GEOCHRONOMETRIA Vol. 23, pp 79-91, 2004 – *Journal on Methods and Applications of Absolute Chronology*

SOME NEW ^{14}C DATA TO THE BRONZE AGE IN THE SLOVAKIA

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Key words: CARPATHIAN BASIN, SLOVAKIA, ARCHAEOLOGY, MULTICULTURAL SETTLEMENT, BRONZE AGE, ^{14}C DATING

Abstract: **The data come from samples from the archaeological site Včelince (Slovakia). It is a settlement of a multicultural character. The stratigraphy of the layers VII –I assigns chronological sequence: the Hatvan culture, Hatvan-Otomani Horizon of the Hatvan culture, Otomani/Füzesabony culture circle, the Koszider Horizon, Piliny culture.**
There were applied animal bones for the samples of ^{14}C. They came from the pits as well as from the layers dated by typology, horizontal and vertical stratigraphy. The ^{14}C data confirm the chronological order indicated by the stratigraphical observations in the site. It is the very first ^{14}C measurement in the case of the Hatvan culture in Slovakia. Mesurment of the earliest layer of the Hatvan culture in Včelince provides the data (Bln 5560: 3710±38 BP) which is comparable with the data of the earliest Hatvan culture in Hungary. A part of the teritory of Slovakia can not be excluded from the process of its origin also in spite of the data mentioned above. As the dates are coming from stratigraphically and typologically clearly defined contexts, they are of high importance for the Bronze Age archaeology of the region.

1. INTRODUCTION

The new ^{14}C data come from samples from the site Včelince (Slovakia, district Rimavská Sobota). There are small numbers of absolute-chronological data at that part of Slovakia where the site is situated although neither in the other parts of Slovakia their numbers are not represented in a large extent, too. The occurence of ^{14}C samples is uneven not only territorialy, but the differences are in number of samples of individual cultures and sites as well. That can be seen also in comparison with other parts of the north of the Carpathian Basin (**Fig. 1**).

The systematic excavation in Včelince was realised by the Archaeological Institute of the Slovak Academy of Sciences in the years 1985-1992.

The site Včelince is situated in southern part of Central Slovakia, geographically at the boundary of Slovak Ore Mountains, and with fertile lowlands southwards, on the north of Carpathian Basin. The river Slaná that flows west to the site was also of a great importance for the settlement. Flowing into Tiza, it enables connections of this region especially with northeast parts of the Carpathian Basin. The region of the site belongs to its cultural development.

2. RELATIVE DATING

The site is of multicultural character. Relative dating of the features and finds by archaeological methods is based both on horizontal stratigraphy of ditches and settlement pits and vertical stratigraphy of layers in an outer ditch as well as on typology of finds especially the pottery (Furmánek and Marková, 1992; 1998; 1999 and 2001).

Horizontal stratigraphy of ditches

Systematic excavations uncovered fortification consisting of three ditches surrounding the hilltop and following the contours of the hill. All the three ditches were gradually dug in the Early Bronze Age. The earliest ditch and the largest at the same time is the outer one.

The sequence of the ditches is confirmed above all by the character of their layers and by their accumulation. There are, first of all, yellow and gravel layers in the middle and outer ditches formed by throwing out of the gravel from the middle ditch to the outer one, and from the inner ditch to the middle or outer ones. In course of digging the outer ditch the underlying gravel layer of the outer ditch was thrown out of the settlement area.

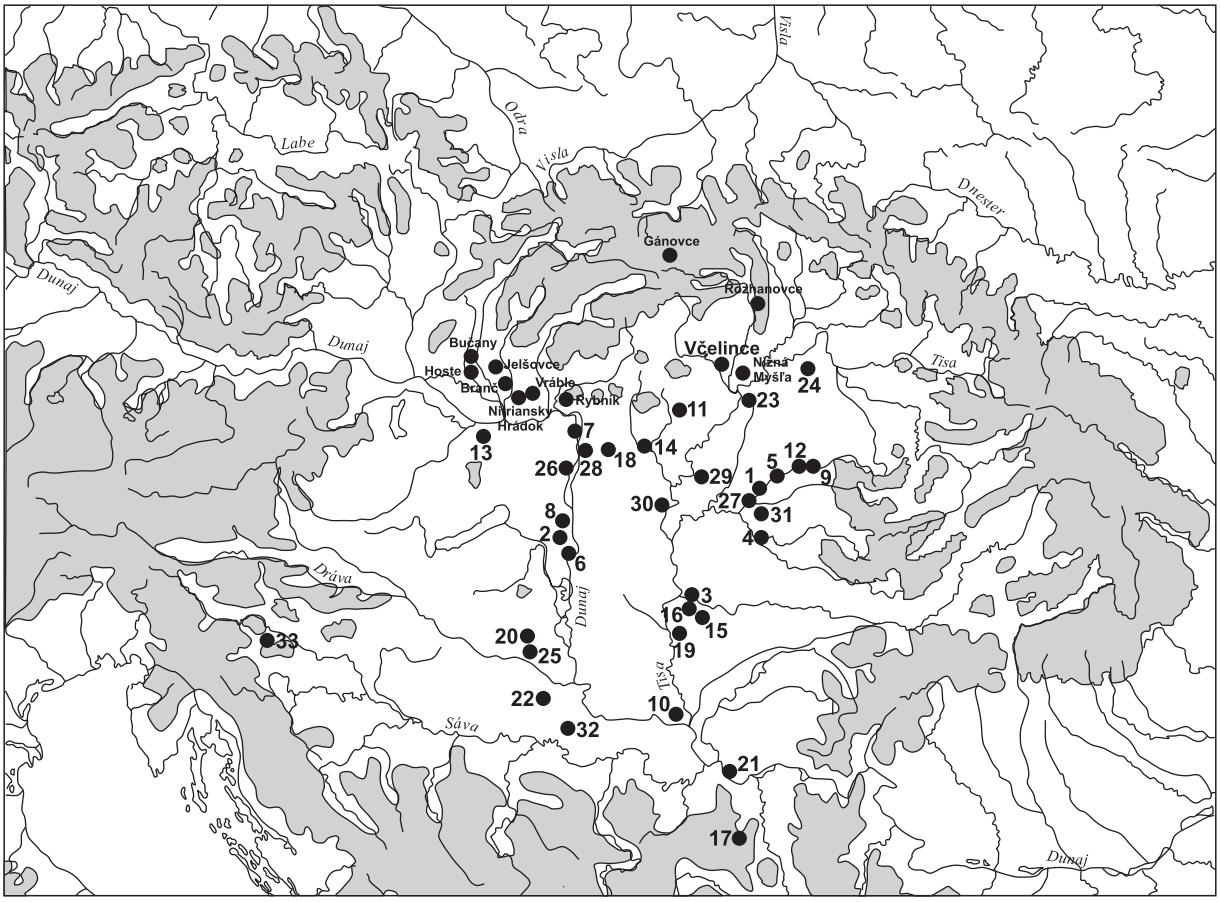


Fig. 1. *Map of Early Bronze Age archaeological sites with published ^{14}C analyses in Slovakia and in the Carpathian Basin (according to Forenbahaer, 1993; Görsdorf, 1993; Rassman, 1996; Furmánek et al., 1999; Gogâltan, 1999; Barta, 2001).*
1 – Bakonyszeg, 2 – Baracs, 3 – Battonya, 4 – Békés, 5 – Berettyóújfalu, 6 – Bölcske, 7 – Budapest, 8 – Dunaújváros, 9 – Esztár, 10 – Feudvar, 11 – Füzesabony, 12 – Gáborján, 13 – Győrszemre, 14 – Jászdózsaa, 15 – Kiszombor, 16 – Klárafalva, 17 – Ljuljaci, 18 – Mende, 19 – Mokrin, 20 – Nagyárpád, 21 – Omoljica, 22 – Podgorać, 23 – Polgár, 24 – Rétkőzberencs, 25 – Szava; 26 – Százhalombata; 27 - Szeghalom; 28 – Szigetcsép; 29 – Törökszentmiklós, 30 – Tószeg, 31 – Vesztó, 32 – Vinkovci, 33 – Zornica

Vertical stratigraphy of layers in the outer ditch and its relationship to the individual ditches

Succession of the settlement and relations of successive Bronze Age cultures were best shown in a section of the outer ditch. The layers in these parts make the impression of a tell accumulation. Generally, we have recognized seven layers.

The outer ditch of the settlement fortification system was built up by the Hatvan culture beares. The two layers situated at the bottom of the outer ditch belong to the Hatvan culture: dark brown layer no VII and gravel layer no VI. The layer no. VII (the lowest one) is from the period of infilling of the outer ditch. The layer no VI (gravel) is connected with the construction of the middle ditch - it is extracted underlying gravel. The sample no. Bln-5560 is conected with the layer VII, section II-D-7 (**Fig. 2**).

The Hatvan culture fortifications in Slovakia are the oldest ones in the Bronze Age – they chronologically form the lowest layers in numerous fortified settlements (e.g. Malé Kosihy, Vráble; Točík 1981 and 1986). It is the very same with the settlement in Včelince-Lászlófala position. The forms of vessels from Včelince site are represented mainly by Hatvans bowls, vases and pots (**Fig. 2**). The gained pottery is thick walled, with smooth surface inside and with fabric-impressed ruffling and broom-stroked ("Besestrich") outside, the plastic knobs are frequent, too.

The section of the largest ditch shows the heavier grey layer no.V and brownish-yellow layer no. IV. Layer V (heavy ash) is connected with the existence of the middle ditch. Layer IV (brownish-yellow) is connected with the construction of the inner ditch as well as the gravel thin layer above this layer does.

These two layers (V, IV) represent the penetrating of elements of the Otomani-Füzesabony cultural circles and its influence on the local Hatvan Culture named the Hatvan – Otomani horizon. This is seen in decoration motives as well as in the pottery shapes: e.g. decoration by hatched triangle, grooves or the ladder motif or a bowl of a Swedish helmet form (**Fig. 3**).

There were uncovered 92 cultural pits. Only 4 pits of this amount belong to the Hatvan culture – that is to say to its Hatvan-Otomani horizon. The pit 73/88 from which the sample Bln-5561 was collected is typologically ordered to them (**Fig. 4**). The pit is associated with the Hatvan-Otomani horizon on the basis of the typology of its inventory. However, it cannot be decided with which of two Hatvan-Otomani horizons of the site it is to be connected.

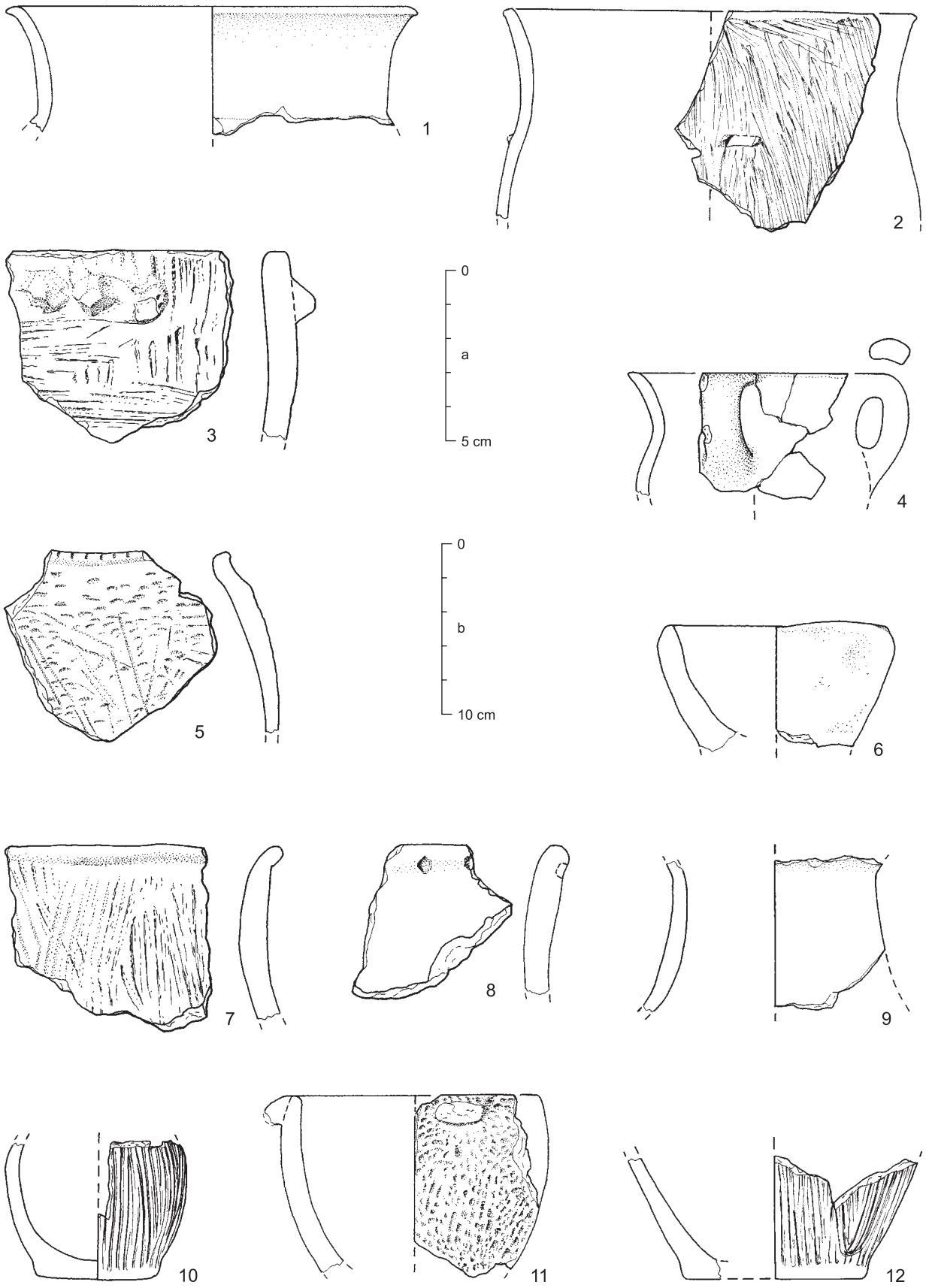


Fig. 2. *Assortment of the finds in the layer VII (Hatvan culture) – surrouding of the sample BIn-5560. Scale a: 3, 5-9; b: 1, 2, 4, 10-12*

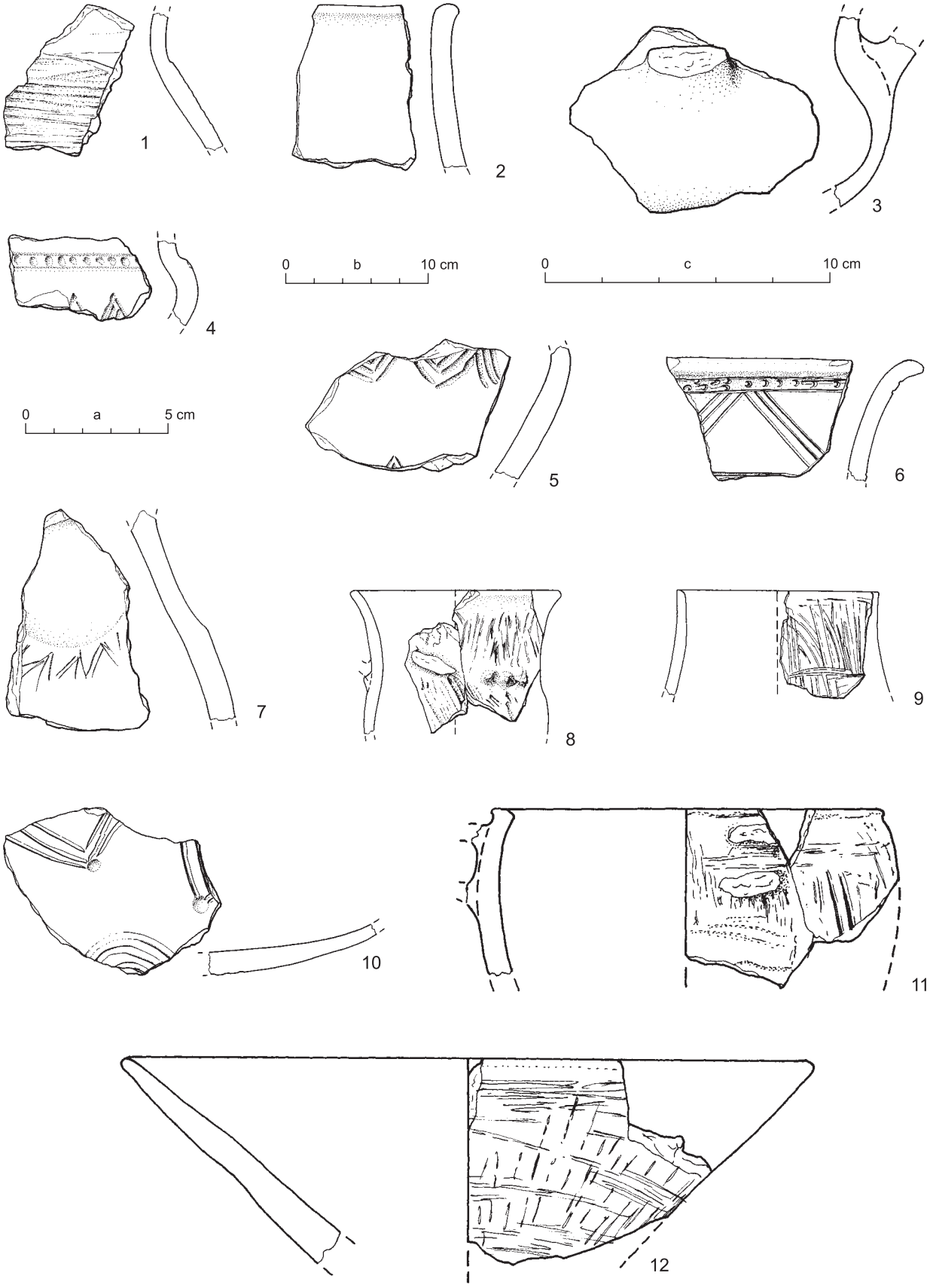


Fig. 3. *Assortment of the finds in the layer IV and V. Scale a: 1- 7, 10; b: 8, 9; c: 11, 12*

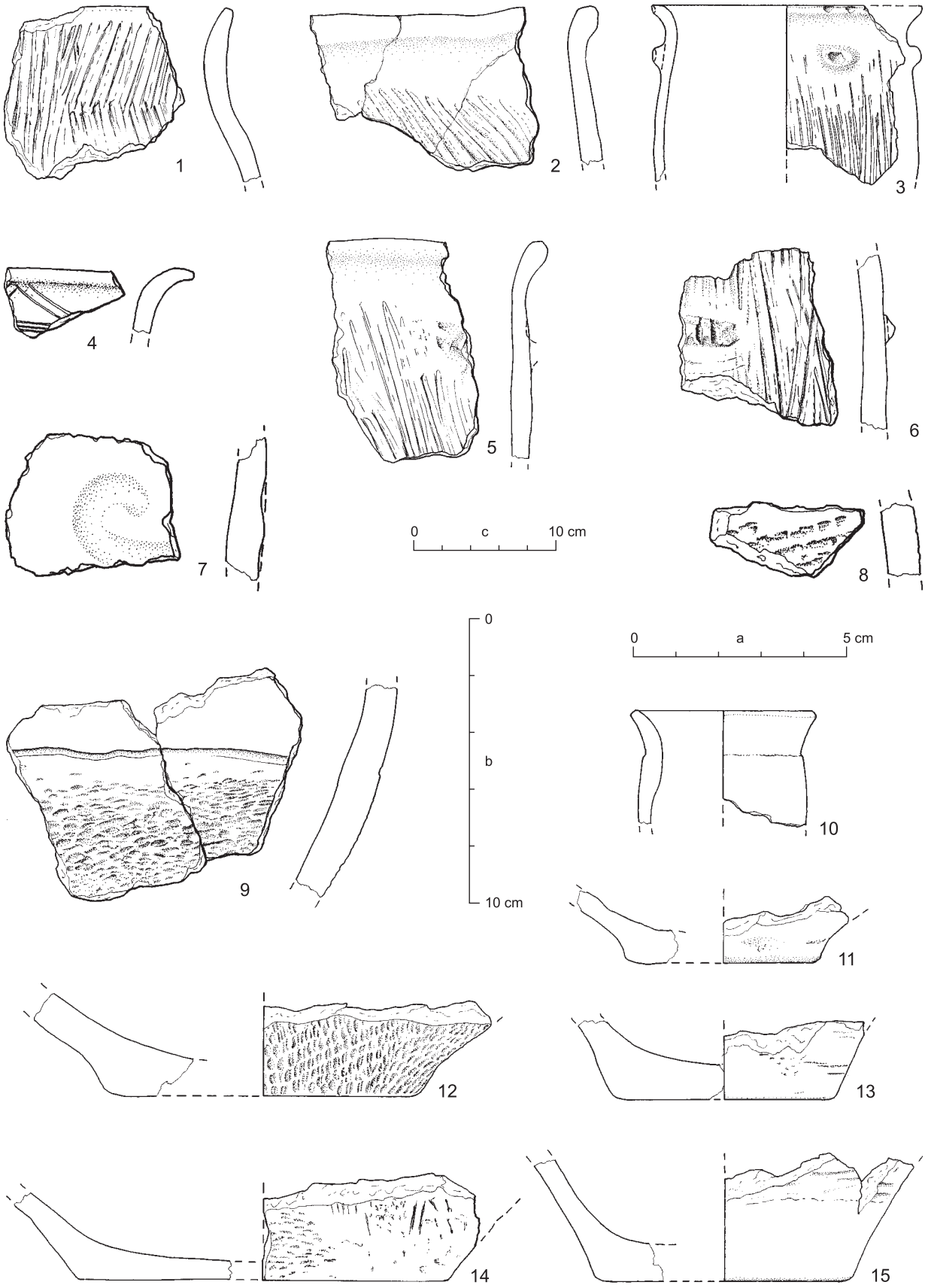


Fig. 4. *Assortment of the finds in the pit 73/88 (the Hatvan-Otomani Horizon) surrouding of the sample BIn-5561. Scale a: 4, 7, 8; b: 1, 2, 5, 6, 9-15; c: 3*

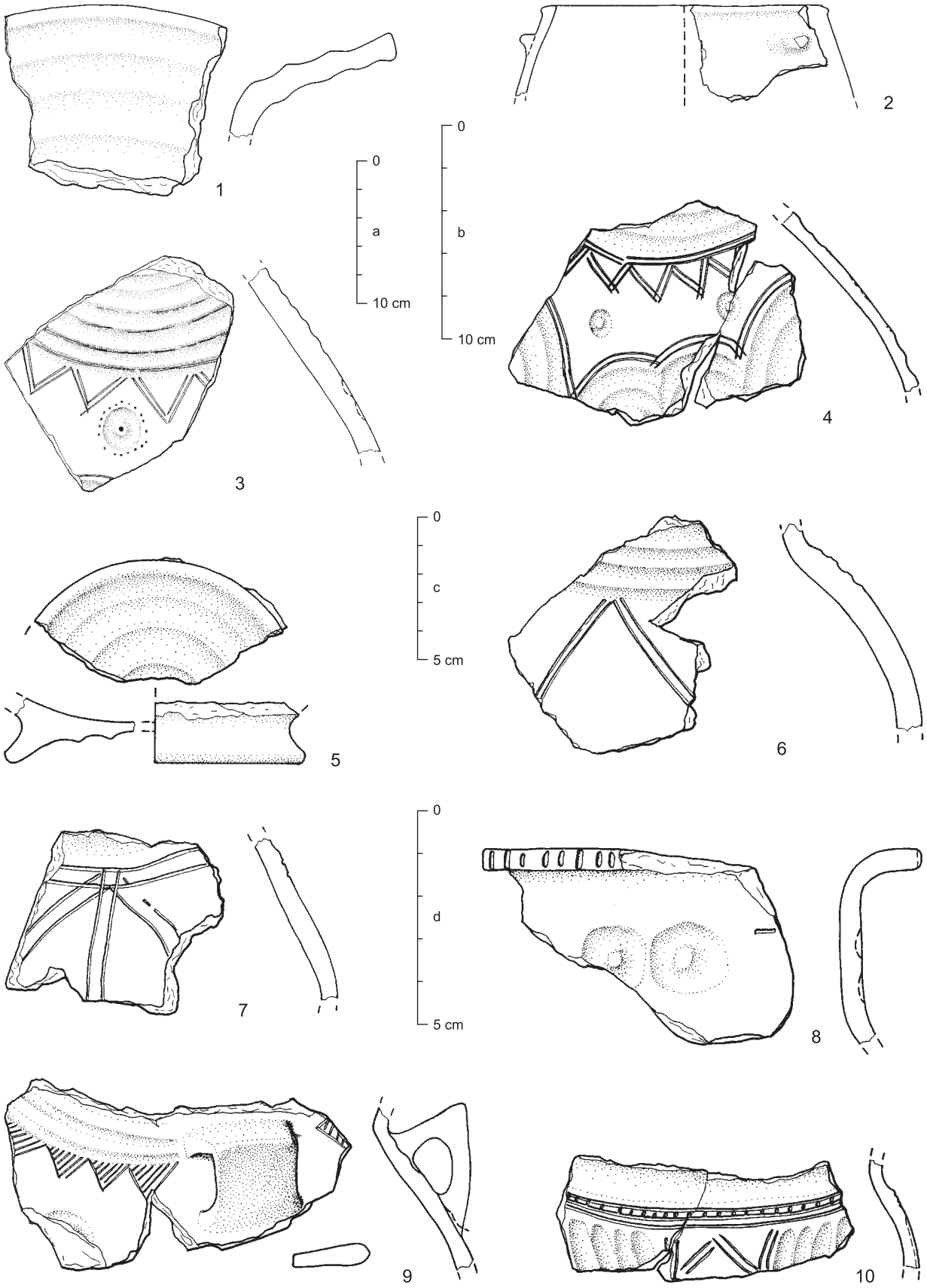


Fig. 5. *Assortment of the finds in the layer III (the Koszider Horizon) - surrouding of the sample Bln-5559.*
Scale a: 2; b: 4, 9; c: 1, 3; d: 5-8, 10

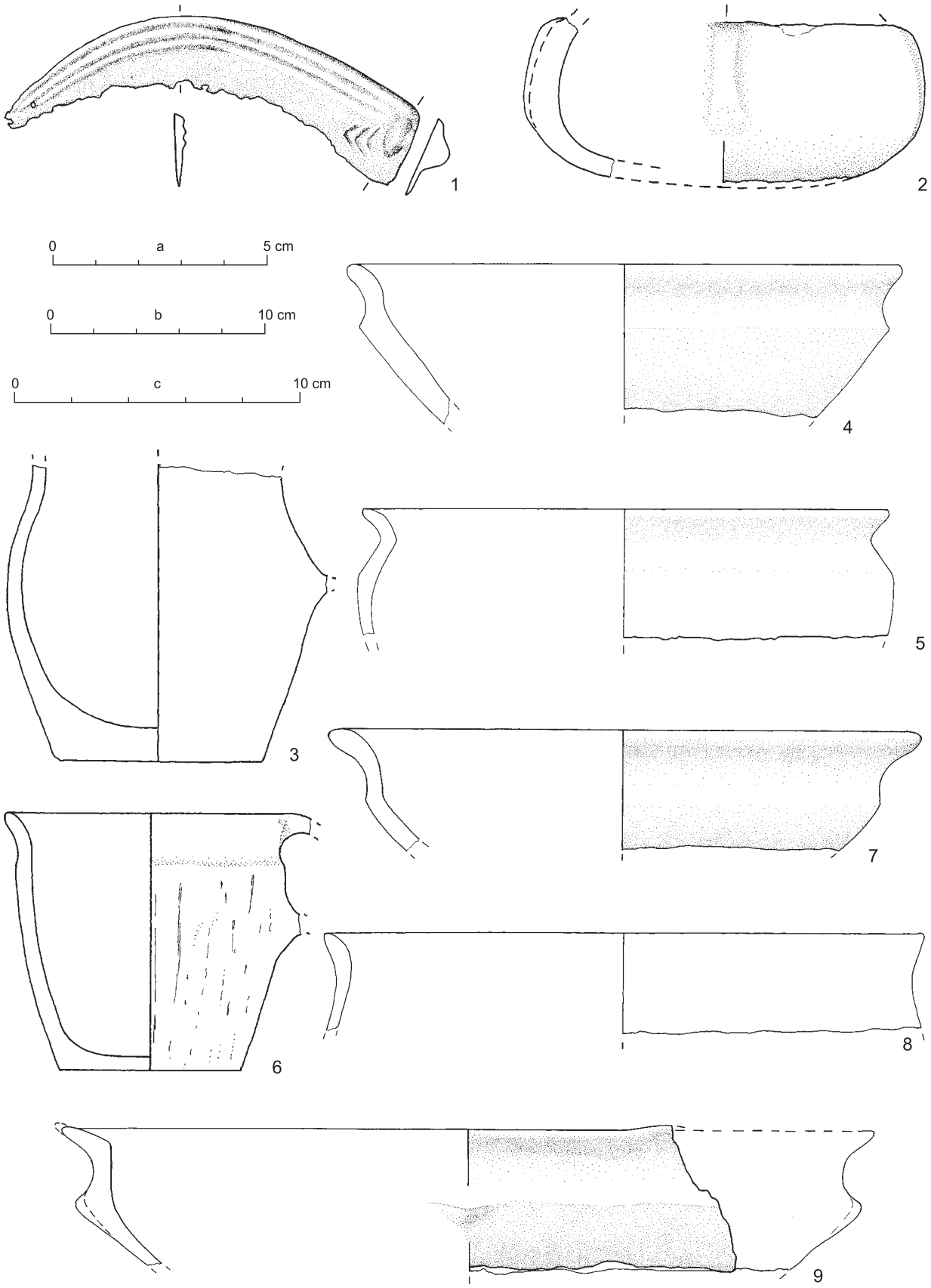


Fig. 6. *Assortment of the finds in the pit 7B/85 (the Piliny culture) surrouding of the sample Bln-5557. Scale a: 2; b: 3, 6; c: 1, 4, 5, 7, 8, 9*

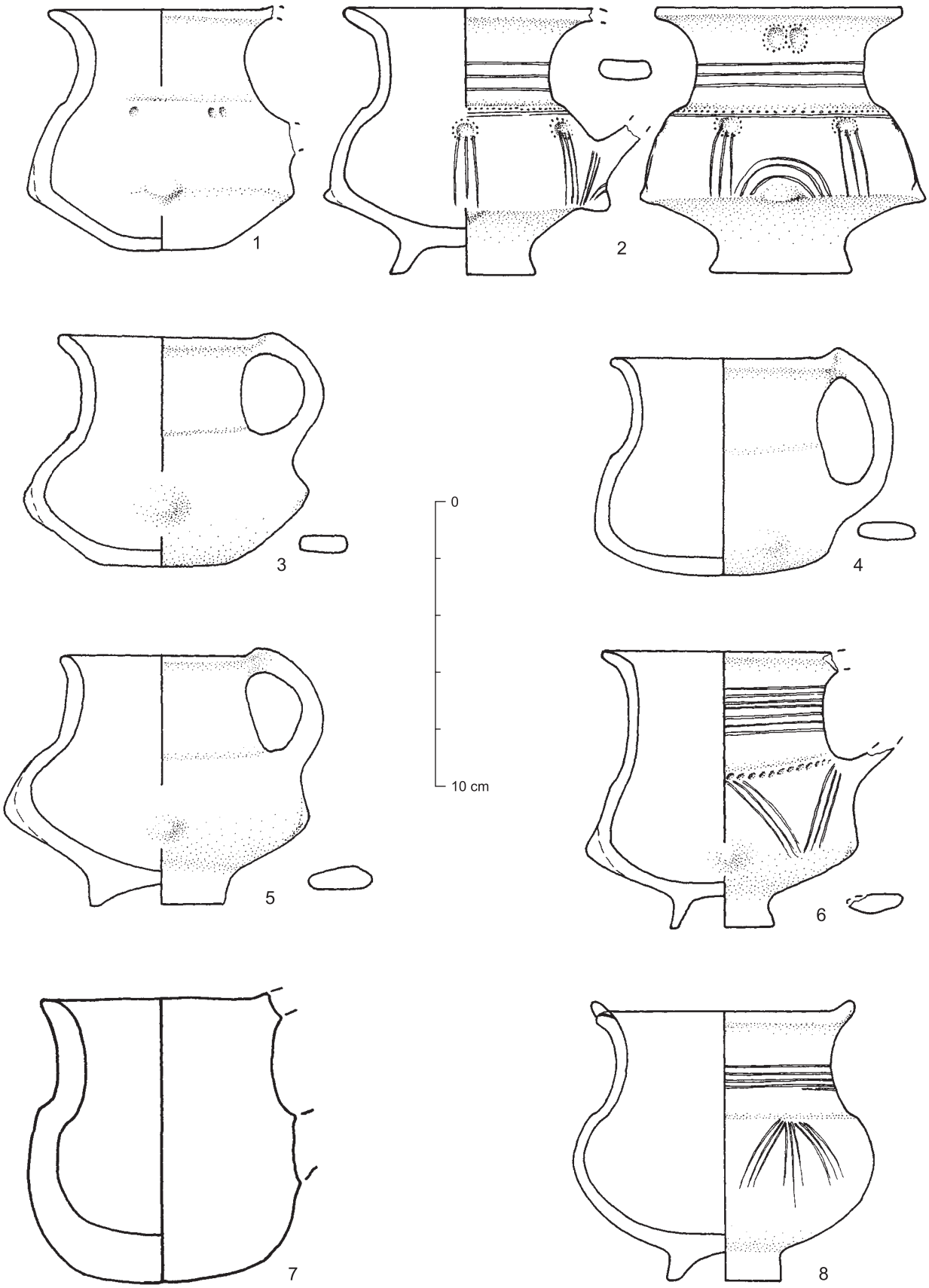
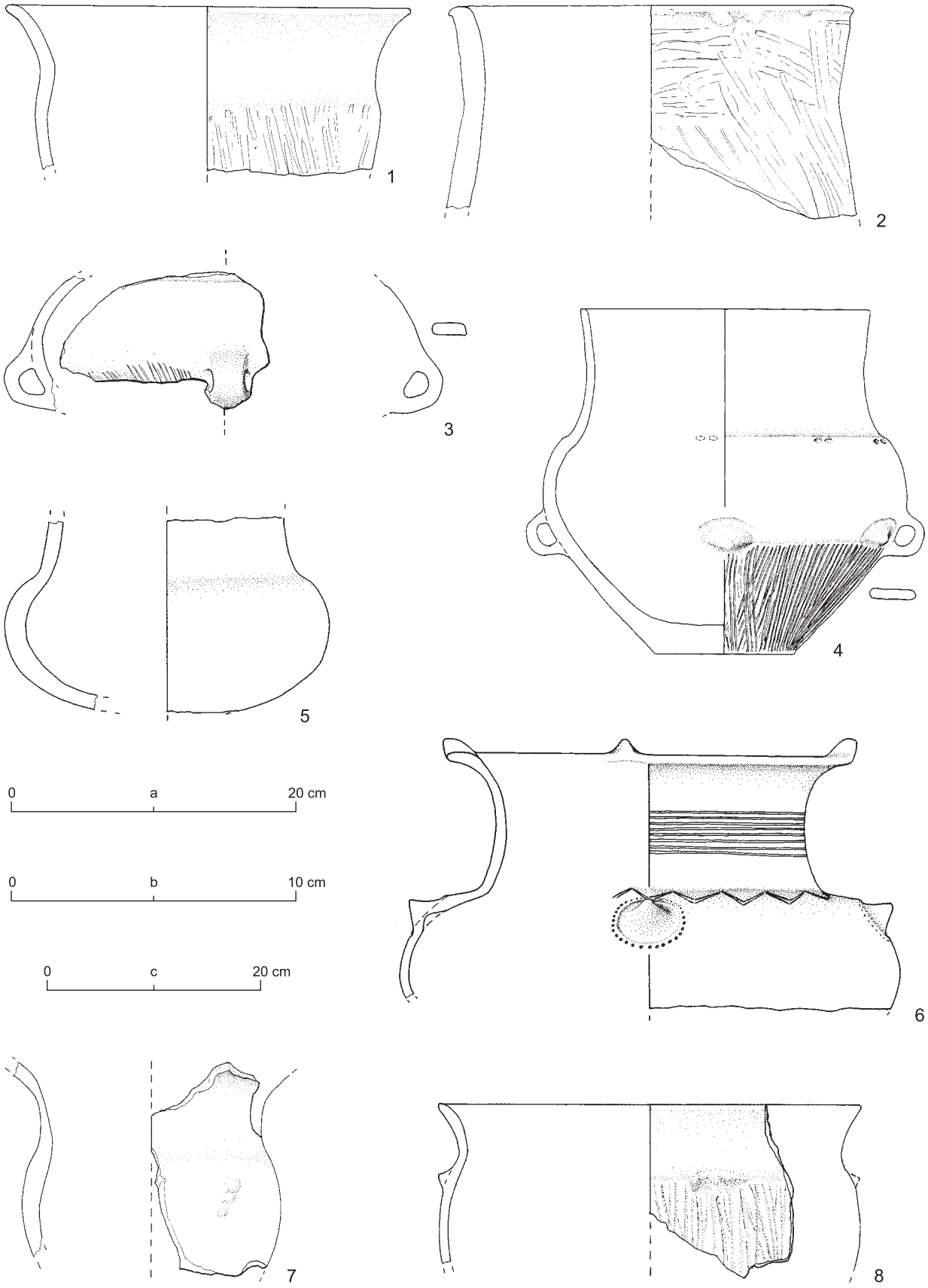


Fig. 7a. *Assortment of the finds in the pit 11/85 (the Piliny culture) surrouding of the sample Bln -5558*



Scale a:1, 3, 6, 8; b: 2, 5, 7; c: 4.

Fig. 7b. *Assortment of the finds in the pit 11/85 (the Piliny culture) surrouding of the sample Bln -5558*

The transition period between the Early and Middle Bronze Ages gave rise to a mighty ashes grey layer no. III. This layer is, at the part of outer and in the middle ditch, separated from the brownish-yellow layer no. IV by a thin layer of gravel. The lowest, dark grey part of layer III is connected with the period of the inner ditch in-filling. Light grey ashy part of the layer III, sealing all the ditches, indicates that during the Koszider horizon known for a mobility among the groups living in the Carpathian basin, the layer III represented the set of cultural features of the late phase of the Otomani-Füzesabony culture circle. It is represented especially by jars standing on a ring-like small foot and vessels decorated with softly geometric decoration. The material of nearly half of the settlement pits is dated back to the period of creation of the layer III to the so called Koszider horizon. The sample Bln-5559 comes from the trench II-D-6/II-C-6, layer III (**Fig. 5**).

The greyish-black layer no II, that lies over the Koszider period layer, belongs to the Piliny culture. It is confirmed by shapes of numerous pottery fragments, e.g. bowls in sharp S-shaped profiles with a bent-out brim and with a lobe. The Piliny culture is represented also by finds from the settlements pits. Samples Bln-5557and Bln-5558 come from two of them – from the pit 7B/85 (**Fig. 6**) and 11/85 (**Fig. 7a, b**). The typology of their inventory represents early stages of the Piliny culture.

Overlying layer (I) included finds of the Late Bronze Age Kyjatice culture, the Late Iron Age, Roman Period and the Period of Developed Medieval Ages. During the period of Kyjatice culture the settlement spread southward.

As for the radiocarbon samples collagen from undetermined animal bones was used. Bones clearly came from the layers (early phase of the Hatvan culture, Koszider horizon) and from the pits (features 73/88: Hatvan-Otomani horizon of the Hatvan culture; 7B/85, 11/85: Early phase of the Piliny culture). There were five samples measured from the site. They were assorted as to represent basic relative-chronological horizons established by archaeological means of dating, that is to say according to typology, horizontal and vertical stratigraphy.

3. ABSOLUTE CHRONOLOGY

Methods

The samples where taken under the guidance of autors of the exavations. The procedure for separating the collagen fraction of bones was essentially according to Longin and Olsson (Longin, 1970; Olsson *et al.,* 1974). The dating was performed with gas proportional counters of the Houtermans-Oeschger type, using methane at 133.3 kPa pressure as filling gas. Measurement control and data processing were done with the help of computers (Görsdorf, 1990; Görsdorf, 2000). A modern measurement electronics is used. Preamplifier, pulse amplifier, comparator, pulse shaper and anti-coincidence are located in a box (19cm x 10cm x 5cm), which is directly connected to the counter. The detection of variation of the environmental radiation and the inspection of the long time stability of the electronics were required in order to reach the measurement accuracy. The $\delta^{13}C$-measurements were done by H. Erlenkeuser and colleagues (Leibniz-Labor, University of Kiel) and are reported with respect to PDB-standard.

Results

In the calibration program OxCal v3.8 (Ramsey, 1995; 1998; 2001; 2002) the decadal calibration curve (Stuiver *et al.,* 1998) was used as a first approximation for all samples. The calibration intervals were presented for a confidence of 68.2% in a 10 year rounded form. The **Table 1** shows the dating results together with locations, ordered after laboratory number.

Interpretation

In **Fig. 8** the calibration results of the above presented dates are shown.

Relative-chronological sequence established by the archaeological method already described above is displayed on the left side of the next **Table 2**; sequence of the radiocarbon dates are demonstrated on the right side of the **Table 2.**

Table 1. *Dating results of bone samples*

Lab. code	*Sample's location*	*$\delta^{13}C$ (‰, PDB)*	*^{14}C Age (BP) Cal Age (BC) (68.2% conf. intervals)*
Bln-5557	Včelince Pit 7B/85	-22,3	**3225 ± 44** 1530 - 1430
Bln-5558	Včelince Pit 11/85	-22,3	**3200 ± 32** 1500 - 1430
Bln-5559	Včelince Trench II-D-6/II-C-6, Layer III	-22,6	**3328 ± 30** 1690 - 1650 1640 - 1580 1570 - 1520
Bln-5560	Včelince Trench II-D-7, layer VII	-23,1	**3710 ± 38** 2200 - 2170 2150 - 2030
Bln-5561	Včelince Pit 73/88	-23,1	**3518 ± 37** 1890 - 1750

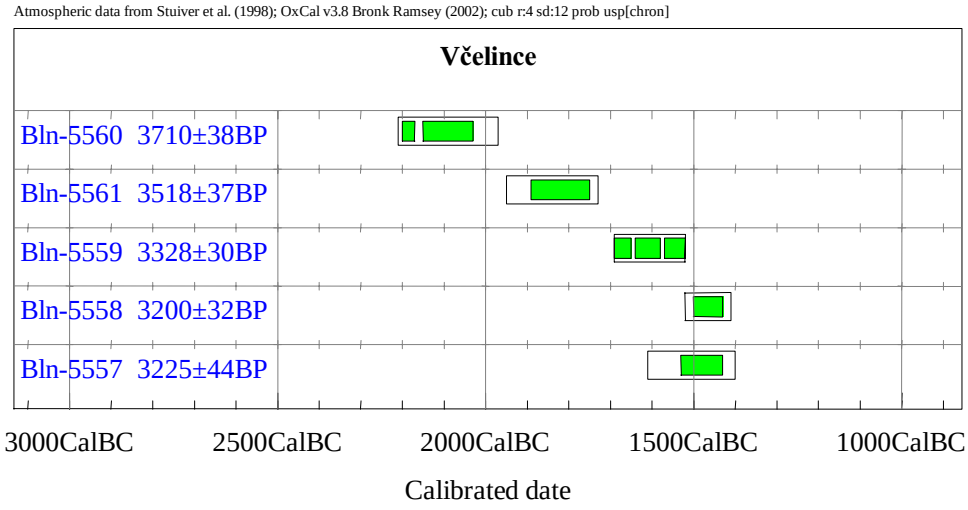


Fig. 8. *Calibration of dating results with the program OxCal v3.8. The confidence limit of the smaller, hatched boxes is 68.2% and of the broader boxes 95.4%.*

Table 2. *Comparison of the absolute and relative chronological sequencies in Včelince*

Layer	*Culture*	*Location*	*Sample code*	*^{14}C Age (BP)*	*Cal Age (BC)*
Layer II	Piliny culture	Pit 11/85 Pit 7B/85	Bln-5558 Bln-5557	3200±32 3225±44	1500 - 1430 1530 - 1430
Layer III	Koszider Hor.		Bln-5559	3328±30	1690 - 1650 1640 - 1580 1570 - 1520
Layer IV	Hatv-otom. Hor.	Pit 73/88	Bln-5561	3518±37	1890 - 1750 1890 - 1750
Layer V	Hatv-otom. Hor				
Layer VI	Hatvan culture				
Layer VII	Hatvan culture		Bln-5560	3710±38	2150 - 2030 2200 - 2170

Mutual comparison of the both sides of the table proves that obtained radiocarbon data evidence is in perfect accord with that of archaeology.

It is the very first ^{14}C mesurment in the case of the Hatvan culture in Slovakia. The measurement of the earliest layer of the Hatvan culture in Včelince (Bln-5560) is dated to 3710±38 BP (2200-2170, 2150-2030 cal BC). This value is comparable with dates of the earliest Hatvan culture known so far in Hungary: Jászdózsa-Kápolnahalom: Bln-1220: 3790±100 BP (2400-2030 cal BC); (Acknowl. 2). They are comparable in the time space with ^{14}C data coming from the southwest Carpathian Basin from Zornica at Blatna Brezovica in Slovenia according to the measurments of Institute of Ruder Bošković in Zagreb {Z-1934: 3785±100 BP, (2400-2030 cal BC)}. They were dated around the year 2150 cal BC. (Dirjec, 1991; Gogâltan, 1999). To a limited extent published material from Blatna Brezovica is typologically similar to the oldest finds from Včelince. The Blatna Brezovica material is particularly comparable with finds from the opposite – south-eastern part of the Carpathian Basin - from the Gorneã-Orleşti group in southwestern Romania (Gogâltan, 1996). However, these have not been ^{14}C - dated yet.

Hatvan culture is the oldest Bronze Age culture in this region of Slovakia. In the whole Slovakia, there are approximately 60 sites recorded at the present. The genesis of this culture is not sufficiently explained as well as there is not known enough about the late Aeneolithic development of this region. The question of the Hatvan culture origin can be therefore considered open. But a part of the territory of Slovakia cannot be excluded from this process as for dates suggest.

Value of the sample Bln 5561 from the Hatvan-Otomani horizon of Hatvan culture in Včelince is 3518±37 BP (1890 - 1750 cal BC). These data are comparable with those from the samples classified in Hungarian research as later stage of the Hatvan culture (Jászdózsa: Bln-1851: 3480±48 BP**,** Bln-1849: 3600±60 BP, Bln-1845: 3480±50 BP, Bln-1848: 3525±50 BP; Polgár Deb-1490: 3490±60 BP; Raczky *et al.,* 1992; Gogâltan, 1999). The sample from Včelince is coming from the pit 73/88 and in vertical stratigraphy there is not to identify its paralelism with one of two Hatvan-Otomani horizons. Duration of this horizon could be indicated by some samples from Hungarian sites. The date Bln 5561 in the milieu of the Otomani-Füzesabony culture circle can be compared with the date from the timbered well in Gánovce {Bln-2011: 3445±40 BP (1870-1680 cal BC); Fra-62: 3400±100 BP (1880-1520 cal BC); GrN-7319: 3415±35 BP (1770-1630 cal BC); LJ- 5262: 3500±90 BP (1940-1680 cal BC); Barta 2001}. Archaeologic-typological dating of the scarcely published material of this well gives it to the classic or post-classic stage of the Otomani-Füzesabony culture circle (Furmánek, 2000; Vlček and Hájek, 1963).

The sample Bln-5559 from the layer III assigned to the Koszider horizon of bronze hoards gives data 3328± 30 BP (1690-1650, 1640-1580, 1570-1520 cal BC). It is comparable with the some data also signed as the Koszider

horizon in several „tell“ cultures of the Carpathian Basin: (Jászdózsa: Bln-1850: 3330±50 BP; Dunaújváros: Grn-1944: 3270±50 BP; Mende: Bln-1942: 3280±45 BP, Raczky *et al.,* 1992; Gogâltan, 1999). In Slovakia it is comparable within the surrounding Otomani-Füzesabony cultural circle with data from the site in Nižná Myšľa (Pit 120a: Bln-2776: 3290±100 BP; pit 89: Bln-2810: 3300±70 BP; Pit 112: Bln-2811: 3480±50 BP, Furmánek *et al.,* 1999; Barta 2001; Olexa, 1993 list of the exhibition nr. 168, 132). The pits 120 and 112 the author of excavations classified as post-classic stage of this culture circles.

The ^{14}C data of archaeological material, ascribed as the Koszider horizon, represent a large time range in the Carpathian Basin **since** 2030-1830 cal BC{Bln-1923: 3590±50 BP (Tószeg), Bln-1847: 3595±50 BP (Jászdózsa); Bln-1904: 3450±55 BP (Füzesabony)} **until** 1500-1210 cal BC {Bln-1217: 3105±100 BP; (Jászdózsa); Raczky *et al.,* 1992; Gogâltan, 1999}. They are related to the later stages of „tell“ cultures of the Carpathian Basin in Hungary. This data support a comprehension of this horizon as a period of a complex of gradual cultural changes. The solution of complex problems in dating of these assemblages is connected not only with diverse terminology but also with the publishing of their archaeological contexts and finding circumstances.

The data from the two latest samples from the multicultural settlement in Včelince are belonging to the early stage of Piliny culture {Pit 7B/85, Bln-5557: 3225±44 BP (1530-1430 cal BC); Pit. 11/85; Bln-5558: 3200±32 BP (1500-1430 cal BC)}. They are close to the above mentioned question, too. They are partly comparable in time span with the already mentioned data of the Koszider horizon, which were indicated by a typological analysis of pottery from the pit 11/85 as well (Furmánek and Marková, 1998; Furmánek, 2000). There are among the scarce culturally identified date from Slovakia comparable only with the data of the grave 151/69 {Bln-1498: 3370±55 BP (1740-1530 cal BC), Furmánek *et al.,* 1999; Barta, 2001} from the cemetery in Radzovce.

Presented radiocarbon dates and the associated archaeological assemblages could have only been sketched here. As the dates are comming from stratigraphically and typologically clearly defined contexts, they are of high importance for the Bronze Age archaeology of the region.

The evidence of ^{14}C data from individual settlements phases in Včelince can be exploited for identical cultural environment of the Hatvan, Otomani-Füzesabony and Piliny cultures in the Carpathian Basin. It should be recalled, however, that the heterogeneity of cultural development in the large geographical region and different pace of cultural progress could be reflected in the absolute dating as well.

ACKNOWLEDGEMENTS

We gratefully acknowledge Dr. H. Erlenkeuser and colleagues (Leibniz-Labor, University of Kiel) for $\delta^{13}C$ measurements. Thanks are extended to D. Schulz for assistance in the preparation and measurement of samples.

Bln numbers are given according to the Laboratory records in Berlin (Raczky *et al.* 1992; Gogâltan, 1999 numbers. 26, 37, 31).

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