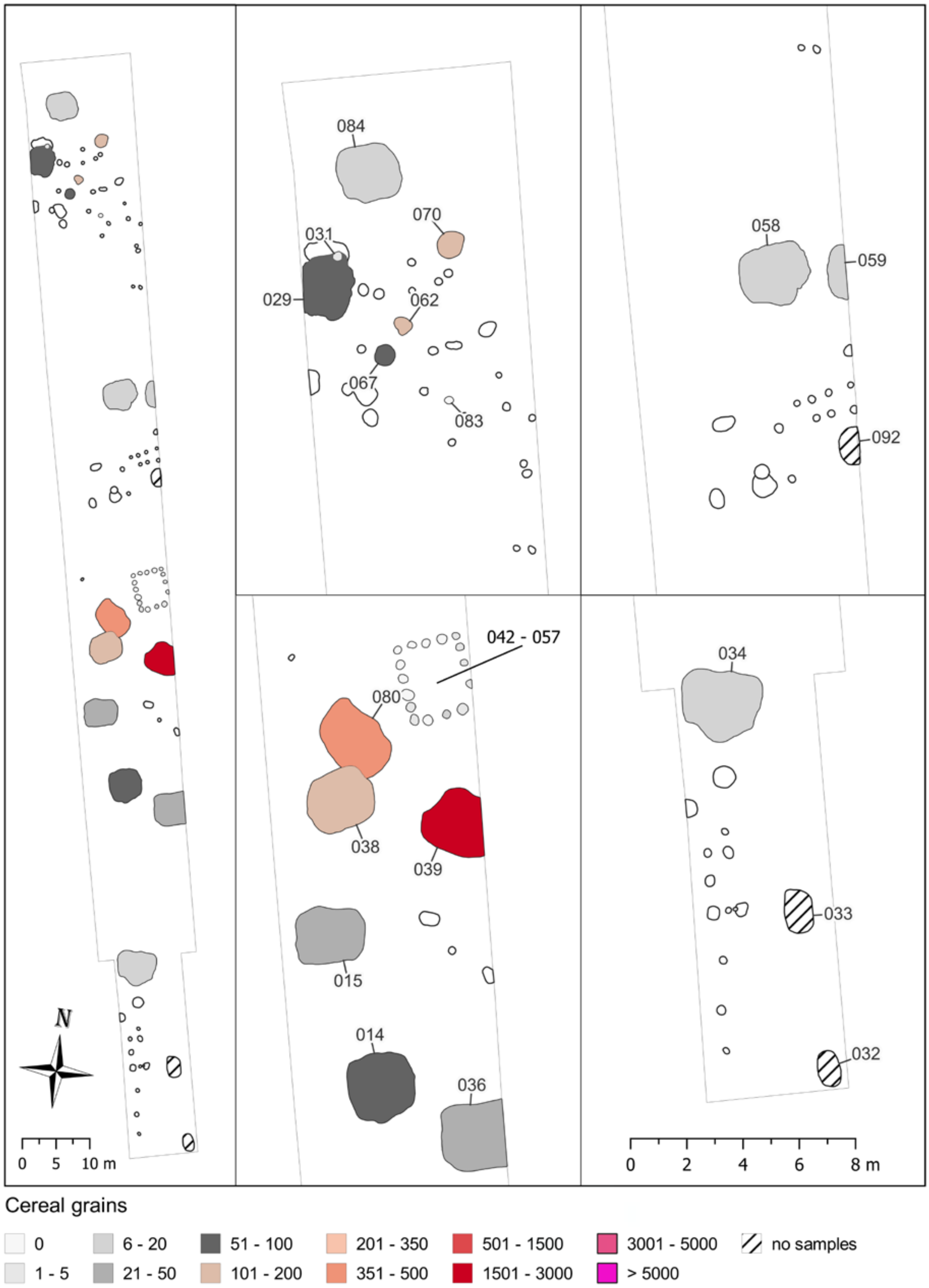


Fig. 80. Jevišovka. Plan of the excavated area. Total numbers of carbonised cereal grains (excl. Cerealia indet.) found in samples from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

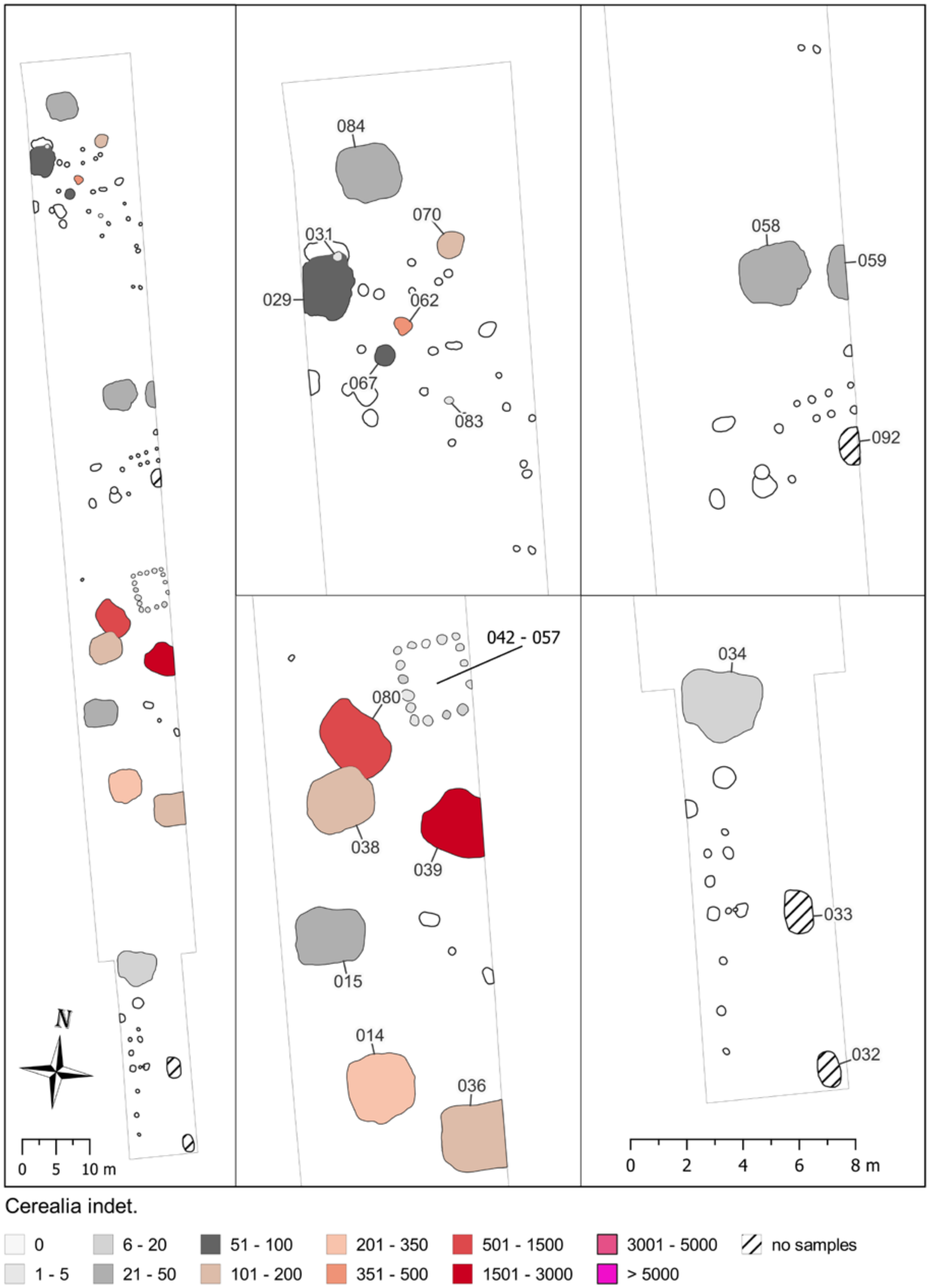


Fig. 81. Jevišovka. Plan of the excavated area. Total numbers of indeterminate carbonised cereal grains (Cerealia indet.) found in samples from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

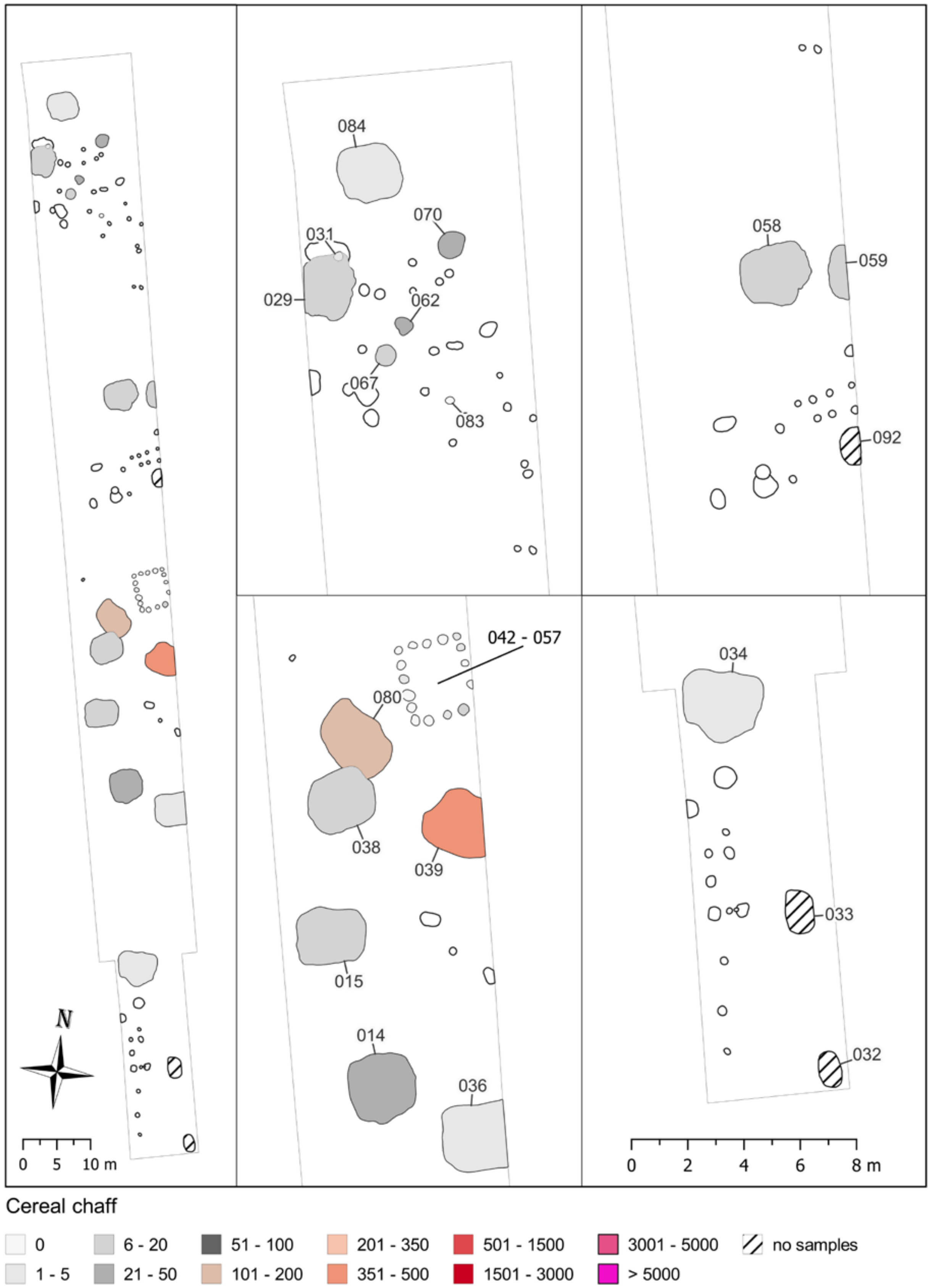


Fig. 82. Jevišovka. Plan of the excavated area. Total numbers of carbonised cereal chaff (glumes and rachises) found in samples from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

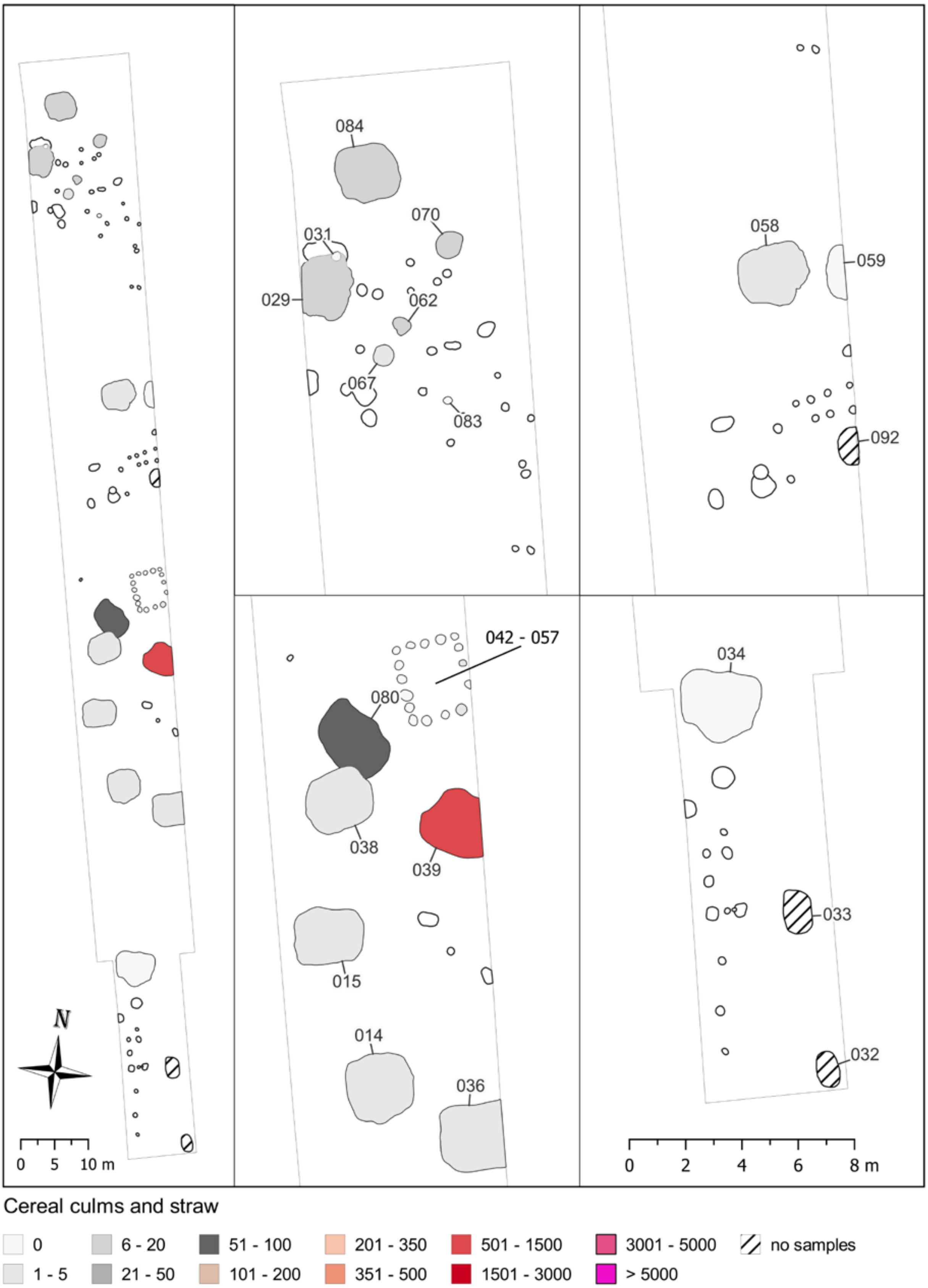
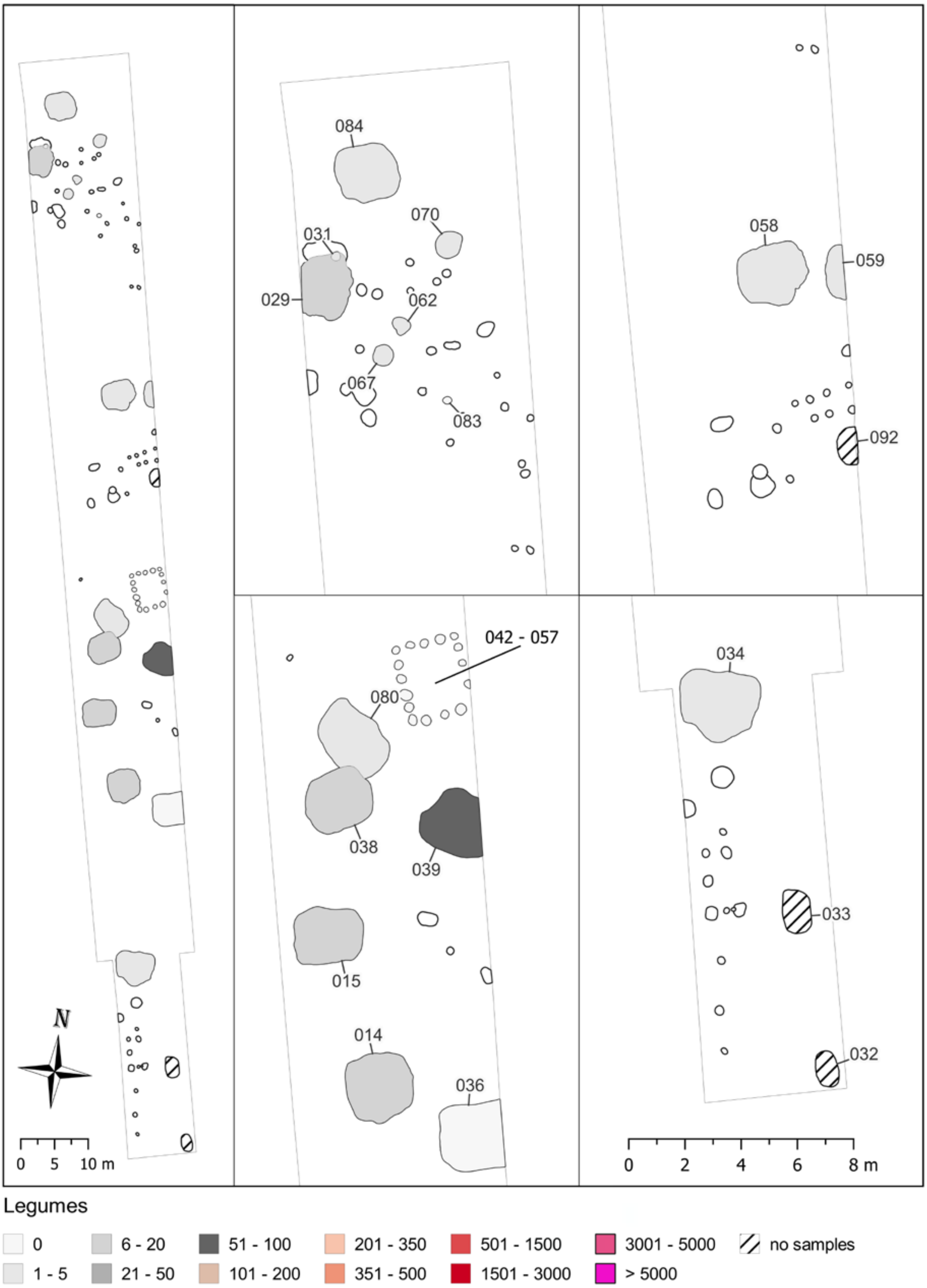


Fig. 83. Jevišovka. Plan of the excavated area. Total numbers of carbonised cereal culms and straw found in samples from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.



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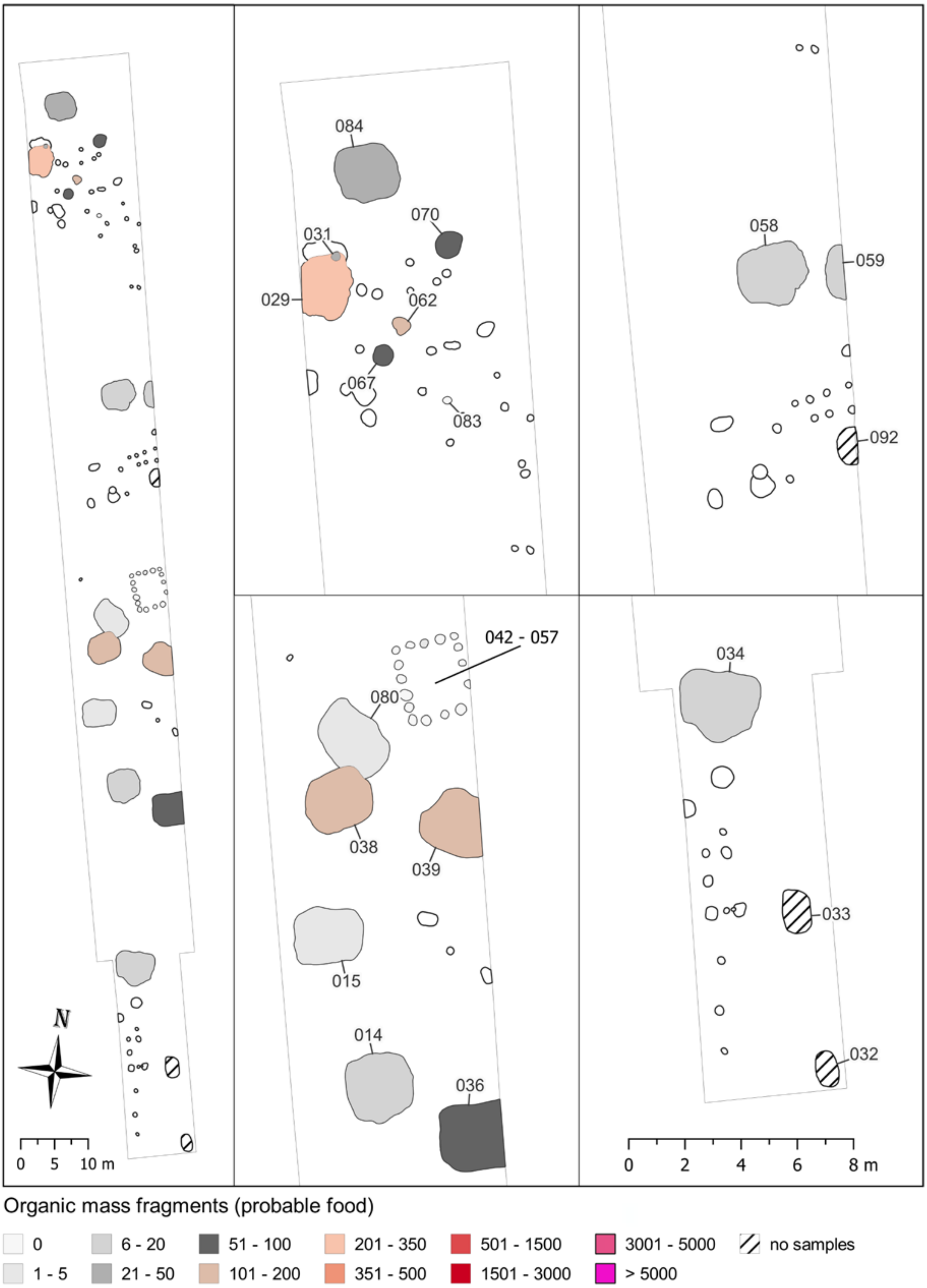


Fig. 85. Jevišovka. Plan of the excavated area. Total numbers of carbonised organic mass fragments (probable food) found in samples from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

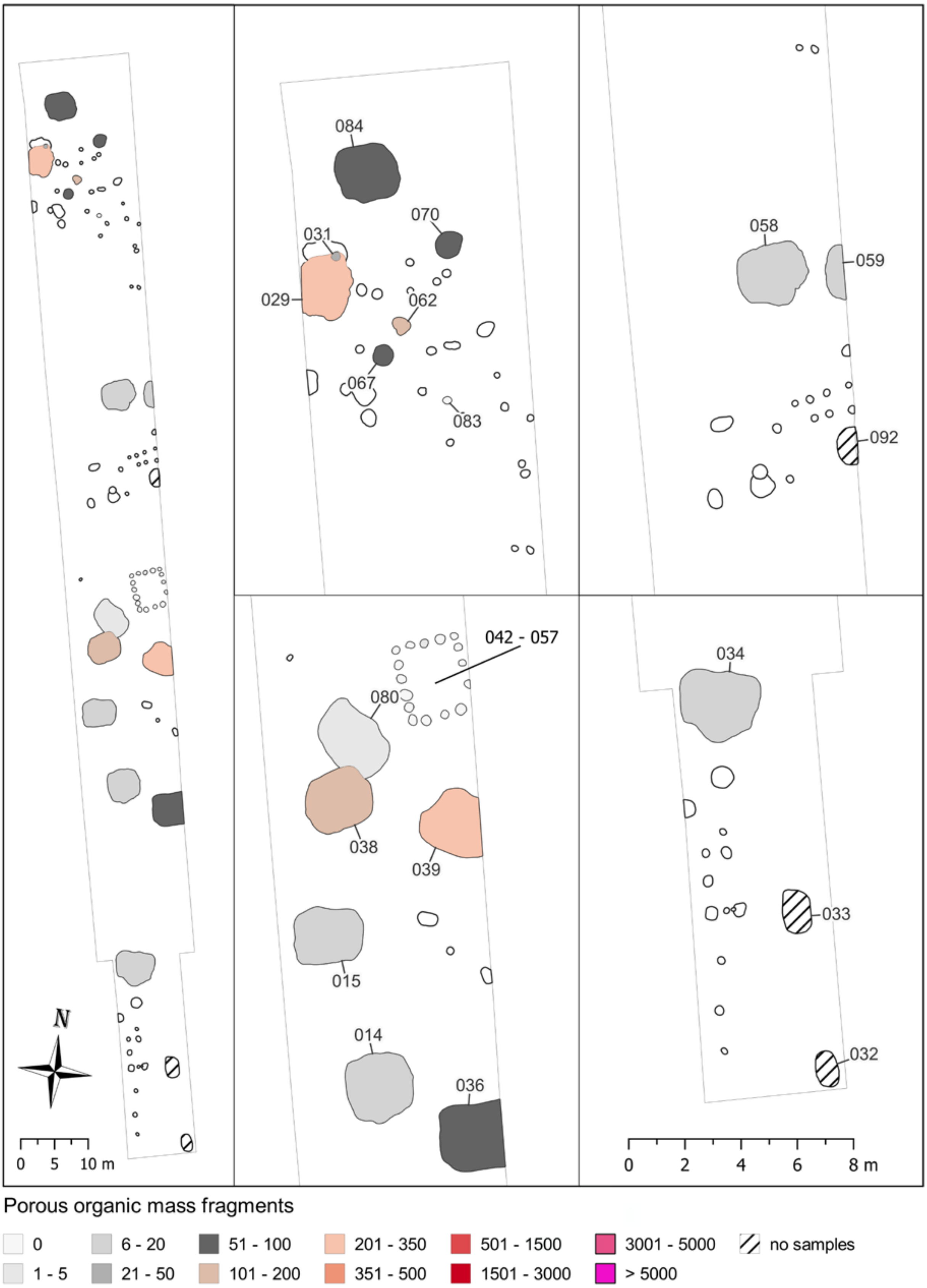


Fig. 86. Jevišovka. Plan of the excavated area. Total numbers of indeterminate carbonised porous organic mass found in samples from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

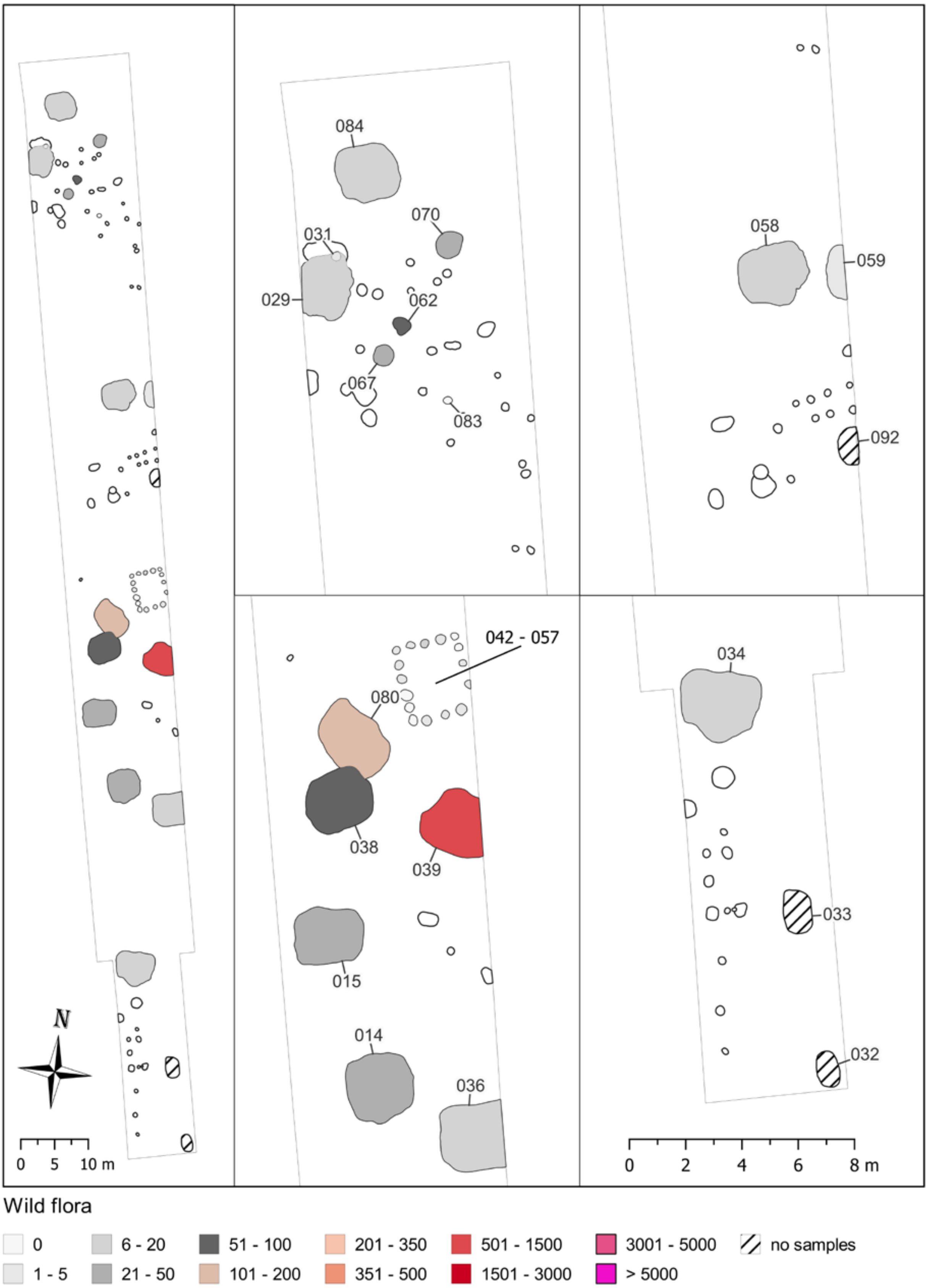


Fig. 87. Jevišovka. Plan of the excavated area. Total numbers of carbonised wild flora seeds found in samples from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

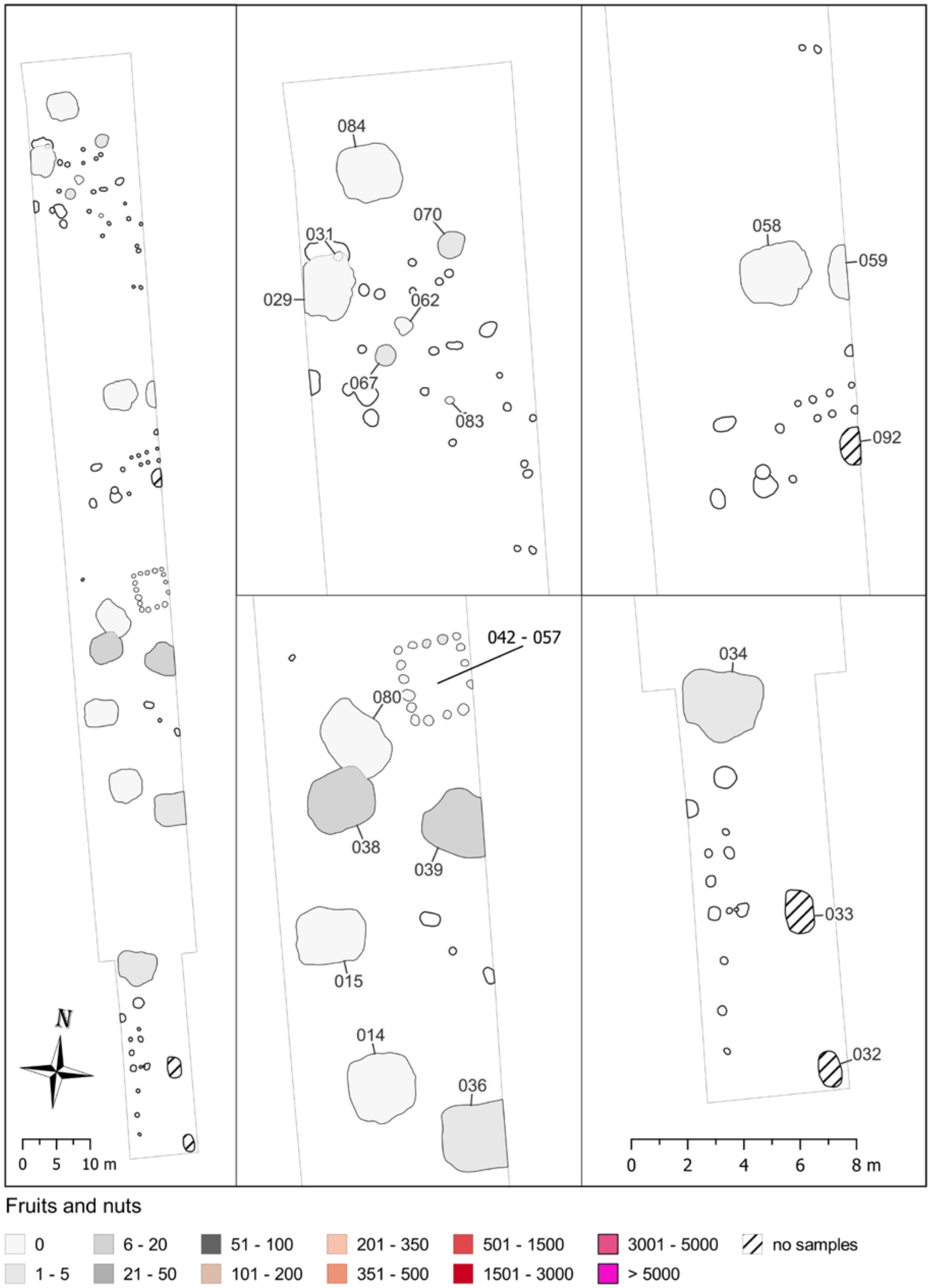


Fig. 88. Jevišovka. Plan of the excavated area. Total numbers of carbonised fruit and nut remains found in samples from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

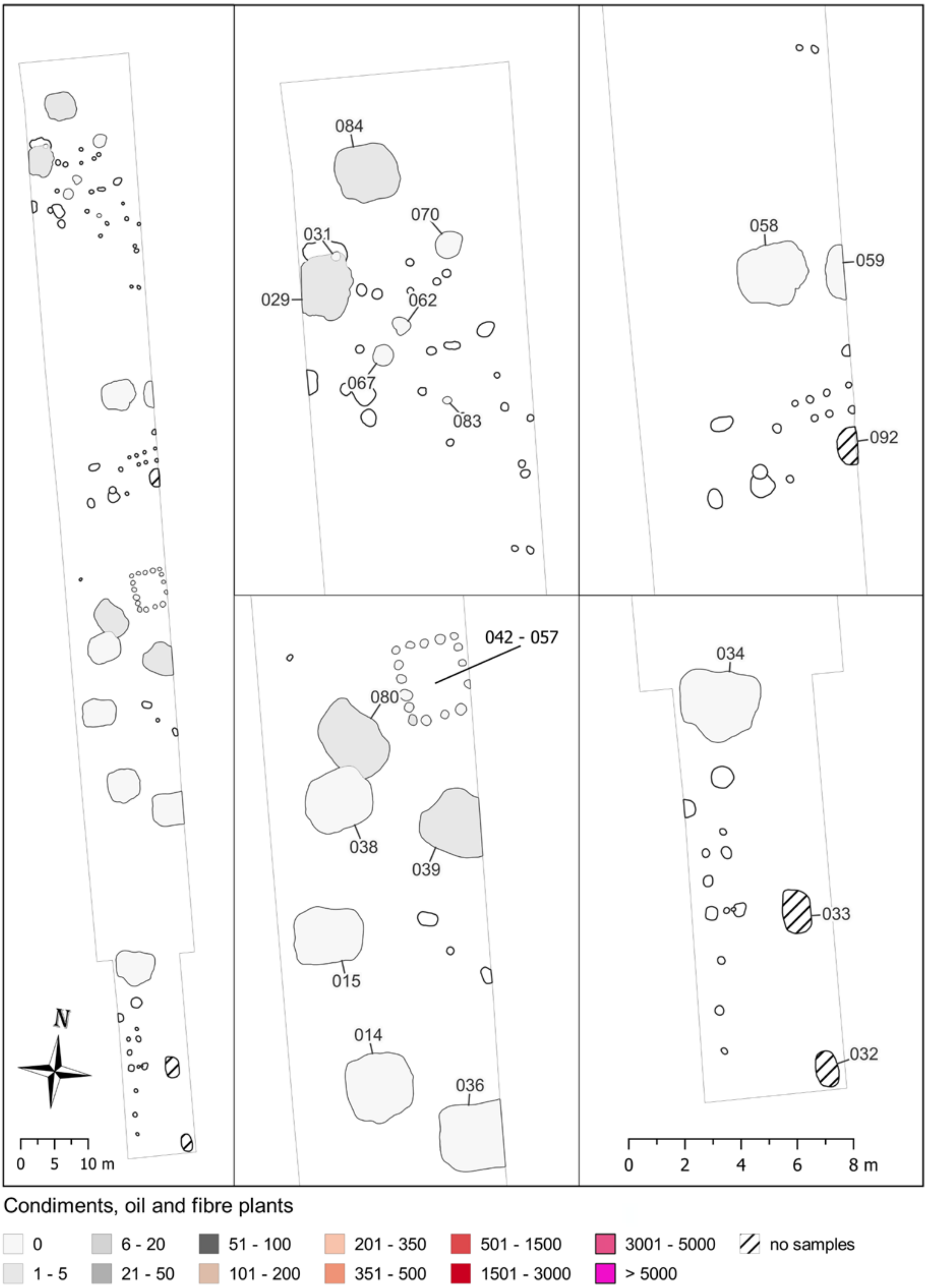


Fig. 89. Jevišovka. Plan of the excavated area. Total numbers of carbonised condiment, oil and fibre plant remains found in samples from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

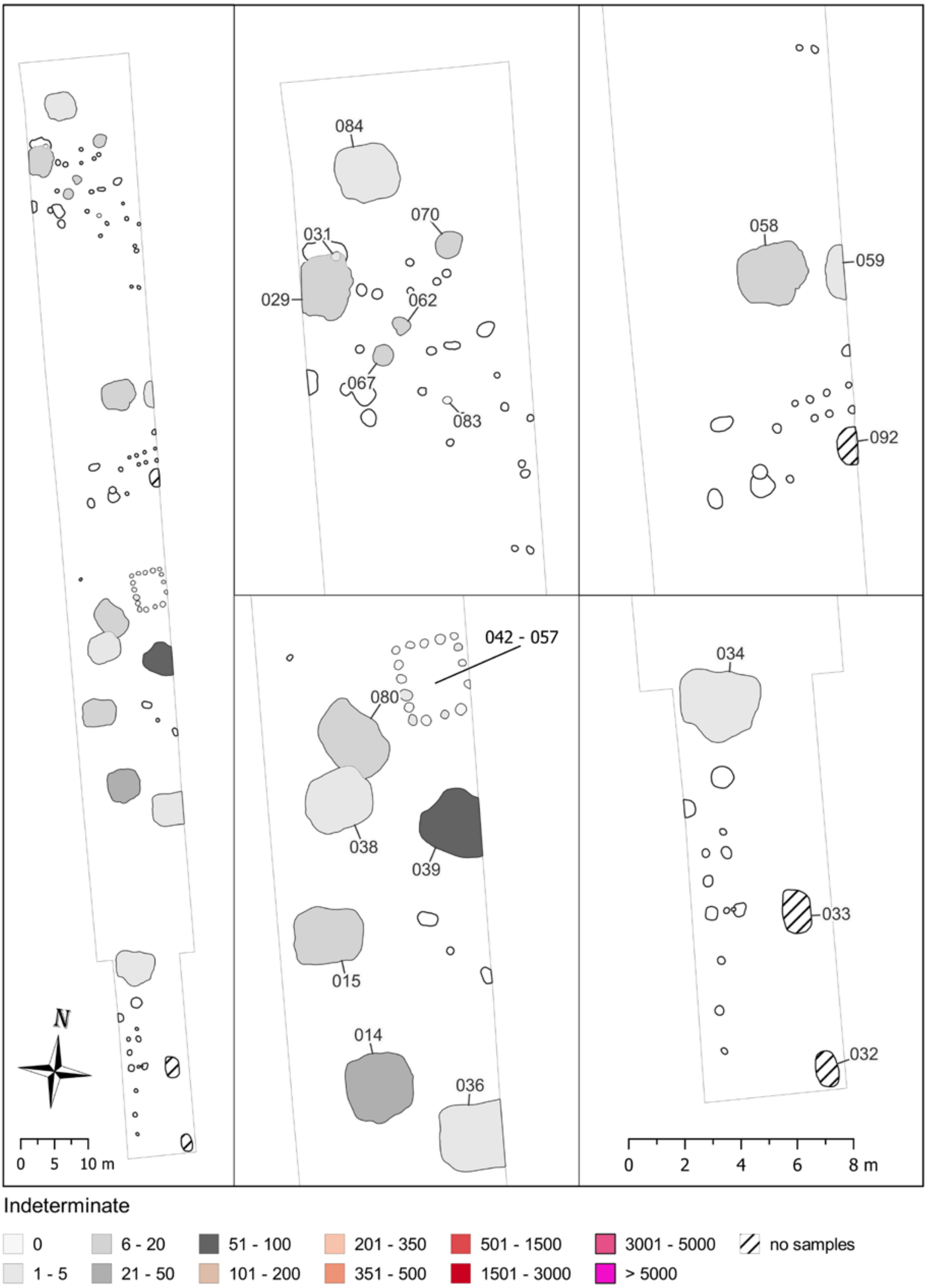


Fig. 90. Jevišovka. Plan of the excavated area. Total numbers of indeterminate carbonised remains (seeds and seed fragments) found in samples from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

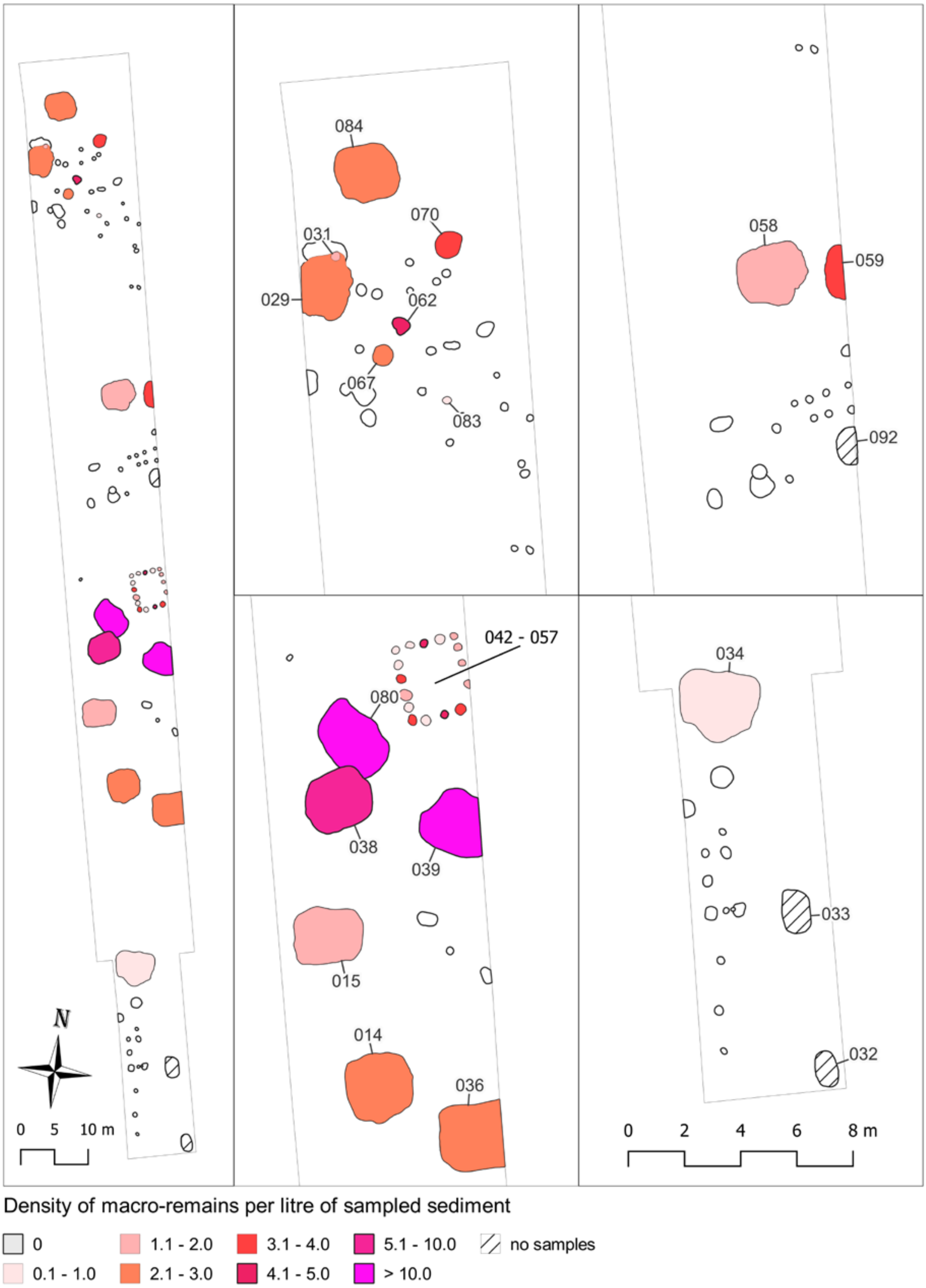


Fig. 91. Jevišovka. Plan of the excavated area. The density of carbonised macro-remains per litre of sediment collected from Roman and La Tène/Roman period features (labelled). Author: P. Apiar, ARÚB. Source base: after Zelíková 2019, M. Lukáš, M. Vlach, ARÚB. Source archaeobotanical data: J. Apiar, ARÚB.

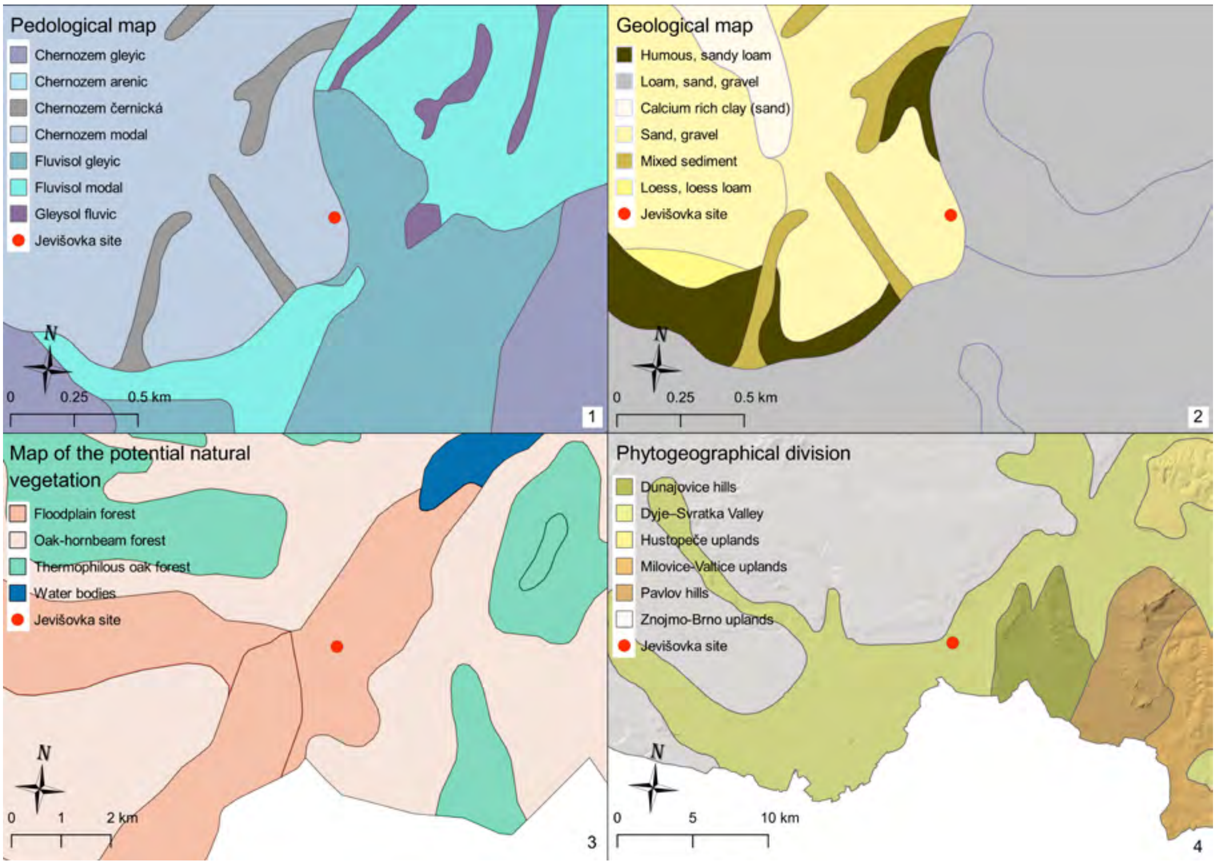


Fig. 92. Jevišovka. Pedological and geological map, source base: CGS. Map of the potential natural vegetation of the Czech Republic and phytogeographical division of the Czech Republic, source base: Pladias, www.pladias.cz. Author: P. Apiar, ARÚB.

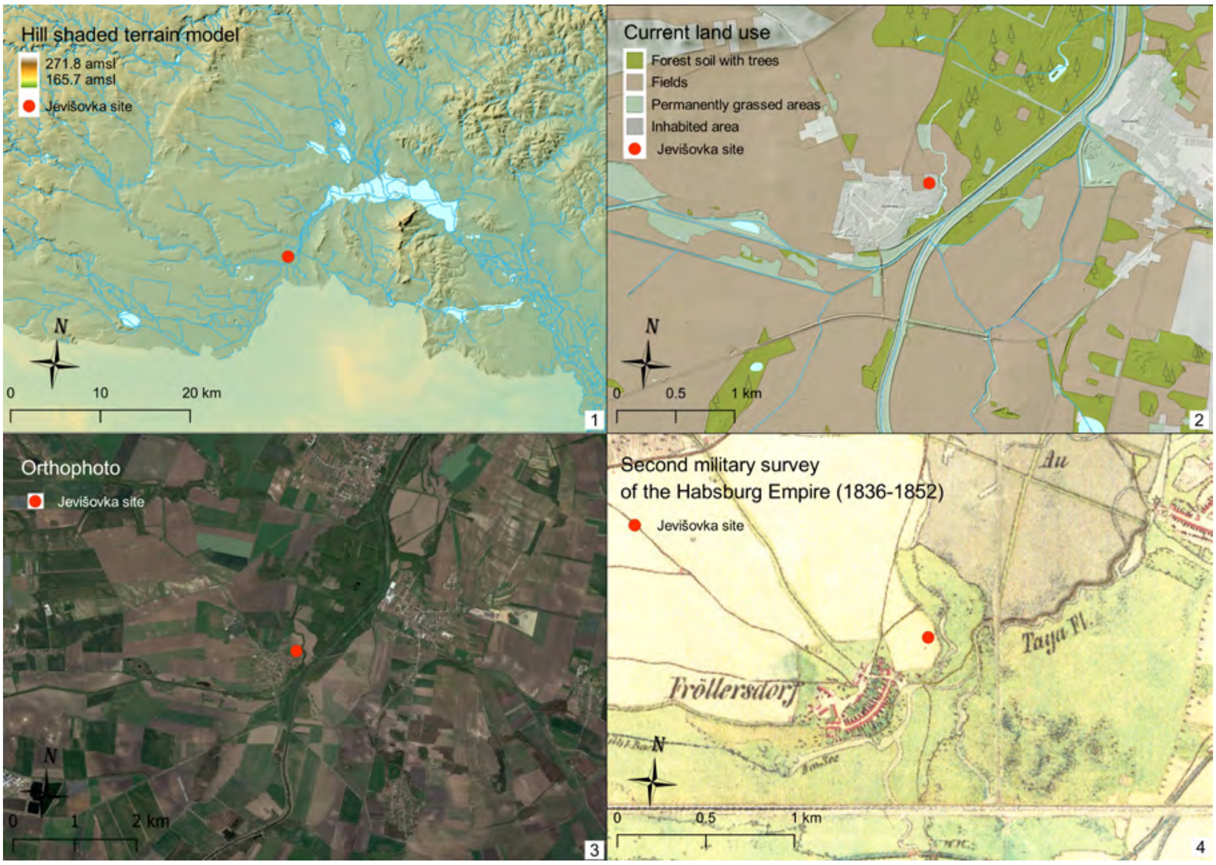


Fig. 93. Jevišovka. Hill-shaded terrain model, current land use and orthophoto of the region, source base: CUZK. Second military survey of the Habsburg Empire (1836–1852) with localisation of the site, source base: CENIA. Author: P. Apiar, ARÚB.

Tab. 15. List of archaeological sites (the comparative assemblage) with collected archaeobotanical samples, from which the plant macro-remain determination results were made available and further analysed during the lead author's doctoral research, including the authorship of particular primary analyses conducted by several authors. After Hlavatá 2017, edited. Author: J. Apiar, ARÚB.

Geography	Site number (see Appendix Fig. 67)	Site	Location	District	Excavation	Analysis report number	Archaeobotanist (author of the original primary analysis)	Further references
Bohemia	1	Droužkovice	---	Chomutov	J. Blažek, K. Derner/2010	22/2013	P. Kočár	
	2	Holubice	---	Praha-západ	L. Šulová/2005	282/2005	P. Kočár, R. Kočárová	
	3	Holubice	RD ppč. 64/92	Praha-západ	K. Smíšek/2007	6/57/2008	P. Kočár, R. Kočárová	
	4	Roztoky	---	Praha-západ	M. Kuna/1980–1983	---	E. Hajnalová, J. Mihályiová	Beech 1993
	5	Praha-Kbely	Obytný park centrum Kbely	Praha 19.	D. Malyková/2007–2008	2/2011	P. Kočár, R. Kočárová	
	6	Praha-Hloubětín	ul. U Elektry	Praha 9./14.	P. Hušťák/2006–2007	187/2008	P. Kočár, R. Kočárová	
	7	Pečky	Kandie II	Kolín	J. Hložek/2009	4/2010	P. Kočár, R. Kočárová	
Moravia	8	Ivanovice/I. u Brna	U Černých	Brno	D. Parma/ ---	10/2003	M. Hajnalová	
	9	Pasohlávky	U vodárny	Brno-venkov	B. Komoróczy/2010, 2011	1/2012, 6/2012	M. Hajnalová, P. Kočár, R. Kočárová	Kočár, Kočárová 2011; Hajnalová 2011b
	10	Jevišovka	Nová ul.	Břeclav	B. Komoróczy/2013	---	J. Apiar	Hlavatá 2017; Apiar, Zelíková 2021
	11	Vrchoslavice 2	Panský lán	Prostějov	T. Berkovec/ ---	32/2006	P. Kočár, R. Kočárová	
	12	Vrchoslavice 1	Za hróbňó	Prostějov	T. Berkovec/ ---	27/2006	P. Kočár, R. Kočárová	
	13	Vrchoslavice-Vitčice 1	---	Prostějov	A. Tajer/2007	127/2008	P. Kočár	
	14	Hulín-Pravčice 2	---	Kroměříž	AC Olomouc/2006?	---	P. Kočár, R. Kočárová	
	15	Hrubá Vrbka	„Za Bařinou"	Hodonín	J. Šmerda, T. Zeman/2009	59/2009	P. Kočár	
Slovakia	16	Zohor	Piesky	Malacky	E. Elschek/1995, 2008–10	---	D. Krčová, revid. M. Hajnalová	Krčová 2016
	17	Bratislava-Devín	Hrad	Bratislava IV.	V. Plachá, J. Hlavicová, D. Hulínek (J. Eisner)/1987, 1999	14290/2000	J. Mihályiová, E. Hajnalová	
	18	Bratislava-Trnávka	Silničné	Bratislava II.	V. Varsik/1997	14573/2001	M. Hajnalová	
	19	Bratislava-Trnávka	Šajba I.	Bratislava II.	V. Varsik/1999	14571/2001	M. Hajnalová	
	20	Bratislava-Trnávka	Zadné	Bratislava II.	V. Varsik/1998–99	14574/2001	M. Hajnalová	
	21	Bratislava-Rusovce	Horné pole	Bratislava V.	V. Varsik/1996–98	---	J. Apiar	Varsik 1999a; 1999b; Hlavatá, Varsik 2017; 2019; Hlavatá 2017
	22	Bratislava-Rusovce	Bergl	Bratislava V.	J. Dekan/1966	5083/1969	E. Hajnalová	
	23	Bratislava-Rusovce	Tehelný hon	Bratislava V.	V. Plachá/2010	---	J. Apiar	Beňová et al. 2010; Hlavatá 2017
	24	Bratislava-Čunovo	---	Bratislava V.	J. Schmidtová/1996	---	J. Apiar	Hlavatá 2017

Geography	Site number (see Appendix Fig. 67)	Site	Location	District	Excavation	Analysis report number	Archaeobotanist (author of the original primary analysis)	Further references
Slovakia	25	Beckov	---	Nové Mesto nad Váhom	V. Varsik, M. Hanuliak, B. Kovár/2006	---	M. Hajnalová	Hajnalová, Varsik 2010; Varsik et al. 2006
	26	Cífer–Pác	Nad mlynom	Trnava	T. Kolník/1972–80	9077/1980, 9765/1981	E. Hajnalová	
	27	Veľký Meder	---	Dunajská Streda	V. Varsik/1991, 2003	---	M. Hajnalová, E. Hajnalová, J. Mihályiová	Hajnalová, Mihályiová 2000; Hajnalová, Varsik 2010
	28	Nitra	SHELL	Nitra	G. Březinová/1996	---	M. Hajnalová	Benediková, Hajnalová 2003
	29	Nitra	BAUMAX	Nitra	G. Březinová, L. Benediková/1999–2000	---	M. Hajnalová	Benediková, Hajnalová 2003
	30	Nitra	Párovské háje	Nitra	---	---	E. Hajnalová, E. Hunková	Hajnalová 1975; Benková et al. 1991
	31	Nitra	Mikov dvor	Nitra	B. Chropovský/1979–80	11925/1987	B. Račeková, E. Hajnalová	
	32	Nitra–Chrenová I.	Športový areál/ Záhradníctvo	Nitra	G. Fusek/1983	11762/1986	E. Hajnalová	
	33	Nitra–Mlynárce	koryto rieky Nitry	Nitra	R. Daňo/2000	14508/2001	M. Hajnalová	
	34	Komjatice	---	Nové Zámky	---	---	E. Hajnalová	Hajnalová 1989; Hajnalová, Varsik 2010
	35	Hurbanovo	Štrkovisko	Komárno	J. Rajtár/2003	---	D. Krčová, revid. M. Hajnalová	Krčová 2016
	36	Iža	Leányvár	Komárno	J. Rajtár/1981–82, J. Rajtár, K. Kuzmová/1984–93	10144/82.10734 83–84.12890 91.14430/ 2000	E. Hajnalová, J. Marettová, H. Hunková, J. Mihályová, J. Opralová, J. Apiar	Hajnalová, Rajtár 2009; Hlavatá 2017
	37	Žilina–Závodie	Skalka	Žilina	O. Šedo/1976	8548/1978	E. Hajnalová	
	38	Lopušné Pažite	Podhuboč (Záriečie)	Kysucké Nové Mesto	O. Šedo/1980	14004/1998	J. Mihályiová	
	39	Banská Bystrica (Nemce)	Hrádok – jaskyňa Kaplnka	Banská Bystrica	P. Ušiak/1996	13754/1997	J. Mihályiová, E. Hajnalová	
	40	Vrbov	Vrbovský lesík	Kežmarok	M. Giertlová, M. Soják/2001	14882/2003	M. Hajnalová, J. Mihályiová	
	41	Medzany	Za Imunou	Prešov	M. Lamiová/1983	11508/1986	E. Hajnalová	
	42	Zemplín	Szelmalomdomb	Trebišov	V. Budinský-Krička/1958–61, 1963	11805/1987	E. Hajnalová	

Tab. 16. Jevišovka. Results of the volume modelling for Roman and La Tène / Roman period features and layers. Authors: A. Szabová, Z. Porubčanová, ARÚB.

Feature No.	Fill specif.	Model labelling	Volume abs./l	Volume abs./m^3
14	layerA+B+C+D	feat14.blend	8760.3	8.760
14	layerA	feat14_A-D.blend	5132.6	5.133
14	layerB	feat14_A-D.blend	1550.8	1.551
14	layerC	feat14_A-D.blend	936.7	0.937
14	layerD	feat14_A-D.blend	1140.2	1.140
15	layerA+B+the rest of the fill	feat15.blend	3949.4	3.949
15	layerA+B	feat15_A-B.blend	3785.9	3.786
15	layerA	feat15_A-B.blend	2619.7	2.620
15	layerB	feat15_A-B.blend	1166.2	1.166
15	the rest of the fill	feat15_A-B.blend	163.4	0.163
29	layerA+B	feat29.blend	3918.8	3.919
29	layerA	feat29_A-B.blend	1633.2	1.633
29	layerB	feat29_A-B.blend	2285.6	2.286
31	layerA+B	feat31.blend	132.6	0.133
31	layerA	feat31_A-B.blend	75.9	0.076
31	layerB	feat31_A-B.blend	56.7	0.057
32	layerA+B	feat32.blend	1160.1	1.160
32	layerA	feat32_A-B.blend	1047.4	1.047
32	layerB	feat32_A-B.blend	112.7	0.113
33	layerA+B	feat33.blend	2584.2	2.584
33	layerA	feat33_A-B.blend	293.1	0.293
33	layerB	feat33_A-B.blend	2291.1	2.291
34	layerA+B	feat34.blend	7235	7.235
34	layerA	feat34_A-B.blend	7033.7	7.034
34	layerB	feat34_A-B.blend	201.3	0.201
36	layerA+B	feat36.blend	4901.5	4.902
36	layerA	feat36_A-B.blend	2340.8	2.341
36	layerB	feat36_A-B.blend	2560.7	2.561
38	layerA+B	feat38.blend	5682.3	5.682
38	layerA	feat38_A-B.blend	3302.4	3.302
38	layerB	feat38_A-B.blend	2379.8	2.380
39	layerA+B+C+D+E+F+G+H+CH	feat39.blend	13378	13.378
39	layerA	feat39_A-CH.blend	4371.8	4.372
39	layerB	feat39_A-CH.blend	637.2	0.637
39	layerC	feat39_A-CH.blend	718.8	0.719
39	layerD	feat39_A-CH.blend	412.7	0.413
39	layerE	feat39_A-CH.blend	3361	3.361
39	layerF	feat39_A-CH.blend	1504.6	1.505
39	layerG	feat39_A-CH.blend	513.9	0.514
39	layerH	feat39_A-CH.blend	548	0.548
39	layerCH	feat39_A-CH.blend	1309.7	1.310
42	layerA	feat42.blend	91.8	0.092
43	layerA	feat43.blend	58.3	0.058
44	layerA	feat44.blend	87	0.087
45	layerA	feat45.blend	68.2	0.068
46	layerA	feat46.blend	55.8	0.056
47	layerA	feat47.blend	26.6	0.027
48	layerA	feat48.blend	46.7	0.047
49	layerA	feat49.blend	31.4	0.031
50	layerA	feat50.blend	36.7	0.037
51	layerA	feat51.blend	35.6	0.036
52	layerA	feat52.blend	36.6	0.037
53	layerA	feat53.blend	91.9	0.092
54	layerA	feat54.blend	31.6	0.032
55	layerA	feat55.blend	31.3	0.031
56	layerA	feat56.blend	22.6	0.023
57	layerA	feat57.blend	19.9	0.020
58	layerA	feat58.blend	6556	6.556
59	layerA+B+C+D+E+F+the rest of the fill	feat59.blend	2320.4	2.320
59	layerA	feat59_A-F.blend	1286.5	1.287
59	layerB	feat59_A-F.blend	117.5	0.118
59	layerC	feat59_A-F.blend	80.3	0.080
59	layerD	feat59_A-F.blend	51.6	0.052
59	layerE	feat59_A-F.blend	379	0.379
59	layerF	feat59_A-F.blend	335.3	0.335
59	the rest of the fill	feat59_A-F.blend	70.2	0.070
62	layerA	feat62_A-I.blend	266.6	0.267
62	layerB	feat62_A-I.blend	103.2	0.103
62	layerC	feat62_A-I.blend	57.5	0.058
62	layerD	feat62_A-I.blend	148.9	0.149
62	layerE	feat62_A-I.blend	106.4	0.106
62	layerF	feat62_A-I.blend	41.4	0.041
62	layerG	feat62_A-I.blend	84.9	0.085
62	layerH	feat62_A-I.blend	52.5	0.053
62	layerCH	feat62_A-I.blend	223.1	0.223
62	layerI	feat62_A-I.blend	152.2	0.152
62	layerA+B+C+D+E+F+G+H+CH-I	feat62.blend	1236.7	1.237
67	layerA	feat67.blend	325	0.325
70	layerA	feat70_A-G.blend	352.8	0.353
70	layerB	feat70_A-G.blend	505.2	0.505
70	layerC	feat70_A-G.blend	185.9	0.186
70	layerD	feat70_A-G.blend	407.4	0.407
70	layerE	feat70_A-G.blend	393.9	0.394
70	layerF	feat70_A-G.blend	291.6	0.292
70	layerG	feat70_A-G.blend	233.7	0.234
70	layerA+B+C+D+E+F+G+the rest of the fill	feat70.blend	2627.1	2.627
70	the rest of the fill	feat70_A-G.blend.	256.6	0.257
80	layerA	feat80_A-C.blend	5612.2	5.612
80	layerB	feat80_A-C.blend	3023.1	3.023
80	layerC	feat80_A-C.blend	2966.9	2.967
80	layerA+B+C	feat80.blend	11602.2	11.602
83	layerA+B	feat83.blend	33.3	0.033
83	layerA	feat83_A-B.blend	14	0.014
83	layerB	feat83_A-B.blend	19.3	0.019
84	layerA	feat84.blend	2522.6	2.523

Tab. 17. Jevišovka. Results of the volume modelling for Roman and La Tène/Roman period pithouse postholes. Authors: A. Szabová, Z. Porubčanová, ARÚB.

Feature No.	Post-hole No.	Fill specif.	Model labelling	Volume abs./l	Volume abs./m³
14	1	layerA	feat14_KJ1.blend	43.7	0.044
14	2	layerA	feat14_KJ2.blend	17.7	0.018
14	3	layerA	feat14_KJ3.blend	25.3	0.025
14	4	layerA	feat14_KJ4.blend	9.2	0.009
14	5	layerA	feat14_KJ5.blend	34.4	0.034
14	6	layerA	feat14_KJ6.blend	22	0.022
14	8	layerA	feat14_KJ8.blend	4.5	0.005
14	9	layerA	feat14_KJ9.blend	8.9	0.009
14	10	layerA	feat14_KJ10.blend	25.6	0.026
14	11	layerA	feat14_KJ11.blend	32.6	0.033
14	15	layerA	feat14_KJ15.blend	23.7	0.024
14	20	layerA	feat14_KJ20.blend	32.1	0.032
15	1	layerA	feat15_KJ1.blend	30.2	0.030
15	2	layerA	feat15_KJ2.blend	61.7	0.062
15	3	layerA	feat15_KJ3.blend	22	0.022
15	4	layerA	feat15_KJ4.blend	14	0.014
15	5	layerA	feat15_KJ5.blend	24.7	0.025
15	6	layerA	feat15_KJ6.blend	2.6	0.003
15	7	layerA	feat15_KJ7.blend	14.9	0.015
15	8	layerA	feat15_KJ8.blend	9.8	0.010
15	10	layerA	feat15_KJ10.blend	7.1	0.007
15	11	layerA	feat15_KJ11.blend	12.4	0.012
15	12	layerA	feat15_KJ12.blend	61.7	0.062
29	1	layerA	feat29_KJ1.blend	54.8	0.055
29	2	layerA	feat29_KJ2.blend	6.7	0.007
29	3	layerA	feat29_KJ3.blend	71.8	0.072
29	4	layerA+B	feat29_KJ4.blend	19	0.019
29	5	layerA	feat29_KJ5.blend	69.9	0.070
29	6	layerA	feat29_KJ6.blend	40.6	0.041
29	7	layerA	feat29_KJ7.blend	18.4	0.018
29	8	layerA	feat29_KJ8.blend	7.5	0.008
29	9	layerA	feat29_KJ9.blend	0.44	0.000
34	1	layerA+B +C	feat34_KJ1.blend	103	0.103
34	2	layerA+B +C	feat34_KJ2.blend	108	0.108
34	3	layerA+B	feat34_KJ3.blend	67	0.067
34	4	layerA	feat34_KJ4.blend	70	0.07
34	5	layerA	feat34_KJ5.blend	380	0.38
34	6	layerA	feat34_KJ6.blend	80	0.08
34	7	layerA	feat34_KJ7.blend	15	0.015
34	8	layerA	feat34_KJ8.blend	12.4	0.012
34	10	layerA	feat34_KJ10.blend	53	0.053
36	1	layerA	feat36_KJ1.blend	24.3	0.024
36	2	layerA	feat36_KJ2.blend	82.7	0.082
36	3	layerA+B +C	feat36_KJ3.blend	48	0.048
36	4	layerA+B	feat36_KJ4.blend	110	0.11
36	5	layerA	feat36_KJ5.blend	6.8	0.007
36	6	layerA	feat36_KJ6.blend	15.6	0.016
38	1	layerA+B	feat38_KJ1.blend	53.9	0.054
38	2	layerA	feat38_KJ2.blend	77.8	0.078
38	3	layerA+B	feat38_KJ3.blend	23	0.023
38	4	layerA+B	feat38_KJ4.blend	40.3	0.040
38	5	layerA+B	feat38_KJ5.blend	42	0.042
38	7	layerA+B	feat38_KJ7.blend	62.3	0.062
39	1	layerA+B	feat39_KJ1.blend	70.2	0.070
39	2	layerA+B +C	feat39_KJ2.blend	51.6	0.052
39	3	layerA	feat39_KJ3.blend	4.4	0.004
39	4	layerA	feat39_KJ4.blend	5	0.005
39	5	layerA+B	feat39_KJ5.blend	41.4	0.041
39	6	layerA	feat39_KJ6.blend	4.7	0.005
39	7	layerA+B	feat39_KJ7.blend	16.6	0.017
39	8	layerA	feat39_KJ8.blend	1.04	0.001
58	1	layerA	feat58_KJ1.blend	66.5	0.067
58	2	layerA	feat58_KJ2.blend	139.7	0.140
58	3	layerA	feat58_KJ3.blend	117.8	0.118
58	5	layerA	feat58_KJ5.blend	105.8	0.106
58	6	layerA	feat58_KJ6.blend	151.4	0.151
58	7	layerA	feat58_KJ7.blend	29.7	0.030
58	8	layerA	feat58_KJ8.blend	31.8	0.032
58	9	layerA	feat58_KJ9.blend	3.7	0.004
59	1	layerA	feat59_KJ1.blend	25	0.025
59	2	layerA	feat59_KJ2.blend	19.7	0.020
80	1	layerA	feat80_KJ1.blend	26.02	0.026
80	1	layerB	feat80_KJ1.blend	1.79	0.002
80	1	the rest of the fill	feat80_KJ1.blend	5.16	0.005
80	1	layerA+B+ the rest of the fill	feat80_KJ1.blend	32.97	0.033
80	2	layerA	feat80_KJ2.blend	6.45	0.006
80	2	layerB	feat80_KJ2.blend	10.49	0.010
80	2	the rest of the fill	feat80_KJ2.blend	0.78	0.001
80	2	layerA+B+ the rest of the fill	feat80_KJ2.blend	17.72	0.018
84	1	layerA+B +C	feat84_KJ1.blend	55.8	0.056
84	2	layerA+B +C	feat84_KJ2.blend	49.4	0.049
84	3	layerA+B +C	feat84_KJ3.blend	54.8	0.055
84	4	layerA+B	feat84_KJ4.blend	23.5	0.024
84	5	layerA+B	feat84_KJ5.blend	35.8	0.036
84	6	layerA+B +C	feat84_KJ6.blend	38.3	0.038
84	7	layerA+B +C	feat84_KJ7.blend	57.5	0.058
84	8	layerA+B	feat84_KJ8.blend	25.9	0.026

Tab. 18. Jevišovka. Overview of archaeological information regarding particular collected samples. W – west; NW – northwest; SE – southeast; S – south; PH – posthole; specif. – specification; unspec. – unspecified. After Hlavatá 2017; Zelíková 2019; Komoróczy et al. 2013. Authors: J. Apiar, M. Kmošková, ARÚB.

Sample	Field No.	Analysis or revision year	Dating	Dating (secondary)	Trench	Sector	Feature No.	Feature type	Context interpretation	Depth/ Fill specif.	Feature Sub-No.	Posthole fill specif.	Additional info	Volume (l)
1277	189	2022	Roman period			W	14	pithouse	floor					16
1295	207	2022	Roman period			W	14	pithouse	floor					13
1314	226	2021	Roman period			W	14	pithouse	floor					21
1280	192	2022	Roman period				14	pithouse	floor					16
1348	259	2021	Roman period			NW corner	14	pithouse	floor					16
1184	123	2021	Roman period			SE	14	pithouse	floor					17
1193	132	2021	Roman period			S	14	pithouse	floor					15
1324	236	2021	Roman period			S	14	pithouse	floor					14
1355	266	2021	Roman period			S	14	pithouse	floor					18
1283	195	2022	Roman period				14	pithouse	entrance niche		PH5	unspec.		7
1293	205	2022	Roman period				14	pithouse	entrance niche		PH6	unspec.		11
1341	253	2021	Roman period				14	pithouse	pithouse posthole		PH1	unspec.	association or superposition with PH20	5
823	65	2021	Roman period				14	pithouse	pithouse posthole		PH20	layer C	association or superposition with PH1	6
799	21	2022	Roman period				14	pithouse	pithouse posthole		PH4	light-coloured layer		4
1273	185	2022	Roman period				14	pithouse	pithouse posthole		PH4	unspec.		8
1296	208	2021	Roman period				14	pithouse	pithouse posthole		PH4	unspec.		3
1274	186	2022	Roman period				14	pithouse	pithouse posthole		PH8	unspec.		4
826	68	2022	Roman period				14	pithouse	pithouse posthole		PH10	unspec.		4
890	31	2022	Roman period				14	pithouse	pithouse posthole		PH15	unspec.		4
1304	216	2022	Roman period				14	pithouse	pithouse posthole		PH15	unspec.		4
1310	220	2022	Roman period				14	pithouse	pithouse posthole		PH11	unspec.		8
829	71	2021	Roman period				14	pithouse	pithouse posthole	above floor layer	PH11	unspec.		2
1266	178	2022	Roman period				14	pithouse	pithouse posthole		PH13	unspec.		5
1311	223	2022	Roman period				14	pithouse	pithouse posthole		PH14	unspec.		0.5
1281	193	2022	cf. Roman/Migration period				14	pithouse	pithouse posthole		PH9	unspec.	probable association with Migration period grave	2

Sample	Field No.	Analysis or revision year	Dating	Dating (secondary)	Trench	Sector	Feature No.	Feature type	Context interpretation	Depth/ Fill specif.	Feature Sub-No.	Posthole fill specif.	Additional info	Volume (l)
1353	264	2021	cf. Roman/ Migration period				14	pithouse	pithouse posthole		PH9	unspec.	probable association with Migration period grave	3.5
1282	194	2021	Roman period				15	pithouse	pithouse posthole		PH1	unspec.		6
1276	188	2021	Roman period				15	pithouse	pithouse posthole		PH2	unspec.		7
1297	209	2022	Roman period				15	pithouse	pithouse posthole		PH3	unspec.		4
1294	206	2021	Roman period				15	pithouse	pithouse posthole		PH5	unspec.		9
1275	187	2022	Roman period				15	pithouse	pithouse posthole		PH6	unspec.		6
1272	184	2022	Roman period				15	pithouse	pithouse posthole		PH7	unspec.		4
1279	191	2022	Roman period				15	pithouse	pithouse posthole		PH8	unspec.		3
1271	183	2022	Roman period				15	pithouse	pithouse posthole		PH10	unspec.		4
1269	181	2022	Roman period				15	pithouse	pithouse posthole		PH11	unspec.		3
1308	220	2022	Roman period				15	pithouse	entrance niche		PH4	unspec.		2
1267	179	2022	Roman period				15	pithouse	unspec. pithouse pit		PH12	unspec.		4
1201	140	2021	Roman period				15	pithouse	floor					16
1286	198	2021	Roman period			1	15	pithouse	profile	layer A				5
1306	218	2021	Roman period			5	15	pithouse	profile	layer A				8
1289	201	2021	Roman period			7	15	pithouse	profile	layer A				7
1291	203	2021	Roman period			2	15	pithouse	profile	layer B				5
1301	213	2021	Roman period			6	15	pithouse	profile	layer B				7
1309	221	2022	Roman period			4	15	pithouse	profile	layer B				5
809	51	2022	Roman period				29	pithouse	profile	layer 2B				6
817	59	2022	Roman period				29	pithouse	profile	layer 6B				12
881	22	2022	Roman period				29	pithouse	profile	layer 8B				6
1198	137	2021	Roman period				29	pithouse	profile	layer 4B				4
821	63	2022	Roman period				29	pithouse	profile	layer 1A				5
1335	247	2021	Roman period				29	pithouse	profile	layer 5A				6
883	24	2022	Roman period				29	pithouse	floor					4
1265	177	2022	Roman period				29	pithouse	fill	unspec.				8
1175	114	2021	Roman period				29	pithouse	pithouse posthole		PH1	unspec.		12.5
1200	139	2021	Roman period				29	pithouse	pithouse posthole		PH1	unspec.		19
811	53	2022	Roman period				29	pithouse	pithouse posthole		PH2	unspec.		7

Tab. 18. Continuation 1

Sample	Field No.	Analysis or revision year	Dating	Dating (secondary)	Trench	Sector	Feature No.	Feature type	Context interpretation	Depth/ Fill specif.	Feature Sub-No.	Posthole fill specif.	Additional info	Volume (l)
1345	256	2021	Roman period				29	pithouse	pithouse posthole		PH3	unspec.		12
807	49	2022	Roman period				29	pithouse	pithouse posthole		PH4	unspec.		6
1350	261	2021	Roman period				29	pithouse	pithouse posthole		PH5	unspec.		4
1261	173	2022	Roman period				29	pithouse	pithouse posthole		PH5	unspec.		12
1185	124	2021	Roman period				29	pithouse	pithouse posthole		PH5	unspec.		15
1237	162	2021	Roman period				29	pithouse	pithouse posthole		PH5	unspec.		21
1183	122	2021	Roman period				29	pithouse	pithouse posthole		PH6	unspec.		12
1140	111	2021	Roman period				29	pithouse	pithouse posthole		PH6	unspec.		11
1253	165	2021	Roman period				29	pithouse	entrance niche		PH7	unspec.		12
1125	96	2021	Roman period				29	pithouse	entrance niche		PH7	unspec.		7
1259	171	2022	Roman period				29	pithouse	entrance niche		PH8	unspec.		7
825	67	2022	Roman period uncertain				31	settlement pit	fill	unspec.				16
837	79	2022	Roman period uncertain				31	settlement pit	fill	unspec.				10
835	77	2022	Roman period			1	34	pithouse	pithouse posthole		PH1	layer B		7
893	34	2022	Roman period				34	pithouse	pithouse posthole		PH1	layer C		4
896	37	2022	Roman period				34	pithouse	pithouse posthole		PH1	layer A		6
1312	224	2022	Roman period				34	pithouse	floor					9
1284	196	2021	Roman period				34	pithouse	floor					9
1288	200	2021	Roman period				34	pithouse	floor					14
1351	262	2021	Roman period			7_2	34	pithouse	profile					7
806	48	2022	Roman period			1	36	pithouse	profile	layer A				4
1254	166	2022	Roman period			5	36	pithouse	profile	layer A				5
805	47	2021	Roman period			3	36	pithouse	profile	layer A				6
1258	170	2022	Roman period			7	36	pithouse	profile	layer A				5
1130	101	2021	Roman period			2	36	pithouse	profile	layer B				5
1178	117	2021	Roman period			4	36	pithouse	profile	layer B				4.5
886	27	2022	Roman period		6		36	pithouse	profile	layer B				5
820	62	2022	Roman period			8	36	pithouse	profile	layer B				10

Sample	Field No.	Analysis or revision year	Dating	Dating (secondary)	Trench	Sector	Feature No.	Feature type	Context interpretation	Depth/ Fill specif.	Feature Sub-No.	Posthole fill specif.	Additional info	Volume (l)
1260	172	2021	Roman period			2	36	pithouse	floor					13
1176	115	2021	Roman period				36	pithouse	floor					11
788	10	2021	Roman period				36	pithouse	fill	unspec.				7
1239	164	2021	Roman period				36	pithouse	pithouse posthole		PH1	unspec.		7.5
1126	97	2021	Roman period				36	pithouse	pithouse posthole		PH2	unspec.		7
1257	169	2022	Roman period				36	pithouse	pithouse posthole		PH3	unspec.		2
1197	136	2021	Roman period				36	pithouse	entrance niche		PH4	layer A		6
1123	94	2021	Roman period				36	pithouse	entrance niche		PH4	layer B		6
1256	168	2022	Roman period				36	pithouse	pithouse posthole		PH5	unspec.		4
830	72	2022	Roman period				36	pithouse	pithouse posthole		PH6	unspec.		6
814	56	2022	Roman period	cf. La Tène/ Roman period		2	38	pithouse	profile	layer B			superposition with feature no. 80	4
834	76	2022	Roman period			6	38	pithouse	profile	layer B				4.5
1278	190	2021	Roman period			4	38	pithouse	profile	layer B				5
1268	180	2022	Roman period			5	38	pithouse	profile	layer A				6
1270	182	2022	Roman period			7	38	pithouse	profile	layer A				7
1319	231	2021	Roman period			3	38	pithouse	profile	layer A				8
1328	240	2021	Roman period	cf. La Tène/ Roman period		1	38	pithouse	profile	layer A			superposition with feature no. 80	6
827	69	2022	Roman period				38	pithouse	pithouse posthole		PH7	unspec.		4
888	29	2022	Roman period	cf. La Tène/ Roman period			38	pithouse	pithouse posthole		PH2	unspec.	superposition with feature no. 80	5
897	38	2022	Roman period				38	pithouse	pithouse posthole		PH3	unspec.		7
1141	112	2021	Roman period				38	pithouse	pithouse posthole		PH4	unspec.		3
1287	199	2021	Roman period				38	pithouse	fill	0-30				14
1323	235	2021	Roman period				38	pithouse	fill	0-30				14
803	45	2022	La Tène/Roman period uncertain				39	pithouse	fill	layer A			probable superposition 2	8
818	60	2022	La Tène/Roman period uncertain				39	pithouse	above floor	layer A			probable superposition 2	4
1122	93	2021	La Tène/Roman period uncertain				39	pithouse	floor?	layer B			probable superposition 2	9
1215	154	2021	La Tène/Roman period uncertain				39	pithouse	floor	20-40			probable superposition 2	14

Tab. 18. Continuation 2

Sample	Field No.	Analysis or revision year	Dating	Dating (secondary)	Trench	Sector	Fea-ture No.	Feature type	Context interpre-tation	Depth/ Fill specif.	Feature Sub-No.	Posthole fill specif.	Additional info	Volume (l)
791	13	2021	La Tène/Roman period uncertain				39	pithouse	fill	layer C			probable superposition 2	7
785	7	2021	La Tène/Roman period uncertain				39	pithouse	fill	layer D			probable superposition 3	9
844	86	2022	cf. Roman period				39	pithouse	fill	layer E			superposition 1	10
1133	104	2021	cf. Roman period				39	pithouse	fill	layer F			superposition 1	7
1238	163	2021	cf. Roman period				39	pithouse	fill	layer G			superposition 1	9
1216	155	2022	cf. Roman period				39	pithouse	fill	layer H			superposition 1	10
784	6	2022	cf. Roman period				39	pithouse	fill	layer CH			superposition 1	10
1357	268	2021	La Tène/Roman period				39	pithouse	pithouse posthole		PH1	layer A	superposition 1	4
787	9	2022	La Tène/Roman period				39	pithouse	pithouse posthole		PH1	layer B	superposition 1	3
1337	249	2021	La Tène/Roman period	cf. La Tène period			39	pithouse	pithouse posthole		PH2	layer C	superposition 1	2
1318	230	2021	La Tène/Roman period	cf. La Tène period			39	pithouse	pithouse posthole		PH2	layer B	superposition 1	2
1359	270	2021	La Tène/Roman period	cf. La Tène period			39	pithouse	pithouse posthole		PH2	layer A	superposition 1	5
786	8	2022	La Tène/Roman period	cf. La Tène period			39	pithouse	pithouse posthole		PH3	layer A	superposition 1	5
790	12	2022	La Tène/Roman period	cf. La Tène period			39	pithouse	pithouse posthole		PH4	layer A	superposition 1	4
1346	257	2021	La Tène/Roman period	cf. Roman period			39	pithouse	pithouse posthole		PH5	layer B	superposition 1	4
1354	265	2021	La Tène/Roman period	cf. Roman period			39	pithouse	pithouse posthole		PH7	layer B	superposition 1	2
1336	248	2021	La Tène/Roman period	cf. Roman period			39	pithouse	pithouse posthole		PH7	layer A	superposition 1	2
1221	160	2022	La Tène/Roman period	cf. Roman period			39	pithouse	pithouse posthole		PH8	layer A	superposition 1	1
836	78	2022	La Tène/Roman period				39	pithouse	pithouse posthole		PH10	layer A	superposition 1	2
1128	99	2021	Roman period				42	above-ground pole structure	posthole			unspec.		8
1203	142	2021	Roman period				43	above-ground pole structure	posthole			unspec.		5
1136	107	2021	Roman period				44	above-ground pole structure	posthole			unspec.		3
1213	152	2021	Roman period				45	above-ground pole structure	posthole			unspec.		4
781	3	2021	Roman period				46	above-ground pole structure	posthole			unspec.		6

Sample	Field No.	Analysis or revision year	Dating	Dating (secondary)	Trench	Sector	Feature No.	Feature type	Context interpretation	Depth/ Fill specif.	Feature Sub-No.	Posthole fill specif.	Additional info	Volume (l)
779	1	2022	Roman period				47	above-ground pole structure	posthole			unspec.		6
780	2	2021	Roman period				48	above-ground pole structure	posthole			unspec.		5
1205	144	2021	Roman period				49	above-ground pole structure	posthole			unspec.		4
1188	127	2021	Roman period				50	above-ground pole structure	posthole			unspec.		5
1135	106	2021	Roman period				51	above-ground pole structure	posthole			unspec.		5
1131	102	2021	Roman period				52	above-ground pole structure	posthole			unspec.		5
1199	138	2021	Roman period				53	above-ground pole structure	posthole			unspec.		7
1187	126	2022	Roman period				54	above-ground pole structure	posthole			unspec.		4.5
1182	121	2021	Roman period				55	above-ground pole structure	posthole			unspec.		5
1202	141	2022	Roman period				56	above-ground pole structure	posthole			unspec.		6
1217	156	2022	Roman period				57	above-ground pole structure	posthole			unspec.		3.5
792	14	2021	Roman period				58	pithouse	pithouse posthole		PH2	unspec.		6
1181	120	2021	Roman period				58	pithouse	pithouse posthole		PH3	unspec.		4.5
1321	233	2021	Roman period				58	pithouse	pithouse posthole		PH5	unspec.		6
1325	237	2021	Roman period				58	pithouse	fill	layer A				7
1339	251	2021	Roman period				58	pithouse	pithouse posthole		PH4	unspec.		6
1340	252	2021	Roman period				58	pithouse	entrance niche		PH7	unspec.		4
1344	271	2021	Roman period				58	pithouse	pithouse posthole		PH6	unspec.		7
1349	260	2021	Roman period				58	pithouse	pithouse posthole		PH1	unspec.		5
1332	244	2021	Roman period				59	pithouse	fill	layer B				6
1333	245	2021	Roman period				59	pithouse	fill	layer A				3
1334	246	2021	Roman period				59	pithouse	fill	layer F				6
1358	269	2021	Roman period				59	pithouse	fill	layer D				4

Tab. 18. Continuation 3

Sample	Field No.	Analysis or revision year	Dating	Dating (secondary)	Trench	Sector	Feature No.	Feature type	Context interpretation	Depth/ Fill specif.	Feature Sub-No.	Posthole fill specif.	Additional info	Volume (l)
801	43	2022	Roman period				62	storage pit	fill	layer A				27
838	80	2021	Roman period				62	storage pit	fill	layer A				23
1338	250	2021	Roman period				62	storage pit	fill	layer A				20
1121	92	2021	Roman period				62	storage pit	fill	layer B				15
1180	119	2021	Roman period				62	storage pit	fill	layer G				14.5
1303	215	2021	Roman period				62	storage pit	fill	layer G				16
899	40	2022	Roman period				62	storage pit	fill	layer D				12
1262	174	2021	Roman period				62	storage pit	fill	layer D				15
1190	129	2021	Roman period				62	storage pit	bottom fill	layer I				5
1263	175	2021	Roman period				62	storage pit	fill	layer CH				15
1305	217	2021	Roman period				62	storage pit	fill	layer E				10
832	74	2022	Roman period				67	storage pit	fill	unspec.				32
898	39	2022	Roman period				67	storage pit	fill	unspec.				12
802	44	2021	Roman period				67	storage pit	fill	unspec.				15
839	81	2021	Roman period				67	storage pit	fill	unspec.				22
845	87	2021	Roman period				67	storage pit	fill	unspec.				10
847	89	2021	Roman period				67	storage pit	fill	unspec.				18
1186	125	2021	Roman period				67	storage pit	fill	unspec.				6
782	4	2022	Roman period				70	storage pit	fill	layer E				8
794	16	2021	Roman period				70	storage pit	fill	layer B/D?				12
1134	105	2021	Roman period				70	storage pit	fill	layer D				6
1137	108	2021	Roman period				70	storage pit	bottom fill	layer G				7
1177	116	2021	Roman period				70	storage pit	fill	layer C				6.5
1189	128	2021	Roman period				70	storage pit	fill	layer B				8
828	70	2021	La Tène period				80	pithouse	profile	layer A				6
849	91	2021	Roman period				80	pithouse	pithouse posthole		PH1	unspec.		5
892	33	2022	Roman period			B	80	pithouse	profile	layer B				6
1174	113	2021	La Tène period				80	pithouse	burnt fill	burnt layer 3, 40-60				10

Sample	Field No.	Analysis or revision year	Dating	Dating (secondary)	Trench	Sector	Feature No.	Feature type	Context interpretation	Depth/ Fill specif.	Feature Sub-No.	Posthole fill specif.	Additional info	Volume (l)
1264	176	2022	Roman period uncertain				83	posthole	fill	layer AB				6
842	84	2022	Roman period				84	pithouse	profile	layer C				7
798	20	2021	Roman period				84	pithouse	fill	unspec.				13
1204	143	2021	Roman period				84	pithouse	profile	layer D				4
1206	145	2021	Roman period				84	pithouse	profile	layer E				4
1208	147	2021	Roman period			A	84	pithouse	profile	layer A				4
1218	157	2021	Roman period			B	84	pithouse	profile	layer B				4
800	42	2022	Roman period				84	pithouse	pithouse posthole		PH1	layer C		2
843	85	2022	Roman period				84	pithouse	pithouse posthole		PH1	layer B		3
840	82	2021	Roman period				84	pithouse	pithouse posthole		PH1	layer A		5
1220	159	2022	Roman period				84	pithouse	pithouse posthole		PH3	layer B		2
1207	146	2021	Roman period				84	pithouse	pithouse posthole		PH3	layer A		2
1214	153	2022	Roman period				84	pithouse	pithouse posthole		PH4	layer B		2
1219	158	2022	Roman period				84	pithouse	pithouse posthole		PH4	layer A		4
831	73	2022	Roman period				84	pithouse	pithouse posthole		PH5	layer B		3
1212	151	2021	Roman period				84	pithouse	pithouse posthole		PH5	layer A		3
1196	135	2021	Roman period				84	pithouse	pithouse posthole		PH6	layer C		2
885	26	2022	Roman period				84	pithouse	pithouse posthole		PH7	layer H		1
891	32	2021	Roman period				84	pithouse	pithouse posthole		PH7	layer A		1
1129	100	2021	Roman period				84	pithouse	pithouse posthole		PH7	layer B		1
894	35	2021	Roman period				84	pithouse	entrance niche		PH8	layer B		2
1222	161	2021	Roman period				84	pithouse	entrance niche		PH8	layer A		3

Tab. 19. Jevišovka. Overview of other finds determined in collected samples (excl. carbonised macro-remains) in relative proportions (where * – a small number of finds, e.g. one or two; ***** – a big number of finds, e.g. hundreds of fragments or a prevalent proportion of the sample volume). PH – posthole; NISP – number of identified specimens; (nc) – non-carbonised; cf./confer – compare/probable; frag. – fragment(s). Author: J. Apiar, ARÚB.

Sample	1277	1295	1314	1280	1348	1184	1193	1324	1355	1283	1293	1341	823	799	1273
Field No.	189	207	226	192	259	123	132	236	266	195	205	253	65	21	185
Analysis or revision year	2022	2022	2021	2022	2021	2021	2021	2021	2021	2022	2022	2021	2021	2022	2022
Feature No.	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Feature Sub-No.										PH5	PH6	PH1	PH20	PH4	PH4
FINDS															
Charcoal (NISP)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Charcoal <3mm (%)	7	5	5	3	–	–	–	3	16	20	20	20	1	1	15
Charcoal >3mm (%)	15	5	30	1	1	30	–	7	5	1	50	20	–	–	10
Charcoal >3mm (NISP)	–	–	–	–	1	–	12	–	–	–	–	–	–	–	–
Roots and rhizomes (nc) %	50	60	30	65	50	30	50	20	16	30	30	27	95	70	80
Cereal straw (nc)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bark or twig	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Insect	**	**	**	–	***	–	*	**	***	**	*	**	*	*	–
Insect egg	–	–	*	–	–	*	*	*	–	–	–	–	–	–	–
Bone	*	*	–	–	*	–	**	*	**	**	*	**	–	**	*
Bone (burnt)	**	–	–	–	–	–	–	–	–	*	–	–	*	–	–
Bone (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone mass (burnt) or ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Coprolite	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tooth (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone (fish)	–	–	–	–	–	–	–	–	–	*	–	*	–	–	–
Scale (fish)	*	–	–	–	*	*	–	–	–	*	*	**	–	*	*
Malacofauna	–	*	*	–	–	*	*	–	–	*	*	–	–	–	–
Eggshell	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Daub	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Plaster or mortar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Shards, ceramics	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber	–	–	–	–	–	–	–	–	–	–	–	*	–	******	*
Stone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Resin	–	*	–	–	*	–	–	–	*	–	–	–	–	–	*
Calcareous concretions	–	–	–	–	–	***	****	–	–	–	–	–	–	–	–
Glass ingot or slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineral or natural silver	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–
Ferrous concretions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfloatable sediment aggregates	–	–	–	–	–	****	–	–	–	–	–	–	–	–	–
Mineralised coprolite frag., dung	–	–	–	–	–	–	–	–	**	–	–	**	–	–	–
Organic mass or cf. leather	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bead	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber bead fragment	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineralised frag. or resin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mineralised sediment covering charcoal, straw or cf. grains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Sample	1296	1274	826	890	1304	1310	829	1266	1311	1281	1353	1282	1276	1297	1294
Field No.	208	186	68	31	216	220	71	178	223	193	264	194	188	209	206
Analysis or revision year	2021	2022	2022	2022	2022	2022	2021	2022	2022	2022	2021	2021	2021	2022	2021
Feature No.	14	14	14	14	14	14	14	14	14	14	14	15	15	15	15
Feature Sub-No.	PH4	PH8	PH10	PH15	PH15	PH11	PH11	PH13	PH14	PH9	PH9	PH1	PH2	PH3	PH5
FINDS															
Charcoal (NISP)	39	–	–	–	–	–	–	–	–	–	–	–	–	–	308
Charcoal <3mm (%)	10	5	–	–	3	2	1	6	10	5	7	15	10	10	10
Charcoal >3mm (%)	–	–	–	–	7	10	–	–	30	–	25	15	15	5	10
Charcoal >3mm (NISP)	2	–	–	–	–	–	–	–	–	–	–	–	–	–	5
Roots and rhizomes (nc) %	40	60	40	1	65	65	85	70	10	85	25	20	25	45	40
Cereal straw (nc)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bark or twig	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Insect	**	**	*	***	–	**	–	*	–	*	–	–	–	**	***
Insect egg	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–
Bone	**	**	–	–	**	**	–	**	***	–	***	**	**	*****	***
Bone (burnt)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone mass (burnt) or ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Coprolite	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tooth (animal)	–	–	–	–	–	–	–	–	–	–	–	*	*	–	–
Bone (fish)	*	*	–	–	**	**	–	–	–	–	*	–	*	–	*
Scale (fish)	*	*	–	–	**	*	*	*	*	–	*	–	*	*	*
Malacofauna	*	*	–	–	*	–	–	**	–	–	–	–	–	*	–
Eggshell	*	–	–	–	–	–	–	–	–	–	–	–	*	–	**
Daub	–	–	–	–	–	*	–	–	–	–	–	–	–	*	*
Plaster or mortar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Shards, ceramics	–	–	–	–	–	–	–	–	–	–	–	–	*	–	*
Amber	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Stone	–	–	–	–	–	–	–	–	–	–	–	–	****	–	–
Resin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Calcareous concretions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Glass ingot or slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineral or natural silver	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ferrous concretions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfloatable sediment aggregates	–	–	–	–	–	–	–	–	–	–	–	–	***	–	–
Mineralised coprolite frag., dung	–	–	–	–	–	–	–	–	–	–	*****	–	**	–	–
Organic mass or cf. leather	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bead	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*
Amber bead fragment	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineralised frag. or resin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mineralised sediment covering charcoal, straw or cf. grains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Tab. 19. Continuation 1

Sample	1275	1272	1279	1271	1269	1308	1267	1201	1286	1306	1289	1291	1301	1309	809
Field No.	187	184	191	183	181	220	179	140	198	218	201	203	213	221	51
Analysis or revision year	2022	2022	2022	2022	2022	2022	2022	2021	2021	2021	2021	2021	2021	2022	2022
Feature No.	15	15	15	15	15	15	15	15	15	15	15	15	15	15	29
Feature Sub-No.	PH6	PH7	PH8	PH10	PH11	PH4	PH12								
FINDS															
Charcoal (NISP)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Charcoal <3mm (%)	20	2	3	1	–	5	1	–	2	–	1	1	1	3	5
Charcoal >3mm (%)	10	10	1	–	–	10	1	2	–	–	10	13	15	20	3
Charcoal >3mm (NISP)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Roots and rhizomes (nc) %	70	80	95	98	70	60	85	50	35	10	30	35	35	70	90
Cereal straw (nc)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bark or twig	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Insect	**	–	*	–	–	*	*	–	–	*	–	*	*	**	–
Insect egg	–	–	–	–	–	–	–	–	***	–	*	–	**	–	–
Bone	***	**	*	**	*	***	–	***	–	**	*****	**	*	***	*
Bone (burnt)	***	–	–	–	–	*	–	–	–	–	–	–	–	–	–
Bone (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone mass (burnt) or ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Coprolite	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tooth (animal)	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–
Bone (fish)	–	–	–	–	–	–	–	–	–	*	*	–	–	–	–
Scale (fish)	**	**	–	**	–	**	–	–	–	*	*	–	*	–	*
Malacofauna	***	–	–	*	–	*	–	–	–	**	*	–	–	*	*
Eggshell	*	*	–	–	–	**	–	–	–	–	–	–	–	–	–
Daub	*	–	–	*	–	***	–	–	–	–	–	–	–	–	–
Plaster or mortar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Shards, ceramics	*	–	–	–	–	*	–	–	–	–	–	*	–	–	–
Amber	–	–	–	–	–	****	–	–	–	–	–	–	–	–	–
Stone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Resin	–	*	*	–	–	–	–	–	–	*	–	–	–	–	–
Calcareous concretions	–	–	–	–	–	–	–	***	–	–	–	–	–	–	–
Glass ingot or slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineral or natural silver	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ferrous concretions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfloatable sediment aggregates	–	–	–	–	–	–	–	–	–	–	–	*****	–	–	–
Mineralised coprolite frag., dung	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Organic mass or cf. leather	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bead	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber bead fragment	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineralised frag. or resin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mineralised sediment covering charcoal, straw or cf. grains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Sample	817	881	1198	821	1335	883	1265	1175	1200	811	1345	807	1350	1261	1185
Field No.	59	22	137	63	247	24	177	114	139	53	256	49	261	173	124
Analysis or revision year	2022	2022	2021	2022	2021	2022	2022	2021	2021	2022	2021	2022	2021	2022	2021
Feature No.	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Feature Sub-No.								PH1	PH1	PH2	PH3	PH4	PH5	PH5	PH5
FINDS															
Charcoal (NISP)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Charcoal <3mm (%)	10	5	2	3	5	–	1	–	1	8	2	–	1	–	3
Charcoal >3mm (%)	15	3	5	1	20	–	–	25	35	2	10	–	2	20	20
Charcoal >3mm (NISP)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Roots and rhizomes (nc) %	50	80	40	60	45	75	95	60	25	90	50	95	49	50	50
Cereal straw (nc)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bark or twig	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Insect	–	*	–	*	–	*	–	–	*	–	–	–	*	**	*
Insect egg	–	–	*	–	*	–	–	*	*	–	*	–	*	*	*
Bone	**	***	*	**	***	–	*	*	*	***	*	–	*	**	***
Bone (burnt)	*	–	–	–	–	–	–	–	–	–	–	–	–	*	–
Bone (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone mass (burnt) or ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Coprolite	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tooth (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*
Bone (fish)	–	–	–	–	–	–	–	–	–	–	*	–	–	*	–
Scale (fish)	–	**	*	**	**	–	–	*	*	**	*	*	**	**	**
Malacofauna	*	***	*	*	**	–	–	*	*	–	–	–	–	***	*
Eggshell	–	–	–	*	–	–	–	*	*	–	–	–	–	*	–
Daub	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Plaster or mortar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Shards, ceramics	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Stone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Resin	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–
Calcareous concretions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	***
Glass ingot or slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineral or natural silver	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ferrous concretions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfloatable sediment aggregates	–	–	–	–	–	–	–	***	*****	–	***	–	–	–	****
Mineralised coprolite frag., dung	–	–	–	–	–	–	–	***	**	–	*****	–	–	–	**
Organic mass or cf. leather	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bead	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber bead fragment	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineralised frag. or resin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mineralised sediment covering charcoal, straw or cf. grains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Tab. 19. Continuation 2

Sample	1237	1183	1140	1253	1125	1259	825	837	835	893	896	1312	1284	1288	1351
Field No.	162	122	111	165	96	171	67	79	77	34	37	224	196	200	262
Analysis or revision year	2021	2021	2021	2021	2021	2022	2022	2022	2022	2022	2022	2022	2021	2021	2021
Feature No.	29	29	29	29	29	29	31	31	34	34	34	34	34	34	34
Feature Sub-No.	PH5	PH6	PH6	PH7	PH7	PH8			PH1	PH1	PH1				
FINDS															
Charcoal (NISP)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Charcoal <3mm (%)	–	1	–	1	2	1	5	10	1	3	2	10	1	1	1
Charcoal >3mm (%)	40	20	1	4	20	10	3	5	1	20	2	1	1	5	48
Charcoal >3mm (NISP)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Roots and rhizomes (nc) %	20	50	60	45	70	75	50	85	45	25	30	2	30	45	1
Cereal straw (nc)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bark or twig	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Insect	*	–	*	*	*	**	*	–	*	–	*	**	*	*	–
Insect egg	*	*	*	*	*	–	–	–	–	–	–	–	–	*	*
Bone	***	**	**	*	**	*	***	*	**	**	*	*	–	–	**
Bone (burnt)	*	–	–	–	–	*	–	–	–	–	–	–	–	–	–
Bone (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone mass (burnt) or ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Coprolite	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tooth (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone (fish)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*
Scale (fish)	**	*	**	*	**	–	***	*	**	–	***	*	–	*	**
Malacofauna	*	–	–	*	*	*	***	*	**	–	**	*	–	–	–
Eggshell	–	–	–	–	–	–	*	**	–	–	–	–	–	–	–
Daub	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–
Plaster or mortar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Shards, ceramics	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Stone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Resin	–	–	–	*	–	–	*	–	–	*	–	**	–	–	–
Calcareous concretions	***	**	–	****	**	–	–	–	–	–	–	–	–	–	*
Glass ingot or slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineral or natural silver	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ferrous concretions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfloatable sediment aggregates	****	*****	****	–	**	–	–	–	–	–	–	–	–	–	**
Mineralised coprolite frag., dung	**	**	**	–	–	–	–	–	–	–	–	–	–	–	*****
Organic mass or cf. leather	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bead	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber bead fragment	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineralised frag. or resin	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mineralised sediment covering charcoal, straw or cf. grains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Sample	806	1254	805	1258	1130	1178	886	820	1260	1176	788	1239	1126	1257	1197
Field No.	48	166	47	170	101	117	27	62	172	115	10	164	97	169	136
Analysis or revision year	2022	2022	2021	2022	2021	2021	2022	2022	2021	2021	2021	2021	2021	2022	2021
Feature No.	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Feature Sub-No.												PH1	PH2	PH3	PH4
FINDS															
Charcoal (NISP)	_	_	_	_	_	_	_	_	3	_	_	_	_	_	_
Charcoal <3mm (%)	1	_	1	5	_	2	3	15	1	_	_	1	2	10	1
Charcoal >3mm (%)	_	3	5	1	25	15	1	5	_	1	1	5	45	_	30
Charcoal >3mm (NISP)	_	_	_	_	_	_	_	_	1	_	_	_	_	_	_
Roots and rhizomes (nc) %	65	85	90	80	45	60	95	75	40	70	95	40	25	50	40
Cereal straw (nc)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bark or twig	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Insect	_	*	*	_	_	_	*	_	**	_	*	_	_	*	_
Insect egg	_	_	_	_	_	_	_	_	_	*	_	*	_	_	_
Bone	***	**	*	***	*	*	***	***	*	*	*	*	**	_	**
Bone (burnt)	_	*	_	*	_	_	_	_	_	_	*	_	_	_	*
Bone (animal)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bone mass (burnt) or ash	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Coprolite	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Tooth (animal)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bone (fish)	_	_	*	_	_	*	_	_	_	_	_	*	_	**	_
Scale (fish)	**	_	*	**	_	_	*	*	_	*	_	_	_	_	***
Malacofauna	_	_	_	_	_	_	_	_	_	_	_	_	*	*	*
Eggshell	_	_	_	*	_	_	_	_	_	_	_	*	_	_	_
Daub	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Plaster or mortar	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Shards, ceramics	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Amber	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Stone	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Resin	_	_	_	*	_	_	_	_	_	_	_	_	_	_	_
Calcareous concretions	_	_	_	_	_	_	_	_	_	*	_	_	***	_	***
Glass ingot or slag	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Slag	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Indet. mineral or natural silver	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Ferrous concretions	_	_	_	_	_	_	**	_	_	_	_	_	_	_	_
Unfloatable sediment aggregates	_	_	_	_	**	_	_	_	_	_	_	_	****	_	***
Mineralised coprolite frag., dung	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Organic mass or cf. leather	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bead	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Amber bead fragment	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Indet. mineralised frag. or resin	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Ash	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Mineralised sediment covering charcoal, straw or cf. grains	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_

Tab. 19. Continuation 3

Sample	1123	1256	830	814	834	1278	1268	1270	1319	1328	827	888	897	1141	1287
Field No.	94	168	72	56	76	190	180	182	231	240	69	29	38	112	199
Analysis or revision year	2021	2022	2022	2022	2022	2021	2022	2022	2021	2021	2022	2022	2022	2021	2021
Feature No.	36	36	36	38	38	38	38	38	38	38	38	38	38	38	38
Feature Sub-No.	PH4	PH5	PH6								PH7	PH2	PH3	PH4	
FINDS															
Charcoal (NISP)	–	–	–	–	–	143	–	–	–	–	–	–	–	–	349
Charcoal <3mm (%)	1	5	7	5	5	10	10	–	7	2	20	3	20	1	2
Charcoal >3mm (%)	5	–	3	5	3	–	2	2	38	15	20	2	30	20	–
Charcoal >3mm (NISP)	1	–	–	–	–	4	–	5	–	–	–	–	–	–	4
Roots and rhizomes (nc) %	85	90	80	70	85	30	65	85	45	45	50	70	40	65	30
Cereal straw (nc)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bark or twig	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Insect	*	**	*	–	–	–	–	**	–	**	*	–	–	–	**
Insect egg	–	–	–	–	–	–	–	–	*	**	–	–	–	–	–
Bone	–	*	***	***	**	*	***	**	*	**	*	**	**	***	***
Bone (burnt)	–	–	–	*	–	–	*	*	–	–	–	–	–	–	–
Bone (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone mass (burnt) or ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Coprolite	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tooth (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone (fish)	–	*	–	–	–	*	–	–	*	*	–	–	–	–	**
Scale (fish)	–	–	**	*	**	–	**	*	*	*	–	**	*	*	*
Malacofauna	–	–	–	*	–	*	*	–	*	–	*	*	–	–	*
Eggshell	–	–	–	*	–	–	*	–	*	–	–	–	–	–	–
Daub	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–
Plaster or mortar	–	–	–	–	–	–	–	–	–	–	–	**	–	–	–
Shards, ceramics	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Stone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Resin	–	–	–	*	*	*	**	*	–	–	–	–	–	–	–
Calcareous concretions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Glass ingot or slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineral or natural silver	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ferrous concretions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfloatable sediment aggregates	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*****
Mineralised coprolite frag., dung	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Organic mass or cf. leather	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bead	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber bead fragment	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineralised frag. or resin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mineralised sediment covering charcoal, straw or cf. grains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Sample	1323	803	818	1122	1215	791	785	844	1133	1238	1216	784	1357	787	1337
Field No.	235	45	60	93	154	13	7	86	104	163	155	6	268	9	249
Analysis or revision year	2021	2022	2022	2021	2021	2021	2021	2022	2021	2021	2022	2022	2021	2022	2021
Feature No.	38	39	39	39	39	39	39	39	39	39	39	39	39	39	39
Feature Sub-No.													PH1	PH1	PH2
FINDS															
Charcoal (NISP)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Charcoal <3mm (%)	3	15	18	1	10	2	–	15	2	–	15	–	7	3	–
Charcoal >3mm (%)	28	5	30	2	50	15	30	15	30	60	50	20	35	20	–
Charcoal >3mm (NISP)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Roots and rhizomes (nc) %	40	70	60	30	15	20	70	40	20	15	30	45	35	50	50
Cereal straw (nc)	–	–	–	***	–	–	–	–	–	–	–	–	–	–	–
Bark or twig	–	–	–	–	–	–	–	–	–	–	–	**	–	–	–
Insect	*	–	–	*	*	*	–	–	*	*	*	–	*	–	*
Insect egg	*	–	–	*	–	–	–	–	–	–	–	*	*	–	–
Bone	***	****	**	**	*	****	*	****	**	*	***	*	–	**	**
Bone (burnt)	–	–	–	–	–	*	–	–	*	–	**	–	–	–	–
Bone (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone mass (burnt) or ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Coprolite	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–
Tooth (animal)	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–
Bone (fish)	*	–	–	*	–	–	–	–	*	–	–	–	*	–	*
Scale (fish)	***	****	**	****	*	****	–	**	**	*	**	–	*	**	*
Malacofauna	**	**	–	*	*	–	*	*	–	–	–	*	–	–	–
Eggshell	–	****	–	–	–	–	–	–	–	*	–	–	–	–	–
Daub	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–
Plaster or mortar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Shards, ceramics	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Stone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Resin	–	*	–	–	–	–	–	–	–	*	–	–	*	–	–
Calcareous concretions	**	–	–	–	–	–	–	–	–	***	–	–	–	–	–
Glass ingot or slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineral or natural silver	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ferrous concretions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfloatable sediment aggregates	***	–	–	–	–	–	–	***	–	***	–	–	–	–	–
Mineralised coprolite frag., dung	***	–	–	–	–	–	–	**	–	**	–	*	–	–	–
Organic mass or cf. leather	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bead	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber bead fragment	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineralised frag. or resin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mineralised sediment covering charcoal, straw or cf. grains	–	–	–	–	–	***	–	–	–	–	–	–	–	–	–

Tab. 19. Continuation 4

Sample	1318	1359	786	790	1346	1354	1336	1221	836	1128	1203	1136	1213	781	779
Field No.	230	270	8	12	257	265	248	160	78	99	142	107	152	3	1
Analysis or revision year	2021	2021	2022	2022	2021	2021	2021	2022	2022	2021	2021	2021	2021	2021	2022
Feature No.	39	39	39	39	39	39	39	39	39	42	43	44	45	46	47
Feature Sub-No.	PH2	PH2	PH3	PH4	PH5	PH7	PH7	PH8	PH10						
FINDS															
Charcoal (NISP)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Charcoal <3mm (%)	2	1	–	–	7	–	5	10	1	–	2	1	8	1	–
Charcoal >3mm (%)	3	2	1	–	35	1	6	–	–	–	3	5	15	2	–
Charcoal >3mm (NISP)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Roots and rhizomes (nc) %	45	68	90	50	35	50	27	30	60	65	50	70	65	60	70
Cereal straw (nc)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bark or twig	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Insect	****	**	*	–	*	**	–	*	*	*	****	–	*	–	–
Insect egg	–	*	–	–	–	–	–	–	–	****	–	–	***	–	–
Bone	*	**	*	*****	***	–	****	**	–	*	**	**	–	**	**
Bone (burnt)	–	–	–	–	–	–	–	*	–	–	–	–	*	–	–
Bone (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone mass (burnt) or ash	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Coprolite	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–
Tooth (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone (fish)	–	–	–	–	**	*	*	–	–	–	**	–	*	–	–
Scale (fish)	*	–	**	*	*	–	*	–	–	*	*	*	*	–	–
Malacofauna	–	–	*	–	–	–	–	–	–	***	*	*	**	*	–
Eggshell	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Daub	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–
Plaster or mortar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Shards, ceramics	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Stone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Resin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Calcareous concretions	***	–	–	–	–	****	***	–	–	–	–	–	–	–	**
Glass ingot or slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineral or natural silver	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ferrous concretions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfloatable sediment aggregates	**	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mineralised coprolite frag., dung	**	–	–	–	*****	****	**	–	–	–	–	–	–	–	–
Organic mass or cf. leather	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bead	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber bead fragment	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineralised frag. or resin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mineralised sediment covering charcoal, straw or cf. grains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Sample	780	1205	1188	1135	1131	1199	1187	1182	1202	1217	792	1181	1321	1325	1339
Field No.	2	144	127	106	102	138	126	121	141	156	14	120	233	237	251
Analysis or revision year	2021	2021	2021	2021	2021	2021	2022	2021	2022	2022	2021	2021	2021	2021	2021
Feature No.	48	49	50	51	52	53	54	55	56	57	58	58	58	58	58
Feature Sub-No.											PH2	PH3	PH5		PH4
FINDS															
Charcoal (NISP)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Charcoal <3mm (%)	10	_	_	_	_	_	1	_	2	_	2	2	3	20	_
Charcoal >3mm (%)	1	5	1	1	5	_	_	30	1	_	30	40	20	12	15
Charcoal >3mm (NISP)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	25
Roots and rhizomes (nc) %	90	40	50	50	70	50	_	45	_	_	25	35	20	35	7
Cereal straw (nc)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bark or twig	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Insect	_	_	*	_	*	_	**	_	*	*	_	_	**	_	*
Insect egg	*	*	_	*	****	*	_	_	_	_	_	_	_	**	***
Bone	****	**	**	**	*	*****	**	***	**	_	**	**	*	***	_
Bone (burnt)	_	_	*	_	*	_	_	_	*	_	_	_	_	_	_
Bone (animal)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bone mass (burnt) or ash	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Coprolite	_	_	_	_	*	_	_	_	_	_	_	_	_	_	_
Tooth (animal)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bone (fish)	_	*	_	_	*	_	**	_	**	_	_	_	*	_	*
Scale (fish)	**	*	_	*	*	_	*	*	**	_	**	_	*	**	_
Malacofauna	*	*	*	**	**	*	**	_	**	**	_	_	_	**	_
Eggshell	_	_	_	_	_	_	_	*	_	_	_	_	_	_	_
Daub	*	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Plaster or mortar	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Shards, ceramics	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Amber	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Stone	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Resin	_	*	*	_	_	_	_	_	*	_	_	_	_	_	_
Calcareous concretions	_	_	_	_	_	_	_	_	_	_	_	**	_	_	_
Glass ingot or slag	_	_	_	_	*	_	_	_	_	_	_	_	_	_	_
Slag	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Indet. mineral or natural silver	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Ferrous concretions	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Unfloatable sediment aggregates	_	_	_	_	_	_	_	_	_	_	*****	*****	****	_	_
Mineralised coprolite frag., dung	_	_	_	_	_	_	_	_	_	_	**	_	**	_	_
Organic mass or cf. leather	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bead	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Amber bead fragment	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Indet. mineralised frag. or resin	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Ash	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Mineralised sediment covering charcoal, straw or cf. grains	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_

Tab. 19. Continuation 5

Sample	1340	1344	1349	1332	1333	1334	1358	801	838	1338	1121	1180	1303	899	1262
Field No.	252	271	260	244	245	246	269	43	80	250	92	119	215	40	174
Analysis or revision year	2021	2021	2021	2021	2021	2021	2021	2022	2021	2021	2021	2021	2021	2022	2021
Feature No.	58	58	58	59	59	59	59	62	62	62	62	62	62	62	62
Feature Sub-No.	PH7	PH6	PH1												
FINDS															
Charcoal (NISP)	–	–	–	–	–	–	–	–	–	–	–	–	–	173	–
Charcoal <3mm (%)	6	17	7	6	3	5	5	–	10	7	–	50	5	25	10
Charcoal >3mm (%)	7	17	17	60	20	60	13	3	35	25	20	–	50	40	15
Charcoal >3mm (NISP)	–	–	–	–	–	–	–	10	–	–	–	20	–	–	–
Roots and rhizomes (nc) %	23	16	36	2	30	1	36	60	65	45	60	20	1	15	1
Cereal straw (nc)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bark or twig	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Insect	***	*	*	**	–	–	–	–	*	*	*	–	–	*	–
Insect egg	–	–	***	–	–	–	–	–	**	*	**	–	–	*	*
Bone	***	***	*	***	**	–	**	****	***	***	**	**	**	*	*
Bone (burnt)	–	–	–	–	*	–	–	–	–	–	–	*	–	–	–
Bone (animal)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bone mass (burnt) or ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Coprolite	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tooth (animal)	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–
Bone (fish)	**	*	*	*	**	–	–	–	*	*	–	–	–	–	–
Scale (fish)	*	*	*	–	**	–	–	–	***	**	**	*	–	**	**
Malacofauna	–	–	*	*	**	*	–	****	*	*	*	*	*	*	–
Eggshell	*	*	*	–	–	–	–	–	–	–	–	–	–	–	–
Daub	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–
Plaster or mortar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Shards, ceramics	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Stone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Resin	–	–	–	–	–	*	–	*	–	–	*	–	**	–	–
Calcareous concretions	–	–	–	**	–	**	–	–	–	***	–	–	**	–	***
Glass ingot or slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Slag	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineral or natural silver	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ferrous concretions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfloatable sediment aggregates	–	–	–	**	–	***	–	–	–	**	–	***	*****	–	–
Mineralised coprolite frag., dung	–	–	–	*****	*	****	*****	–	–	*	–	–	****	–	***
Organic mass or cf. leather	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–
Bead	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amber bead fragment	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–
Indet. mineralised frag. or resin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ash	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mineralised sediment covering charcoal, straw or cf. grains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Sample	1190	1263	1305	832	898	802	839	845	847	1186	782	794	1134	1137	1177
Field No.	129	175	217	74	39	44	81	87	89	125	4	16	105	108	116
Analysis or revision year	2021	2021	2021	2022	2022	2021	2021	2021	2021	2021	2022	2021	2021	2021	2021
Feature No.	62	62	62	67	67	67	67	67	67	67	70	70	70	70	70
Feature Sub-No.															
FINDS															
Charcoal (NISP)	_	_	40	_	_	_	_	_	_	_	_	_	_	_	_
Charcoal <3mm (%)	1	2	2	3	_	1	5	_	1	_	_	_	_	1	_
Charcoal >3mm (%)	50	60	_	2	_	1	30	_	15	10	_	30	5	5	_
Charcoal >3mm (NISP)	_	_	2	_	_	_	_	_	_	_	_	_	_	_	_
Roots and rhizomes (nc) %	10	5	45	80	60	75	70	90	70	25	45	15	70	15	90
Cereal straw (nc)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bark or twig	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Insect	_	*	**	_	_	*	_	*	*	_	_	*	*	*	*
Insect egg	_	*	*	_	*	**	*	_	_	*	_	_	*	_	*
Bone	*	*	*	***	**	***	**	***	**	**	*	**	*	*	_
Bone (burnt)	_	_	_	_	_	*	*	_	_	_	_	*	_	*	*
Bone (animal)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bone mass (burnt) or ash	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Coprolite	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Tooth (animal)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bone (fish)	*	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Scale (fish)	_	*	_	**	_	*	**	_	*	*	_	*	_	*	_
Malacofauna	*	*	_	***	_	*	*	*	_	*	_	*	*	*	_
Eggshell	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Daub	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Plaster or mortar	_	_	_	_	*	_	_	_	_	_	_	_	_	_	_
Shards, ceramics	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Amber	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Stone	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Resin	_	_	_	_	_	_	_	_	*	_	_	_	_	_	_
Calcareous concretions	***	_	_	_	_	_	**	_	_	***	_	_	_	**	_
Glass ingot or slag	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Slag	_	_	_	_	_	_	_	_	_	_	*	_	_	_	_
Indet. mineral or natural silver	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Ferrous concretions	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Unfloatable sediment aggregates	****	**	*****	_	_	_	**	_	_	**	*****	_	_	_	_
Mineralised coprolite frag., dung	*****	****	_	_	_	_	_	_	_	_	***	_	_	_	_
Organic mass or cf. leather	*	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bead	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Amber bead fragment	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Indet. mineralised frag. or resin	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Ash	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Mineralised sediment covering charcoal, straw or cf. grains	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_

Tab. 19. Continuation 6

Sample	1189	828	849	892	1174	1264	842	798	1204	1206	1208	1218	800	843	840
Field No.	128	70	91	33	113	176	84	20	143	145	147	157	42	85	82
Analysis or revision year	2021	2021	2021	2022	2021	2022	2022	2021	2021	2021	2021	2021	2022	2022	2021
Feature No.	70	80	80	80	80	83	84	84	84	84	84	84	84	84	84
Feature Sub-No.			PH1										PH1	PH1	PH1
FINDS															
Charcoal (NISP)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Charcoal <3mm (%)	2	2	_	_	1	2	10	30	1	10	1	_	_	15	15
Charcoal >3mm (%)	_	2	_	_	15	_	1	5	50	20	15	15	_	4	1
Charcoal >3mm (NISP)	3	_	1	_	_	_	_	_	_	_	_	_	_	_	_
Roots and rhizomes (nc) %	50	2	_	_	1	90	90	70	5	25	2	50	90	80	70
Cereal straw (nc)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bark or twig	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Insect	**	****	_	_	**	**	_	*	*	_	_	_	_	*	_
Insect egg	*	_	_	_	*	_	_	*	_	*	_	_	_	_	_
Bone	**	_	*	*	**	*	***	*	**	**	*	**	_	**	*
Bone (burnt)	_	_	_	*	_	_	_	_	_	_	_	*	_	_	_
Bone (animal)	_	_	_	_	_	_	_	_	_	*	_	_	_	_	_
Bone mass (burnt) or ash	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Coprolite	_	_	_	_	**	_	_	_	_	_	_	_	_	_	_
Tooth (animal)	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bone (fish)	**	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Scale (fish)	**	*	_	_	**	_	**	*	*	**	_	*	_	**	**
Malacofauna	**	_	_	**	_	*	_	*	_	*	_	*	_	*	_
Eggshell	_	_	_	_	_	_	*	_	_	_	_	_	_	_	_
Daub	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Plaster or mortar	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Shards, ceramics	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Amber	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Stone	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Resin	_	_	_	_	_	_	*	_	_	_	_	_	_	_	_
Calcareous concretions	_	***	_	*****	*****	_	_	_	_	_	**	*	_	_	_
Glass ingot or slag	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Slag	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Indet. mineral or natural silver	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Ferrous concretions	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Unfloatable sediment aggregates	_	_	_	_	*****	_	_	_	***	_	**	**	_	_	****
Mineralised coprolite frag., dung	_	_	_	*****	*****	_	_	_	_	_	_	_	_	_	_
Organic mass or cf. leather	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Bead	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Amber bead fragment	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Indet. mineralised frag. or resin	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Ash	_	_	_	*****	_	_	_	_	_	_	_	_	_	_	_
Mineralised sediment covering charcoal, straw or cf. grains	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_

Sample	1220	1207	1214	1219	831	1212	1196	885	891	1129	894	1222
Field No.	159	146	153	158	73	151	135	26	32	100	35	161
Analysis or revision year	2022	2021	2022	2022	2022	2021	2021	2022	2021	2021	2021	2021
Feature No.	84	84	84	84	84	84	84	84	84	84	84	84
Feature Sub-No.	PH3	PH3	PH4	PH4	PH5	PH5	PH6	PH7	PH7	PH7	PH8	PH8
FINDS												
Charcoal (NISP)	–	–	–	–	–	–	–	–	–	–	–	3
Charcoal <3mm (%)	20	1	–	–	5	1	1	–	–	–	1	1
Charcoal >3mm (%)	5	2	–	–	1	25	1	10	–	1	–	–
Charcoal >3mm (NISP)	–	–	–	–	–	–	–	–	–	–	–	1
Roots and rhizomes (nc) %	70	50	–	90	90	55	5	80	80	60	50	50
Cereal straw (nc)	–	–	–	–	–	–	–	–	–	–	–	–
Bark or twig	–	–	–	–	–	–	–	–	–	–	–	–
Insect	*	–	–	*	–	–	–	–	–	–	–	–
Insect egg	–	–	–	–	–	–	–	–	–	–	–	–
Bone	***	**	*	**	**	**	–	–	–	*	–	*
Bone (burnt)	–	–	–	–	–	–	–	–	–	–	–	–
Bone (animal)	–	–	–	–	–	–	–	–	–	–	–	–
Bone mass (burnt) or ash	–	–	–	–	–	–	–	–	–	–	–	–
Coprolite	–	–	–	–	–	–	–	–	–	–	–	–
Tooth (animal)	–	–	–	–	–	–	–	–	–	–	–	–
Bone (fish)	–	–	–	–	–	–	–	–	–	–	–	–
Scale (fish)	*	–	*	*	–	*	*	–	–	–	–	–
Malacofauna	**	–	*	**	*	–	–	–	–	–	–	*
Eggshell	*	–	–	*	–	–	–	–	–	–	–	–
Daub	*	–	–	–	–	–	–	–	–	–	–	–
Plaster or mortar	–	–	–	–	–	–	–	–	–	–	–	–
Shards, ceramics	–	–	–	–	–	–	–	–	–	–	–	–
Amber	–	–	–	–	–	–	–	–	–	–	–	–
Stone	–	–	–	–	–	–	–	–	–	–	–	–
Resin	–	–	–	*	–	–	–	–	–	–	–	–
Calcareous concretions	–	***	–	–	–	–	–	–	–	–	–	–
Glass ingot or slag	–	–	–	–	–	–	–	–	–	–	–	–
Slag	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineral or natural silver	–	–	–	–	–	–	–	–	–	–	–	–
Ferrous concretions	–	–	–	–	–	–	–	–	–	–	–	–
Unfloatable sediment aggregates	–	***	–	–	–	–	****	–	–	**	***	–
Mineralised coprolite frag., dung	–	–	–	–	–	–	–	–	–	–	–	–
Organic mass or cf. leather	–	–	–	–	–	–	–	–	–	–	–	–
Bead	–	–	–	–	–	–	–	–	–	–	–	–
Amber bead fragment	–	–	–	–	–	–	–	–	–	–	–	–
Indet. mineralised frag. or resin	–	–	–	–	–	–	–	–	–	–	–	–
Ash	–	–	–	–	–	–	–	–	–	–	–	–
Mineralised sediment covering charcoal, straw or cf. grains	–	–	–	–	–	–	–	–	–	–	–	–

Tab. 20. Jevišovka. Overview of carbonised macro-remains determined in elements or samples. Author: J. Apiar, ARÚB.

Element or sample	Feature No.	Volume (l)	Sum of macro-remains (MNI)	Cereal grains	Cerealia indet.	Chaff	Culms and straw	Legumes	Condiments, oil and fibre plants, other use plants	Coniferae seeds	Fruits and nuts	Wild plants	Indeterminate	Organic mass fragments (probable food)	Porous organic mass frag. indet
1277_1295_1314	14	50	121	30	52	8	1	4	–	–	–	3	19	2	2
1280	14	16	54	11	35	2	–	1	–	–	–	4	–	1	–
1348	14	16	15	1	10	2	–	–	–	–	–	1	–	1	–
1184	14	17	10	1	8	–	1	–	–	–	–	–	–	–	–
1193_1324_1355	14	47	156	11	102	19	2	–	–	–	–	8	9	2	3
1341_823	14	11	46	6	33	4	–	–	–	–	–	2	1	–	–
826	14	4	3	1	2	–	–	–	–	–	–	–	–	–	–
1310_829	14	10	12	2	3	–	–	–	–	–	–	5	2	–	–
1266	14	5	7	4	3	–	–	–	–	–	–	–	–	–	–
1311	14	0.5	9	–	–	–	–	–	–	–	–	–	–	9	–
890_1304	14	8	13	5	3	3	–	–	–	–	–	1	–	–	1
799_1273_1296	14	15	33	4	10	4	1	2	–	–	–	8	–	–	4
1283_1293	14	18	6	4	1	–	–	–	–	–	–	1	–	–	–
1274	14	4	6	1	1	–	–	–	–	–	–	2	1	–	1
1281_1353	14	5.5	17	–	11	–	–	–	–	–	–	6	–	–	–
1282	15	6	6	4	1	1	–	–	–	–	–	–	–	–	–
1271	15	4	2	1	1	–	–	–	–	–	–	–	–	–	–
1269	15	3	4	–	1	–	–	3	–	–	–	–	–	–	–
1267	15	4	1	–	1	–	–	–	–	–	–	–	–	–	–
1276	15	7	13	6	5	–	1	–	–	–	–	1	–	–	–
1297	15	4	21	1	5	2	–	–	–	–	–	6	5	2	–
1308	15	2	14	6	2	–	–	1	–	–	–	2	2	1	–
1294	15	9	28	6	9	3	1	–	–	–	–	8	1	–	–
1275	15	6	16	7	6	1	–	1	–	–	–	1	–	–	–
1272	15	4	10	6	2	–	–	–	–	–	–	–	2	–	–
1279	15	3	5	–	1	2	–	–	–	–	–	2	–	–	–
1201	15	16	1	–	1	–	–	–	–	–	–	–	–	–	–
1286_1306_1289	15	20	16	1	9	1	–	1	–	–	–	2	1	–	1
1291_1301_1309	15	17	10	2	4	–	–	–	–	–	–	2	–	–	2
809_817_881_1198	29	28	197	15	9	2	–	1	–	–	–	4	3	–	163
821_1335	29	11	27	5	6	–	1	–	–	–	–	1	–	–	14
883	29	4	2	–	–	–	–	–	1	–	–	–	–	–	1
1265	29	8	6	–	4	1	–	–	1	–	–	–	–	–	–
1175_1200	29	31.5	22	3	9	4	1	1	1	–	–	3	–	–	–
811	29	7	63	3	6	2	1	1	–	–	–	1	4	–	45
1345	29	12	3	–	3	–	–	–	–	–	–	–	–	–	–
807	29	6	17	2	1	–	–	–	–	–	–	–	–	–	14
1350_1261_1185_1237	29	52	74	23	26	–	1	4	–	–	–	2	7	4	7
1183_1140	29	23	15	4	6	3	–	–	–	–	–	2	–	–	–
1253_1125_1259	29	26	21	4	11	2	2	–	–	–	–	2	–	–	–
825_837	31	26	48	2	2	3	–	2	–	–	–	2	2	–	35
835_893_896	34	17	36	4	1	–	–	–	–	–	1	11	2	–	17
1312_1284_1288	34	32	11	1	4	–	–	2	–	–	–	4	–	–	–
1351	34	7	9	2	4	2	–	1	–	–	–	–	–	–	–
806_1254_805_1258	36	20	107	21	32	3	–	–	–	–	1	6	3	3	38
1130_1178_886_820	36	24.5	50	5	19	–	–	–	–	–	–	3	2	–	21
1260_1176	36	24	24	9	9	2	1	–	–	1	–	2	–	–	–

Tab. 20. Continuation 1

Element or sample	Feature No.	Volume (l)	Sum of macro-remains (MNI)	Cereal grains	Cerealia indet.	Chaff	Culms and straw	Legumes	Condiments, oil and fibre plants, other use plants	Coniferae seeds	Fruits and nuts	Wild plants	Indeterminate	Organic mass fragments (probable food)	Porous organic mass frag. indet
788	36	7	2	–	2	–	–	–	–	–	–	–	–	–	–
1239	36	7.5	9	2	4	–	1	–	–	–	–	1	–	–	1
1126	36	7	10	2	3	–	–	–	–	–	–	2	–	1	2
1257	36	2	80	–	78	–	–	–	–	–	–	2	–	–	–
1197_1123	36	12	10	3	5	–	–	–	–	–	–	–	–	2	–
1256	36	4	3	1	2	–	–	–	–	–	–	–	–	–	–
830	36	6	29	1	2	–	–	–	–	–	–	1	–	–	25
814	38	4	37	7	3	–	–	–	–	–	1	–	–	–	26
834_1278	38	9.5	46	6	10	1	–	2	–	–	1	4	–	–	22
1268_1270_1319	38	21	129	56	50	–	1	2	–	–	1	14	–	1	4
1328	38	6	34	4	4	2	–	–	–	–	–	24	–	–	–
827	38	4	12	3	1	–	–	–	–	–	–	1	–	–	7
888	38	5	49	7	6	4	–	–	–	–	–	9	–	–	23
897	38	7	34	3	4	–	2	1	–	–	1	2	–	–	21
1141	38	3	14	–	1	–	–	–	–	–	–	–	–	–	13
1287_1323	38	28	101	22	42	4	–	1	–	–	4	6	2	12	8
803_818	39	12	115	16	15	3	10	–	–	–	–	5	1	–	65
1122_1215	39	23	2224	323	600	144	841	33	1	1	–	201	12	47	21
791	39	7	778	116	358	74	51	4	–	–	5	157	12	–	1
785	39	9	194	51	99	11	–	–	–	–	–	25	8	–	–
844	39	10	216	121	51	10	8	5	–	–	–	14	7	–	–
1133	39	7	671	281	135	72	100	3	–	1	–	22	1	20	36
1238	39	9	390	142	66	57	86	3	–	–	–	13	1	22	–
1216	39	10	449	177	167	8	37	5	–	–	1	23	2	29	–
784	39	10	263	138	72	11	21	4	–	–	1	6	–	–	10
1357_787	39	7	27	6	9	–	–	–	–	–	–	1	–	–	11
1337_1318_1359	39	9	74	24	17	13	15	–	1	–	–	1	2	–	1
786	39	5	34	4	7	2	–	–	–	–	–	4	2	–	15
790	39	4	11	4	2	3	–	–	–	–	–	1	–	–	1
1346	39	4	130	30	11	14	53	–	–	1	–	1	8	12	–
1354_1336	39	4	51	8	35	5	3	–	–	–	–	–	–	–	–
1221	39	1	225	126	50	10	8	3	–	–	–	24	2	–	2
836	39	2	20	4	1	–	7	–	–	–	–	4	–	–	4
1128	42	8	27	3	12	7	1	–	–	–	–	4	–	–	–
1203	43	5	25	6	9	3	–	–	–	–	–	2	5	–	–
1136	44	3	3	–	2	–	–	–	–	–	–	1	–	–	–
1213	45	4	13	4	3	–	–	–	1	–	–	–	5	–	–
781	46	6	2	1	1	–	–	–	–	–	–	–	–	–	–
779	47	6	7	–	4	–	–	–	–	–	–	–	3	–	–
780	48	5	18	–	14	2	–	–	–	–	–	2	–	–	–
1205	49	4	2	–	1	–	–	–	–	–	–	1	–	–	–
1188	50	5	3	–	1	–	–	–	–	–	–	2	–	–	–
1135	51	5	4	–	1	–	–	–	–	–	–	3	–	–	–
1131	52	5	24	–	–	–	–	–	–	–	1	20	–	–	3
1199	53	7	3	–	1	–	–	–	–	–	1	1	–	–	–
1187	54	4.5	6	1	3	2	–	–	–	–	–	–	–	–	–
1182	55	5	6	1	2	2	–	–	–	–	–	–	1	–	–

Tab. 20. Continuation 2

Element or sample	Feature No.	Volume (l)	Sum of macro-remains (MNI)	Cereal grains	Cerealia indet.	Chaff	Culms and straw	Legumes	Condiments, oil and fibre plants, other use plants	Coniferae seeds	Fruits and nuts	Wild plants	Indeterminate	Organic mass fragments (probable food)	Porous organic mass frag. indet
1202	56	6	12	3	4	–	2	–	–	–	–	3	–	–	–
1217	57	3.5	4	1	2	–	–	–	–	–	–	1	–	–	–
792	58	6	7	2	3	2	–	–	–	–	–	–	–	–	–
1181	58	4.5	8	–	2	4	–	–	–	–	–	1	–	–	1
1321	58	6	6	2	1	–	–	–	–	–	–	1	–	2	–
1325	58	7	12	1	5	1	–	–	–	–	–	1	–	4	–
1339	58	6	10	–	1	2	–	1	–	–	–	1	1	4	–
1340	58	4	9	2	5	–	–	1	–	–	–	1	–	–	–
1344	58	7	10	2	4	–	–	–	–	–	–	–	–	1	3
1349	58	5	22	1	3	4	1	–	–	–	–	3	5	–	5
1332	59	6	9	2	5	2	–	–	–	–	–	–	–	–	–
1333	59	3	4	1	3	–	–	–	–	–	–	–	–	–	–
1334	59	6	34	2	11	4	–	1	–	–	–	1	–	–	15
1358	59	4	25	3	18	–	–	–	–	–	–	1	2	1	–
801_838_1338	62	70	165	20	23	–	3	1	–	–	–	9	–	–	109
1121	62	15	47	11	19	6	–	–	–	–	–	5	–	6	–
1180_1303	62	30.5	350	57	222	26	3	1	–	–	–	26	11	–	4
899_1262	62	27	124	55	55	4	–	–	–	–	–	7	3	–	–
1190	62	5	12	3	7	–	–	–	–	–	–	1	1	–	–
1263	62	15	68	32	26	2	2	–	–	–	–	3	2	–	1
1305	62	10	18	3	5	–	–	–	–	3	–	–	2	5	–
832_898_802_839_845_847_1186	67	115	242	54	67	6	1	1	–	–	1	23	13	–	76
782	70	8	44	34	–	9	–	1	–	–	–	–	–	–	–
794	70	12	48	12	16	2	2	1	–	–	–	8	–	3	4
1134	70	6	3	–	1	–	–	–	–	–	–	2	–	–	–
1137	70	7	173	43	105	4	7	–	–	–	–	8	1	–	5
1177	70	6.5	3	2	1	–	–	–	–	–	–	–	–	–	–
1189	70	8	7	1	5	–	–	–	–	–	–	1	–	–	–
828	80	6	135	34	84	8	1	–	–	–	–	8	–	–	–
849	80	5	10	2	5	–	–	–	–	–	–	3	–	–	–
892	80	6	278	60	97	17	37	1	1	–	–	57	4	3	1
1174	80	10	1524	333	907	113	59	4	–	–	–	103	5	–	–
1264	83	6	1	–	1	–	–	–	–	–	–	–	–	–	–
842	84	7	25	7	1	–	–	–	–	–	–	2	–	–	15
798	84	13	8	1	3	4	–	–	–	–	–	–	–	–	–
1204	84	4	1	–	1	–	–	–	–	–	–	–	–	–	–
1206	84	4	2	–	1	–	1	–	–	–	–	–	–	–	–
1208	84	4	2	1	1	–	–	–	–	–	–	–	–	–	–
1218	84	4	2	–	2	–	–	–	–	–	–	–	–	–	–
800_843_840	84	10	18	1	3	–	–	1	1	–	–	3	–	–	9
1220_1207	84	4	2	–	1	–	–	–	–	–	–	1	–	–	–
1214_1219	84	6	23	1	3	–	12	–	–	–	–	3	4	–	–
831_1212	84	6	4	–	2	–	–	–	–	–	–	–	–	–	2
1196	84	2	2	1	1	–	–	–	–	–	–	–	–	–	–
885_891_1129	84	3	74	–	3	–	–	–	–	–	–	–	–	71	–
894_1222	84	5	0	–	–	–	–	–	–	–	–	–	–	–	–

Tab. 21. Jevišovka. Overview of created elements. PH – posthole. Author: J. Apiar, ARÚB.

Element number	Count of sample units	Dating	Dating (secondary)	Sector	Feature No.	Interpretation	Depth/Fill specification	Feature Sub-No.	Posthole fill specification	Additional info
1277_1295_1314	3	Roman period		west	14	pithouse	floor			
1193_1324_1355	3	Roman period		south	14	pithouse	floor			
1341_823	2	Roman period			14	pithouse posthole		PH1_ PH20		association or superposition
1310_829	2	Roman period			14	pithouse posthole		PH11		
890_1304	2	Roman period			14	pithouse posthole		PH15		
799_1273_1296	3	Roman period			14	pithouse posthole		PH4		
1283_1293	2	Roman period			14	entrance niche		PH5_PH6		
1281_1353	2	Roman/Migration period			14	pithouse posthole		PH9		probable association with Migration period grave
1286_1306_1289	3	Roman period		1_5_7	15	pithouse	profile, layer A			
1291_1301_1309	3	Roman period		2_6_4	15	pithouse	profile, layer B			
809_817_881_1198	4	Roman period		2_4_6_8	29	pithouse	profile, layer B			
821_1335	2	Roman period		1_5	29	pithouse	profile, layer A			
1175_1200	2	Roman period			29	pithouse posthole		PH1		
1350_1261_1185_1237	4	Roman period			29	pithouse posthole		PH5		
1183_1140	2	Roman period			29	pithouse posthole		PH6		
1253_1125_1259	3	Roman period			29	entrance niche		PH7_PH8		
825_837	2	Roman period uncertain			31	settlement pit	unspecified			
835_893_896	3	Roman period		1_	34	pithouse posthole		PH1	layer A, B, C	
1312_1284_1288	3	Roman period			34	pithouse	floor			
806_1254_805_1258	4	Roman period		1_5_3_7	36	pithouse	profile, layer A			
1130_1178_886_820	4	Roman period		2_4_6_8	36	pithouse	profile, layer B			
1260_1176	2	Roman period			36	pithouse	floor			
1197_1123	2	Roman period			36	entrance niche		PH4	layer A, B	
834_1278	2	Roman period		6_4	38	pithouse	profile, layer B			
1268_1270_1319	3	Roman period		5_7_3	38	pithouse	profile, layer A			
1287_1323	2	Roman period			38	pithouse	0-30			
803_818	2	La Tène/Roman period uncertain			39	pithouse	above the floor, layer A			probable superposition 2

Element number	Count of sample units	Dating	Dating (secondary)	Sector	Feature No.	Interpretation	Depth/Fill specification	Feature Sub-No.	Posthole fill specification	Additional info
1122_1215	2	La Tène/Roman period uncertain			39	pithouse	20-40, floor?, layer B			probable superposition 2
1357_787	2	La Tène/Roman period			39	pithouse posthole		PH1	layer A, B	superposition 1
1337_1318_1359	3	La Tène/ Roman period	cf. La Tène period		39	pithouse posthole		PH2	layer A, B, C	superposition 1
1354_1336	2	La Tène/Roman period	cf. Roman period		39	pithouse posthole		PH7	layer A, B	superposition 1
801_838_1338	3	Roman period			62	storage pit	layer A			
1180_1303	2	Roman period			62	storage pit	layer G			
899_1262	2	Roman period			62	storage pit	layer D			
832_898_802_839_845_847_1186	7	Roman period			67	storage pit	unspecified			
800_843_840	3	Roman period			84	pithouse		PH1	layer A, B, C	
1220_1207	2	Roman period			84	pithouse		PH3	layer A, B	
1214_1219	2	Roman period			84	pithouse		PH4	layer A, B	
831_1212	2	Roman period			84	pithouse		PH5	layer A, B	
885_891_1129	3	Roman period			84	pithouse		PH7	layer A, B, H	
894_1222	2	Roman period			84	entrance niche		PH8	layer A, B	

Tab. 22. Jevišovka. Pithouses. Average density, the sum of macro-remains and total volume of sampled sediment from different deposits inside pithouses. Author: J. Apiar, ARÚB.

	Average density of macro-remains				**Sum of macro-remains**				**Total volume**			
Feature No.	pithouse posthole	floor	fill	entrance niche	pithouse posthole	floor	fill	entrance niche	pithouse posthole	floor	fill	entrance niche
14	3.93	2.21	_	0.33	136	371	_	6	57.5	146	_	18
14	3.09	_	_	_	17	_	_	_	5.5	_	_	_
14 Total	**3.83**	**2.21**	_	**0.33**	**153**	**371**	_	**6**	**63**	**146**	_	**18**
15	2.22	0.06	0.69	7.00	106	1	26	14	46	16	37	2
15 Total	**2.22**	**0.06**	**0.69**	**7.00**	**106**	**1**	**26**	**14**	**46**	**16**	**37**	**2**
29	2.31	0.75	3.48	_	224	3	233	_	157.5	4	47	_
29 Total	**2.31**	**0.75**	**3.48**	_	**224**	**3**	**233**	_	**157.5**	**4**	**47**	_
34	2.18	0.34	1.57	_	37	11	11	_	17	32	7	_
34 Total	**2.18**	**0.34**	**1.57**	_	**37**	**11**	**11**	_	**17**	**32**	**7**	_
36	8.17	1.00	2.56	_	141	24	159	_	38.5	24	51.5	_
36 Total	**8.17**	**1.00**	**2.56**	_	**141**	**24**	**159**	_	**38.5**	**24**	**51.5**	_
38	5.63	_	5.91	_	110	_	348	_	19	_	68.5	_
38 Total	**5.63**	_	**5.91**	_	**110**	_	**348**	_	**19**	_	**68.5**	_
39	6.15	_	_	_	125	_	_	_	18	_	_	_
39	91.25	_	_	_	417	_	_	_	9	_	_	_
39	6.93	_	_	_	47	_	_	_	9	_	_	_
39	_	_	63.12	_	_	_	3504	_	_	_	51	_
39	_	_	48.16	_	_	_	2061	_	_	_	46	_
39 Total	**38.26**	_	**54.81**	_	**589**	_	**5565**	_	**36**	_	**97**	_
58	2.18	_	1.86	_	80	_	13	_	38.5	_	7	_
58 Total	**2.18**	_	**1.86**	_	**80**	_	**13**	_	**38.5**	_	**7**	_
59	_	_	3.94	_	_	_	78	_	_	_	19	_
59 Total	_	_	**3.94**	_	_	_	**78**	_	_	_	**19**	_
80	_	_	89.48	_	_	_	1695	_	_	_	16	_
80	2.00	_	47.17	_	10	_	283	_	5	_	6	_
80 Total	**2.00**	_	**75.38**	_	**10**	_	**1978**	_	**5**	_	**22**	_
84	4.65	_	1.04	_	124	_	44	_	36	_	36	_
84 Total	**4.65**	_	**1.04**	_	**124**	_	**44**	_	**36**	_	**36**	_

Tab. 23. Comparative assemblage. Matrices used in correspondence analysis of cereal densities (Fig. 40), including the newest data from Jevišovka. CA – correspondence analysis; BAR – Barbaricum; LIM – Limes; UNSPEC – Unspecified zone; BOH – Bohemian sites; MOR – Moravian sites; SVK – Slovak sites; EMW-BMP – end of the Marcomannic Wars to the beginning of Migration period; ERP-EMW – early Roman period to the end of the Marcomannic Wars; RPU – Roman period unspecified; EMW-E3C – end of the Marcomannic Wars to the end of the 3rd century AD; TA – *Triticum aestivum* (bread wheat); TM – *Triticum monococcum* (einkorn); TD – *Triticum dicoccum* (emmer); TS – *Triticum spelta* (spelt); HV – *Hordeum vulgare* (barley); HVN – *Hordeum vulgare* var. *nudum* (naked barely); PM – *Panicum miliaceum* (millet); SC – *Secale cereale* (rye); AS – *Avena sativa* (oat), Authors: J. and P. Apiar, ARÚB.

CA graph	Area	TA	TM	TD	TS	HV	HVN	PM	SC	AS
Fig. 40, top	Barbaricum	0.150	0.080	0.320	0.421	1.738	0.056	4.321	0.216	0.196
	Limes	3.075	1.267	1.653	2.053	1.023	0.011	0.403	0.591	0.274
	Unspecified	0.277	0.049	0.055	0.063	0.281	0.099	0.477	0.115	0.022
Fig. 40, middle	BAR_BOH	0.048	0.005	0.076	0.115	7.842	0.270	0.101	0.027	0.000
	BAR_MOR	0.065	0.103	0.188	0.011	0.049	0.000	0.032	0.004	0.000
	BAR_SVK	0.354	0.096	0.692	1.273	0.285	0.000	13.939	0.679	0.639
	LIM_SVK	3.075	1.267	1.653	2.053	1.023	0.011	0.403	0.591	0.274
	UNSPEC_MOR	0.064	0.029	0.027	0.032	0.243	0.001	0.293	0.011	0.014
	UNSPEC_SVK	2.929	0.300	0.394	0.459	0.753	0.718	2.771	1.412	0.124
Fig. 40, bottom	BAR_BOH_EMW-BMP	0.059	0.002	0.008	0.009	6.316	0.011	0.256	0.033	0.000
	BAR_BOH_ERP-EMW	0.051	0.002	0.127	0.231	12.900	0.597	0.005	0.036	0.000
	BAR_BOH_RPU	0.029	0.013	0.072	0.038	0.227	0.000	0.070	0.000	0.000
	BAR_MOR_EMW-BMP	0.133	0.001	0.017	0.009	0.016	0.000	0.006	0.011	0.000
	BAR_MOR_ERP-EMW	0.013	0.035	0.098	0.016	0.047	0.000	0.037	0.000	0.000
	BAR_MOR_RPU	0.046	0.516	0.821	0.003	0.130	0.000	0.078	0.000	0.000
	BAR_SVK_EMW-BMP	0.335	0.047	1.303	0.638	0.324	0.000	27.492	1.291	1.293
	BAR_SVK_ERP-EMW	0.005	0.005	0.060	0.025	0.060	0.000	0.613	0.045	0.000
	BAR_SVK_RPU	0.706	0.271	0.129	3.593	0.415	0.000	0.796	0.114	0.000
	LIM_SVK_EMW-BMP	5.142	2.577	3.373	4.150	1.838	0.019	0.150	1.131	0.567
	LIM_SVK_ERP-EMW	1.498	0.068	0.072	0.090	0.187	0.006	0.272	0.103	0.000
	LIM_SVK_RPU	0.762	0.028	0.034	0.122	0.356	0.001	1.056	0.074	0.002
	UNSPEC_MOR_EMW-E3C	0.131	0.060	0.053	0.061	0.472	0.000	0.574	0.019	0.029
	UNSPEC_MOR_ERP-EMW	0.001	0.000	0.002	0.000	0.000	0.000	0.124	0.000	0.000
	UNSPEC_MOR_RPU	0.000	0.000	0.003	0.004	0.027	0.001	0.005	0.003	0.000
	UNSPEC_SVK_EMW-BMP	4.720	0.510	0.660	0.770	1.190	0.410	4.510	2.350	0.000
	UNSPEC_SVK_RPU	0.371	0.000	0.014	0.014	0.129	1.157	0.286	0.071	0.300

Tab. 24. Jevišovka. The main component method results for the proportions 1–3 in samples. Dark grey – the content of macro-remains 50 MNI and more; light grey – the content of macro-remains 10 to 49 MNI; bold – relevant results, i.e. for samples with 50 and more finds of a particular component; PMR – plant macro-remains; MNI – minimum number of individuals; *Triticum monococcum* – einkorn; *Triticum dicoccum* – emmer; *Triticum spelta* – spelt; *Triticum* cf. *timopheevi* – probable new glume wheat; *Panicum miliaceum* – millet; *Setaria italica* – Italian millet; *Triticum aestivum* – bread wheat; *Hordeum vulgare* – barley; *Secale cereale* – rye; *Avena* cf. *sativa* – oat; number "-1" – replaced zero values; numbers in brackets 0.3, 0.5, 1 – significant level for interpretation of results – a lower number indicates a cleaned grain supply, a higher number indicates a waste or first phases of a crop treatment process, an equal number indicates unthreshed ears or mixed products (see Hajnalová 2012, 97, 98). Author: J. Apiar, ARÚB.

Element or sample number	Feature No.	Sample count	Volume (l)	PMR	p1 *Triticum monococcum*			p1 *Triticum dicoccum*			p1 *Triticum spelta*			p1 *Triticum* cf. *timopheevi*			p1 *Panicum miliaceum*			p1 *Setaria italica*		
				MNI	glume	grain	result (0.5)	glume	grain	result (1)	glume	grain	result (1)	glume	grain	result (1)	glume	grain	result	glume	grain	result
1277_1295_1314	14	3	50	122	1	2	0.5	0	0	–	0	0	–	0	0	–	0	4	0.0	–	2	0.0
1280	14	1	16	56	0	1	0.0	2	-1	2.0	0	0	–	0	–	–	0	3	0.0	–	0	–
1193_1324_1355	14	3	47	168	12	-1	**12.0**	0	1	0.0	2	1	2.0	0	0	–	0	4	0.0	–	0	–
1341_823	14	2	11	50	2	1	2.0	2	1	2.0	0	0	–	0	0	–	0	1	0.0	–	0	–
809_817_881_1198	29	4	28	199	0	0	–	2	0	–	0	0	–	0	0	–	0	10	0.0	–	0	–
811	29	1	7	65	0	0	–	2	-1	2.0	0	0	–	0	–	–	0	0	–	–	0	–
1350_1261_1185_1237	29	4	52	74	0	3	0.0	0	0	–	0	0	–	0	0	–	0	9	0.0	–	1	0.0
825_837	31	2	26	50	0	0	–	0	0	–	0	0	–	0	0	–	0	0	–	–	0	–
806_1254_805_1258	36	4	20	107	0	0	–	0	2	0.0	0	0	–	0	0	–	0	8	0.0	–	0	–
1130_1178_886_820	36	4	24.5	50	0	0	–	0	0	–	0	0	–	0	0	–	0	4	0.0	–	0	–
1257	36	1	2	80	0	0	–	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
1268_1270_1319	38	3	21	129	0	1	0.0	0	1	0.0	0	0	–	0	0	–	0	17	**0.0**	–	0	–
888	38	1	5	50	0	0	–	1	-1	1.0	1	-1	1.0	0	–	–	0	1	0.0	–	0	–
1287_1323	38	2	28	102	0	0	–	1	1	1.0	1	-1	1.0	0	0	–	0	12	**0.0**	–	1	0.0
803_818	39	2	12	115	0	0	–	0	1	0.0	0	0	–	0	0	–	0	1	0.0	–	0	–
1122_1215	39	2	23	2363	70	14	**5.0**	7	17	**0.4**	12	18	**0.7**	0	0	–	0	84	**0.0**	–	0	–
791	39	1	7	824	40	3	**13.3**	0	10	**0.0**	16	-1	**16.0**	0	0	–	0	19	**0.0**	–	0	–
785	39	1	9	202	8	-1	8.0	0	0	–	1	-1	1.0	0	–	–	0	30	**0.0**	–	0	–
844	39	1	10	223	4	6	0.7	3	5	0.6	3	3	1.0	0	–	–	0	46	**0.0**	–	0	–
1133	39	1	7	703	32	2	**16.0**	0	0	–	2	12	**0.2**	0	0	–	0	165	**0.0**	–	30	**0.0**
1238	39	1	9	413	17	7	**2.4**	2	5	0.4	24	4	**6.0**	0	–	–	4	67	**0.1**	–	0	–
1216	39	1	10	450	0	4	0.0	1	5	0.2	6	4	1.5	0	1	0.0	0	96	**0.0**	–	21	**0.0**
784	39	1	10	272	5	-1	5.0	4	2	2.0	2	1	2.0	0	–	–	0	77	**0.0**	–	0	–
1337_1318_1359	39	3	9	80	6	0	–	0	3	0.0	1	-1	1.0	0	0	–	0	9	0.0	–	0	–
1346	39	1	4	136	4	2	2.0	2	-1	2.0	0	0	–	0	0	–	0	23	**0.0**	–	0	–
1354_1336	39	2	4	55	4	-1	4.0	0	0	–	1	-1	1.0	0	0	–	0	4	0.0	–	0	–
1221	39	1	1	226	0	0	–	0	0	–	0	0	–	0	–	–	0	6	0.0	–	0	–
801_838_1338	62	3	70	165	0	0	–	0	0	–	0	0	–	0	0	–	0	5	0.0	–	0	–
1121	62	1	15	51	0	0	–	4	3	1.3	0	5	0.0	0	–	–	0	0	–	–	0	–
1180_1303	62	2	30.5	360	4	-1	4.0	5	12	**0.4**	0	1	0.0	0	0	–	0	7	0.0	–	0	–
899_1262	62	2	27	124	0	2	0.0	0	5	0.0	0	2	0.0	0	1	0.0	0	7	0.0	–	0	–
1263	62	1	15	68	0	0	–	0	1	0.0	0	0	–	0	1	0.0	0	15	**0.0**	–	0	–
832_898_802_839_845_847_1186	67	7	115	244	2	-1	2.0	0	1	0.0	0	0	–	0	0	–	0	14	**0.0**	–	0	–
1137	70	1	7	177	0	2	0.0	4	6	0.7	0	13	0.0	0	0	–	0	4	0.0	–	0	–
794	70	1	12	50	0	0	–	2	-1	2.0	0	4	0.0	0	–	–	0	4	0.0	–	0	–
828	80	1	6	142	2	1	2.0	1	-1	1.0	0	4	0.0	0	–	–	0	0	–	–	0	–
892	80	1	6	283	5	6	0.8	0	0	–	7	4	1.8	0	0	–	0	9	0.0	–	1	0.0

Element or sample number	Feature No.	Sample count	Volume (l)	PMR	p2 *Triticum aestivum*			p2 *Hordeum vulgare*			p2 *Secale cereale*			p2 *Avena* cf. *sativa*			p3		
				MNI	rachis	grain	result (0.3)	rachis	grain	result (0.3)	rachis	grain	result (0.5)	rachis	grain	result (0.5)	weed seeds	crop grains	result (0.5)
1277_1295_1314	14	3	50	122	0	0	–	0	11	**0.0**	0	0	–	0	0	–	3	86	**0.03**
1280	14	1	16	56	–	0	–	0	7	0.0	–	0	–	–	0	–	4	47	**0.09**
1193_1324_1355	14	3	47	168	0	0	–	0	0	–	0	0	–	0	0	–	8	113	**0.07**
1341_823	14	2	11	50	0	0	–	0	1	0.0	0	0	–	0	0	–	2	39	**0.05**
809_817_881_1198	29	4	28	199	0	0	–	0	0	–	0	0	–	0	0	–	4	25	**0.16**
811	29	1	7	65	–	0	–	0	0	–	–	0	–	–	0	–	1	10	**0.10**
1350_1261_1185 _1237	29	4	52	74	0	0	–	0	2	0.0	0	0	–	0	0	–	2	53	**0.04**
825_837	31	2	26	50	0	2	0.0	0	0	–	0	0	–	0	0	–	2	6	**0.33**
806_1254_805 _1258	36	4	20	107	0	2	0.0	0	2	0.0	0	0	–	0	0	–	6	53	**0.11**
1130_1178_886 _820	36	4	24.5	50	0	0	–	0	0	–	0	0	–	0	1	0.0	3	24	**0.13**
1257	36	1	2	80	–	0	–	0	0	–	–	0	–	–	0	–	2	78	**0.03**
1268_1270_1319	38	3	21	129	0	0	–	0	16	**0.0**	0	0	–	0	0	–	14	108	**0.13**
888	38	1	5	50	–	2	0.0	0	0	–	–	0	–	–	0	–	9	13	**0.69**
1287_1323	38	2	28	102	0	0	–	1	2	0.5	0	0	–	0	0	–	6	65	**0.09**
803_818	39	2	12	115	0	0	–	0	5	0.0	0	0	–	0	0	–	5	31	**0.16**
1122_1215	39	2	23	2363	3	90	**0.0**	1	23	**0.0**	0	4	0.0	0	8	0.0	201	956	**0.21**
791	39	1	7	824	0	7	0.0	0	1	0.0	0	0	–	0	0	–	156	478	**0.33**
785	39	1	9	202	–	0	–	1	1	1.0	–	0	–	–	0	–	25	150	**0.17**
844	39	1	10	223	–	1	0.0	0	9	0.0	–	0	–	–	0	–	14	177	**0.08**
1133	39	1	7	703	0	3	0.0	0	0	–	0	0	–	0	0	–	22	419	**0.05**
1238	39	1	9	413	–	8	0.0	0	0	–	–	2	0.0	–	0	–	13	211	**0.06**
1216	39	1	10	450	1	19	**0.1**	0	9	0.0	–	0	–	–	0	–	23	349	**0.07**
784	39	1	10	272	–	4	0.0	0	2	0.0	–	0	–	–	0	–	5	214	**0.02**
1337_1318_1359	39	3	9	80	0	0	–	0	0	–	0	0	–	0	0	–	1	41	**0.02**
1346	39	1	4	136	0	2	0.0	0	0	–	0	0	–	0	0	–	1	41	**0.02**
1354_1336	39	2	4	55	0	0	–	0	0	–	0	0	–	0	0	–	0	43	**0.00**
1221	39	1	1	226	–	1	0.0	6	77	**0.1**	–	0	–	–	0	–	24	179	**0.13**
801_838_1338	62	3	70	165	0	0	–	0	0	–	0	0	–	0	0	–	9	44	**0.20**
1121	62	1	15	51	0	0	–	0	0	–	0	0	–	0	0	–	5	30	**0.17**
1180_1303	62	2	30.5	360	0	1	0.0	0	2	0.0	0	0	–	0	23	**0.0**	26	280	**0.09**
899_1262	62	2	27	124	0	4	0.0	0	3	0.0	0	0	–	0	0	–	7	110	**0.06**
1263	62	1	15	68	0	0	–	0	2	0.0	0	0	–	0	0	–	3	58	**0.05**
832_898_802_839 _845_847_1186	67	7	115	244	0	4	0.0	0	2	0.0	0	0	–	0	2	0.0	24	121	**0.20**
1137	70	1	7	177	0	0	–	0	0	–	0	0	–	0	17	**0.0**	8	148	**0.05**
794	70	1	12	50	0	0	–	0	3	0.0	0	0	–	0	1	0.0	8	29	**0.28**
828	80	1	6	142	0	12	**0.0**	3	6	0.5	0	0	–	0	0	–	8	118	**0.07**
892	80	1	6	283	0	5	0.0	2	18	**0.1**	0	2	0.0	0	0	–	56	158	**0.35**

Tab. 24. Continuation 1

				PMR	p1 *Triticum monococcum*			p1 *Triticum dicoccum*			p1 *Triticum spelta*			p1 *Triticum* cf. *timopheevi*			p1 *Panicum miliaceum*			p1 *Setaria italica*		
Element or sample number	Feature No.	Sample count	Volume (l)	MNI	glume	grain	result (0.5)	glume	grain	result (1)	glume	grain	result (1)	glume	grain	result (1)	glume	grain	result	glume	grain	result
1174	80	1	10	1553	26	25	**1.0**	1	12	**0.1**	46	21	**2.2**	2	-1	2.0	2	38	**0.1**	–	0	–
885_891_1129	84	3	3	74	0	0	–	0	0	–	0	0	–	0	0	–	0	0	–	–	0	–
1348	14	1	16	15	0	0	–	0	0	–	0	0	–	0	0	–	0	0	–	–	1	0.0
1184	14	1	17	10	0	0	–	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
799_1273_1296	14	3	15	36	3	-1	3.0	0	0	–	0	0	–	0	0	–	0	1	0.0	–	0	–
890_1304	14	2	8	13	0	0	–	0	0	–	0	0	–	2	-1	2.0	0	0	–	–	0	–
1310_829	14	2	10	12	0	0	–	0	0	–	0	0	–	0	0	–	0	1	0.0	–	1	0.0
1281_1353	14	2	5.5	17	0	0	–	0	0	–	0	0	–	0	0	–	0	0	–	–	0	–
1276	15	1	7	13	0	0	–	0	0	–	0	0	–	0	–	–	0	6	0.0	–	0	–
1297	15	1	4	21	0	0	–	0	0	–	0	0	–	0	–	–	0	1	0.0	–	0	–
1294	15	1	9	29	1	-1	1.0	0	0	–	0	0	–	0	0	–	0	4	0.0	–	1	0.0
1275	15	1	6	16	0	0	–	0	0	–	0	0	–	0	–	–	0	4	0.0	–	1	0.0
1272	15	1	4	10	0	0	–	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
1308	15	1	2	14	0	0	–	0	0	–	0	0	–	0	–	–	0	4	0.0	–	0	–
1286_1306_1289	15	3	20	16	0	0	–	0	0	–	1	-1	1.0	0	0	–	0	1	0.0	–	0	–
1291_1301_1309	15	3	17	10	0	0	–	0	0	–	0	0	–	0	0	–	0	2	0.0	–	0	–
821_1335	29	2	11	27	0	0	–	0	0	–	0	0	–	0	0	–	0	3	0.0	–	0	–
1175_1200	29	2	31.5	26	4	-1	4.0	0	0	–	0	0	–	0	0	–	0	2	0.0	–	0	–
807	29	1	6	17	0	0	–	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
1183_1140	29	2	23	16	0	0	–	1	-1	1.0	0	0	–	0	0	–	0	1	0.0	–	0	–
1253_1125_1259	29	3	26	23	2	-1	2.0	0	0	–	0	0	–	0	0	–	0	2	0.0	–	0	–
835_893_896	34	3	17	37	0	0	–	0	0	–	0	0	–	0	0	–	0	1	0.0	–	0	–
1312_1284_1288	34	3	32	11	0	0	–	0	0	–	0	0	–	0	0	–	0	1	0.0	–	0	–
1351	34	1	7	11	0	0	–	2	-1	2.0	0	0	–	0	0	–	0	2	0.0	–	0	–
1260_1176	36	2	24	24	0	0	–	0	0	–	0	0	–	0	0	–	0	1	0.0	–	0	–
1126	36	1	7	10	0	0	–	0	0	–	0	0	–	0	–	–	0	2	0.0	–	0	–
1197_1123	36	2	12	10	0	0	–	0	0	–	0	0	–	0	0	–	0	1	0.0	–	0	–
830	36	1	6	29	0	0	–	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
814	38	1	4	37	0	0	–	0	0	–	0	0	–	0	–	–	0	3	0.0	–	0	–
834_1278	38	2	9.5	46	0	2	0.0	0	0	–	1	-1	1.0	0	0	–	0	0	–	–	0	–
1328	38	1	6	34	0	0	–	0	0	–	0	0	–	0	–	–	0	3	0.0	–	0	–
827	38	1	4	12	0	0	–	0	2	0.0	0	0	–	0	–	–	0	1	0.0	–	0	–
897	38	1	7	34	0	0	–	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
1141	38	1	3	14	0	0	–	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
1357_787	39	2	7	27	0	0	–	0	0	–	0	0	–	0	0	–	0	3	0.0	–	0	–
786	39	1	5	34	0	0	–	0	0	–	0	0	–	0	–	–	0	2	0.0	–	0	–
790	39	1	4	11	0	0	–	0	0	–	1	-1	1.0	0	–	–	0	2	0.0	–	0	–
836	39	1	2	20	0	0	–	0	0	–	0	0	–	0	–	–	0	2	0.0	–	0	–
1128	42	1	8	29	2	1	2.0	0	0	–	1	-1	1.0	0	–	–	0	1	0.0	–	1	0.0
1203	43	1	5	25	0	1	0.0	0	1	0.0	0	0	–	0	0	–	0	1	0.0	–	0	–
1213	45	1	4	13	0	1	0.0	0	0	–	0	0	–	0	–	–	0	2	0.0	–	0	–
780	48	1	5	18	0	0	–	0	0	–	0	0	–	0	0	–	0	0	–	–	0	–
1131	52	1	5	24	0	0	–	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
1202	56	1	6	13	0	0	–	0	0	–	0	0	–	0	–	–	0	2	0.0	–	0	–
1181	58	1	4.5	10	2	-1	2.0	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
1325	58	1	7	13	1	-1	1.0	0	0	–	0	0	–	0	–	–	0	0	–	–	1	0.0

Element or sample number	Feature No.	Sample count	Volume (l)	PMR	p2 *Triticum aestivum*			p2 *Hordeum vulgare*			p2 *Secale cereale*			p2 *Avena* cf. *sativa*			p3		
				MNI	rachis	grain	result (0.3)	rachis	grain	result (0.3)	rachis	grain	result (0.5)	rachis	grain	result (0.5)	weed seeds	crop grains	result (0.5)
1174	80	1	10	1553	0	48	**0.0**	8	44	**0.2**	1	30	**0.0**	1	6	0.2	103	1244	**0.08**
885_891_1129	84	3	3	74	0	0	–	0	0	–	0	0	–	0	0	–	0	3	0.00
1348	14	1	16	15	0	0	–	0	0	–	0	0	–	0	0	–	1	11	0.09
1184	14	1	17	10	0	0	–	0	1	0.0	0	0	–	0	0	–	0	9	0.00
799_1273_1296	14	3	15	36	0	0	–	0	1	0.0	0	0	–	0	0	–	8	16	0.50
890_1304	14	2	8	13	0	0	–	0	1	0.0	0	0	–	0	0	–	1	8	0.13
1310_829	14	2	10	12	0	0	–	0	0	–	0	0	–	0	0	–	5	5	1.00
1281_1353	14	2	5.5	17	0	0	–	0	0	–	0	0	–	0	0	–	6	11	0.55
1276	15	1	7	13	0	0	–	0	0	–	0	0	–	0	0	–	1	11	0.09
1297	15	1	4	21	–	0	–	0	0	–	–	0	–	–	0	–	6	6	1.00
1294	15	1	9	29	0	0	–	0	0	–	0	0	–	0	0	–	8	15	0.53
1275	15	1	6	16	–	0	–	0	0	–	–	0	–	–	0	–	1	14	0.07
1272	15	1	4	10	–	1	0.0	0	1	0.0	–	0	–	–	0	–	0	8	0.00
1308	15	1	2	14	–	0	–	0	0	–	–	0	–	–	0	–	2	9	0.22
1286_1306_1289	15	3	20	16	0	0	–	0	0	–	0	0	–	0	0	–	2	11	0.18
1291_1301_1309	15	3	17	10	0	0	–	0	0	–	0	0	–	0	0	–	2	6	0.33
821_1335	29	2	11	27	0	0	–	0	0	–	0	0	–	0	0	–	1	11	0.09
1175_1200	29	2	31.5	26	0	0	–	0	0	–	0	0	–	0	1	0.0	3	13	0.23
807	29	1	6	17	–	2	0.0	0	0	–	–	0	–	–	0	–	0	3	0.00
1183_1140	29	2	23	16	0	0	–	0	0	–	0	0	–	0	1	0.0	2	10	0.20
1253_1125_1259	29	3	26	23	0	0	–	0	0	–	0	0	–	0	0	–	2	15	0.13
835_893_896	34	3	17	37	0	1	0.0	0	2	0.0	0	0	–	0	0	–	11	5	2.20
1312_1284_1288	34	3	32	11	0	0	–	0	0	–	0	0	–	0	0	–	4	7	0.57
1351	34	1	7	11	0	0	–	0	0	–	0	0	–	0	0	–	0	7	0.00
1260_1176	36	2	24	24	0	0	–	0	2	0.0	0	0	–	0	0	–	2	18	0.11
1126	36	1	7	10	0	0	–	0	0	–	0	0	–	0	0	–	2	5	0.40
1197_1123	36	2	12	10	0	2	0.0	0	0	–	0	0	–	0	0	–	0	8	0.00
830	36	1	6	29	–	0	–	0	1	0.0	–	0	–	–	0	–	1	3	0.33
814	38	1	4	37	–	0	–	0	0	–	–	0	–	–	0	–	0	10	0.00
834_1278	38	2	9.5	46	0	0	–	0	3	0.0	0	0	–	0	0	–	4	18	0.22
1328	38	1	6	34	–	0	–	0	0	–	–	0	–	–	0	–	24	8	3.00
827	38	1	4	12	–	0	–	0	0	–	–	0	–	–	0	–	1	4	0.25
897	38	1	7	34	–	0	–	0	2	0.0	–	0	–	–	0	–	2	8	0.25
1141	38	1	3	14	–	0	–	0	0	–	–	0	–	–	0	–	0	1	0.00
1357_787	39	2	7	27	0	0	–	0	2	0.0	0	0	–	0	0	–	1	15	0.07
786	39	1	5	34	–	1	0.0	0	0	–	–	0	–	–	0	–	4	11	0.36
790	39	1	4	11	–	0	–	0	0	–	–	0	–	–	0	–	1	6	0.17
836	39	1	2	20	–	0	–	0	0	–	–	0	–	–	0	–	4	5	0.80
1128	42	1	8	29	0	0	–	0	0	–	0	0	–	0	0	–	4	15	0.27
1203	43	1	5	25	0	0	–	0	1	0.0	0	0	–	0	0	–	2	15	0.13
1213	45	1	4	13	–	0	–	0	0	–	–	0	–	–	0	–	0	7	0.00
780	48	1	5	18	0	0	–	0	0	–	0	0	–	0	0	–	2	14	0.14
1131	52	1	5	24	–	0	–	0	0	–	–	0	–	–	0	–	20	0	–
1202	56	1	6	13	–	1	0.0	0	0	–	–	0	–	–	0	–	3	7	0.43
1181	58	1	4.5	10	–	0	–	0	0	–	–	0	–	–	0	–	1	2	0.50
1325	58	1	7	13	–	0	–	0	0	–	–	0	–	–	0	–	1	6	0.17

Tab. 24. Continuation 2

Element or sample number	Feature No.	Sample count	Volume (l)	PMR	p1 *Triticum monococcum*			p1 *Triticum dicoccum*			p1 *Triticum spelta*			p1 *Triticum* cf. *timopheevi*			p1 *Panicum miliaceum*			p1 *Setaria italica*		
				MNI	glume	grain	result (0.5)	glume	grain	result (1)	glume	grain	result (1)	glume	grain	result (1)	glume	grain	result	glume	grain	result
1339	58	1	6	12	2	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1344	58	1	7	10	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1349	58	1	5	26	3	-1	3.0	1	-1	1.0	0	0	_	0	0	_	0	0	_	_	0	_
1332	59	1	6	11	2	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1334	59	1	6	38	2	-1	2.0	2	-1	2.0	0	0	_	0	_	_	0	0	_	_	0	_
1358	59	1	4	25	0	0	_	0	1	0.0	0	0	_	0	0	_	0	0	_	_	0	_
1190	62	1	5	12	0	0	_	0	0	_	0	0	_	0	_	_	0	2	0.0	_	0	_
1305	62	1	10	18	0	0	_	0	0	_	0	0	_	0	_	_	0	1	0.0	_	0	_
782	70	1	8	48	0	5	0.0	4	1	4.0	5	11	0.5	0	_	_	0	0	_	_	0	_
849	80	1	5	10	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
842	84	1	7	25	0	0	_	0	0	_	0	0	_	0	_	_	0	4	0.0	_	0	_
798	84	1	13	12	0	0	_	4	-1	4.0	0	0	_	0	_	_	0	1	0.0	_	0	_
800_843_840	84	3	10	19	0	0	_	0	0	_	0	0	_	0	0	_	0	0	_	_	0	_
1214_1219	84	2	6	23	0	0	_	0	0	_	0	0	_	0	0	_	0	1	0.0	_	0	_
1283_1293	14	2	18	6	0	0	_	0	0	_	0	0	_	0	0	_	0	1	0.0	_	1	0.0
1274	14	1	4	6	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
826	14	1	4	3	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1266	14	1	5	7	0	0	_	0	0	_	0	0	_	0	_	_	0	2	0.0	_	0	_
1311	14	1	0.5	9	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1282	15	1	6	6	0	0	_	0	0	_	0	0	_	0	_	_	0	3	0.0	_	0	_
1279	15	1	3	5	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1271	15	1	4	2	0	0	_	0	0	_	0	0	_	0	_	_	0	1	0.0	_	0	_
1269	15	1	3	4	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1267	15	1	4	1	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1201	15	1	16	1	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
883	29	1	4	3	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1265	29	1	8	7	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1345	29	1	12	3	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
788	36	1	7	2	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1239	36	1	7.5	9	0	0	_	0	0	_	0	0	_	0	_	_	0	1	0.0	_	0	_
1256	36	1	4	3	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1136	44	1	3	3	0	0	_	0	0	_	0	0	_	0	0	_	0	0	_	_	0	_
781	46	1	6	2	0	1	0.0	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
779	47	1	6	7	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1205	49	1	4	2	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1188	50	1	5	3	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1135	51	1	5	4	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1199	53	1	7	3	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1187	54	1	4.5	8	2	-1	2.0	0	0	_	0	0	_	0	_	_	0	1	0.0	_	0	_
1182	55	1	5	8	2	-1	2.0	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
1217	57	1	3.5	4	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_
792	58	1	6	7	0	0	_	0	0	_	1	-1	1.0	0	_	_	0	1	0.0	_	1	0.0
1321	58	1	6	6	0	0	_	0	1	0.0	0	0	_	0	_	_	0	1	0.0	_	0	_
1340	58	1	4	9	0	0	_	0	0	_	0	0	_	0	_	_	0	1	0.0	_	0	_
1333	59	1	3	4	0	0	_	0	0	_	0	0	_	0	_	_	0	1	0.0	_	0	_
1134	70	1	6	3	0	0	_	0	0	_	0	0	_	0	_	_	0	0	_	_	0	_

				PMR	p2 *Triticum aestivum*			p2 *Hordeum vulgare*			p2 *Secale cereale*			p2 *Avena* cf. *sativa*			p3		
Element or sample number	Feature No.	Sample count	Volume (l)	MNI	rachis	grain	result (0.3)	rachis	grain	result (0.3)	rachis	grain	result (0.5)	rachis	grain	result (0.5)	weed seeds	crop grains	result (0.5)
1339	58	1	6	12	–	0	–	0	0	–	–	0	–	–	0	–	1	2	0.50
1344	58	1	7	10	–	0	–	0	1	0.0	–	0	–	–	0	–	0	6	0.00
1349	58	1	5	26	0	1	0.0	0	0	–	0	0	–	0	0	–	3	4	0.75
1332	59	1	6	11	0	0	–	0	1	0.0	0	0	–	0	0	–	0	7	0.00
1334	59	1	6	38	0	0	–	0	1	0.0	0	0	–	0	0	–	1	14	0.07
1358	59	1	4	25	0	0	–	0	0	–	0	0	–	0	0	–	1	21	0.05
1190	62	1	5	12	0	1	0.0	0	0	–	0	0	–	0	0	–	1	10	0.10
1305	62	1	10	18	0	0	–	0	0	–	0	0	–	0	0	–	0	8	0.00
782	70	1	8	48	–	2	0.0	0	0	–	–	1	0.0	–	1	0.0	0	35	0.00
849	80	1	5	10	0	0	–	0	0	–	0	0	–	0	0	–	3	7	0.43
842	84	1	7	25	–	1	0.0	0	0	–	–	0	–	–	0	–	2	8	0.25
798	84	1	13	12	–	0	–	0	0	–	–	0	–	–	0	–	0	4	0.00
800_843_840	84	3	10	19	0	0	–	0	0	–	0	0	–	0	0	–	4	5	0.80
1214_1219	84	2	6	23	0	0	–	0	0	–	0	0	–	0	0	–	3	4	0.75
1283_1293	14	2	18	6	0	0	–	0	2	0.0	0	0	–	0	0	–	1	5	0.20
1274	14	1	4	6	–	0	–	0	1	0.0	–	0	–	–	0	–	2	2	1.00
826	14	1	4	3	–	0	–	0	0	–	–	0	–	–	0	–	0	3	0.00
1266	14	1	5	7	–	0	–	0	1	0.0	–	0	–	–	0	–	0	7	0.00
1311	14	1	0.5	9	–	0	–	0	0	–	–	0	–	–	0	–	0	0	–
1282	15	1	6	6	0	0	–	0	1	0.0	0	0	–	0	0	–	0	5	0.00
1279	15	1	3	5	–	0	–	0	0	–	–	0	–	–	0	–	2	1	2.00
1271	15	1	4	2	–	0	–	0	0	–	–	0	–	–	0	–	0	2	0.00
1269	15	1	3	4	–	0	–	0	0	–	–	0	–	–	0	–	0	4	0.00
1267	15	1	4	1	–	0	–	0	0	–	–	0	–	–	0	–	0	1	0.00
1201	15	1	16	1	–	0	–	0	0	–	–	0	–	–	0	–	0	1	0.00
883	29	1	4	3	–	0	–	0	0	–	–	0	–	–	0	–	1	0	–
1265	29	1	8	7	–	0	–	0	0	–	–	0	–	–	0	–	1	4	0.25
1345	29	1	12	3	–	0	–	0	0	–	–	0	–	–	0	–	0	3	0.00
788	36	1	7	2	–	0	–	0	0	–	–	0	–	–	0	–	0	2	0.00
1239	36	1	7.5	9	0	0	–	0	0	–	0	0	–	0	0	–	1	6	0.17
1256	36	1	4	3	–	0	–	0	0	–	–	0	–	–	0	–	0	3	0.00
1136	44	1	3	3	0	0	–	0	0	–	0	0	–	0	0	–	1	2	0.50
781	46	1	6	2	–	0	–	0	0	–	–	0	–	–	0	–	0	2	0.00
779	47	1	6	7	–	0	–	0	0	–	–	0	–	–	0	–	0	4	0.00
1205	49	1	4	2	–	0	–	0	0	–	–	0	–	–	0	–	1	1	1.00
1188	50	1	5	3	–	0	–	0	0	–	–	0	–	–	0	–	2	1	2.00
1135	51	1	5	4	–	0	–	0	0	–	–	0	–	–	0	–	3	1	3.00
1199	53	1	7	3	–	0	–	0	0	–	–	0	–	–	0	–	1	1	1.00
1187	54	1	4.5	8	–	0	–	0	0	–	–	0	–	–	0	–	0	4	0.00
1182	55	1	5	8	–	0	–	0	0	–	–	0	–	–	0	–	0	3	0.00
1217	57	1	3.5	4	–	0	–	0	0	–	–	0	–	–	0	–	1	3	0.33
792	58	1	6	7	–	0	–	1	-1	1.0	–	0	–	–	0	–	0	5	0.00
1321	58	1	6	6	–	0	–	0	0	–	–	0	–	–	0	–	1	3	0.33
1340	58	1	4	9	–	0	–	0	0	–	–	0	–	–	0	–	1	8	0.13
1333	59	1	3	4	0	0	–	0	0	–	0	0	–	0	0	–	0	4	0.00
1134	70	1	6	3	–	0	–	0	0	–	–	0	–	–	0	–	2	1	2.00

Tab. 24. Continuation 3

Element or sample number	Feature No.	Sample count	Volume (1)	PMR	p1 *Triticum monococcum*			p1 *Triticum dicoccum*			p1 *Triticum spelta*			p1 *Triticum* cf. *timopheevi*			p1 *Panicum miliaceum*			p1 *Setaria italica*		
				MNI	glume	grain	result (0.5)	glume	grain	result (1)	glume	grain	result (1)	glume	grain	result (1)	glume	grain	result	glume	grain	result
1177	70	1	6.5	3	0	0	–	0	1	0.0	0	0	–	0	–	–	0	1	0.0	–	0	–
1189	70	1	8	7	0	0	–	0	0	–	0	0	–	0	–	–	0	1	0.0	–	0	–
1264	83	1	6	1	0	0	–	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
1204	84	1	4	1	0	0	–	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
1206	84	1	4	2	0	0	–	0	0	–	0	0	–	0	0	–	0	0	–	–	0	–
1208	84	1	4	2	0	0	–	0	0	–	0	0	–	0	–	–	0	1	0.0	–	0	–
1218	84	1	4	2	0	0	–	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
1220_1207	84	2	4	2	0	0	–	0	0	–	0	0	–	0	0	–	0	0	–	–	0	–
831_1212	84	2	6	4	0	0	–	0	0	–	0	0	–	0	0	–	0	0	–	–	0	–
1196	84	1	2	2	0	0	–	0	0	–	0	0	–	0	–	–	0	0	–	–	0	–
894_1222	84	2	5	0	0	0	–	0	0	–	0	0	–	0	0	–	0	0	–	–	0	–

				PMR	p2 *Triticum aestivum*			p2 *Hordeum vulgare*			p2 *Secale cereale*			p2 *Avena* cf. *sativa*			p3		
Element or sample number	Feature No.	Sample count	Volume (l)	MNI	rachis	grain	result (0.3)	rachis	grain	result (0.3)	rachis	grain	result (0.5)	rachis	grain	result (0.5)	weed seeds	crop grains	result (0.5)
1177	70	1	6.5	3	–	0	–	0	0	–	–	0	–	–	0	–	0	3	0.00
1189	70	1	8	7	0	0	–	0	0	–	0	0	–	0	0	–	1	6	0.17
1264	83	1	6	1	–	0	–	0	0	–	–	0	–	–	0	–	0	1	0.00
1204	84	1	4	1	–	0	–	0	0	–	–	0	–	–	0	–	0	1	0.00
1206	84	1	4	2	0	0	–	0	0	–	0	0	–	0	0	–	0	1	0.00
1208	84	1	4	2	0	0	–	0	0	–	0	0	–	0	0	–	0	2	0.00
1218	84	1	4	2	–	0	–	0	0	–	–	0	–	–	0	–	0	2	0.00
1220_1207	84	2	4	2	0	0	–	0	0	–	0	0	–	0	0	–	1	1	1.00
831_1212	84	2	6	4	0	0	–	0	0	–	0	0	–	0	0	–	0	2	0.00
1196	84	1	2	2	–	1	0.0	0	0	–	–	0	–	–	0	–	0	2	0.00
894_1222	84	2	5	0	0	0	–	0	0	–	0	0	–	0	0	–	0	0	–

Tab. 25. Jevišovka. Categorisation of wild plants according to their physical properties (after Jones 1984a). Author: J. Apiar, ARÚB.

Weed category	Taxon	Element or sample	1277_1295_1314	1280	1348	1184	1193_1324_1355	1283_1293	1341_823	799_1273_1296	1274	826	890_1304	1310_829	1266	1311	1281_1353	1282	1276	1297	1294	1275	1272	1279	1271	1269
BFH	*Vicia cracca* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Vicia tetrasperma*		–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Vicia* sp.		–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	cf. *Viciaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Agrostemma githago*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Galium aparine/ tricornutum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Fallopia convolvulus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–
BFH	*Lithospermum arvense*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BHH	*Cirsium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Asteraceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Achillea/Anthemis*		–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Alchemilla/Anthemis*		–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Amaranthus* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Amaranthus lividus/ retrofelxus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Anthemis tinctoria/aus-triaca*		–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Anthemis* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–
SFH	*Atriplex* spp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Brassica* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Brassica* cf. *nigra*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Bromus arvensis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Bromus secalinus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Digitaria ischaeum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium* cf. *aparine*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium spurium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium* sp.		1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium album* agg.		–	–	–	–	2	–	–	3	2	–	–	1	–	–	4	–	–	1	5	–	–	–	–	–
SFH	*Chenopodium album/poly-spermum*		–	2	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium ficifolium/ polyspermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium hybridum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium polyspermum*		–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium* sp.		–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
SFH	*Chenopodiaceae*		2	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Lamiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Lepidium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–
SFH	*Mentha* sp./ *Lamiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Mentha/Salvia* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Persicaria* cf. *maculosa*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Plantago lanceolata*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Plantago* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Polygonum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Polygonum aviculare*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Potentilla anserina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Weed category	Taxon	Element or sample	1277_1295_1314	1280	1348	1184	1193_1324_1355	1283_1293	1341_823	799_1273_1296	1274	826	890_1304	1310_829	1266	1311	1281_1353	1282	1276	1297	1294	1275	1272	1279	1271	1269
SFH	*Potentilla* cf. *supina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Potentilla* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex acetosella*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex crispus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex obtusifolius/crispus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria italica/pumila*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria pumila*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–
SFH	*Solanum nigrum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–
SFH	*Stellaria media*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Thalictrum minus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Thalictrum* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Thlaspi arvense*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Teucrium* cf. *botrys*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Teucrium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Veronica hederifolia*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus tectorum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus tectorum/sterilis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus* cf. *racemosus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–
SFL	*Bupleurum rotundifolium*		–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Digitaria* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	cf. *Poaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	cf. *Poa* sp.		–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Poaceae* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Poaceae small*		–	–	–	–	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Fabaceae small*		–	–	–	–	1	–	–	2	–	–	–	1	–	–	–	–	–	4	1	–	–	1	–	–
SHH	*Fabaceae*		–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–
SHH	cf. *Galega officinalis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago* cf. *lupulina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	cf. *Medicago* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago/Melilotus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago falcata*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Trifolium/Melilotus small*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	cf. *Anagallis arvensis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Malva sylvestris*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Malva* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Salsola kali* syn. *tragus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Sideritis montana*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Silene vulgaris*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Silene* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Tab. 25. Continuation 1

Weed category	Taxon	Element or sample	1308	1267	1201	1286_1306_1289	1291_1301_1309	809_817_881_1198	821_1335	883	1265	1175_1200	811	1345	807	1350_1261_1185_1237	1183_1140	1253_1125_1259	825_837	835_893_896	1312_1284_1288	1351	806_1254_805_1258	1130_1178_886_820	1260_1176	788
BFH	*Vicia cracca* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Vicia tetrasperma*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
BFH	*Vicia* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–
BFH	cf. *Viciaceae*		–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Agrostemma githago*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Galium aparine/ tricornutum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Fallopia convolvulus*		–	–	–	–	–	–	1	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Lithospermum arvense*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BHH	*Cirsium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Asteraceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Achillea/Anthemis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Alchemilla/Anthemis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Amaranthus* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–
SFH	*Amaranthus lividus/ retrofelxus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Anthemis tinctoria/aus-triaca*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Anthemis* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Atriplex* spp.		–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–
SFH	*Brassica* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Brassica* cf. *nigra*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Bromus arvensis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Bromus secalinus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Digitaria ischaeum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium* cf. *aparine*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium spurium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1	–	–	–	–	–
SFH	*Chenopodium album* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	4	–	–	–	–	–	–
SFH	*Chenopodium album/poly-spermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–
SFH	*Chenopodium ficifolium/ polyspermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium hybridum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–
SFH	*Chenopodium polyspermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–
SFH	*Chenopodium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–	–	–
SFH	*Chenopodiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
SFH	*Lamiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
SFH	*Lepidium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Mentha* sp./ *Lamiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Mentha/Salvia* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Persicaria* cf. *maculosa*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Plantago lanceolata*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Plantago* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Polygonum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Polygonum aviculare*		1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–
SFH	*Potentilla anserina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Weed category	Taxon	Element or sample	1308	1267	1201	1286_1306_1289	1291_1301_1309	809_817_881_1198	821_1335	883	1265	1175_1200	811	1345	807	1350_1261_1185_1237	1183_1140	1253_1125_1259	825_837	835_893_896	1312_1284_1288	1351	806_1254_805_1258	1130_1178_886_820	1260_1176	788
SFH	*Potentilla* cf. *supina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Potentilla* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex acetosella*		–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex crispus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex obtusifolius/crispus*		–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
SFH	*Setaria italica/pumila*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria pumila*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria* sp.		1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Solanum nigrum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Stellaria media*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Thalictrum minus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Thalictrum* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Thlaspi arvense*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Teucrium* cf. *botrys*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Teucrium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
SFH	*Veronica hederifolia*		–	–	–	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus tectorum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus tectorum/sterilis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus* cf. *racemosus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus* sp.		–	–	–	–	–	1	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–
SFL	*Bupleurum rotundifolium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Digitaria* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	cf. *Poaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–
SFL	cf. *Poa* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Poaceae* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Poaceae small*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Fabaceae small*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Fabaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	–
SHH	cf. *Galega officinalis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
SHH	*Medicago* cf. *lupulina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
SHH	cf. *Medicago* sp.		–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago/Melilotus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago falcata*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Trifolium/Melilotus small*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	cf. *Anagallis arvensis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Malva sylvestris*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Malva* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Salsola kali* syn. *tragus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–
SHH	*Sideritis montana*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Silene vulgaris*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–
SHH	*Silene* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Tab. 25. Continuation 2

Weed category	Taxon	Element or sample	1239	1126	1257	1197_1123	1256	830	814	834_1278	1268_1270_1319	1328	827	888	897	1141	1287_1323	803_818	1122_1215	791	785	844	1133	1238	1216	784
BFH	*Vicia cracca* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Vicia tetrasperma*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
BFH	*Vicia* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
BFH	cf. *Viciaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Agrostemma githago*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	6	–	–	–	1	–	–
BFH	*Galium aparine/ tricornutum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Fallopia convolvulus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	3	7	3	1	3	–	–	–	–
BFH	*Lithospermum arvense*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	96	121	12	2	8	–	5	1
BHH	*Cirsium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–
SFH	*Asteraceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
SFH	*Achillea/Anthemis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Alchemilla/Anthemis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Amaranthus* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Amaranthus lividus/ retrofelxus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Anthemis tinctoria/aus-triaca*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Anthemis* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Atriplex* spp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Brassica* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Brassica* cf. *nigra*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Bromus arvensis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	49	–	–	–	–	–	1	–
SFH	*Bromus secalinus*		–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–
SFH	cf. *Digitaria ischaeum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–
SFH	*Galium* cf. *aparine*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium spurium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–
SFH	*Chenopodium album* agg.		–	–	–	–	–	–	–	1	8	24	–	1	–	–	–	1	16	1	2	1	–	–	–	–
SFH	*Chenopodium album/poly-spermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium ficifolium/ polyspermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium hybridum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	2	3	1	1	1	–	–
SFH	*Chenopodium polyspermum*		–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium* sp.		–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–
SFH	*Chenopodiaceae*		–	–	–	–	–	–	–	1	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Lamiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–
SFH	*Lepidium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Mentha* sp./ *Lamiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Mentha/Salvia* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–
SFH	*Persicaria* cf. *maculosa*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Plantago lanceolata*		–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Plantago* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Polygonum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–
SFH	*Polygonum aviculare*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–
SFH	*Potentilla anserina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Weed category	Taxon	Element or sample	1239	1126	1257	1197_1123	1256	830	814	834_1278	1268_1270_1319	1328	827	888	897	1141	1287_1323	803_818	1122_1215	791	785	844	1133	1238	1216	784
SFH	*Potentilla* cf. *supina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Potentilla* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex acetosella*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex crispus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–
SFH	*Rumex obtusifolius/crispus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–
SFH	*Rumex* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria italica/pumila*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria pumila*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	–	–	–
SFH	*Setaria* sp.		–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	–	–	–	–
SFH	*Solanum nigrum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Stellaria media*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
SFH	*Thalictrum minus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–
SFH	cf. *Thalictrum* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–
SFH	*Thlaspi arvense*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Teucrium* cf. *botrys*		–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
SFH	cf. *Teucrium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Veronica hederifolia*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
SFL	*Bromus tectorum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus tectorum/sterilis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus* cf. *racemosus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus* sp.		–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	15	16	4	1	7	3	2	–
SFL	*Bupleurum rotundifolium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Digitaria* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	cf. *Poaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	–	–	3	–
SFL	cf. *Poa* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Poaceae* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Poaceae small*		–	–	2	–	–	–	–	–	–	–	–	5	–	–	–	–	–	–	1	1	–	1	1	–
SHH	*Fabaceae small*		–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–	–	–	1
SHH	*Fabaceae*		–	1	–	–	–	–	–	1	1	–	–	–	–	–	2	–	4	–	–	1	–	–	1	–
SHH	cf. *Galega officinalis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago* cf. *lupulina*		–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–
SHH	cf. *Medicago* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago/Melilotus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
SHH	*Medicago falcata*		1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Trifolium/Melilotus small*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	cf. *Anagallis arvensis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Malva sylvestris*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Malva* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Salsola kali* syn. *tragus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Sideritis montana*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–
SHH	*Silene vulgaris*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–
SHH	*Silene* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Tab. 25. Continuation 3

Weed category	Taxon	Element or sample	1357_787	1337_1318_1359	786	790	1346	1354_1336	1221	836	1128	1203	1136	1213	781	779	780	1205	1188	1135	1131	1199	1187	1182	1202	1217
BFH	*Vicia cracca* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Vicia tetrasperma*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
BFH	*Vicia* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	cf. *Viciaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Agrostemma githago*		–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
BFH	*Galium aparine/ tricornutum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Fallopia convolvulus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–
BFH	*Lithospermum arvense*		1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BHH	*Cirsium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Asteraceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Achillea/Anthemis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20	–	–	–	–	–
SFH	*Alchemilla/Anthemis*		–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Amaranthus* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Amaranthus lividus/ retrofelxus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Anthemis tinctoria/aus-triaca*		–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Anthemis* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Atriplex* spp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Brassica* sp.		–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Brassica* cf. *nigra*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Bromus arvensis*		–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Bromus secalinus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Digitaria ischaeum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium* cf. *aparine*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium spurium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium album* agg.		–	–	–	–	1	–	11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
SFH	*Chenopodium album/poly-spermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium ficifolium/ polyspermum*		–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium hybridum*		–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium polyspermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium* sp.		–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodiaceae*		–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Lamiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Lepidium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Mentha* sp./ *Lamiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
SFH	cf. *Mentha/Salvia* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Persicaria* cf. *maculosa*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Plantago lanceolata*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Plantago* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Polygonum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Polygonum aviculare*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Potentilla anserina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Weed category	Taxon	Element or sample	1357_787	1337_1318_1359	786	790	1346	1354_1336	1221	836	1128	1203	1136	1213	781	779	780	1205	1188	1135	1131	1199	1187	1182	1202	1217
SFH	*Potentilla* cf. *supina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Potentilla* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex acetosella*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex crispus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex obtusifolius/crispus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria italica/pumila*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria pumila*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Solanum nigrum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Stellaria media*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Thalictrum minus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Thalictrum* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Thlaspi arvense*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Teucrium* cf. *botrys*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Teucrium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Veronica hederifolia*		–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus tectorum*		–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus tectorum/sterilis*		–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus* cf. *racemosus*		–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus* sp.		–	–	–	–	–	–	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bupleurum rotundifolium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Digitaria* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	cf. *Poaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
SFL	cf. *Poa* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Poaceae* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Poaceae small*		–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Fabaceae small*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Fabaceae*		–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	2	–	1	–	–	–	–
SHH	cf. *Galega officinalis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago* cf. *lupulina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	cf. *Medicago* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago/Melilotus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago falcata*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Trifolium/Melilotus small*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	cf. *Anagallis arvensis*		–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Malva sylvestris*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Malva* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Salsola kali* syn. *tragus*		–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Sideritis montana*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Silene vulgaris*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Silene* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Tab. 25. Continuation 4

Weed category	Taxon	Element or sample	792	1181	1321	1325	1339	1340	1344	1349	1332	1333	1334	1358	801_838_1338	1121	1180_1303	899_1262	1190	1263	1305	832_898_802_839_ 845_847_1186	782	794	1134	1137
BFH	*Vicia cracca* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–
BFH	*Vicia tetrasperma*		–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–
BFH	*Vicia* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	cf. *Viciaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Agrostemma githago*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Galium aparine/ tricornutum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
BFH	*Fallopia convolvulus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	12	5	1	–	–	2	–	–	1	3
BFH	*Lithospermum arvense*		–	–	–	–	–	–	–	–	–	–	–	–	2	1	–	–	–	–	–	–	–	–	–	–
BHH	*Cirsium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Asteraceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Achillea/Anthemis*		–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Alchemilla/Anthemis*		–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Amaranthus* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Amaranthus lividus/ retrofelxus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Anthemis tinctoria/aus-triaca*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Anthemis* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Atriplex* spp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Brassica* sp.		–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–
SFH	*Brassica* cf. *nigra*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Bromus arvensis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Bromus secalinus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Digitaria ischaeum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium* cf. *aparine*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–
SFH	*Galium spurium*		–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1
SFH	*Galium* sp.		–	–	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	1	–	–	–	2	–	1
SFH	*Chenopodium album* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium album/poly-spermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium ficifolium/ polyspermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium hybridum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	3	–	–	–	–
SFH	*Chenopodium polyspermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium* sp.		–	–	1	–	–	–	–	–	–	–	–	–	–	–	5	–	–	–	–	1	–	–	–	–
SFH	*Chenopodiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Lamiaceae*		–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Lepidium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Mentha* sp./ *Lamiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Mentha/Salvia* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Persicaria* cf. *maculosa*		–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Plantago lanceolata*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Plantago* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Polygonum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
SFH	*Polygonum aviculare*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Potentilla anserina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–

Weed category	Taxon	Element or sample	792	1181	1321	1325	1339	1340	1344	1349	1332	1333	1334	1358	801_838_1338	1121	1180_1303	899_1262	1190	1263	1305	832_898_802_839_845_847_1186	782	794	1134	1137
SFH	*Potentilla* cf. *supina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Potentilla* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex acetosella*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex crispus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex obtusifolius/crispus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–
SFH	*Setaria italica/pumila*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–
SFH	*Setaria pumila*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–
SFH	*Setaria* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–
SFH	*Solanum nigrum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Stellaria media*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Thalictrum minus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Thalictrum* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Thlaspi arvense*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Teucrium* cf. *botrys*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
SFH	cf. *Teucrium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–
SFH	*Veronica hederifolia*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
SFL	*Bromus tectorum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus tectorum/sterilis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus* cf. *racemosus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–
SFL	*Bupleurum rotundifolium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Digitaria* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	cf. *Poaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	cf. *Poa* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Poaceae* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	–	–	–	–
SFL	*Poaceae small*		–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Fabaceae small*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
SHH	*Fabaceae*		–	1	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	2	–	–	1	2
SHH	cf. *Galega officinalis*		–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago* cf. *lupulina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	cf. *Medicago* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago/Melilotus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago falcata*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Trifolium/Melilotus small*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
SHH	cf. *Anagallis arvensis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Malva sylvestris*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Malva* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–
SHH	*Salsola kali* syn. *tragus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Sideritis montana*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Silene vulgaris*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Silene* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–

Tab. 25. Continuation 5

Weed category	Taxon	Element or sample	1177	1189	828	849	892	1174	1264	842	798	1204	1206	1208	1218	800_843_840	1220_1207	1214_1219	831_1212	1196	885_891_1129	894_1222
BFH	*Vicia cracca* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Vicia tetrasperma*		–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Vicia* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–
BFH	cf. *Viciaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Agrostemma githago*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Galium aparine/ tricornutum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BFH	*Fallopia convolvulus*		–	–	1	1	1	3	–	–	–	–	–	–	–	1	–	–	–	–	–	–
BFH	*Lithospermum arvense*		–	–	1	–	1	54	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BHH	*Cirsium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Asteraceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Achillea/Anthemis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Alchemilla/Anthemis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Amaranthus* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Amaranthus lividus/ retrofelxus*		–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–
SFH	cf. *Anthemis tinctoria/aus- triaca*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Anthemis* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Atriplex* spp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Brassica* sp.		–	–	–	–	14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Brassica* cf. *nigra*		–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Bromus arvensis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Bromus secalinus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Digitaria ischaeum*		–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium* cf. *aparine*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium spurium*		–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Galium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium album* agg.		–	–	–	–	25	1	–	–	–	–	–	–	–	–	–	1	–	–	–	–
SFH	*Chenopodium album/poly- spermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium ficifolium/ polyspermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium hybridum*		–	–	–	–	3	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium polyspermum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Chenopodiaceae*		–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Lamiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Lepidium* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Mentha* sp./ *Lamiaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Mentha/Salvia* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Persicaria* cf. *maculosa*		–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Plantago lanceolata*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Plantago* sp.		–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Polygonum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Polygonum aviculare*		–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Potentilla anserina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Potentilla* cf. *supina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–

Weed category	Taxon	Element or sample	1177	1189	828	849	892	1174	1264	842	798	1204	1206	1208	1218	800_843_840	1220_1207	1214_1219	831_1212	1196	885_891_1129	894_1222
SFH	*Potentilla* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–
SFH	*Rumex acetosella*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex crispus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex obtusifolius/crispus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Rumex* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria italica/pumila*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria pumila*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Setaria* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Solanum nigrum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Stellaria media*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Thalictrum minus*		–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Thalictrum* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Thlaspi arvense*		–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Teucrium* cf. *botrys*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	cf. *Teucrium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFH	*Veronica hederifolia*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus tectorum*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus tectorum/sterilis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus* cf. *racemosus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bromus* sp.		–	1	6	–	2	22	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Bupleurum rotundifolium*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Digitaria* sp.		–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	cf. *Poaceae*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	cf. *Poa* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Poaceae* agg.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SFL	*Poaceae small*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Fabaceae small*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Fabaceae*		–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–
SHH	cf. *Galega officinalis*		–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago* cf. *lupulina*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	cf. *Medicago* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago/Melilotus*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Medicago falcata*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Trifolium/Melilotus small*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	cf. *Anagallis arvensis*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Malva sylvestris*		–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Malva* sp.		–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Salsola kali* syn. *tragus*		–	–	–	–	3	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Sideritis montana*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Silene vulgaris*		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SHH	*Silene* sp.		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Tab. 26. Jevišovka. Matrix of all samples containing wild plant finds, transformed. Author: J. Apiar, ARÚB.

Feature	Sample sequence number	BHH	BFH	SHH	SHL	SFH	SFL	Total number of wild plant seeds
14	1	0.00	0.00	0.00	0.00	13.94	0.00	3
14	2	0.00	0.00	0.00	0.00	12.07	5.00	4
14	3	0.00	0.00	0.00	0.00	10.00	0.00	1
14	5	0.00	0.00	7.56	0.00	10.69	3.78	7
14	6	0.00	0.00	0.00	0.00	10.00	0.00	1
14	7	0.00	7.07	0.00	0.00	7.07	0.00	2
14	8	0.00	0.00	5.00	0.00	9.66	7.07	8
14	9	0.00	0.00	0.00	0.00	10.00	0.00	2
14	11	0.00	0.00	0.00	0.00	10.00	0.00	1
14	12	0.00	4.47	8.94	0.00	8.94	0.00	5
14	15	0.00	0.00	0.00	0.00	13.94	0.00	6
15	17	0.00	10.00	0.00	0.00	0.00	0.00	1
15	18	0.00	0.00	8.16	0.00	4.08	4.08	6
15	19	0.00	0.00	3.54	0.00	14.98	0.00	8
15	20	0.00	0.00	0.00	0.00	10.00	0.00	1
15	22	0.00	0.00	7.07	0.00	7.07	0.00	2
15	25	0.00	0.00	0.00	0.00	14.14	0.00	2
15	28	0.00	0.00	0.00	0.00	10.00	0.00	2
15	29	0.00	0.00	0.00	0.00	10.00	0.00	2
29	30	0.00	5.00	0.00	0.00	10.00	5.00	4
29	31	0.00	10.00	0.00	0.00	0.00	0.00	1
29	34	0.00	8.16	5.77	0.00	0.00	0.00	3
29	35	0.00	0.00	0.00	0.00	0.00	10.00	1
29	38	0.00	0.00	7.07	0.00	7.07	0.00	2
29	39	0.00	0.00	0.00	0.00	14.14	0.00	2
29	40	0.00	0.00	0.00	0.00	10.00	0.00	1
31	41	0.00	0.00	0.00	0.00	7.07	7.07	2
34	42	0.00	0.00	6.03	0.00	19.34	0.00	11
34	43	0.00	5.00	0.00	0.00	15.00	0.00	4
36	45	0.00	4.08	4.08	0.00	16.33	0.00	6
36	46	0.00	0.00	0.00	0.00	0.00	10.00	3
36	47	0.00	0.00	14.14	0.00	0.00	0.00	2
36	49	0.00	0.00	10.00	0.00	0.00	0.00	1
36	50	0.00	0.00	7.07	0.00	7.07	0.00	2
36	51	0.00	0.00	0.00	0.00	0.00	10.00	2
36	54	0.00	0.00	10.00	0.00	0.00	0.00	1
38	56	0.00	0.00	5.77	0.00	11.55	0.00	3
38	57	0.00	0.00	2.67	0.00	16.68	2.67	14
38	58	0.00	0.00	0.00	0.00	10.00	0.00	24
38	59	0.00	0.00	0.00	0.00	10.00	0.00	1
38	60	0.00	0.00	0.00	0.00	11.38	7.45	9
38	61	0.00	0.00	10.00	0.00	0.00	0.00	1
38	63	0.00	4.08	9.86	0.00	8.16	0.00	6
39	64	0.00	7.75	0.00	0.00	8.94	0.00	5
39	65	0.00	9.82	2.13	0.00	11.67	3.45	199
39	66	0.80	12.15	1.60	0.00	4.67	3.20	156
39	67	0.00	8.93	0.00	0.00	10.29	6.00	25

Feature	Sample sequence number	BHH	BFH	SHH	SHL	SFH	SFL	Total number of wild plant seeds
39	68	0.00	8.73	2.77	0.00	11.09	8.32	13
39	69	0.00	6.17	0.00	0.00	7.06	5.77	21
39	70	0.00	10.00	0.00	0.00	6.67	9.11	9
39	71	0.00	5.42	2.43	0.00	9.29	10.06	17
39	72	0.00	4.47	8.94	0.00	6.32	0.00	5
39	73	0.00	10.00	0.00	0.00	0.00	0.00	1
39	74	0.00	0.00	10.00	0.00	0.00	0.00	1
39	75	0.00	0.00	0.00	0.00	10.00	10.00	4
39	76	0.00	0.00	0.00	0.00	10.00	0.00	1
39	77	0.00	0.00	0.00	0.00	10.00	0.00	1
39	79	0.00	2.09	2.09	0.00	11.95	7.61	23
39	80	0.00	0.00	7.07	0.00	7.07	0.00	4
42	81	0.00	0.00	0.00	0.00	15.00	5.00	4
43	82	0.00	0.00	0.00	0.00	0.00	10.00	1
48	87	0.00	7.07	0.00	0.00	7.07	0.00	2
49	88	0.00	10.00	0.00	0.00	0.00	0.00	1
50	89	0.00	0.00	10.00	0.00	0.00	0.00	2
51	90	0.00	0.00	10.00	0.00	0.00	0.00	2
52	91	0.00	0.00	0.00	0.00	10.00	0.00	20
53	92	0.00	0.00	10.00	0.00	0.00	0.00	1
56	95	0.00	5.77	0.00	0.00	11.55	0.00	3
57	96	0.00	0.00	0.00	0.00	0.00	10.00	1
58	98	0.00	0.00	10.00	0.00	0.00	0.00	1
58	99	0.00	0.00	0.00	0.00	10.00	0.00	1
58	100	0.00	0.00	0.00	0.00	10.00	0.00	1
58	101	0.00	0.00	0.00	0.00	0.00	10.00	1
58	102	0.00	0.00	0.00	0.00	10.00	0.00	1
58	104	0.00	0.00	0.00	0.00	17.32	0.00	3
62	109	0.00	10.00	5.00	0.00	7.07	0.00	8
62	110	0.00	7.07	7.07	0.00	0.00	0.00	2
62	111	0.00	9.11	4.08	0.00	12.73	0.00	24
62	112	0.00	13.21	0.00	0.00	0.00	0.00	6
62	113	0.00	10.00	0.00	0.00	0.00	0.00	1
62	114	0.00	0.00	0.00	0.00	14.14	0.00	2
67	116	0.00	2.89	4.93	0.00	17.82	8.65	24
70	118	0.00	0.00	5.77	0.00	8.16	0.00	3
70	119	0.00	7.07	7.07	0.00	0.00	0.00	2
70	120	0.00	6.12	5.00	0.00	10.61	0.00	8
70	122	0.00	0.00	0.00	0.00	0.00	10.00	1
80	123	0.00	7.07	0.00	0.00	0.00	8.66	8
80	124	0.00	5.77	0.00	0.00	8.16	0.00	3
80	125	0.00	2.70	2.34	0.00	20.86	3.26	55
80	126	0.00	10.03	5.62	0.00	7.69	4.67	101
84	128	0.00	0.00	10.00	0.00	0.00	0.00	2
84	134	0.00	5.77	5.77	0.00	5.77	0.00	3
84	135	0.00	0.00	0.00	0.00	10.00	0.00	1
84	136	0.00	5.77	0.00	0.00	11.55	0.00	3

Tab. 27. Jevišovka. Matrix of all samples containing 11 and more finds of wild plants, transformed. Author: J. Apiar, ARÚB.

Sample sequence number	BHH	BFH	SHH	SHL	SFH	SFL	Total number of wild plant seeds
42	0.00	0.00	6.03	0.00	19.34	0.00	11
57	0.00	0.00	2.67	0.00	16.68	2.67	14
58	0.00	0.00	0.00	0.00	10.00	0.00	24
65	0.00	9.82	2.13	0.00	11.67	3.45	199
66	0.80	12.15	1.60	0.00	4.67	3.20	156
67	0.00	8.93	0.00	0.00	10.29	6.00	25
68	0.00	8.73	2.77	0.00	11.09	8.32	13
69	0.00	6.17	0.00	0.00	7.06	5.77	21
71	0.00	5.42	2.43	0.00	9.29	10.06	17
79	0.00	2.09	2.09	0.00	11.95	7.61	23
91	0.00	0.00	0.00	0.00	10.00	0.00	20
111	0.00	9.11	4.08	0.00	12.73	0.00	24
116	0.00	2.89	4.93	0.00	17.82	8.65	24
125	0.00	2.70	2.34	0.00	20.86	3.26	55
126	0.00	10.03	5.62	0.00	7.69	4.67	101

Tab. 28. Jevišovka. Percentages of finds calculated for proportions p4 and p5. Author: J. Apiar, ARÚB.

Element or sample number	Volume (l)	Density	p4 % of big weed seeds	p5 % of weed seeds
1277_1295_1314	50	2.44	0.00	3.37
1193_1324_1355	47	3.57	0.00	6.61
1350_1261_1185_1237	52	1.42	0.00	3.64
835_893_896	17	2.18	0.00	64.71
806_1254_805_1258	20	5.35	16.67	10.17
1257	2	40.00	0.00	2.50
1268_1270_1319	21	6.14	0.00	11.48
1328	6	5.67	0.00	75.00
1287_1323	28	3.64	16.67	8.45
1122_1215	23	102.74	52.24	16.49
791	7	117.71	83.97	24.38
785	9	22.44	52.00	14.29
844	10	22.30	35.71	7.33
1133	7	100.43	36.36	4.99
1238	9	45.89	23.08	5.80
1216	10	45.00	21.74	6.18
784	10	27.20	20.00	2.28
1337_1318_1359	9	8.89	0.00	2.38
1346	4	34.00	0.00	2.38
1221	1	226.00	4.17	11.76
1131	5	4.80	0.00	100.00
1180_1303	30.5	11.80	50.00	8.47
899_1262	27	4.59	85.71	5.98
1263	15	4.53	0.00	4.92
832_898_802_839_845_847_1186	115	2.12	8.33	16.55
1137	7	25.29	37.50	5.13
828	6	23.67	25.00	6.15
892	6	47.17	3.57	26.05
1174	10	155.30	56.31	7.65

Tab. 29. Jevišovka. Percentages of finds calculated for proportions p4 and p6. Author: J. Apiar, ARÚB.

Element or sample number	p4 % of big weed seeds	p6 % SHL_SHH_BHH seeds	% of weed seeds from sum of weed seeds and chaff	% of chaff from sum of weed seeds and chaff	% grains from sum of grains, weed seeds and chaff
1277_1295_1314	0.00	0.00	3.09	8.25	88.66
1193_1324_1355	0.00	25.00	5.71	13.57	80.71
1350_1261_1185_1237	0.00	50.00	3.64	0.00	96.36
1257	0.00	0.00	2.50	0.00	97.50
1287_1323	16.67	50.00	8.00	5.33	86.67
844	35.71	7.14	6.97	4.98	88.06
1133	36.36	0.00	4.29	14.04	81.68
1238	23.08	0.00	4.56	21.40	74.04
1216	21.74	4.35	6.05	2.11	91.84
784	20.00	40.00	2.17	4.78	93.04
1337_1318_1359	0.00	100.00	1.82	23.64	74.55
1346	0.00	0.00	1.79	25.00	73.21
1180_1303	50.00	7.69	7.81	7.81	84.38
899_1262	85.71	0.00	5.79	3.31	90.91
1263	0.00	0.00	4.76	3.17	92.06
1137	37.50	25.00	4.94	2.47	91.36
828	25.00	0.00	5.80	5.80	88.41
1174	56.31	9.71	7.05	7.87	85.09
806_1254_805_1258	16.67	16.67	9.68	4.84	85.48

Tab. 30. Jevišovka. Ecological characteristics of wild plant taxa determined in the assemblage. After www.pladias.cz; Jurko 1990; Ellenberg 1991. For original nomenclature and sources, see List of abbreviations and References. Author: J. Apiar, ARÚB.

Taxon	Roman period features: ubiquity in samples	Roman period features: sum of PMR	La Tène/Roman period features: ubiquity in samples	La Tène/Roman period features: sum of PMR	Occurrence in habitats main (after www.pladias.cz)	Occurrence in habitats constant dominant	Occurrence in habitats dominant	Occurrence in habitats optimum	Occurrence in habitats rare
Agrostemma githago	1	1	4	10	Anthropogenic veg			13B	13A
Arctostaphylos uva-ursi			1	1	Heathlands and scrub, Forests			11A, 12L, 12O	1A, 1B
Brassica cf. *nigra*			1	1	Wetland and riverine herbaceous veg, Anthropogenic veg			4L, 13A	4I, 11J, 13BDE
Bromus arvensis			3	51	Anthropogenic veg				13ABD
Bromus cf. *racemosus*			1	1	Meadows and mesic pastures			6D	6E, 10I
Bromus secalinus	1	1	1	2	Anthropogenic veg				13ABD
Bromus tectorum			1	2	Anthropogenic veg, Sand grasslands and rock-outcrop veg		13A	9BD, 13D	1ABCD, 8ACE, 9CEF, 11LNR, 12T, 13BC
Bupleurum rotundifolium	1	1			Anthropogenic veg			13B	13A
cf. *Anagallis arvensis*			1	1	Anthropogenic veg			13B	4HI, 9F, 10GI, 12T, 13AD
cf. *Digitaria ischaeum*			2	3	Sand grasslands and rock-outcrop veg, Anthropogenic veg			9B, 13AC	4HI, 6C, 11R, 13BDF
cf. *Galega officinalis*	2	2	1	1	Meadows and mesic pastures, Heathlands and scrub, Anthropogenic veg			6G, 11J, 13D	4I, 4J, 4L, 6D, 10I, 11R, 13A, 13E
cf. *Ornithopus perpusillus*	1	1			Sand grasslands, Sparse forests margins				
Conium maculatum			1	1	Anthropogenic veg			13D	4D, 4L, 11J, 11R, 13A, 13B, 13E
Fallopia convolvulus	12	31	9	23	Forests, Anthropogenic veg, Vegetation of cliffs, screes and walls			12JT, 13AB, 1D	1ABC, 4DHI, 6ACDG, 8ABCEF, 9BCF, 11LNR, 12CDFHIKUW, 13CDEF
Galium aparine/tricornutum	1	1			Anthropogenic veg			13B	
Galium cf. *Aparine*	1	1			Anthropogenic veg, Wetland and riverine herbaceous veg, Heathlands and scrub, Forests	13E	4L	4DK, 11JLNR, 12BCHJTU, 13ABDF	1ABCD, 4ABEGIJ, 5ABDE, 6AC-DEFG, 7B, 8ABCF, 9BEF, 10I, 11I, 12AEFGIKLVW, 13C
Galium spurium	2	2	1	1	Anthropogenic veg			13B	11LN, 13AD
Chenopodium album agg.	15	59	9	59	Anthropogenic veg, Wetland and riverine herbaceous vegetation	13A	4I	4H, 13BCD	3C, 4ABDEJL, 6CG, 8ACF, 9BC, 10GI, 11JLNR, 12TUVW, 13EF
Chenopodium hybridum	4	7	8	18	Anthropogenic veg			13AB	1AD, 4BDIJKL, 10I, 11JR, 12TUVW, 13CDEF
Chenopodium polyspermum	4	4			Wetland and riverine herbaceous vegetation, Anthropogenic veg			4HI, 13AB	3C, 4BCDJKL, 6G, 10I, 11R, 13F
Lotus cf. *corniculatus*	1	1			Veg of springs and mires, Meadows and mesic pastures, Acidophilous grasslands, Dry grasslands, Sand grasslands and rock-outcrop veg, Forests			5D, 6ACF, 7B, 8CDEF, 9C, 12HO	1D, 4H, 5EF, 6BDEG, 7A, 8AB, 9BDEF, 10IJ, 11AHLN, 12IJKLW, 13ABCDEF
Malva sylvestris	1	2			Anthropogenic veg			13DE	6G, 11R, 12TU, 13AB

Taxon	Growth form	Life form	Height (m)	Taxon origin in Czech Republic	Geographic origin	Light indicator value (L. Ellenberg)	Temperature indicator value (T. Ellenberg)	Moisture indicator value (M. Ellenberg)	Reaction indicator value (R. Ellenberg)	Nutrient indicator value (N. Ellenberg)	Salinity indicator value (S. Ellenberg)	Soil moisture (Pv. Jurko)	Soil reaction (Pr. Jurko)	Soil nitrogen (Pd. Jurko)	Flowering phase	Flowering period	Flowering phase (F. Jurko)
Agrostemma githago	annual herb	therophyte	0.3-1	archae-ophyte	anecophyte	7	6	4x	6x	6x	0	3	3-5	3-4	7	June-August	4*
Arctostaphylos uva-ursi	dwarf shrub	chamae-phyte	0.1-0.3	native		6	4	3	3x	2	0	3	2-5	1	3	May-June	3
Brassica cf. *nigra*	annual herb	therophyte	1-2.5	archae-ophyte	Mediterra-nean	8	7	6	8	7	1	3-4	3-4	3-4	7	June-October	4*
Bromus arvensis	annual herb	therophyte	0.3-0.9	archae-ophyte	Mediterra-nean	7	6	4	8	6	0	2/3	4-3	2/3		June-July	5
Bromus cf. *racemosus*	annual herb	therophyte (hemicryp-tophyte)	0.2-0.8	native		7	6	8	6	5	1	3-4	3-2	3-4	8	May-June	4
Bromus secalinus	annual herb	therophyte (hemicryp-tophyte)	0.2-1	archae-ophyte	Mediterra-nean	7	6	5x	5	5x	0	3	2-3	2-3		June-July	5
Bromus tectorum	annual herb	therophyte	0.1-0.5	archae-ophyte	Mediterra-nean	8	6	3	8	5	0	2	4-5	2	7	May-July	4
Bupleurum rotundifolium	annual herb	therophyte	0.1-0.6	archae-ophyte	Mediterra-nean	8	7	3	9	4	0	2	4-5	3-2	6	May-July	3
cf. *Anagallis arvensis*	annual herb	therophyte	0.06-0.5	archae-ophyte	Mediterra-nean	7	6	5	7x	6	1	2-3	3-5	3	7	June-September	4*
cf. *Digitaria ischaeum*	annual herb	therophyte	0.1-0.3	archae-ophyte	Mediterra-nean	8	6	4	4	5	1	3	2	2	8	July-October	6
cf. *Galega officinalis*	polycarpic perennial non-clonal herb	hemicryp-tophyte	0.4-1	archae-ophyte	Europe, Mediterranean	7	6	6	7	7	2	3-4	2-4	2		July- September	5
cf. *Ornithopus perpusillus*	annual herb	therophyte	0.05-0.3	native		7	6	3	2	2	0	2/3	2-3	2		May-July	4
Conium maculatum	monocarpic perennial non-clonal herb	hemicryp-tophyte	0.5-3.5	archae-ophyte	Mediterra-nean, Asia	8	6	6	7x	8	1	3	2-4	4/5	6	May-August	5*
Fallopia convolvulus	annual herb	therophyte	0.1-0.4	archae-ophyte	Mediterra-nean	7x	6	5	6x	6	0	1-4	2-5	2-4	7	July-October	6
Galium aparine/ tricornutum	annual herb	therophyte	-												6	June-July	4*
Galium cf. *Aparine*	annual herb	therophyte	0.8-1.8	native		6x	6	5x	6	8	1	3-4	3-5	4-5	6	May-October	4*
Galium spurium	annual herb	therophyte	0.15-1.5	archae-ophyte	Europe, Mediterranean	7	6	5	7	6	0	2-3	3-4	2-3	6	June-July	4*
Chenopodium album agg.	annual herb	therophyte	0.1-1.8	native	Europe, Mediterranean, North America, South America, Asia	7	6x	5	6x	7	1	2-3	3-5a	4	8	June-November	6
Chenopodium hybridum	annual herb	therophyte	0.4-1	native		7	6	5	7	8	2	3	3-5	4	8	June-October	*
Chenopodium polyspermum	annual herb	therophyte	0.1-0.6	native		7	6	6	6x	8	0	3/4	3-5	4	8	May-October	6
Lotus cf. *corniculatus*	polycarpic perennial non-clonal herb	hemicryp-tophyte	0.15-0.6	native		7	5x	4	7	4	1	2-4	3-5a	2-3	6	June-August	4*
Malva sylvestris	monocarpic perennial non-clonal herb	hemicryp-tophyte	0.3-1.5	archae-ophyte	Mediterra-nean, anecophyte	8	6	4	7	8	1	2/3	4	4	7	June-October	4*

Tab. 30. Continuation 1

Taxon	Roman period features: ubiquity in samples	Roman period features: sum of PMR	La Tène/Roman period features: ubiquity in samples	La Tène/Roman period features: sum of PMR	Occurrence in habitats main (after www.pladias.cz)	Occurrence in habitats constant dominant	Occurrence in habitats dominant	Occurrence in habitats optimum	Occurrence in habitats rare
Medicago cf. *lupulina*	2	2			Meadows and mesic pastures, Dry grasslands, Anthropogenic veg			6A, 6C, 8D, 13B, 13C, 13D	1C, 4H, 4I, 4J, 4L, 5D, 6B, 6D, 6E, 6F, 6G, 7B, 8A, 8B, 8C, 8E, 8F, 9BCDEF, 10I, 11LNR, 12HIOTUW, 13AE
Medicago falcata	1	1			Dry grasslands, Heathlands and scrub, Anthropogenic veg			8CDF, 11L, 13D	5D, 6ACF, 8ABE, 9CEF, 11N, 12HW, 13A
Persicaria maculosa	2	1	1	1	Wetland and riverine herbaceous vegetation, Anthropogenic veg			4HI, 13BC	3C, 4DE, 11J, 12T, 13AD
Plantago lanceolata	1	1			Vegetation of springs and mires, Meadows and mesic pastures, Dray grasslands, Acidophilous grasslands, Sand grasslands and rock-outcrop veg, Anthropogenic veg			5D, 6ABCDFG, 7B, 8DE, 9C, 13D	1D, 4EHIJKL, 5E, 6E, 7A, 8ABCF, 9BDEF, 10IJ, 11ALN, 12TUW, 13ABCEF
Polygonum aviculare	2	2	3	5	Anthropogenic veg, Meadows and mesic pastures	13C		6C, 13ABD	1C, 3C, 4DEHIJK, 6G, 8CE, 9BCDEF, 10GIJ, 11R, 12TW, 13EF
Potentilla anserina	1	1			Saline veg, Meadows and mesic pastures, Wetland and riverine herbaceous veg		6G, 10IJ	4BI, 6CD	3C, 4CDEGHL, 5D, 6AEF, 8D, 9EF, 10G, 11JR, 12AB, 13ABCDEF
Potentilla cf. *supina*	1	1			Wetland and riverine herbaceous veg			4HI	3C, 4BDG, 6CG, 10GI, 13ACD
Rumex acetosella	1	1			Sand grasslands and rock-outcrop veg, Forests, Anthropogenic veg, Dry grasslands, Vegetation of cliffs, screes and walls, Acidophilous grasslands, Heathlands and scrub			1B, 7B, 8AE, 9CDE, 11A, 12JKL, 13BF	1D, 4I, 6ABCD, 7A, 8BCDF, 9F, 11LNR, 12CDFGORTUVW, 13ACD
Rumex crispus			1	1	Meadows and mesic pastures, Saline veg, Anthropogenic veg			6CD, 10I, 13BD	3C, 4ABCDEGHIJKL, 6ABEF, 10G, 11JLR, 13ACEF
Salsola kali syn. *tragus*	1	1	3	12	Anthropogenic veg			13AD	9BD
Sambucus ebulus	2	2	2	2	Anthropogenic veg, Heathlands and scrub		13D	11L	13E, 13F
Setaria pumila	1	1	1	5	Anthropogenic veg			13AB	1ABCD, 4I, 12TUW, 13CDF
Sideritis montana			1	1	Dry grasslands, Sand grasslands			8C, 9F	13A, 13D
Silene vulgaris	1	1	1	1	Forests, Vegetation of cliffs, screes and walls, Alpine and subalpine grasslands, Meadows and mesic pastures, Acidophilous grasslands, Dry grasslands, Heathlands and scrub			1B, 2B, 6B, 7A, 8F, 11D, 12JLO	1AD, 2A, 5C, 6ACDF, 7B, 8ABCDE, 9CEF, 11AHLNR, 12DFHIKTVW, 13BDE
Solanum nigrum	1	1			Anthropogenic veg			13AB	1C, 4IL, 6G, 11JR, 12BTUW, 13DEF
Stellaria media			1	1	Anthropogenic veg	13AB		13C	1C, 3C, 4DEHIJKL, 5B, 6ACDG, 8CEF, 9BCDEF, 10I, 11HIJLNR, 12ABCDEFGHIJKTUVW, 13DEF
Teucrium cf. *botrys*	3	3			Dry grasslands, Sand grasslands and rock-outcrop veg, Vegetation of cliffs, screes and walls			1D, 8AB, 9F	8CF, 11N, 12JW, 13D
Thalictrum minus			2	2	Dry grasslands, Heathlands and scrub, Forests			8CDF, 11LN, 12H	1ABD, 6ADF, 8AB, 12CDFIJW
Thlaspi arvense			1	3	Anthropogenic veg				4HI, 6CDG, 9E, 10I, 13CD
Veronica hederifolia	5	7			Forests, Anthropogenic veg			12CT, 13E	1ABD, 4K, 8E, 9EF, 11JLR, 12BDHJU, 13ABF
Vicia cracca agg.	1	1			Dry grasslands, Meadows and mesic pastures, Acidophilous grasslands		8F	1B, 2B, 4D, 6ABDEF, 7AB, 8CD, 11LN	1D, 4ABEGKL, 5DEF, 6CG, 8E, 9CEF, 10I, 11HIJR, 12HIJKLOW, 13ABDEF
Vicia tetrasperma	4	5	2	2	Dry grasslands, Sand grasslands, Anthropogenic veg			6A, 8EF, 9E, 13BE	1BD, 4HI, 6CDFG, 7B, 8ACD, 9BCF, 11ALN, 12HIJKW, 13ADF

Taxon	Growth form	Life form	Height (m)	Taxon origin in Czech Republic	Geographic origin	Light indicator value (L. Ellenberg)	Temperature indicator value (T. Ellenberg)	Moisture indicator value (M. Ellenberg)	Reaction indicator value (R. Ellenberg)	Nutrient indicator value (N. Ellenberg)	Salinity indicator value (S. Ellenberg)	Soil moisture (Pv. Jurko)	Soil reaction (Pr. Jurko)	Soil nitrogen (Pd. Jurko)	Flowering phase	Flowering period	Flowering phase (F. Jurko)
Medicago cf. *lupulina*	annual herb	therophyte (hemicryptophyte)	0.1-0.6	native		7	5	4	7	4x	1	2-3	5-4	2-4	5	May-October	4*
Medicago falcata	polycarpic perennial non-clonal herb	hemicryptophyte	0.25-0.8	native		8	6	3	8	3	1	2-3	5-4	2	8	May-October	5
Persicaria maculosa	annual herb	therophyte	0.2-0.6	native		7	6	5	7	7	1	3-4	5-3a-4	3-4	8	June-September	5
Plantago lanceolata	polycarpic perennial non-clonal herb	hemicryptophyte	0.07-0.3	native		7	5x	5x	6x	5x	1	2-4	2-5a	3-4	4	May-September	4*
Polygonum aviculare	annual herb	therophyte	0.1-0.6	native		7	6	4	6x	7	1	3	5-3a	2-4	7	June-September	5*
Potentilla anserina	clonal herb	hemicryptophyte	0.1-0.3	native		7	6	6	7x	7	3	3-4	5-3a	4	5	June-August	4
Potentilla cf. *supina*	annual herb	therophyte (hemicryptophyte)	0.05-0.6	native	North America, Asia	7	6	7	6	7	1	4-5	3-2a	2-3		June-September	5*
Rumex acetosella	clonal herb	hemicryptophyte (geophyte)	0.05-0.35	native		8	5	3	4	2	0	1-3	1-2	1-2	2	May-July	3*
Rumex crispus	polycarpic perennial non-clonal herb	hemicryptophyte	0.3-1	native		7	5	6	6x	7	1	2-4	3-5a	3-4	7	June-August	5
Salsola kali syn. *tragus*	annual herb	therophyte	0.1-0.6	native		9	7	3	7	6	3	1-2	4-3b	3-2	8	July-August	6
Sambucus ebulus	clonal herb	geophyte (hemicryptophyte)	0.5-1.5	archaeophyte	Europe, Mediterranean	7	6	5	7	7	1	3	5-3	4-3	8	June-July	6
Setaria pumila	annual herb	therophyte	0.15-0.6	archaeophyte	Mediterranean	7	7	4	6	7	1	3	3	3	7	July_September	6
Sideritis montana	annual herb	therophyte	0.15-0.3	native		9	7	3	7	5	0	2	5-4	2		June-September	5
Silene vulgaris	polycarpic perennial non-clonal herb	hemicryptophyte	0.3-1	native		6	6x	4	6	4	0	2-3	3-4	1-3	6	May-September	4*
Solanum nigrum	annual herb	therophyte	0.3-0.7	archaeophyte	Mediterranean	7	6	5	7	8	1	3	5-3	4-5	8	June-October	4*
Stellaria media	annual herb	therophyte	0.05-0.35	native		6	5x	5x	6	8	1	2-3	3-5	3-4	1	March-November	1*
Teucrium cf. *botrys*	annual herb	therophyte (hemicryptophyte)	0.1-0.4	native		9	6	2	8	3	0	1	5	1	8	July-September	6
Thalictrum minus	clonal herb	hemicryptophyte	0.3-1.5	native		6	7	3	8	3	0	1-2	4-5	2	7	June-July	4
Thlaspi arvense	annual herb	therophyte	0.1-0.4	archaeophyte	Mediterranean	7	5	5	7	7	0	3	4-3	3-4	1	April-September	3*
Veronica hederifolia	annual herb	therophyte	0.02-0.1	archaeophyte	Mediterranean	6x	6	5	7	7	0	3	3-4	3	2	March-May	2*
Vicia cracca agg.	clonal herb	hemicryptophyte	0.05-1.5	native		7	5x	4	7x	5x	1	2-4	2-4	2-4	6, 7	May-September	5
Vicia tetrasperma	annual herb	therophyte	0.2-0.6	native		7	6	4	5	5	0	3	2-4	2	7	May-September	4*

Tab. 31. Jevišovka. Matrices used for computing general additive models 1–5. Carb – carbonised; pmr – plant macro-remains; feat – feature. Authors: P. and J. Apiar, ARÚB.

Model 1	feature	sample	feat_type	volume (l)	carb_pmr	sum_pmr	carb_taxa
	14	1277	pithouse	16	73	92	13
	14	1295	pithouse	13	15	31	6
	14	1314	pithouse	21	33	43	11
	14	1280	pithouse	16	54	66	11
	14	1348	pithouse	16	15	51	5
	14	1184	pithouse	17	10	14	3
	14	1193	pithouse	15	8	15	6
	14	1324	pithouse	14	24	33	5
	14	1355	pithouse	18	57	69	19
	14	1283	posthole_in_pithouse	7	5	22	4
	14	1293	posthole_in_pithouse	11	1	1	1
	14	1341	posthole_in_pithouse	5	16	17	11
	14	823	posthole_in_pithouse	6	3	4	3
	14	799	posthole_in_pithouse	4	3	8	3
	14	1273	posthole_in_pithouse	8	9	21	6
	14	1296	posthole_in_pithouse	3	21	22	10
	14	1274	posthole_in_pithouse	4	6	10	5
	14	826	posthole_in_pithouse	4	3	8	3
	14	890	posthole_in_pithouse	4	2	6	2
	14	1304	posthole_in_pithouse	4	11	17	6
	14	1310	posthole_in_pithouse	8	11	16	9
	14	829	posthole_in_pithouse	2	1	3	1
	14	1266	posthole_in_pithouse	5	7	21	4
	14	1311	posthole_in_pithouse	0.5	9	9	1
	14	1281	posthole_in_pithouse	2	8	21	3
	14	1353	posthole_in_pithouse	3.5	9	13	1
	15	1282	posthole_in_pithouse	6	6	8	4
	15	1276	posthole_in_pithouse	7	13	14	4
	15	1297	posthole_in_pithouse	4	21	28	9
	15	1294	posthole_in_pithouse	9	28	36	14
	15	1275	posthole_in_pithouse	6	16	32	8
	15	1272	posthole_in_pithouse	4	10	13	5
	15	1279	posthole_in_pithouse	3	5	9	4
	15	1271	posthole_in_pithouse	4	2	4	2
	15	1269	posthole_in_pithouse	3	4	6	2
	15	1308	posthole_in_pithouse	2	14	26	9
	15	1267	posthole_in_pithouse	4	1	25	1
	15	1201	pithouse	16	1	10	1
	15	1286	pithouse	5	5	14	4
	15	1306	pithouse	8	6	18	3
	15	1289	pithouse	7	5	34	4
	15	1291	pithouse	5	4	10	2
	15	1301	pithouse	7	3	5	1
	15	1309	pithouse	5	3	5	2
	29	809	pithouse	6	34	70	8
	29	817	pithouse	12	122	164	8
	29	881	pithouse	6	32	77	4
	29	1198	pithouse	4	9	30	6
	29	821	pithouse	5	17	77	3

Tab. 31. Continuation 1

Model 1	feature	sample	feat_type	volume (l)	carb_pmr	sum_pmr	carb_taxa
	29	1335	pithouse	6	10	28	4
	29	883	pithouse	4	2	8	2
	29	1265	pithouse	8	6	14	3
	29	1175	posthole_in_pithouse	12.5	3	7	2
	29	1200	posthole_in_pithouse	19	19	21	8
	29	811	pithouse	7	63	94	9
	29	1345	posthole_in_pithouse	12	3	14	1
	29	807	pithouse	6	17	25	3
	29	1350	posthole_in_pithouse	4	1	1	1
	29	1261	posthole_in_pithouse	12	37	75	10
	29	1185	posthole_in_pithouse	15	29	40	9
	29	1237	posthole_in_pithouse	21	11	41	3
	29	1183	posthole_in_pithouse	12	12	18	8
	29	1140	posthole_in_pithouse	11	3	10	3
	29	1253	entrance_niche	12	4	8	3
	29	1125	entrance_niche	7	13	14	5
	29	1259	entrance_niche	7	4	36	2
	31	825	settlement_pit_un-spec	16	26	69	5
	31	837	settlement_pit_un-spec	10	22	26	6
	34	835	posthole_in_pithouse	7	16	53	7
	34	893	posthole_in_pithouse	4	9	13	4
	34	896	posthole_in_pithouse	6	11	26	6
	34	1312	pithouse	9	7	77	5
	34	1284	pithouse	9	0	19	0
	34	1288	pithouse	14	4	18	4
	34	1351	pithouse	7	9	22	4
	36	806	pithouse	4	39	59	8
	36	1254	pithouse	5	29	80	9
	36	805	pithouse	6	14	52	5
	36	1258	pithouse	5	25	39	6
	36	1130	pithouse	5	4	5	2
	36	1178	pithouse	4.5	4	8	3
	36	886	pithouse	5	15	22	3
	36	820	pithouse	10	27	45	5
	36	1260	pithouse	13	5	11	5
	36	1176	pithouse	11	19	37	8
	36	788	pithouse	7	2	3	1
	36	1239	posthole_in_pithouse	7.5	9	12	6
	36	1126	posthole_in_pithouse	7	10	11	6
	36	1257	posthole_in_pithouse	2	13	13	3
	36	1197	entrance_niche	6	9	30	4
	36	1123	entrance_niche	6	1	7	1
	36	1256	posthole_in_pithouse	4	3	8	2
	36	830	posthole_in_pithouse	6	29	39	4
	38	814	pithouse	4	37	42	7
	38	834	pithouse	4.5	34	44	10
	38	1278	pithouse	5	12	19	5
	38	1268	pithouse	6	71	87	10

Tab. 31. Continuation 2

Model 1	feature	sample	feat_type	volume (l)	carb_pmr	sum_pmr	carb_taxa
	38	1270	pithouse	7	37	67	10
	38	1319	pithouse	8	49	68	13
	38	1328	pithouse	6	34	37	5
	38	827	posthole_in_pithouse	4	12	25	5
	38	888	posthole_in_pithouse	5	49	57	14
	38	897	posthole_in_pithouse	7	44	52	9
	38	1141	posthole_in_pithouse	3	14	14	2
	38	1287	pithouse	14	33	93	9
	38	1323	pithouse	14	68	98	18
	42_57	1128	posthole	8	27	55	13
	42_57	1203	posthole	5	25	36	12
	42_57	1136	posthole	3	3	16	2
	42_57	1213	posthole	4	13	86	6
	42_57	781	posthole	6	2	64	2
	42_57	779	posthole	6	7	14	2
	42_57	780	posthole	5	18	64	5
	42_57	1205	posthole	4	2	10	2
	42_57	1188	posthole	5	3	20	2
	42_57	1135	posthole	5	4	12	3
	42_57	1131	posthole	5	24	53	3
	42_57	1199	posthole	7	3	19	3
	42_57	1187	posthole	4.5	6	36	4
	42_57	1182	posthole	5	6	23	4
	42_57	1202	posthole	6	12	20	7
	42_57	1217	posthole	3.5	4	27	3
	58	792	unspecified	6	7	8	5
	58	1181	unspecified	4.5	8	9	5
	58	1321	unspecified	6	6	12	5
	58	1325	unspecified	7	12	42	5
	58	1339	unspecified	6	10	23	6
	58	1340	entrance_niche	4	9	9	5
	58	1344	unspecified	7	10	13	5
	58	1349	unspecified	5	22	30	10
	59	1332	unspecified	6	9	11	4
	59	1333	unspecified	3	4	32	2
	59	1334	unspecified	6	34	43	8
	59	1358	unspecified	4	25	27	8
	62	801	storage_pit	27	138	315	15
	62	838	storage_pit	23	14	55	4
	62	1338	storage_pit	20	13	63	4
	62	1121	storage_pit	15	47	73	11
	62	1180	storage_pit	14.5	217	247	22
	62	1303	storage_pit	16	133	140	17
	62	899	storage_pit	12	35	54	10
	62	1262	storage_pit	15	91	94	14
	62	1190	storage_pit	5	12	14	6
	62	1263	storage_pit	15	68	76	17
	62	1305	storage_pit	10	18	24	6
	67	832	storage_pit	32	125	155	16
	67	898	storage_pit	12	26	88	11

Tab. 31. Continuation 3

Model 1	feature	sample	feat_type	volume (l)	carb_pmr	sum_pmr	carb_taxa
	67	802	storage_pit	15	2	27	1
	67	839	storage_pit	22	54	74	13
	67	845	storage_pit	10	4	14	3
	67	847	storage_pit	18	26	46	8
	67	1186	storage_pit	6	5	17	3
	70	782	storage_pit	8	44	44	11
	70	794	storage_pit	12	48	48	14
	70	1134	storage_pit	6	3	5	3
	70	1137	storage_pit	7	173	184	18
	70	1177	storage_pit	6.5	3	7	3
	70	1189	storage_pit	8	7	39	3
	83	1264	posthole	6	1	9	1
	84	842	pithouse	7	25	41	6
	84	798	unspecified	13	8	31	3
	84	1204	unspecified	4	1	7	1
	84	1206	unspecified	4	2	14	2
	84	1208	unspecified	4	2	5	2
	84	1218	unspecified	4	2	12	2
	84	800	pithouse	2	1	24	1
	84	843	pithouse	3	14	32	6
	84	840	unspecified	5	3	19	3
	84	1220	unspecified	2	2	6	2
	84	1207	unspecified	2	0	0	0
	84	1214	pithouse	2	4	15	4
	84	1219	unspecified	4	19	33	5
	84	831	pithouse	3	2	12	1
	84	1212	unspecified	3	2	3	1
	84	1196	unspecified	2	2	2	2
	84	885	unspecified	1	72	76	2
	84	891	unspecified	1	1	2	1
	84	1129	unspecified	1	1	15	1
	84	894	entrance_niche	2	0	1	0
	84	1222	entrance_niche	3	0	6	0

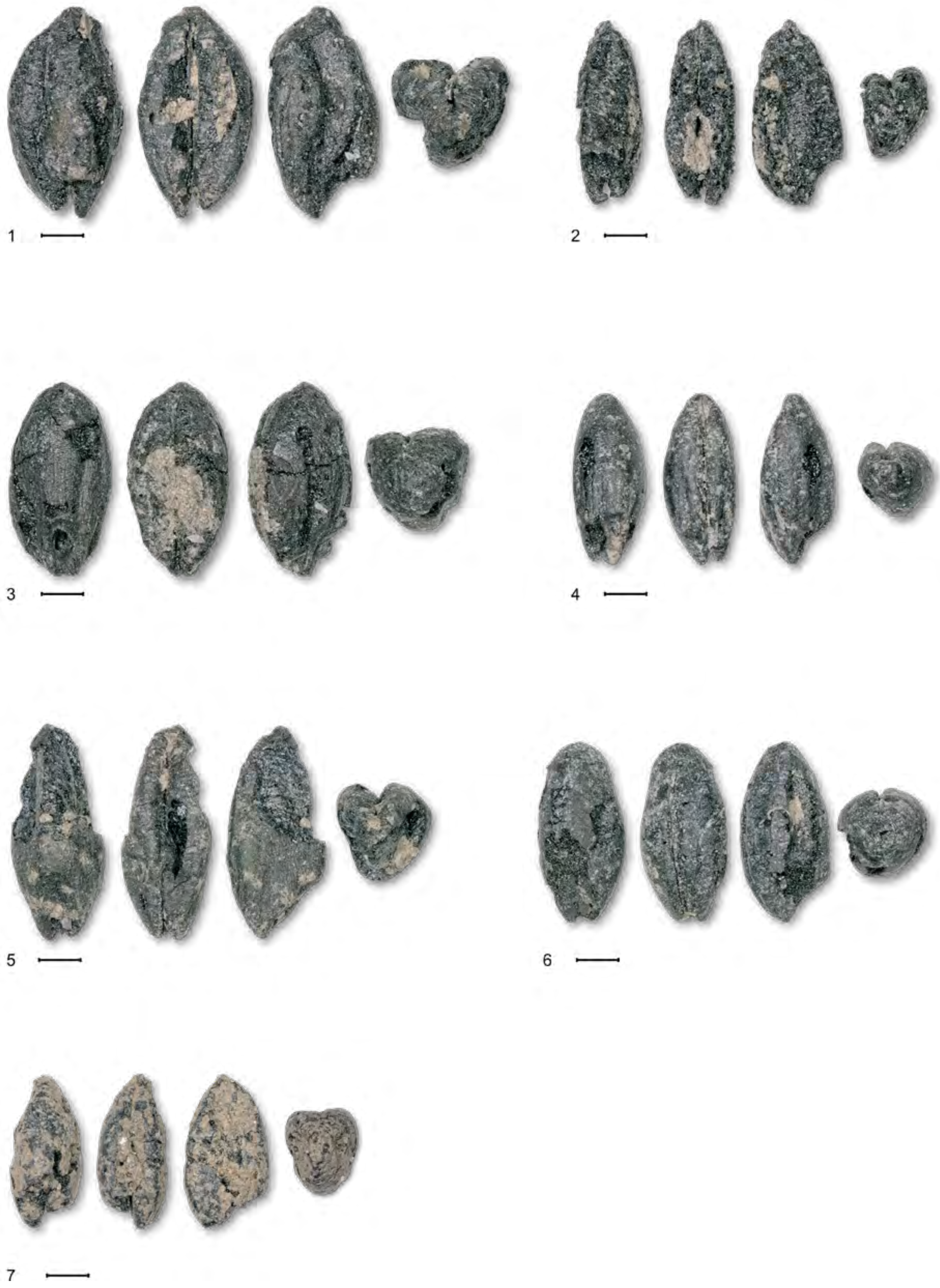
Models 2–4	feature	volume (l)	sum of samples	carb_pmr	sum_pmr
	14	227	26	414	633
	15	105	18	147	297
	29	208.5	22	451	872
	31	26	2	48	95
	34	56	7	56	228
	36	114	18	257	481
	38	87.5	13	494	703
	58	45.5	8	84	146
	59	19	4	72	113
	62	172.5	11	786	1155
	67	115	7	242	421
	70	47.5	6	278	327
	83	6	1	1	9
	84	72	21	163	356
	42_57	82	16	159	555

Tab. 31. Continuation 4

Model 5	feature	sum of ceramic fragments	sum of samples
	14	580	22
	15	348	18
	29	421	22
	31	16	2
	34	793	7
	36	1349	18
	38	580	13
	39	651	23
	42	1	1
	43	2	1
	44	0	1
	45	4	1
	46	2	1
	47	2	1
	48	3	1
	49	1	1
	50	0	1
	51	1	1
	52	3	1
	53	2	1
	54	2	1
	55	1	1
	56	0	1
	57	2	1
	58	626	8
	59	589	4
	62	280	11
	67	16	7
	70	136	13
	80	537	4
	83	0	1
	84	34	21

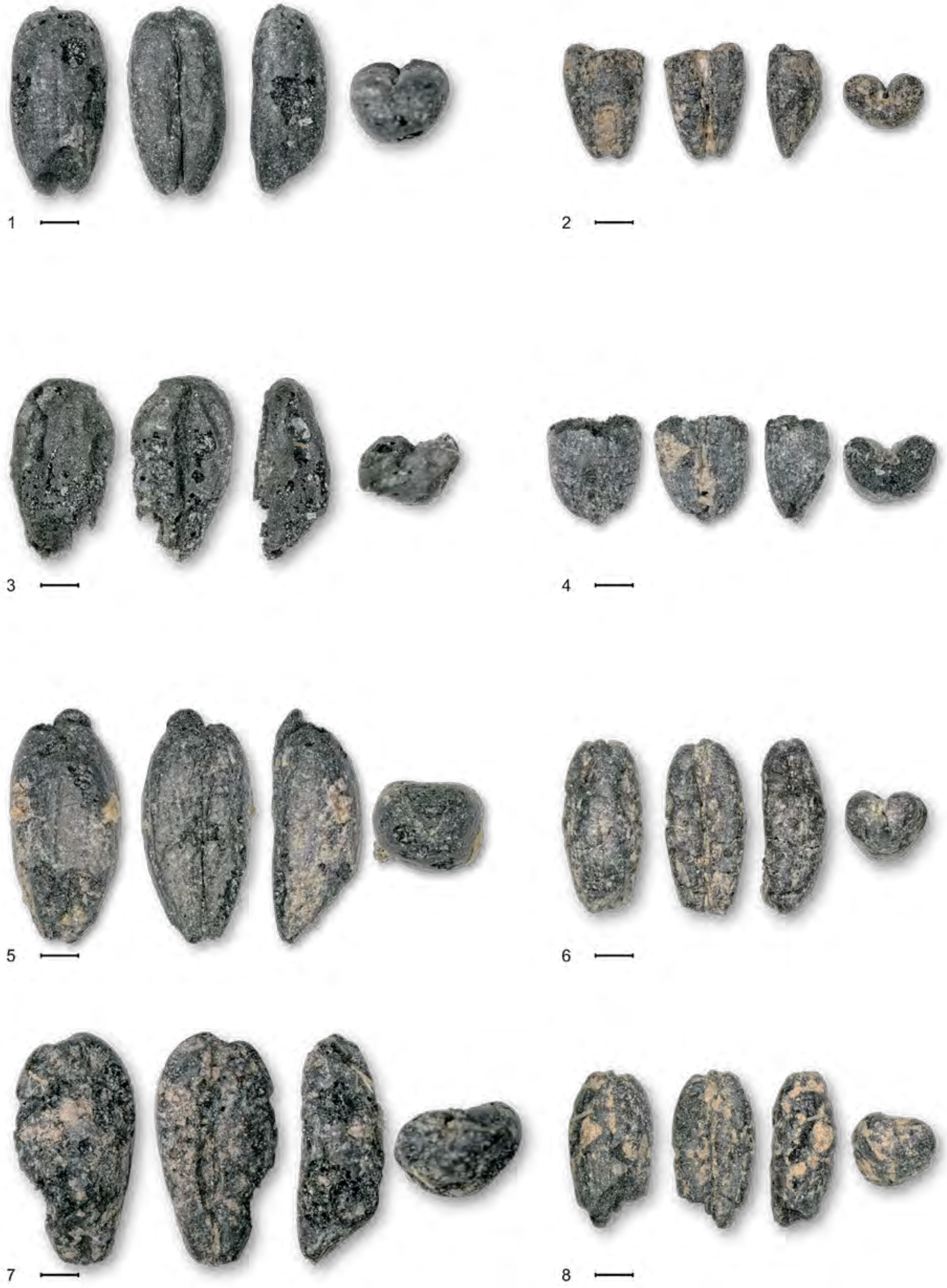
Tab. 32. Jevišovka. Overview of archaeological and archaeobotanical finds found in features. PMR – plant macro-remains. Archaeological information and finds after Zelíková 2019; Sofka in prep.; Komoróczy et al. 2013. Modelled feature volumes after A. Szabová, Z. Porubčanová, in this study. Author: J. Apiar, ARÚB.

			Archaeological finds					Archaeobotanical samples					
Feature No.	Interpretation	Dating	Roman period ceramics (after Zelíková 2019, Sofka in prep.)	Other ceramics	Ceramics_total	Other archaeological finds	Modelled feature volumes (l) after A. Szabová, Z. Porubčanová	Collected archaeobotanical samples Σ	Collected sample volumes (l)	Sampled sediment (%)	PMR density per one litre of sampled sediment	Carbonised macro-remains Σ	Carbonised organic mass frag. Σ
14	pithouse	Roman/Migration period	484	96	580	48	9040	22	216	2.39	2.20	458	17
15	pithouse	Roman period	285	63	348	27	4210.5	18	105	2.49	1.40	141	6
29	pithouse	Roman period	281	140	421	13	4207.94	22	208.5	4.95	2.14	199	248
31	settlement pit	Roman period uncertain	–	–	16	3	132.6	2	26	19.61	1.85	13	35
32	settlement pit	Roman period uncertain	–	–	11	3	–	0	–	–	–	–	–
33	settlement pit	Roman period uncertain	12	–	32	1	–	0	–	–	–	–	–
34	pithouse	Roman period	593	–	793	26	8123.4	7	56	0.69	1.00	39	17
36	pithouse	Roman period	1288	–	1349	28	5188.9	18	114	2.20	2.84	231	93
38	pithouse	Roman period	474	–	580	24	5981.6	13	87.5	1.46	5.21	319	137
42	posthole	Roman period	–	–	1	0	91.8	1	8	8.71	3.38	27	0
43	posthole	Roman period	–	–	2	0	58.3	1	5	8.58	5.00	25	0
44	posthole	Roman period	–	–	–	0	87	1	3	3.45	1.00	3	0
45	posthole	Roman period	–	–	4	0	68.2	1	4	5.87	3.25	13	0
46	posthole	Roman period	–	–	2	0	55.8	1	6	10.75	0.33	2	0
47	posthole	Roman period	–	–	2	0	26.6	1	6	22.56	1.17	7	0
48	posthole	Roman period	–	–	3	0	46.7	1	5	10.71	3.60	18	0
49	posthole	Roman period	–	–	1	0	31.4	1	4	12.74	0.50	2	0
50	posthole	Roman period	–	–	–	0	36.7	1	5	13.62	0.60	3	0
51	posthole	Roman period	–	–	1	0	35.6	1	5	14.04	0.80	4	0
52	posthole	Roman period	–	–	3	0	36.6	1	5	13.66	4.80	21	3
53	posthole	Roman period	–	–	2	1	91.9	1	7	7.62	0.43	3	0
54	posthole	Roman period	–	–	2	0	31.6	1	4.5	14.24	1.33	6	0
55	posthole	Roman period	–	–	1	0	31.3	1	5	15.97	1.20	6	0
56	posthole	Roman period	–	–	–	0	22.6	1	6	26.55	2.00	12	0
57	posthole	Roman period	–	–	2	0	19.9	1	3.5	17.59	1.14	4	0
58	pithouse	Roman period	575	–	626	24	7202.4	8	45.5	0.63	1.85	64	20
59	pithouse	Roman period	523	–	589	5	2320.4	4	19	0.82	3.79	56	16
62	storage pit	Roman period	196	–	280	9	1236.7	11	172.5	13.95	4.54	659	125
67	storage pit	Roman period	–	–	16	3	325	7	115	35.38	2.10	166	76
70	storage pit	Roman period	–	–	136	10	2627.1	13	162.5	6.19	3.20	432	88
83	posthole	Roman period uncertain	–	–	–	0	33.3	1	6	18.02	0.17	1	0
84	pithouse	Roman period	29	–	34	6	2863.6	21	72	2.51	2.26	66	97
92	settlement pit	Roman period	–	–	62	2	–	0	–	–	–	–	–
95	settlement pit	Roman period	56	–	78	2	–	0	–	–	–	–	–
	TOTAL		**4911**	**1066**	**5977**	**235**	**54265.44**	**183**	**1487.5**	–	–	**3000**	**978**
39	pithouse	La Tène/Roman period	268	–	651	59	13572.94	23	133	0.98	44.15	5575	297
80	pithouse	La Tène/Roman period	–	–	537	42	11703.58	4	27	0.23	72.11	1943	4
	TOTAL				**1188**		**25276.52**	**27**	**160**	–	–	**7518**	**301**



Pl. 1. Jevišovka. Poaceae, cereals. 1–7 – *Triticum monococcum*. Scale – 1 mm. Authors: O. Herčík, J. and P. Apiar, ARÚB.

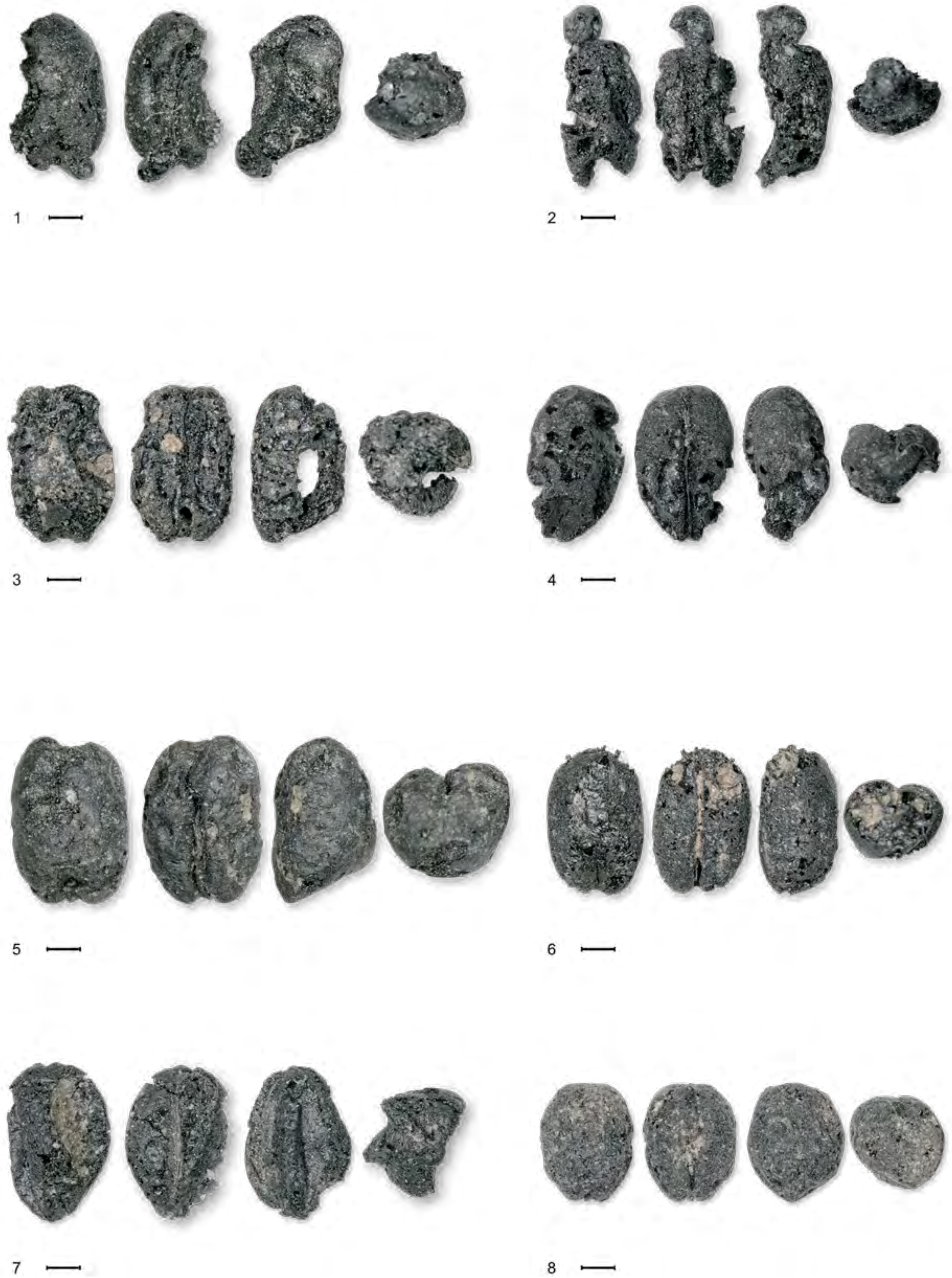
Pl. 2. Jevišovka. Poaceae, cereals. 1–7 – *Triticum dicoccum*. Scale – 1 mm. Authors: O. Herčík, J. and P. Apiar, ARÚB.



Pl. 3. Jevišovka. Poaceae, cereals. 1–8 – *Triticum spelta*. Scale – 1 mm. Authors: O. Herčík, J. and P. Apiar, ARÚB.

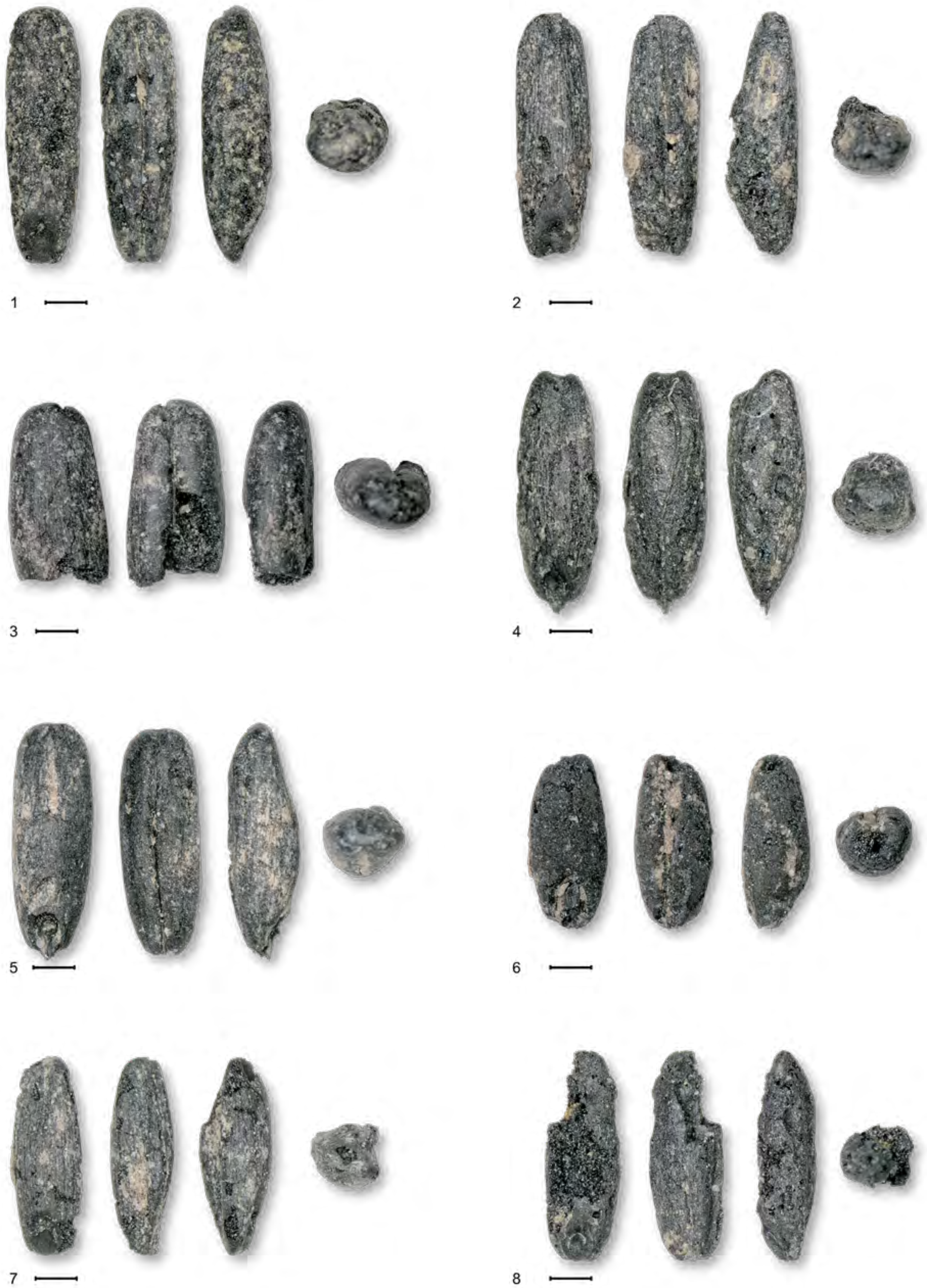
Pl. 4. Jevišovka. Poaceae, cereals. 1–6 – *Triticum spelta;* 7, 8 – *Triticum aestivum.* Scale – 1 mm. Authors: O. Herčík, J. and P. Apiar, ARÚB.

Pl. 5. Jevišovka. Poaceae, cereals. 1–8 – *Triticum aestivum* s.l. Scale – 1 mm. Authors: O. Herčík, J. and P. Apiar, ARÚB.



Pl. 6. Jevišovka. Poaceae, cereals. 1–4, 6 – *Triticum aestivum* s.l.; 5, 7, 8 – *Triticum* cf. *aestivum*/*compactum.* Scale – 1 mm. Authors: O. Herčík, J. and P. Apiar, ARÚB.

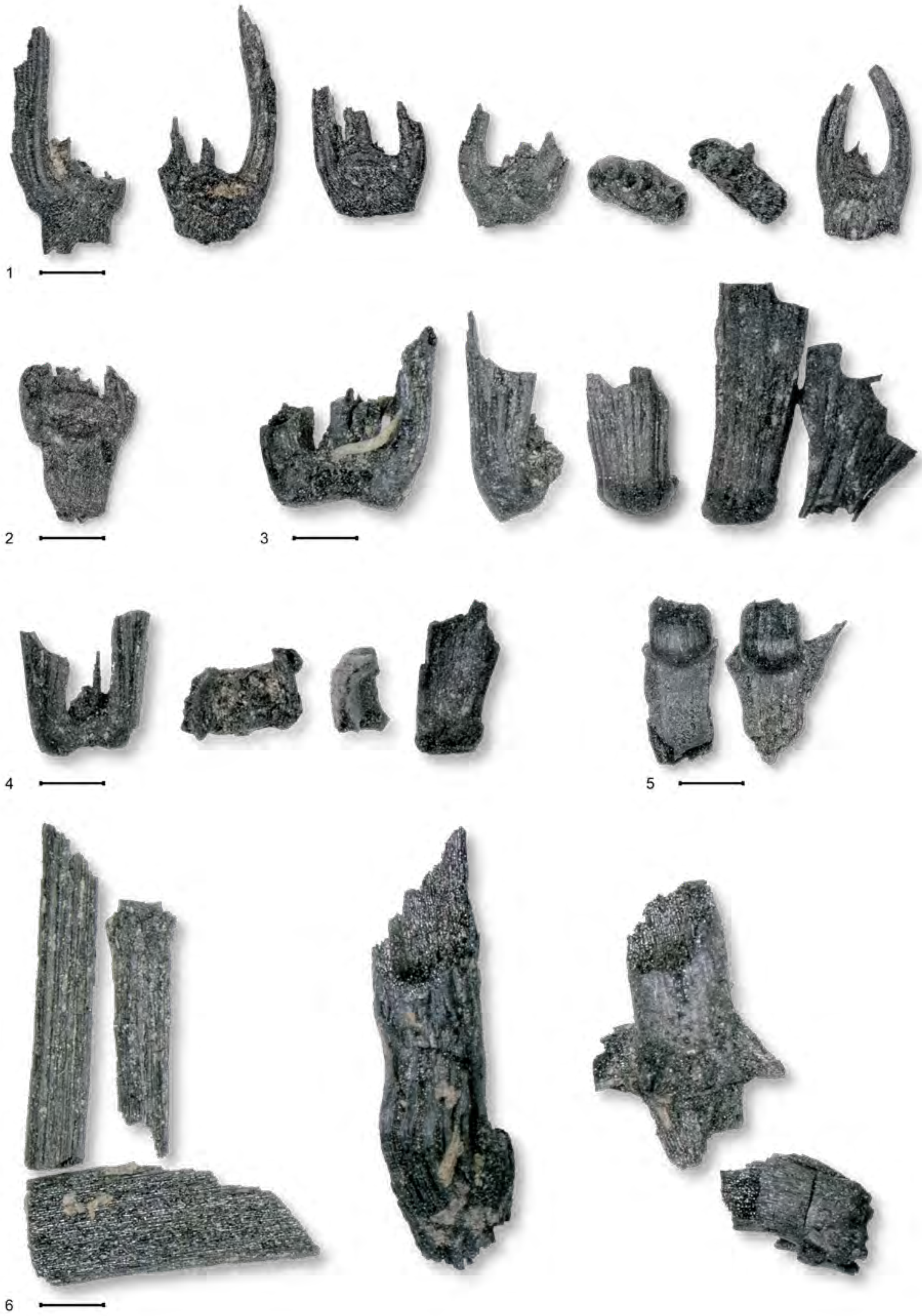
Pl. 7. Jevišovka. Poaceae, cereals. 1–6 – *Hordeum vulgare* subsp. *vulgare;* 7 – *Hordeum*/*Triticum.* Scale – 1 mm. Authors: O. Herčík, J. and P. Apiar, ARÚB.



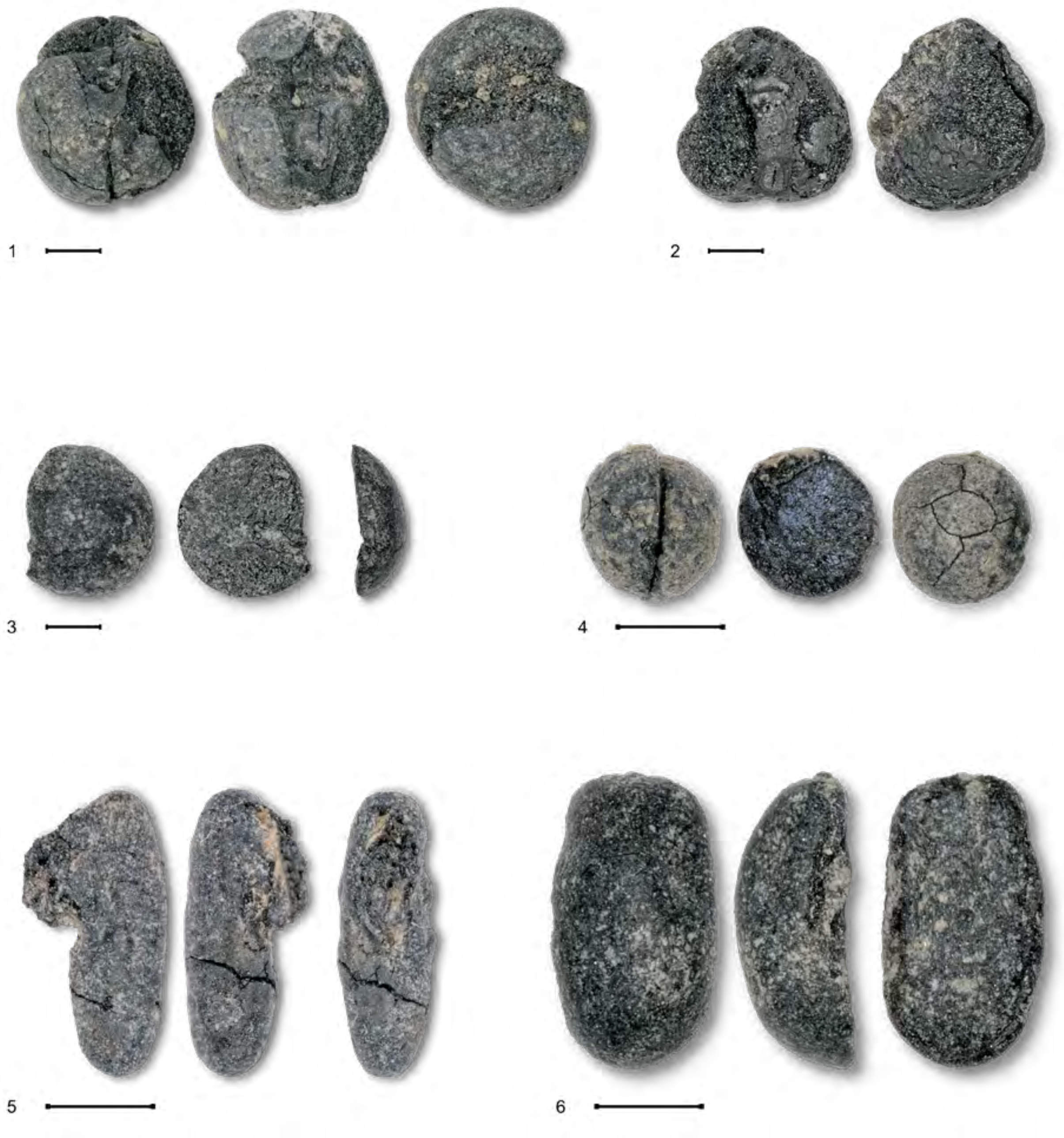
Pl. 8. Jevišovka. Poaceae, cereals. 1–8 – *Avena* cf. *sativa.* Scale – 1 mm. Authors: O. Herčík, J. and P. Apiar, ARÚB.

Pl. 9. Jevišovka. Poaceae, cereals. 1–6 – *Secale cereale.* Scale – 1 mm. Authors: O. Herčík, J. and P. Apiar, ARÚB.

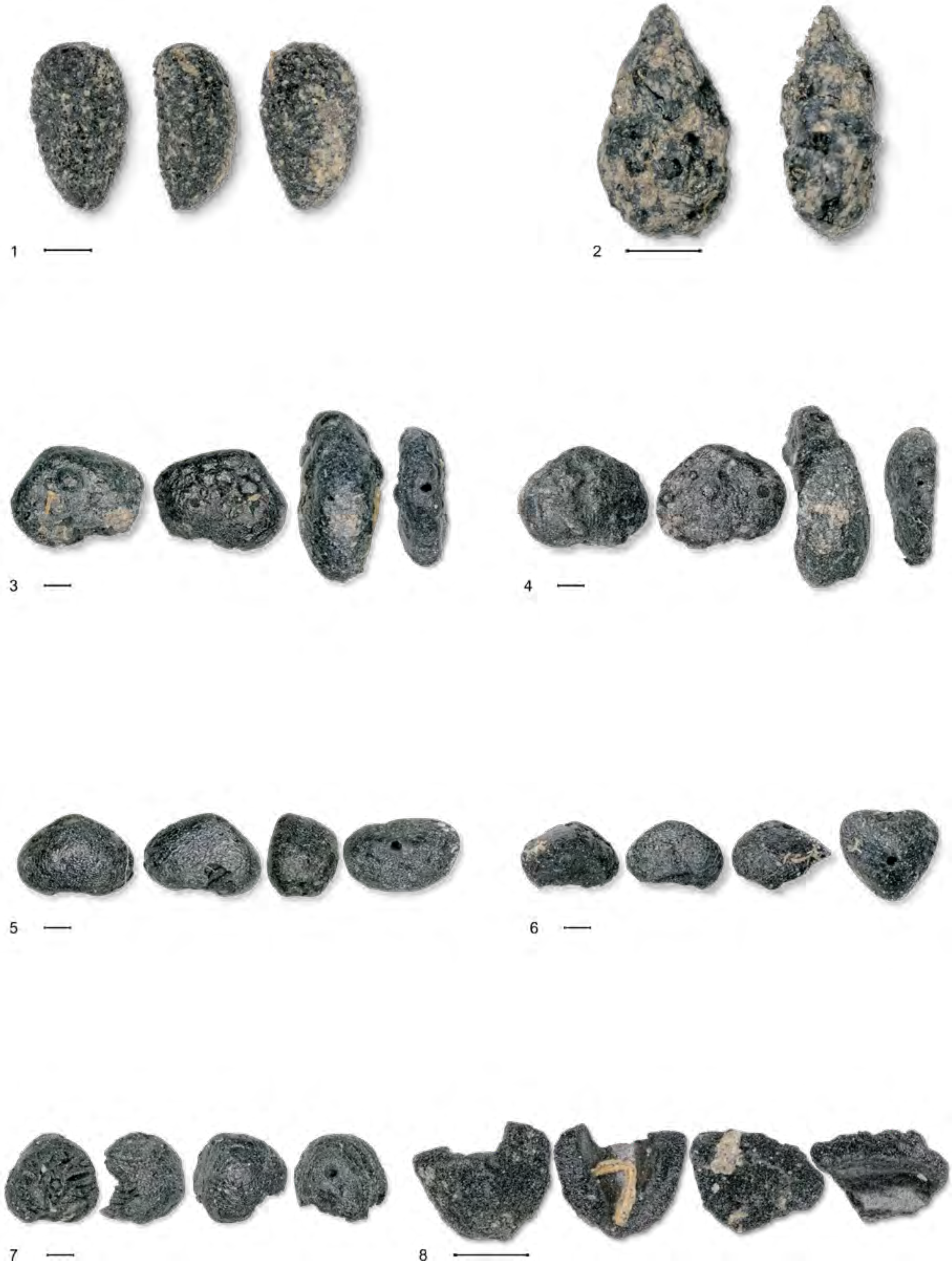
Pl. 10. Jevišovka. Poaceae, cereals and other plants. 1 – *Avena* sp., spikelet; 2 – *Bromus* sp.; 3 – *Panicum miliaceum*; 4 – *Setaria italica*, modern, reference collection ARÚB (seed acquired by the lead author in 2021 from the Botanical Garden Výstaviště Flora Olomouc, a.s., under the catalogue number 127, collected in 2020 by J, Malaska, Ing. P. Souček, Bc. J. Švecová); 6 – *Setaria italica*; 5 – *Setaria pumila*, partly mineralised/carbonised. Scale – 1 mm. Authors: J. and P. Apiar, O. Herčík, ARÚB.



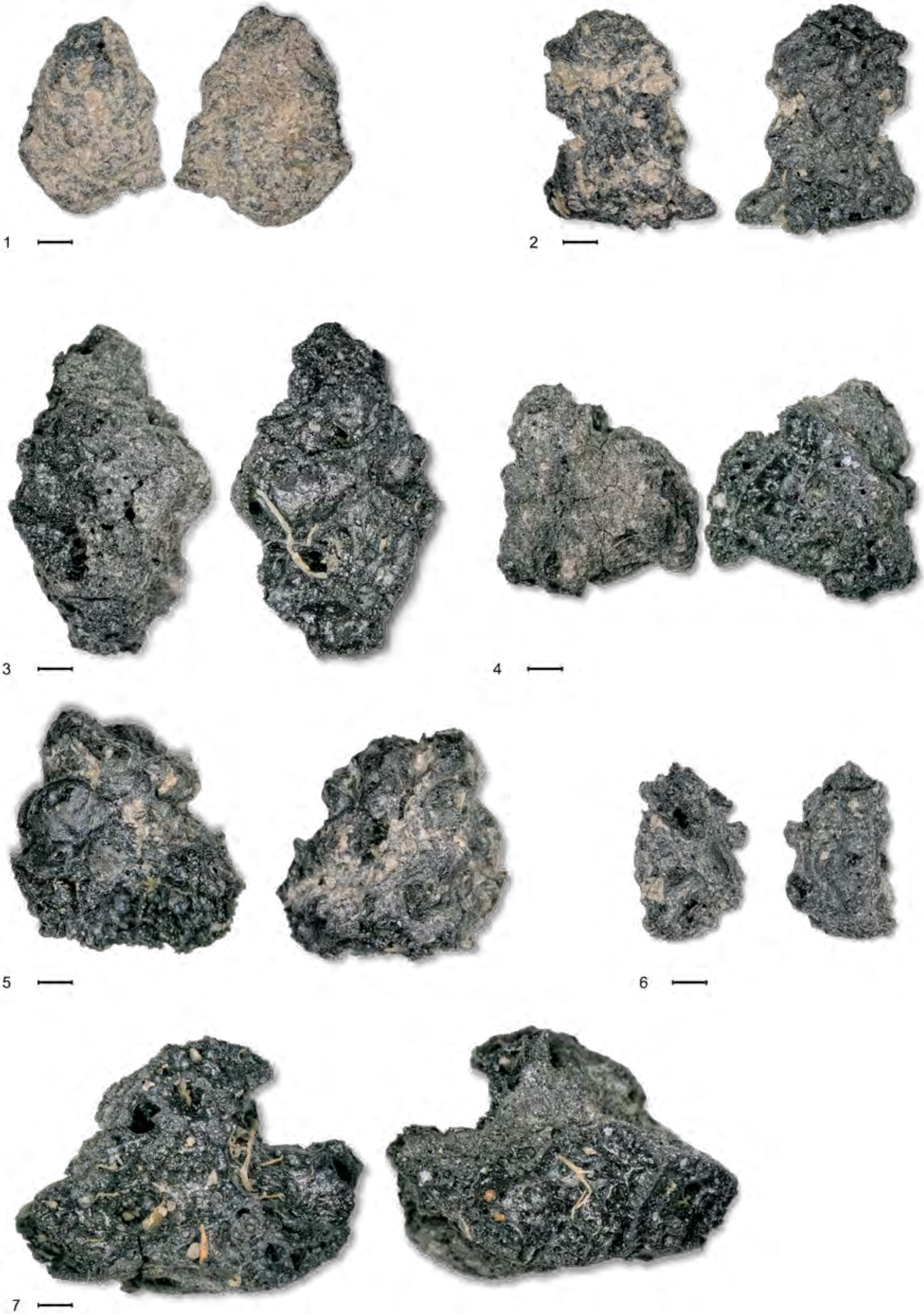
Pl. 11. Jevišovka. Poaceae, cereals. Chaff and culms. 1 – *Triticum monococcum*, fragmented forks; 2 – *Triticum* cf. *dicoccum*, fragmented fork and rachis part; 3, 4 – *Triticum spelta,* fragmented forks, glumes and glume bases; 5 – *Hordeum vulgare*, rachis; 6 – cf. cereal straw and root/basal culm nodes. Scale – 1 mm. Authors: J. and P. Apiar, ARÚB.



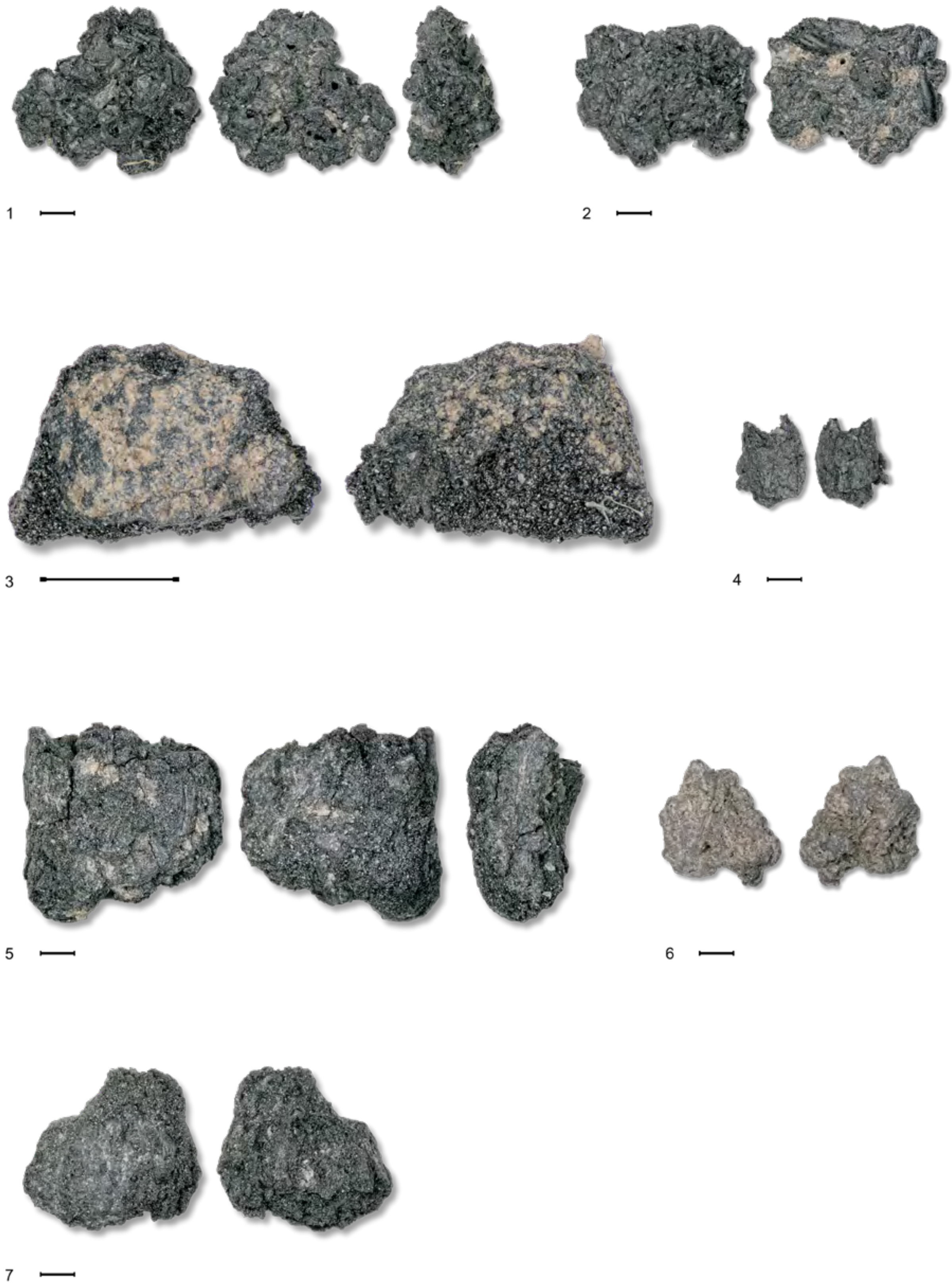
Pl. 12. Jevišovka. Fabaceae. 1–3 – cultivated legumes: 1 – *Pisum sativum*; 2 – *Vicia ervilia*; 3 – *Lens culinaris*; 4–6 – wild species: 4 – *Lotus* cf. *corniculatus*; 5 – cf. *Galega officinalis*; 6 – cf. *Ornithopus perpusillus*. Scale – 1 mm. Authors: J. and P. Apiar, ARÚB.



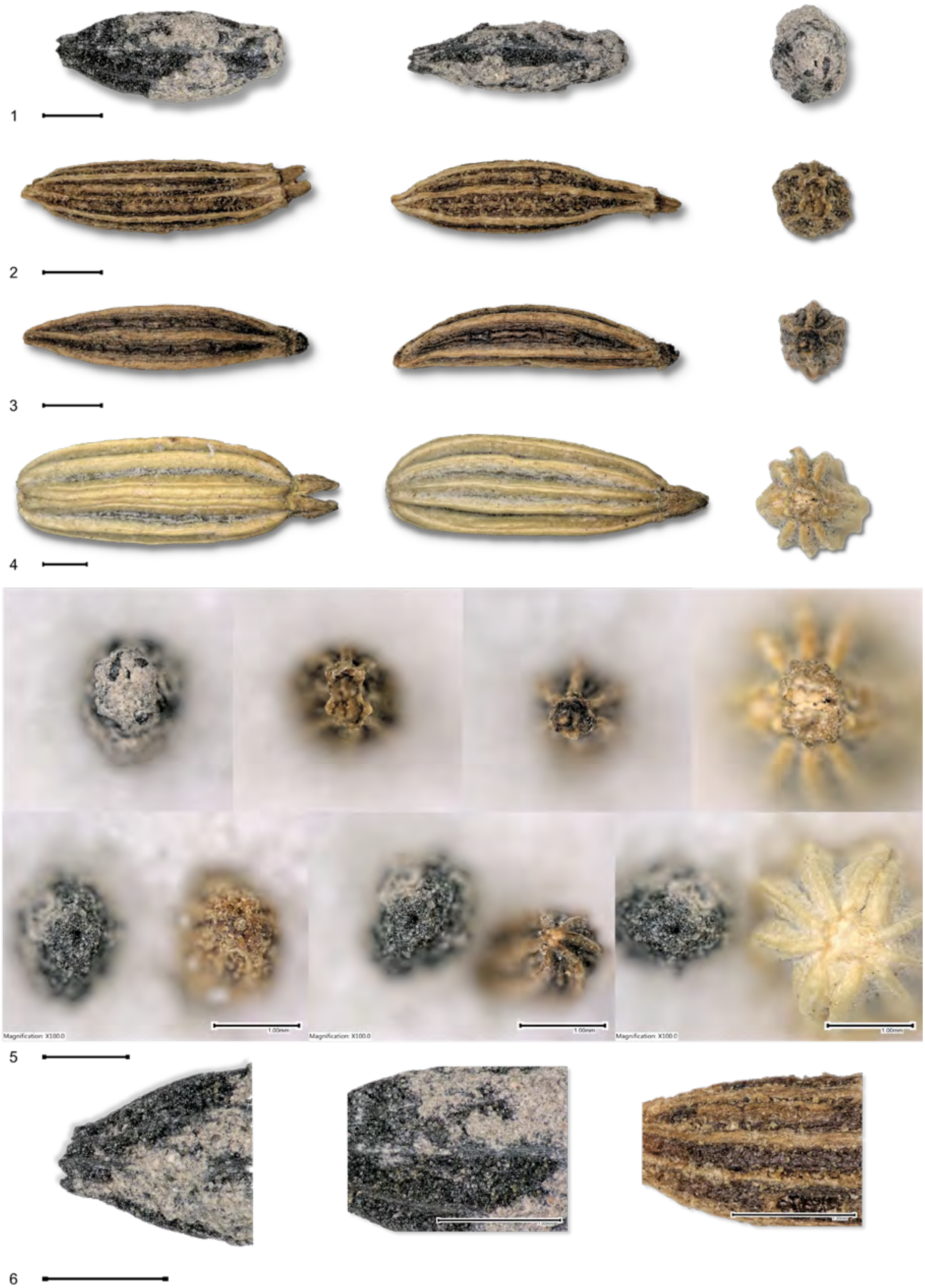
Pl. 13. Jevišovka. Fruits and nuts. 1 – *Sambucus ebulus*; 2 – *Pyrus*/*Malus*; 3–7 – indeterminate, cf. fruit/legume; 8 – indeterminate, fruit/nut. Scale – 1 mm. Authors: J. and P. Apiar, ARÚB.



Pl. 14. Jevišovka. Organic mass fragments. 1 – cf. bread/flatbread; 2–7 – cf. leavened food lumps or cf. bread, flatbread or porridge. Scale – 1 mm. Authors: O. Herčík, J. and P. Apiar, ARÚB.

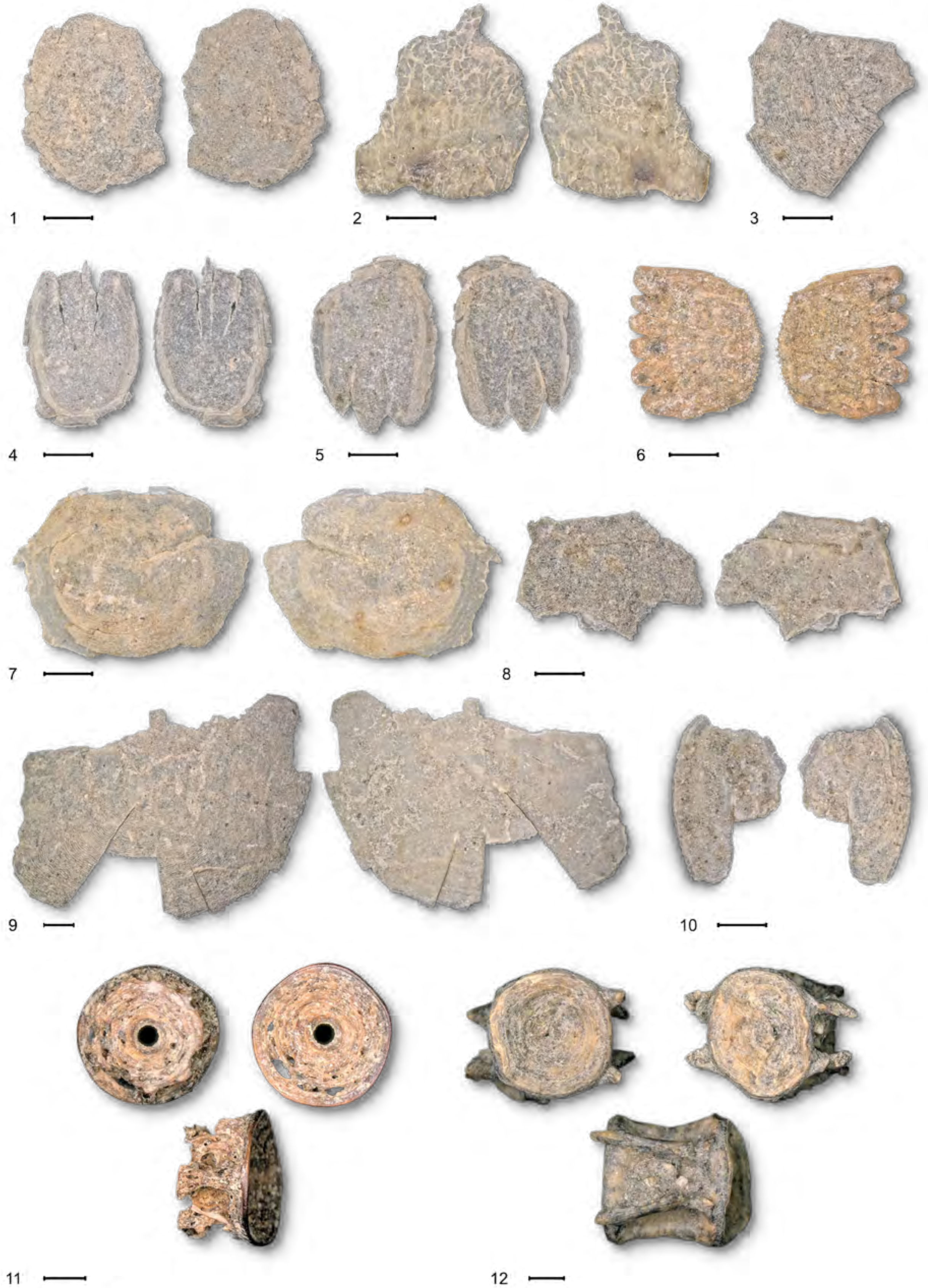


Pl. 15. Jevišovka. Organic mass fragments. 1, 2 – burnt fragments containing Italian millet (*Setaria italica*) and lentil (*Lens culinaris*) seeds; 3 – organic mass or bone mass fragments; 4–7 porous organic mass fragments mixed with charcoal or culms. Scale – 1 mm. Authors: O. Herčík, J. and P. Apiar, ARÚB.

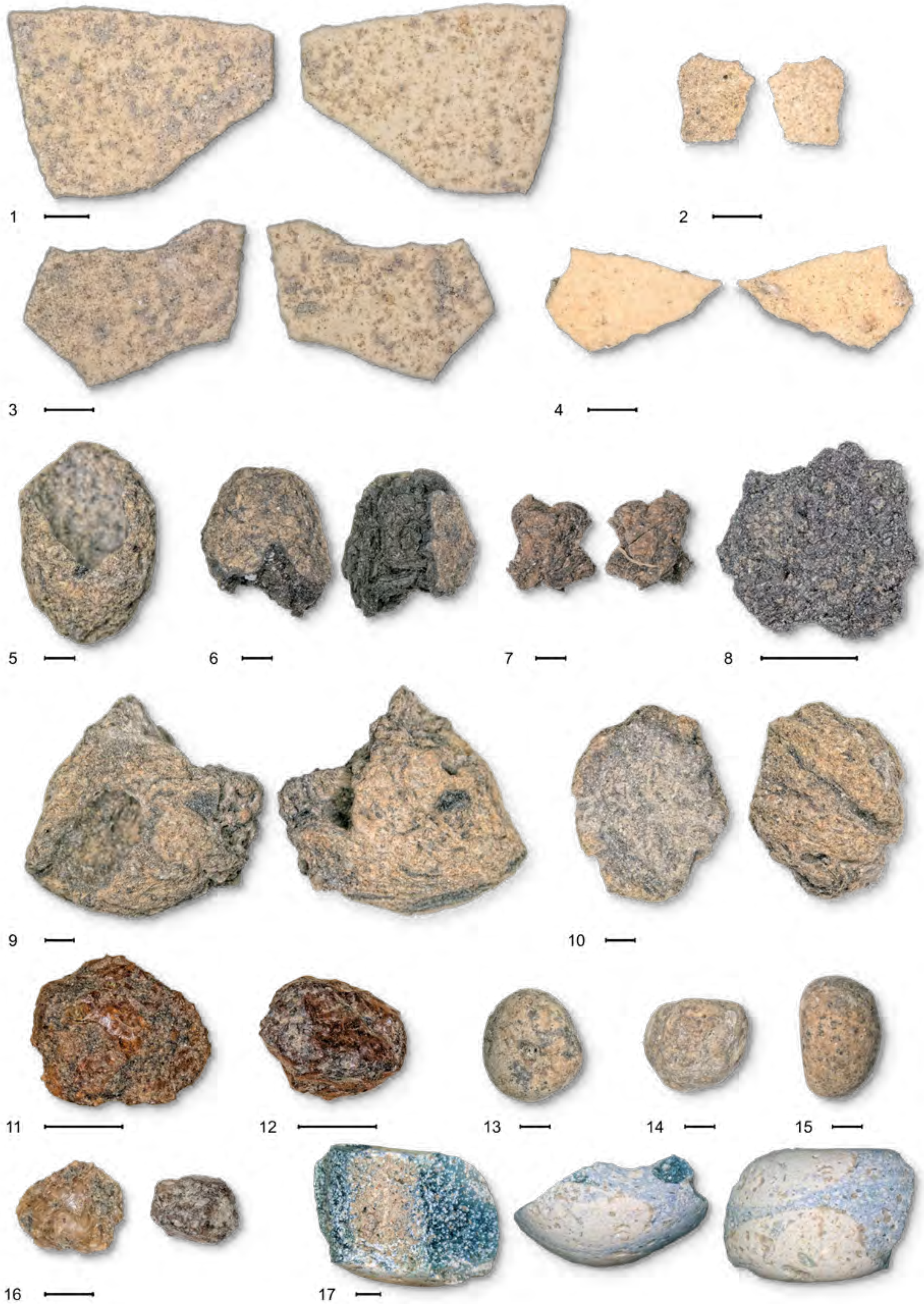


Pl. 16. Jevišovka. Apiaceae. 1 – *Cuminum cyminum*; 2–4 – reference collection: 2 – *Cuminum cyminum*, modern (private collection of the lead author); 3 – *Carum carvi*, modern (private collection of the lead author); 4 – *Foeniculum vulgare*, modern (private collection of the lead author); 5 – comparative analysis of archaeobotanical find and modern seeds, top row, from left to right: apex of archaeobotanical *C. cyminum*, modern *C. cyminum*, *C. carvi*, *F. vulgare*; bottom row, comparison of bases, from left to right: base of archaeobotanical *C. cyminum* beside modern *C. cyminum*, *C. carvi* and *F. vulgare*; 6 – comparison of trichomes, oil ducts, vascular bundles and vallecular vittae in archaeobotanical (left, middle) and modern (right) *C. cyminum*. Scale – 1 mm. Authors: J. and P. Apiar, ARÚB.

Pl. 17. Jevišovka. Plants of other use and wild flora. 1 – cf. *Vitex agnus-castus*; 2 – *Arctostaphylos uva-ursi*; 3 – *Conium maculatum*; 4 – *Sideritis montana*; 5 – *Teucrium* cf. *botrys*; 6 – *Thalictrum minus*; 7 – *Fallopia convolvulus*; 8 – *Salsola kali* syn. *tragus*; 8 – *Solanum nigrum*; 9 – *Agrostemma githago*; 10 – *Thlaspi arvense*; 11 – *Lepidium* sp.; 12 – *Brassica* sp.; 13 – *Galium* sp.; 14 – *Veronica hederifolia*; 15 – *Lithospermum arvense*. Scale – 1 mm. Authors: J. and P. Apiar, ARÚB.



Pl. 18. Jevišovka. Other finds from archaeobotanical samples. 1–10 – fish scales; 11, 12 – fish vertebrae. Scale – 1 mm. Authors: J. and P. Apiar, O. Herčík, ARÚB.



Pl. 19. Jevišovka. Other finds from archaeobotanical samples. 1–4 – egg shells; 5–10 – unfloatable sediment and calcareous concretions; 11, 12, 16 – cf. amber; 13, 14, 15 – indeterminate; 17 – a fragment of a bead. Scale – 1 mm. Authors: J. and P. Apiar, O. Herčík, ARÚB.

List of abbreviations

Occurrence in habitats (**© Sádlo et al. 2007; www.pladias.cz/en/download/features; English by Pladias**)

1 Vegetation of cliffs, screes and walls
- 1A Calcareous cliffs
- 1B Siliceous cliffs and block fields
- 1C Walls
- 1D Mobile calcareous screes

2 Alpine and subalpine grasslands
- 2A Alpine grasslands on siliceous bedrock
- 2B Subalpine tall-forb and tall-grass vegetation

3 Aquatic vegetation
- 3A Macrophytic vegetation of eutrophic and mesotrophic still waters
- 3B Macrophytic vegetation of water streams
- 3C Macrophytic vegetation of oligotrophic lakes and pools

4 Wetland and riverine herbaceous vegetation
- 4A Reed-beds of eutrophic still waters
- 4B Halophilous reed and sedge beds
- 4C Eutrophic vegetation of muddy substrata
- 4D Riverine reed vegetation
- 4E Reed vegetation of brooks
- 4F Mesotrophic vegetation of muddy substrata
- 4G Tall-sedge beds
- 4H Vegetation of low annual hygrophilous herbs
- 4I Vegetation of nitrophilous annual hygrophilous herbs
- 4J River gravel banks
- 4K Petasites fringes of montane brooks
- 4L Nitrophilous herbaceous fringes of lowland rivers

5 Vegetation of springs and mires
- 5A Hard-water springs with tufa formation
- 5B Lowland to montane soft-water springs
- 5C Alpine and subalpine soft-water springs
- 5D Calcareous fens
- 5E Acidic moss-rich fens and peatland meadows
- 5F Transitional mires
- 5G Raised bogs
- 5H Wet peat soils and bog hollows

6 Meadows and mesic pastures
- 6A Mesic Arrhenatherum meadows
- 6B Montane mesic meadows
- 6C Pastures and park grasslands
- 6D Alluvial meadows of lowland rivers
- 6E Wet Cirsium meadows
- 6F Intermittently wet Molinia meadows
- 6G Vegetation of wet disturbed soils

7 Acidophilous grasslands
- 7A Subalpine and montane acidophilous grasslands
- 7B Submontane Nardus grasslands

8 Dry grasslands
- 8A Hercynian dry grasslands on rock outcrops
- 8B Submediterranean dry grasslands on rock outcrops
- 8C Narow-leaved sub-continental steppes
- 8D Broad-leaved dry grasslands
- 8E Acidophilous dry grasslands
- 8F Thermophilous forest fringe vegetation

9 Sand grasslands and rock-outcrop vegetation
- 9B Open vegetation of acidic sands
- 9C Festuca grasslands on acidic sands
- 9D Pannonian sand steppes
- 9E Acidophilous vegetation of spring therophytes and succulents
- 9F Basiphilous vegetation of spring therophytes and succulents

10 Saline vegetation
- 10G Continental vegetation of annual halophilous grasses
- 10H Inland vegetation of succulent halophytes
- 10I Inland saline meadows
- 10J Saline steppes

11 Heathlands and scrub
- 11A Dry lowland to subalpine heathlands
- 11D Subalpine acidophilous Pinus mugo scrub
- 11H Subalpine deciduous scrub
- 11I Willow carrs
- 11J Willow galleries of loamy and sandy river banks
- 11L Tall mesic and xeric shrub
- 11N Low xeric scrub
- 11R Scrub and pioneer woodland of forests clearings

12 Forests
- 12A Alder carrs
- 12B Alluvial forests
- 12C Oak-hornbeam forests
- 12D Ravine forests
- 12E Herb-rich beech forests
- 12F Limestone beech forests
- 12G Acidophilous beech forests
- 12H Peri-Alpidic basiphilous thermophilous oak forests
- 12I Sub-continental thermophilous oak forests
- 12J Acidophilous thermophilous oak forests

12K Acidophilous oak forests
12L Boreo-continental pine forests
12O Peri-Alpidic pine forests
12P Peatland pine forests
12Q Peatland birch forests
12R Acidophilous spruce forests
12S Basiphilous spruce forests
12T Robinia pseudoacacia plantations
12U Plantations of broad-leaved non-native trees
12V Picea plantations
12W Pinus and Larix plantations

13 Anthropogenic vegetation
13A Annual vegetation of ruderal habitats
13B Annual vegetation of arable land
13C Annual vegetation of trampled habitats
13D Perennial thermophilous ruderal vegetation
13E Perennial nitrophilous herbaceous vegetation of mesic sites
13F Herbaceous vegetation of forests clearings and Rubus scrub

Taxon occurrence in each habitat is assessed on a four-degree scale:
1 occurrence – the taxon can grow in the habitat, but it tends to be rare there, and the habitat is not its ecological optimum
2 optimum – the habitat or a part of it is the ecological optimum for this taxon
3 dominant – the taxon can be assigned to the previous category and at the same time it frequently attains a cover above 25% in areas of 10–100 m^2 or 100–1000 m^2 in herbaceous or woody vegetation
4 constant dominant – same as for the previous category but the taxon also determines the general appearance of the habitat, occurring in ≥ 40% of the localities of the habitat

Ellenberg-type indicator values (**© Ellenberg et al 1991; Chytrý et al. 2018; www.pladias.cz/en/download/features; English by Pladias**)

Light – a scale from 1 to 9, in which higher values indicate higher requirements for light. Indicator values for trees relate to juvenile individuals growing in the herb or shrub layer:
1 deep shade plant, occurring where the incident radiation is less than 1% of that in an open area, rarely at more than 30%
2 transition between values 1 and 3
3 shade plant, usually occurring where the incident radiation is less than 5% of that in an open area, but also at sunnier sites
4 transition between values 3 and 5
5 semi-shade plant, only exceptionally occurring in full light, but usually at more than 10% of the diffuse radiation incident in an open area
6 transition between values 5 and 7; rarely at less than 20% of diffuse radiation incident in an open area
7 half-light plant, mostly occurring at full light, but also in the shade up to about 30% of diffuse radiation incident in an open area
8 light plant, only exceptionally occurring at less than 40% of diffuse radiation incident in an open area
9 full light plant, occurring only in fully irradiated places, not at less than 50% of diffuse radiation incident in an open area
1x deep shade plant, occurring where the incident radiation is less than 1% of that in an open area, rarely at more than 30% (generalist)
2x transition between values 1 and 3 (generalist)
3x shade plant, usually occurring where the incident radiation is less than 5% of that in an open area, but also at sunnier sites (generalist)
4x transition between values 3 and 5 (generalist)
5x semi-shade plant, only exceptionally occurring in full light, but usually at more than 10% of the diffuse radiation incident in an open area (generalist)
6x transition between values 5 and 7; rarely at less than 20% of diffuse radiation incident in an open area (generalist)
7x half-light plant, mostly occurring at full light, but also in the shade up to about 30% of diffuse radiation incident in an open area (generalist)
8x light plant, only exceptionally occurring at less than 40% of diffuse radiation incident in an open area (generalist)
9x full light plant, occurring only in fully irradiated places, not at less than 50% of diffuse radiation incident in an open area (generalist)

Temperature – a scale from 1 to 9, in which higher values indicate requirements for higher temperature:
1 cold indicator, occurring only in high mountain areas, i.e. the alpine and nival belts
2 transition between values 1 and 3
3 cool indicator, occurring mainly in subalpine areas
4 transition between values 3 and 5
5 moderate heat indicator, occurring from lowland to montane belt, mainly in submontane-temperate areas
6 transition between values 5 and 7
7 heat indicator, occurring in relatively warm lowlands
8 transition between values 7 and 9
9 extreme heat indicator, restricted to warmest sites in southern Central Europe

1x cold indicator, occurring only in high mountain areas, i.e. the alpine and nival belts (generalist)
2x transition between values 1 and 3 (generalist)
3x cool indicator, occurring mainly in subalpine areas (generalist)
4x transition between values 3 and 5 (generalist)
5x moderate heat indicator, occurring from lowland to montane belt, mainly in submontane-temperate areas (generalist)
6x transition between values 5 and 7 (generalist)
7x heat indicator, occurring in relatively warm lowlands (generalist)
8x transition between values 7 and 9 (generalist)
9x extreme heat indicator, restricted to warmest sites in southern Central Europe (generalist)

Moisture – a scale from 1 to 12, in which higher values indicate requirements for more water:
1 strong drought indicator, viable at sites that frequently dry out and confined to dry soils
2 transition between values 1 and 3
3 missing on damp soil
4 transition between values 3 and 5
5 indicator of fresh soils, focus on soils of average moisture, missing on wet and on soils that frequently dry out
6 transition between values 5 and 7
7 humidity indicator, focus on well moistened, but not wet soils
8 transition between values 7 and 9
9 wetness indicator, focus on often soaked, poorly aerated soils
10 aquatic plant that survives long periods without soil flooding
11 aquatic plant rooted under water, but at least temporarily with leaves above the surface, or a plant floating on the water surface
12 permanently or almost permanently submerged aquatic plant
1x strong drought indicator, viable at sites that frequently dry out and confined to dry soils (generalist)
2x transition between values 1 and 3 (generalist)
3x missing on damp soil (generalist)
4x transition between values 3 and 5 (generalist)
5x indicator of fresh soils, focus on soils of average moisture, missing on wet and on soils that frequently dry out (generalist)
6x transition between values 5 and 7 (generalist)
7x humidity indicator, focus on well moistened, but not wet soils (generalist)
8x transition between values 7 and 9 (generalist)
9x wetness indicator, focus on often soaked, poorly aerated soils (generalist)
10x aquatic plant that survives long periods without soil flooding (generalist)
11x aquatic plant rooted under water, but at least temporarily with leaves above the surface, or a plant floating on the water surface (generalist)
12x permanently or almost permanently submerged aquatic plant (generalist)

Reaction – a scale from 1 to 9, in which higher values indicate taxon affinity to more base-rich environments. In acidic environments, the value can be considered as a proxy for pH, while in near-neutral or alkaline environments it is more a proxy for calcium concentration:
1 indicator of strong acidity, never occurring in slightly acidic to alkaline conditions
2 transition between values 1 and 3
3 acidity indicator, occurring mainly in acidic conditions, exceptionally in neutral conditions
4 transition between values 3 and 5
5 indicator of moderate acidity, occurring rarely in strongly acidic as well as in neutral to alkaline conditions
6 transition between values 5 and 7
7 indicator of slightly acidic to slightly basic conditions, never occurring in very acidic conditions
8 transition between values 7 and 9, occurring mostly in calcium-rich conditions
9 base and lime indicator, always occurring in calcium-rich conditions
1x indicator of strong acidity, never occurring in slightly acidic to alkaline conditions (generalist)
2x transition between values 1 and 3 (generalist)
3x acidity indicator, occurring mainly in acidic conditions, exceptionally in neutral conditions (generalist)
4x transition between values 3 and 5 (generalist)
5x indicator of moderate acidity, occurring rarely in strongly acidic as well as in neutral to alkaline conditions (generalist)
6x transition between values 5 and 7 (generalist)
7x indicator of slightly acidic to slightly basic conditions, never occurring in very acidic conditions (generalist)
8x transition between values 7 and 9, occurring mostly in calcium-rich conditions (generalist)
9x base and lime indicator, always occurring in calcium-rich conditions (generalist)

Nutrients – a scale from 1 to 9, in which higher values indicate higher requirements for nitrogen or phosphorus availability, or higher primary productivity of the site:
1 occurring at nutrient-poorest sites
2 transition between values 1 and 3

3 occurring at nutrient-poor sites more frequently than at average sites and exceptionally at rich sites
4 transition between values 3 and 5
5 occurring at moderately nutrient-rich sites, and less frequently at poor and rich sites
6 transition between values 5 and 7
7 occurring at nutrient-rich sites more often than at average sites and only exceptionally at poor sites
8 pronounced nutrient indicator
9 concentrated at very nutrient-rich sites
1x occurring at nutrient-poorest sites (generalist)
2x transition between values 1 and 3 (generalist)
3x occurring at nutrient-poor sites more frequently than at average sites and exceptionally at rich sites (generalist)
4x transition between values 3 and 5 (generalist)
5x occurring at moderately nutrient-rich sites, and less frequently at poor and rich sites (generalist)
6x transition between values 5 and 7 (generalist)
7x occurring at nutrient-rich sites more often than at average sites and only exceptionally at poor sites (generalist)
8x pronounced nutrient indicator (generalist)
9x concentrated at very nutrient-rich sites (generalist)

Salinity – a scale from 0 to 9, in which higher values indicate higher tolerance to conditions with high concentration of soluble salts, especially sulphates, chlorides and carbonates of sodium, potassium, calcium and magnesium:
0 not salt tolerant, glycophyte
1 salt tolerant, mostly on low-salt to salt-free soils, but occasionally on slightly salty soils
2 oligohaline, often on soils with very low salt content
3 β-mesohaline, mostly on soils with low salt content
4 α/β-mesohaline, mostly on soils with low to moderate salt content
5 α-mesohaline, mostly on soils with a moderate salt content
6 α-meso/polyhaline, on soils with moderate to high salt content
7 polyhaline, on soils with a high salt content
8 euhaline, on soils with a very high salt content
9 euhaline to hypersaline, on soils with a very high and in dry periods extremely high salt content

Soil moisture – Pv (© Jurko 1990, 75)
1 very dry soils
2 dry soils
3 fresh soils
4 moist soils
5 wet soils
6a aquatic vegetation protruding from or floating on water
6b aquatic plants mostly permanently submerged in water

Soil reaction – Pr (© Jurko 1990, 75, 76)
1 strongly acidic soils (pH <4.5)
2 acidic soils (pH 4.5–5.5)
3 slightly acidic soils (pH 5.5–6.5)
4 neutral soils (pH 6.5–7.5)
5 alkaline soils (pH > 7.5)
Additional designation of natural and artificial salinity (e.g. salt sprinkled on the roads in winter – road margins)
a low-salt tolerant taxa, slightly salty soils
b facultative halophytes, usually on salty soils
c obligate halophytes, exclusively on salty soils

Soil nitrogen – Pd (© Jurko 1990, 76)
1 very nutrient-poor soils
2 nutrient-poor soils
3 moderately nutrient-rich soils
4 nutrient-rich soils
5 very nutrient-rich soils

Comment (© Jurko 1990, 76): For all soil properties, a difference of several categories, for example, 2–4, means that the species is more or less indifferent. In the case of two classes, for example, the value 2–3 indicates broader demands, that is, 2 to 3; 2/3 means a value between 2 and 3.

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Carbonised macro-remains from a Germanic settlement in Jevišovka-Nová
A contribution to current archaeobotanical knowledge of the Roman period
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