RAW MATERIAL AS FOSSILE DIRECTEUR?

A case study of the use of Stránská skála-type chert

Jaroslav Bartík – Petr Škrdla

DOI: https://doi.org/10.31577/szausav.2021.suppl.2.14

Keywords: Moravia, Stránská skála, chert exploitation, raw material networks, fossile directeur

Abstract: The Stránská skála-type chert is a local Moravian chert of Jurassic age, which is available only within a limited area restricted to the Stránská skála rock outcrop and secondary sources in nearby gravels. As this raw material has been well-studied petrographically, its distribution is easy to trace. Its use and proportions within individual archaeological assemblages in particular vary over time – ranging from the dominant raw material during several chrono-cultural periods to a complete absence of this raw material in other periods. Periods of significant use include the Initial and Early Upper Palaeolithic, Late Neolithic and Early Eneolithic. Less pronounced evidence of distribution is also known from the Late/ Final Eneolithic and from the Early Bronze Age. Periods of no use include the Middle to Late Upper Palaeolithic, Early – Middle Neolithic and Middle Eneolithic. This raw material was mostly used locally with a limited distribution – the maximum extent of its occurrence is a few tens of kilometres from the source outcrop. The Stránská skála-type chert should be accepted as a fossile directeur sensu lato thanks to its easy determination and the isolation of the outcrop in combination with the techno-typological analysis.

INTRODUCTION

Stránská skála (Fig. 1) is an isolated raw material (the Stránská skála-type chert) outcrop on the eastern edge of the Brno Basin has been well-studied petrographically (Přichystal 2009; 2019), so its distribution is easy to trace (cf. Bartík et al. 2019; Škrdla 2017). Although there are other occurrences of limestones of Jurassic age with petrographically almost identical cherts (e.g. Bílá hora, Hády, or Švédské šance) and similar cherts appear in gravels in the vicinity of Stránská skála (with characteristic pebble cortex), the prevailing volume of cherts of that type in the Palaeolithic assemblages unequivocally came directly from the Stránská skála outcrop.

The Stránská skála-type chert represents a local raw material that was utilized during the entire Stone Age with peaks at the beginning of the Upper Palaeolithic (Přichystal/Svoboda/Skrdla 2003) and during the Late Neolithic – Early Eneolithic periods (Bartík et al. 2019). In contrast, its marginal use was documented during the Late Upper Palaeolithic (Přichystal 2002; Svoboda et al. 2020), Late Eneolithic (Kopacz ed. 2019) and Early Bronze Age (Kopacz/Šebela 2006). This raw material (and the Brno Basin itself) went almost completely unnoticed during the Mid Upper Palaeolithic (Gravettian), Late Upper Palaeolithic, Mesolithic and Early/Middle Neolithic (LBK, STK; Fig. 2).

MATERIALS AND METHODS

As mentioned above, the Stránská skála-type chert comprises characteristic features within its texture, including whitish enclosures (fragments of microfossiles), dark sponge spicules, rectangular cavities after dissolved crinoidal segments and banding. Although some of the features mentioned above allow the identification of this material on the macroscopic level, stereomicroscopy using immersion liquid provides an even more precise diagnosis (e.g. Přichystal 2009).
In this study we would like to explore the extent of export (distance and volume) and test to what extent the presence of the Stránská skála-type chert within individual assemblages is diagnostic as type fossil (inside and outside of the Brno Basin area), which allows cultural classification of archaeological assemblages. To avoid identification discrepancies, we added only assemblages where raw materials were identified by A. Přichystal or our team.

In addition, we tested whether the presence or absence of the Stránská skála-type chert together with specific technological and typological features within individual assemblages can serve as a cultural identification marker – i.e. *fossile directeur sensu lato* (the term borrowed form palaeontology where it identifies a type fossil for a certain period).
RESULTS

Palaeolithic

Cherts of the Stránská skála type have been used to various extents since the Palaeolithic.

Early and Middle Palaeolithic

Unequivocally Early and Middle Palaeolithic sites within the Brno area are scarce. The only possible Early Palaeolithic site was excavated within Cromerian slope sediments below the northwestern cliff of the Stránská skála rock (Valoch 2003, with ref.). The most recent excavation of the site was carried out by K. Valoch (2003) who presented a collection of lithic artefacts (the artificiality of which is, however, disputable) and documented fire traces on bones. Rare stratified Middle Palaeolithic sites (Svoboda 1985) have not yielded artefacts made from the Stránská skála-type cherts. On the top of the Stránská skála rock, sediments related to the Middle Palaeolithic age are absent, possibly eroded during MIS-4 (as indicated by the Bohunician soil lying directly on the limestone scree and Middle Pleistocene soils).

Middle to Upper Palaeolithic transition and Initial Upper Palaeolithic

The Bohunician and the Szeletian techno-complexes were documented in Moravia on the notional boundary (ca. 50–40 ka cal BP) separating the Middle Palaeolithic from the Upper Palaeolithic. While the Bohunician economy is based on the use of the Stránská skála-type chert (almost exclusively within the Brno Basin), the Szeletian used the Stránská skála-type cherts to a significantly lesser degree (isolated artefacts made from this rock were documented only in a stratified assemblage from Želešice III; Fig. 3; Škrdla et al. 2014; other finds are known from surface assemblages in the areas of the River Bobrava; Škrdla et al. 2011b; and Vyškov Gate; Mlejněk 2015). Large Bohunician workshop sites are known from the top of Stránská skála (Svoboda/Valoch 2003, with ref.). In addition, several surface artefact clusters were documented in the eastern vicinity of Stránská skála in the Lišeň cadastre (Svoboda 1987). Another important stratified site cluster is situated on the opposite side of the Brno Basin, in the city quarter Bohunice (Škrdla/Tostevin 2005; Valoch 1976). The Bohunician settlement extended along the Bobrava River upstream.
to the west, where the excavated site Ořechov IV is. The proportion of the Stránská skála-type chert in Ořechov IV is still high (69% in surface collection: Škrdla et al. 2016; 80% in the stratified collection; Škrdla 2017). Other Bohunician-like assemblages were collected from surface sites in the cadastrale of Ořechov (Škrdla et al. 2011b), and upstream of the Jihlava River, in the cadastrale of Dolní Kounice (Nerudová 2014), and more to the west in Mohelno (the Boleniska field) and Lhánice (sites I and II), where the proportion of the Stránská skála-type cherts was less than 5% (Škrdla et al. 2012; Škrdla/Rychtaříková 2012). To the east from the Brno Basin, in the direction of Prostějov (via the Vyškov Gate), there is the excavated site of Tvarožná X, where these cherts constitute 70% of the assemblage (Škrdla et al. 2009). To the northeast, in the Prostějov region, there is the surface collection from the site Ondratice/Želeč I, in which the share of the Stránská skála-type chert amounts only to 9% (Mliejnek/Škrdla/Přichystal 2012). In addition, isolated artefacts have been found on several surface sites in the cadastrates of Ondratice (sites denoted III and IV) and Drysice (sites labeled I, III, V; Mliejnek 2015). Finally, isolated finds of artefacts made from the cherts in question have been found to the south of the Brno Basin (Fig. 3); isolated artefact constitute the surface assemblage from Diváky-Borovinka (Havlíček/Škrdla 2010), Řeznovice-Horní pole (Škrdla et al. 2012), and a stratified assemblage from Milovice I (Oliva 2009).

While an evolved Levallois technology (serial production of often elongated Levallois points and blades with a finely faceted striking platform removed from bidirectional cores) characterise the Bohunician technology, bifacial reduction and irregular cores characterise the Szeletian technology (e.g. Škrdla 2017). The Levallois artefacts made from the Stránská skála-type chert (but not exclusively from this material) can be therefore reliably linked with the Bohunician technocomplex and to its extensive exploitation and workshops on the top of Stránská skála. Contrary, the leaf points, as a product characteristic of the Szeletian bifacial thinning technology, were often made from other raw materials than the Stránská skála-type chert, specifically within stratified assemblages. However, many leaf points found on the eastern boundary of the Brno Basin (surface finds with unclear cultural affinity) were made from this raw material, which indicates no technological limitation related to this raw material (Nerudová/ Přichystal 2001; Svoboda 1987, table 9). In addition, leaf points (made from other rocks than the Stránská skála-type chert) are present within the Bohunician type-site assemblage (but only there), where their possible meaning was discussed in detail by G. Tostevin and P. Škrdla (2006). The leaf points made from the Stránská skála-type chert can be attributed only when new stratified assemblages containing such points are excavated.

**Early Upper Palaeolithic**

Two industrial types have been documented on the Moravian territories at the beginning of the Upper Palaeolithic – the earlier Lišen/Podoli I, followed by the Aurignacian (Škrdla 2017, with ref.). The recently described Lišen/Podoli I industry (so far known only from the Lišen/Podoli I site), chronologically overlaps with Greenland Interstadial II, with the Stránská skála-type cherts as the prevailing raw material used (89.2%; Škrdla 2017).

The first Upper Palaeolithic techno-complex on the Moravian territory undoubtedly created by Anatomically Modern Humans (as confirmed by the skeletal remains discovered in the Mladeč caves) was the Aurignacian. The currently available Moravian radiocarbon dates postdate the HE-4 cold event and overlap with Greenland Interstadial 8, i.e. falls into the time range between 39–33 ka cal BP (Demidenko/ Škrdla/Nejman 2017, with ref.). The Aurignacian sites described as workshops are known directly from the top of Stránská skála (Svoboda 1987; Valoch 1954). Other sites have been excavated in the eastern vicinity of Stránská skála, on the cadastrales of Lišen and Podoli (Škrdla et al. 2010; 2011a). All assemblages from these sites are characterised by the dominance of the Stránská skála-type chert in their raw material spectra – over 95% (cf. Přichystal/Svoboda/Škrdla 2003).

The surface collections indicate limited export of the Stránská skála-type chert in the northeastern direction (Fig. 3), towards the Prostějov area (ca. 40–45 km in a direct line), where it was identified at Vitovice (Mliejnek 2015) and Skalka (Mliejnek/Škrdla 2014) and on the Předina elevation at Dobrochov (Svoboda/Přichystal 2019). Export in the southern direction is indicated by isolated finds discovered in the Kloboucko region (ca. 20–25 km in a direct line; e.g. Diváky, Křepice, Nikolčice, Bošovice; Havlíček/ Škrdla 2010; Škrdla/Havlíček/Rychtaříková 2010a; 2010b; Škrdla/Kuča 2012), and further in the direction of the Pavlov Hills (ca. 35–40 km in a direct line; e.g. Bulhary, Dolní Věstonice III; Škrdla/Cílek/Přichystal 1996; Škrdla/Přichystal 1999). Export in the eastern direction has been documented in Borsice/Buchlovice, at the 331 m elevation marker (ca. 50 km in a direct line; Škrdla 2005).
Carinated endscrapers are characteristic of the Aurignacian tool kit found at the Stránská skála hilltop sites as well as a small stratified assemblage from Lišen VIII (e.g. Demidenko/Skrála/Nejman 2017; Svoboda 1987; 1991). Although it should be easy to trace the distribution of carinated endscrapers made from the Stránská skála-type chert, this raw material is often present in typologically undiagnostic artefacts (e.g. flakes). The Moravian Jurassic cherts were reported from Stratzing in Lower Austria (Brandl et al. 2015), however, it is also possible that they were collected from secondary deposits distributed throughout Southern Moravia/Lower Austria.

The Lišen/Podolí I type industry is known only from a stratified assemblage from an eponymous site and the industry, although it includes important technological and typological features, it cannot be spatially traced at the moment.

Mid Upper Palaeolithic

In Moravia, this period is represented by the Gravettian (more precisely, the Pavlovian) culture (Klíma 1959). Major sites containing such units are located at the main Moravian communication routes along major rivers (i.e. the Morava, Dyje, and Odra). Although an isolated upper Gravettian burial is known from Brno, Francouzská Street (Oliva 1996; Pettit/Trinkaus 2000), and one isolated point, possibly Gravettian, was found at Maloměřice (Valoch 1979), the Brno Basin area was probably beyond the reach of the Pavlovian people. Consequently, the Stránská skála-type chert was completely ignored during the Gravettian. Surprisingly, the raw material from which the famous Upper Gravettian Venus of Willendorf II was made was determined as oolitic limestone, which most probably comes from Stránská skála (Binsteiner et al. 2008). In addition, a possible presence of the Moravian Jurassic cherts was reported from early Gravettian layer AH5 in Willendorf II (Moreau/Brandl/Nigst 2016).

Late Upper Palaeolithic

This period geologically covers the Last Glacial Maximum and the following Late Glacial, or – in archaeological terms – the Epigravettian (including a non-homogeneous group of industry types dated between the Gravettian and the Magdalenian), and Magdalenian. Only two Epigravettian sites (Stránská skála IV and Brno – Vídeňská Street) and one Magdalenian site (Maloměřice-Borky) are known from the Brno Basin area.

The Last Glacial Maximum site Stránská skála IV is located on the slope below the northeastern foot of the Stránská skála cliff (Fig. 1). An analysis of the raw material used by the Epigravettian hunters shows a high proportion of imported rocks. However, the use of the local chert was also documented (Svoboda 1991; Svoboda et al. 2020). A. Přichystal, who analysed this assemblage, noticed the pebble cortex on some artefacts identified as “the Stránská skála chert” and suggested that they might come from local gravels rather than from the primary outcrops directly on Stránská skála. It is in accordance with the preliminary analyses of recently collected materials from Stránská skála IV, which indicate that most of the cherts used at this site were collected from gravels rather than from the Stránská skála hilltop outcrops, although occasional use of the latter cannot be completely excluded.

The Stránská skála IV assemblage is poor both technologically and typologically (cf. Svoboda 1991; Svoboda et al. 2020). The local rocks were probably used as expedient rather than curated tools, however, A. Markó (2019) described a raw material from an Epigravettian site at Magyorsobány, which is macroscopically similar to the Stránská skála chert (stereomicroscopy is needed here to exclude possible confusion with the Upper Cretaceous Tevel flint from the Bákony Mountains).

Although the use of the local cherts has been documented at the Late Glacial site in Brno – Vídeňská Street (which included several isolated clusters), no artefacts made from the Stránská skála cherts have been reported (Nerudová 2016). Based on K. Valoch (1960) – as no more recent information is available – there is no available information on the use of the Stránská skála-type chert at the Magdalenian site of Maloměřice-Borky I. However, isolated finds that were possibly made from the Stránská skála cherts were present in an assemblage from the plateau in front of the Ochozská jeskyně cave (Fig. 3; Přichystal 2002).

Late Neolithic and Early Eneolithic

An analysis of the proofs of the distribution of the Stránská skála-type chert in the post-Palaeolithic periods showed its occurrence at over sixty archaeological sites (Bartík 2020). Chronologically, most of them (46%) belong to the Lengyel culture (Fig. 2). The greatest number of documented components is directly correlated with the widest range of the raw material’s distribution. In the case of the Moravian
Painted Ware Culture (MPWC) a distribution of the raw material in all directions has been observed. The direction in which the Stránská skála-type chert was moved most often is to the SW of the source site (Fig. 4; Bartík et al. 2019). Interestingly, in the Early Neolithic (LBK) and Middle Neolithic (STK), this raw material was ignored completely, probably due to the tradition of the exploitation and use of the Krumlovský les-type chert (cf. Oliva 2015) and the Olomučany-type chert in the Brno area since the Mesolithic.

During the early Eneolithic (Jordanów culture), the use of the Stránská skála-type chert was preserved (e.g. Jelínek 2019; Kaňáková/Hladíková 2018), but the number of sites where it occurred decreased significantly, which was probably related to the overall reduction of population in settlements compared with the previous period (Fig. 3; cf. Šmíd 2017). Another peak in the distribution of the Stránská skála-type chert is linked with the developments at the times of the Funnel Beaker Culture (FBC). However, at this time the distribution was not that intense. Unlike in the previous period, there was an increase in the distribution of the raw material to more remote places – up to several tens of kilometres – the prevailing direction of the distribution being east to northeast (Fig. 4; Bartík et al. 2019).

If we look at this period using other criteria, such as technology and typology, we must primarily look at the assemblages that come directly from Stránská skála and that have been analysed best. Like the assemblages from initial Early Palaeolithic, the assemblages of chipped industry made from the local chert have a workshop character. Thanks to a recent comprehensive analysis of all available post-Palaeolithic assemblages it was possible to reconstruct the chaîne opératoire of the local produce (Bartík 2020). The results show that within the exploitation and workshop complex of Stránská skála, advanced blade making techniques were applied to the local chert during the Late Neolithic (MPWC). The blades were knapped from well prepared, mostly unipolar cores with a removed cortex. This advanced blade making technology reached its peak at the beginning of the Eneolithic, when the Stránská skála-type chert was intensively exploited by the people of the Funnel Beaker Culture (Fig. 5). In the Final Eneolithic and Early Bronze Age, that followed, blades were exceptional and the production of flakes from low quality cores was dominant. A change in the knapping technique of blanks was proven: in the period in question, the Late Neolithic to Early Eneolithic, the producing of blades by means of indirect percussion was proven, while later, in times when people resigned on the gaining of regularly shaped blanks, the technology of direct percussion with a hard hammer (Bartík 2020). From the perspective of technology and applied techniques, the technique of core reduction does not constitute a fossile directeur for a single archaeological
Fig. 5. Selected Funnel Beaker Culture blade products and tools from Stránská skála-type chert. 1–7, 9–26 – Stránská skála III; 8 – Brno-Líšeň, Čtvrté.
culture. However, it is relatively reliable in predicting a relatively well-defined chronological horizon, when the production of the blades from the Stránská skála-type cherts was most popular, not only at the eponymous workshop site, but also in the settlements in the environs (cf. Bartík et al. 2019, 402–406).

While the typological spectrum of tools datable to the MPWC is very low in Stránské skála, probably due to the fact they were carried outside of the exploitation/workshop area, a variety of tools was produced here in the FBC period (Bartík 2020, 163–168; Svoboda/Šmíd 1996, 94), a large part of which then remained at the site (with or without traces of use). Together with the raw material studied here, some of the clearly defined standardised FBC tools may then be considered fossile directeur. These include mainly some microlites, which have been dated to the FBC context thanks to the systematic flotation of the backfill of excavated features. Surprisingly, along with small trapezoids (Fig. 5: 1–3) also two characteristic and one slightly atypical triangle (Fig. 5: 4, 5) were found. This type of tool had not yet been known from the Funnel Beaker Culture. This is probably why the only similar item, which was found at the Hlinsko hillfort – where the FBC settlement horizon has also been documented – was tentatively dated to the Mesolithic (Šebela/Škrdla/Schenk 2007, 359–361, fig. 7: 4). However, in the Mesolithic, this raw material was not used, which allows us to hypothesise that possible further finds of triangles made from the Stránská skála-type chert will be associated with the Early Eneolithic. A similar hypothesis can be made about the occurrence of the microlithic triangles, which were most abundant in Central Europe in the Late Mesolithic and Early Neolithic (Eigner/Rezáč 2014; Matieicuicová 1998; 2008), again – in times when the Stránská skála chert was unknown or deliberately ignored. The last group of tools – a minor one, but technologically and typologically significant – on which the hypothesis of fossile directeur could be applied includes points. From the perspective of the find context at Stránská skála, they have been discovered both by surface collection and stratified features dated to the FBC by pottery. Typologically, 5 forms of arrowheads/points have been determined (Bartík 2020, 167, 168).

The most important for the issue in question are the most standardised points denoted as the Štramberk type (cf. Diviš 2001; Klíma 1960; Struhár 2014). Three finds of this type of point have been made, one of them preserved completely (Fig. 5: 6) and two fragmentary (Fig. 5: 7, 10). There is a distinctive retouch on the ventral side of the point of one of these artefacts. A Štramberk-type point made from the Stránská skála-type chert (Fig. 5: 8) was discovered several hundred metres from the researched exploitation/workshop area at the site Ctvrte in Brno-Líšeň and another one was found at what is now a surface site with evidence of FBC at Želešice I-Za lesem (Bartík et al. 2019, 406). The finds of Štramberk-type points are dated to a broader chronological horizon: from the Late Neolithic to Middle or Late Eneolithic. However, the production of this type of points from the Stránská skála-type chert has not been confirmed in any of the cultures within this period. The Štramberk points have been discovered over a relatively wide geographical area and were produced using different types of raw materials (cf. Struhár 2014). In any case, when the raw material was determined as the Stránská skála-type chert, the finds of points were always linked with the activities of the Funnel Beaker Culture. In the future, it will be necessary to further verify this pattern in order to confirm whether it is a case of distortion caused by the current state of research or a case of a fossile directeur linked to a specific raw material.

Middle and Late Eneolithic

There is no archaeological evidence of the use of the Stránská skála-type chert in the Middle Eneolithic; the demise of the distribution network of this raw material is supported by its petrochemically proven absence at central Moravian hillforts where it was imported during the FBC (cf. Přichystal 2007; 2010; Šmíd/Přichystal 2015). Only sporadic proofs of the distribution of this material are available in the form of isolated flakes and raw material from three hillfort sites of the Jevišovice Culture in the hills in the N-NE outskirts of Brno (Fig. 6; Bartík/Šebela 2019a). The low number of finds does not allow a reliable testing of the fossile directeur hypothesis.

Final Eneolithic

A limited use of the Stránská skála-type chert survived to the Final Eneolithic. While we have only a single component from a grave context dated to the Corded Ware Culture, both burial and settlement contexts have been proven for the Bell Beaker Culture (BBC). In the BBC period, a settlement area directly on Stránská skála, at site SS IV, where an intensive processing of the local cherts – among which the sub-
standard variety C prevailed – was proven along with common settlement activities (Bartík et al. 2018). Although there are several thousand artefacts associated with the production of chipped industry, there are relatively few proofs of the distribution of the Stránská skála-type chert to the surrounding BBC sites. Apart from the Stránská skála, artefacts made from the Stránská skála-type chert have been documented at five sites in the cadastre of the Brno city and its surroundings (Fig. 6; Bartík/Šebela 2019b). Spatially, the distribution of the raw material was considerably limited and, in cases of a larger proportion of the raw material, the distribution radius does not exceed 15 km. Outside the Brno area, this raw material was petrographically proven in isolated artefacts only in the cluster of burial grounds around Hoštice and Ivanovice in Haná (Vyškov District; about 30 km from Stránská skála; Přichystal/Všianský 2012, 304–311). In unique cases, the presence of the Stránská skála-type chert was proved outside Moravia. Examples of the Stránská skála-type chert include individual finds from the BBC cemetery and settlement (find group I/II) at Skalice in Southwest Slovakia (Cheben/Drahovský 2004) and a flake from the BBC burial ground in Tuněchody (Chrudim District; find group II/III; Tichý et al. 2008).

Technologically, the chipped industry as rendered by the BBC peoples from Stránská skála is the complete opposite of the previous developments. flakes became the main products of the reduction of cores, which corresponds with the type of the cores (Fig. 7: 1–16). Limited attention has been paid to the primary fashioning of rocks prior to reducing; direct detaching of final products without any prior preparation of the striking platform cannot be ruled out. Only a small number of blades have been found and it is a question from what cores they were struck from (Bartík 2020, 205–214). Compared to the previous development, the knapping technique changed as well. Most of the industry was knapped by a direct percussion with hard hammerstones; part of the production is supposed to have been made by the bipolar anvil core technique. A reconstruction of the chaîne opératoire (Bartík 2020, 283, fig. 135) shows a striking dichotomy: a difference between the technological developments of the finished retouched tools. While most production from low-quality material was linked with flakes that were not further used or tools for direct consumption (whose real use was verified by trasological analysis), a small part of the assemblage, made from better quality chert varieties, contains more advanced forms of artefacts with complete retouching. Here, finer techniques are supposed, including pressure retouching, applicable for instance in the bifacial reduction of artefacts (in the case of the Stránská skála-type chert this includes a segment and several arrowheads). Interestingly, no arrowheads made from the Stránská skála-type chert – which are generally considered the fossile directeur of the knapped stone industry of the BBC in East Central Europe and beyond (Furestier 2007; Kopacz/Přichystal/Šebela 2009) – have been recorded outside of the Stránská skála area. It is not excluded that the qualities of the Stránská skála-type chert were not suitable for the making of such artefacts-scaled cornea, with its quality properties, they did not intend to produce these artefacts. However, we still know examples directly from Stránská skála, where bifacial reduction was applied to the local cherts. An interesting issue here is the imitation of the prestige artefacts, such as daggers, but we are limited by the state of the only documented artefact. To sum up the result, there is a dominant part of the assemblage with a low technological quality and very limited use in toolmaking, where the raw material used was not important, and a minor part where a better technology was used, and which had higher demands on the toolstone – it had to be a raw material that allowed the production of bifacially reduced standardised tools. Lower quality chert and the primary character of flakes have been documented in industries from the surrounding settlements. However, there is a lack of finds with completely retouched tools of better quality. The activities of the bearers of the BBC date into find group II/III. The future finds of bifacially thinned artefacts from the Stránská skála-type chert will most probably be dated to this chronological phase.

Early Bronze Age

Sporadic evidence of the use of the Stránská skála-type chert is dated to the turn of the Final Eneolithic and Early Bronze Age: two pieces of chert appeared in the grave goods of grave no. 12 in Bedřichovice, dated to the Proto-Únětice Culture (Brno-Country District; Kopacz/Šebela 1998, fig. 2: 15, 16). There are several cases in which the use of the Stránská skála-type chert was documented as the late phases of the Únětice Culture. In the Brno suburbs and its vicinity, the Stránská skála-type and Švedské valy-type cherts were found in the chipped industry assemblages from the settlements in Černá Pole, Slatina, Tuřany, and at the settlement and burial ground in the nearby Podoli (Bartík 2020; Šebela 2019). The analysis of the distribution of the Stránská skála-type chert in the Early Bronze Age showed that the raw material was mainly of local importance and its distribution radius usually did not exceed 5 km (Fig. 6). Outside this area, the Stránská
skála-type chert has been represented by a mere two pieces at the Blučina-Cezavy hillfort site (about 14 km from Stránská skála; Kaňáková Hladíková/Parma 2015, 523). In the later phases of the Early Bronze Age, the Stránská skála-type chert no longer played a significant role among the raw materials used for chipped industry. The only evidence of use in the environment of the Věteřov group comes from the Budkovice hillfort (Brno-Country District; about 30 km from Stránská skála), where two artefacts found and another one, in which the raw material used is spurious (SSC/KLC; Kopacz/Šebela 2006, table 1).

Based on typologically characteristic isolated finds, the latest prehistoric activities associated with the exploitation of the Stránská skála-type cherts are dated to the Early Bronze Age (Bartík 2020). Like in the case of the Jevišovice Culture, the only direct evidence of the use of the raw material is the evidence of its distribution to neighbouring settlements.

The technology of Early Bronze Age chipped industry draws on the previous development in the Late Eneolithic and it almost exclusively consists of flakes, like the industries using the studied raw material. The relatively frequent occurrence of the “janus” flakes is also worth mentioning. Their typical feature is a frequent use of preparation flakes with the remains of cortex for tool production (Kaňáková Hladíková 2013; Kopacz/Šebela 2006). The most important assemblage where the Stránská skála-type chert was represented significantly includes the sites of Slatina-Jihomoravské Square (Salaš 1987), Tuřany-Švédské valy (Kos 2006) and Podolí-Příčný (Kala/Parma 2011; 2013). A collection of 208 pieces was obtained from the “Jihomoravské Square”, of which 153 were made from the Stránská skála-type chert (Kopacz/Šebela 2006, pl. I). Technologically/typologically, this material was used in cores with different stages of reduction (33 pcs), flakes (101 pcs), blades (2 pcs) and blades with utilisation retouch (2 pcs). The rest of the assemblage consists of pieces of raw material (Kopacz/Šebela 2006, 98–100). The industry from feature 10 with a rich collection of chipped industry is supposed to have workshop character (Kaňáková Hladíková/Parma 2015, 523). In the assemblage from Tuřany (106 pcs) the Stránská skála-type chert is dominant. This site also turned up proofs of the mining of the local Švédské šance-type cherts (Kos/Parma 2007), which are geologically similar to the Stránská skála-type chert (see Přichystal 2009; 2019a).

A number of interesting findings was provided by rescue excavations at the site of Příčný (cadastre of Podolí, Brno-Country District, which followed up on each other. A settlement and a burial ground with 44 graves from the classical phase of the Unětice Culture were excavated here (Kala/Parma 2011; 2013). This was the very first time that the Stránská skála-type chert appeared in a funerary context. Importantly, links
Fig. 7. Selected flake products from Stránská skála-type chert. 1–16 – Stránská skála IV, Final Eneolithic; 17–27 – Podolí-Příčný, Early Bronze Age (after Kaňaková Hladíková/Parma 2015).
between material type and the age and sex of the buried was determined, which were by no means coincidental (Kaňáková Hladíková/Parma 2015, 530–533). The Podoli assemblage (Fig. 7: 17–27) gives us an idea of the typological spectrum of instruments made from the Stránská skála-type chert. Among the identified artefacts were saws, chisels and knives with unretouched blades and backed or cortex edges, which are characteristic of the Early Bronze Age in Moravia (cf. Kaňáková Hladíková 2013). Interestingly, no artefacts with sickle-gloss made from the Stránská skála-type chert have been discovered (Kaňáková Hladíková/Parma 2015, 527, 528).

DISCUSSION

The fossile directeur (type fossil) approach has been commonly used by archaeologists in typological and technological studies. The typical examples include the Levallois point as a characteristic tool of the Bohunician, the leaf point for the Szeletian, the carinated endscraper or burin and Dufour bladelets for the Aurignacian and the backed bladelet for the Gravettian and Magdalenian. In this case study, we tested the possibility of using also a type of raw material – here the Stránská skála-type chert – as a fossile directeur. Therefore, the present article discusses the extent to which the presence of the Stránská skála-type chert can be used as a fossile directeur within Initial Upper Palaeolithic/Early Bronze assemblages, within and outside of the Brno Basin. All chronological horizons were tested from the perspective of technology, typology and distribution networks.

There are no available data for this type of analysis for Middle Palaeolithic sites.

The raw material economy of the Bohunician sites in the Brno Basin was primarily based on the Stránská skála-type cherts obtained directly from their outcrops on the top of Stránská skála rock. The proportion of these rocks in individual assemblages decreased (down the line) with the increasing distance from Stránská skála: 90% of the SSC were at sites directly in the Brno Basin, ca. 70% within 15 km, and only a minor amount (below 10%) were found in assemblages up to 30 km and only isolated items were found further than 30 km from Stránská skála. Unlike in the Bohunician, Szeletian sites have not been documented directly in the Brno Basin. However, at Želešice III a surprising find of several artefacts of the Stránská type chert was made (Škrdla et al. 2014). The Early Upper Palaeolithic technocomplexes share the pattern of the Bohunician. Both Aurignacian and Lišen/Podolıı I-type raw industry economies linked with the sites in the Brno Basin were primarily based on the Stránská skála-type cherts, while the export of this raw material outside the Brno Basin was limited (however, this finding can be affected by a low number of analysed stratified assemblages beyond the Brno Basin). Generally, the Stránská skála-type chert was intensively used by the Bohunician and both the above-mentioned Early Upper Palaeolithic technocomplexes in the Brno Basin and its export to the surrounding area was limited. The significant proportion of the Stránská skála chert within the Palaeolithic assemblages from the Brno Basin and its nearest vicinity (up to ca. 15 km) indicate their dating to the initial or early Upper Palaeolithic. When the raw material data are combined with technological and typological data, the Levallois artefacts made from the Stránská skála-type chert are a fossile directeur for the Bohunician and the carinated end scrapers are a fossile directeur for the Aurignacian. There are no available data on the tracing of the Lišen/Podolıı I industry. The Szeletian used the Stránská skála-type chert in differently than the industries mentioned above. Although isolated artefacts made from the Stránská skála-type chert were identified in the Želešice III assemblage, the high proportion of this raw material within any particular assemblage excludes its classification as Szeletian.

Local raw materials including the Stránská skála type chert were almost completely replaced by imported erratic flints from the glacio-fluvial deposits in Northern Moravia/Southern Poland, and other imported rocks (the most important being the White Carpathian radiolarites, followed by the silicites from the Kraków-Częstochowa Jurassic Upland, and sporadically other rocks) in the Gravettian (Pavlovian). A similar trend in the use of the Stránská skála-type chert continued in the Epigravettian (where it was documented only in an assemblage from Stránská skála IV) and the Magdalenian. The only important exception is the possible presence of the Stránská skála-type chert at Magyrosbánya – a site in the Carpathian Basin of similar dating as Stránská skála IV (Markó 2019). If the presence of the Stránská skála chert is microscopically confirmed, then it will be a fossile directeur also in the case of Late Upper Palaeolithic.

In the case of the post-Palaeolithic industries made from the Stránská skála-type chert, a future testing of hypotheses concerning their typological aspects will be necessary. In most cases, the validity of the above patterns is limited by a low number of identified tools. Provided that their numbers rise thanks to further excavations, some types of the standardised tools made from the Stránská skála-type chert might be accepted as fossile directeur.
CONCLUSION

During the Initial and Early Upper Palaeolithic (including the Bohunician, Líšeň/Podolí I type industry, and the Aurignacian) the raw material economy of all the sites in the Brno Basin and its nearest vicinity was based primarily on cherts of the Stránská skála type and this raw material, in combination with technological and typological data, can be used as fossile directeur. In contrast, the bearers of the Szeletian Culture did not settle in the Brno Basin and almost totally ignored this raw material. Similarly, the Gravettian (Pavlovian) culture almost completely ignored the Brno Basin and the Stránská skála-type chert was absent in its assemblages, which can be interpreted as a cultural or technological choice. Similarly, the same pattern can be observed during the subsequent periods: the Epigravettian and Magdalenian. We can conclude that the Stránská skála-type chert cannot be considered a fossile directeur for Mid and Late Upper Palaeolithic assemblages.

Chronologically and technologically, the post-Palaeolithic chipped industries made from the Stránská skála-type chert do not exhibit a clear pattern that would allow them to be linked with a single archaeological culture in the sense of fossile directeur. However, when this chert is present in significant quantities at sites within lower tens of kilometres from Stránská skála, its connection with a settlement dated from the Late Neolithic to Early Eneolithic can be assumed – in case of technologically developed blade industries – or from the Final Eneolithic to Early Bronze Age in the case of flake industries. As for the typological testing of fossile directeur, there are some links, so far hypothetical, to specific types of standardised tools, which will have to be tested and verified considering the low numbers of finds. As regards the Early Eneolithic, they include microliths (triangles, short trapezoids) and some forms of arrowheads (mainly the Štramberk type). Final Eneolithic industries include arrowheads with wings and segments; Early Bronze Age artefacts include tools with saw retouch and different forms of knives. Some of these tools (especially in the Bell Beaker and Únětice Cultures) are fossiles directeurs for the cultures as such, but in connection with the raw material they offer further valuable dating potential that enables a distinction of more detailed chronological phases or the determination of provenance and/or socio-economic context.

Translated by authors

BIBLIOGRAPHY

Bartík 2020
J. Bartík: Těžební a dílenský areál na Stránské skále u Brna v neolitu až straší době bronzové. Ph.D. Thesis. Masaryk University. Faculty of Arts. Department of Archaeology and Museology. Brno 2020. Unpublished.

Bartík et al. 2018
J. Bartík/J. Kopacz/M. Nývltová Fišáková/A. Přichystal/L. Šebela/P. Škrdla: Question of chert exploiting on the Stránská skála Hill (Brno-Slatina, Czech Republic) by the Bell Beaker People. Journal of Neolithic Archaeology 20, 2018, 185–202.
DOI: https://doi.org/10.12766/jna.2018.10

Bartík et al. 2019
J. Bartík/P. Škrdla/L. Šebela/A. Přichystal/L. Nejman: Mining and processing of the Stránská skála-type chert during Late Neolithic and Early Eneolithic periods. Archeologické rozhledy 71, 2019, 373–417.

Bartík/Šebela 2019a
J. Bartík/L. Šebela: Use of cherts of the Stránská skála type in the prehistoric times – The Jevišovice culture. In: Kopacz ed. 2019, 72–77.

Bartík/Šebela 2019b
J. Bartík/L. Šebela: Use of cherts of the Stránská skála type in the prehistoric times – Late Eneolithic. In: Kopacz ed. 2019, 77–81.

Binsteiner et al. 2008
A. Binsteiner/A. Přichystal/G. Wessely/W. Antl Weiser/A. Kern: Neue Untersuchungen zum Kalkoolith der Venus von Willendorf. Mitteilungen der Anthropologischen Gesellschaft in Wien. Anthropologische Gesellschaft in Wien 138, 2008, 23–35.

Brandl et al. 2015
M. Brandl/L. Moreau/O. Schmitsberger/Ch. Neugebauer-Maresch: The Southern Moravian Cherts at the Aurignacian Site of Stratzing-Galgenberg, Austria. Anthropologie 53, 2015, 181–202.

Demidenko/Škrdla/Nejman 2017
Y. E. Demidenko/P. Škrdla/L. Nejman: Aurignacian in Moravia. New geochronological, lithic and settlement data. Památky archeologické 108, 2017, 5–38.

Diviš 2001
J. Diviš: Nová naleziště hrotů typu Štramberk-Krnov v okolí Příbora a Kopřivnice. Archeologie Moravy a Slezska 1, 2001, 53–58.
Nerudová/Přichystal 2001
Z. Nerudová/A. Přichystal: Nálezy ojedinělých listovitých hrotů z Moravy a Čech. Archeologické rozhledy 53, 2001, 343–347.

Oliva 1996
M. Oliva: Mladopaleolitický hrob Brno II jako příspěvek k počátkům šamanismu. Archeologické rozhledy 48, 1996, 353–383.

Oliva 2009
M. Oliva: Štípaná industrie ze severních sektorů. In: M. Oliva (ed.): Sdělili štítí lidí v Milovicích pod Pálavou. Anthroprus 27. Brno 2009, 229–256.

Oliva 2015
M. Oliva: Mezolitická těžba rohovce v Krumlovském lese (jižní Morava) v kontextu neolitizace střední Evropy. Památky archeologické 106, 2015, 5–42.

Pettit/Trinkaus 2000
P. B. Pettit/E. Trinkaus: Direct AMS radiocarbon dating of the Brno 2 Gravettian human remains. Anthropologie 38, 2000, 149–150.

Přichystal 2002
A. Přichystal: Výzkum surovin štípaných artefaktů magdalénského osídlení z Ochozské jeskyně. In: J. Svoboda (ed.): Prehistorické jeskyně. Dolnovesnické studie 7. Brno 2007, 226–228.

Přichystal 2007
A. Přichystal: Kamenná štípaná industrie. In: L. Šebela et al.: Hlinsko. Výšinná osada lidu badenské kultury. Spisy Archeologického ústavu AV ČR Brno 32. Brno 2007, 241–253.

Přichystal 2009
A. Přichystal: Kamenné suroviny v pravěku východní části střední Evropy. Brno 2009.

Přichystal 2010
A. Přichystal: Kamenná štípaná industrie. In: M. Šmíd et al.: Hrad u Bílovic. Eneolitické hradisko na Prostějovsku. Pravěk. Supplementum 21. Brno 2010, 107–109.

Přichystal 2019
A. Přichystal: Petrographic characteristics of cherts from Stránská skála. In: Kopace, ed. 2019, 30–42.

Přichystal/Svoboda/Škrdla 2003
A. Přichystal/J. A. Svoboda/P. Škrdla: Lithic Raw Materials Used by Humans at Stránská skála. In: J. A. Svoboda/O. Bar-Yosef (eds.): Stránská skála. Origins of the Upper Paleolithic in the Brno Basin, Moravia, Czech Republic. American School of Prehistoric Research Bulletin 47. Dolní Věstonice Studies 10. Cambridge 2003, 59–64.

Přichystal/Všianský 2012
A. Přichystal/D. Všianský: Petroarcheological výzkum kamenné industrie z Hoštice I, Hoštice IV a Ivanovic VI. In: A. Matějíčková/P. Dvořák (eds.): Pohřebiště z období zvoncovitých pohárů na trase dálnice D1 Výskov-Mořice. Pravěk. Suplementum 24. Brno 2012, 303–322.

Salaš 1987
M. Salaš: Záchranársky archeological výzkum na sídlišti z doby bronzové v Brné-Slatině. Acta Musei Moraviae, Scientiae sociales 72, 1987, 53–73.

Škrdla 2005
P. Škrdla: Use of cherts of the Stránská skála type in the prehistoric times – The Unětice culture. In: Kopace ed. 2005, 81–84.

Škrdla/Svrčová 2007
L. Šebela/P. Škrdla/Z. Schenk: Hlinsko (okr. Přerov). Přehled výzkumů 49, 2007, 359–362.

Škrdla 2005
P. Škrdla: The Upper Paleolithic on the Middle Course of the Morava River. Dolní Věstonice Studies 13. Brno 2005.

Škrdla 2017
P. Škrdla: Moravia at the onset of the Upper Paleolithic. The Dolní Věstonice Studies 23. Brno 2017.
Surovina jako **fossile directeur**?

**Případová studie využívání rohovce typu Stránská skála**

Jarošlav Bartík – Petr Škrdla

**Souhrn**

Stránská skála (obr. 1) představuje významnou geologickou a archeologickou lokalitu známou také jako bohatý zdroj jurských rohovců, které byly různou měrou využívány po velkou část moravského pravěku. Studie přináší základní přehled doposud známých dokladů využívání rohovce typu Stránská skála v jednotlivých obdobích (obr. 2). Jedním z hlavních cílů bylo rovněž testovat využitelnost předmětu surovin jako významného datačního prvku ve smyslu **fossile directeur** (termín vypůjčen z paleontologie, kde identifikuje typickou fosilii určitého období). Za tímto účelem jsou zde proto analyzovány všechny chronologické horizonty, ve kterých byl doložen výskyt rohovce typu Stránská skála jak pohledu rozsahu distribuční síť, tak po stránce technologických a typologických aspektů kamenných industrií.

**Rohovec typu Stránská skála v paleolitu**

V průběhu staršího a středního paleolitu byly lidmi zdroje rohovců na Stránské skále ignorovány. K významnému využívání rohovce typu Stránská skála docházelo až od bohunicienu, ve které tvořil podstatnou část surovinové základny v brněnské kotlině a jejím okolí. Přímo na lokalitách v prostoru brněnské kotliny dosahuje podíl této suroviny přibližně 90 %, ve vzdálenosti do 15 km od brněnské kotliny stále ještě kolem 70 %, do vzdálenosti 30 km už klesá k asi 10 % a ve vzdálenosti více než 30 km je pak zastoupena jenom ojedinělými kusy. Szeletské lokality oproti bohunicienu v brněnské kotlině chybí a rohovec typu Stránská skála je zastoupen pouze několika kusy na nedaleké lokalitě Želešice III (obr. 3). Naopak surovinové základny industrie typu Líšeň/Podolí I a aurignacienu v brněnské kotlině odpovídají bohunicienu – rohovec typu Stránská skála představuje významnou surovinu k produkci štípané industrii. V následujících obdobiach paleolitu bylo využívání této suroviny výrazně omezeno. V gravettienu byl surovinový zdroj na Stránské skále zcela ignorován.

**Rohovec typu Stránská skála v kulturách zemědělského pravěku**

Analýza dokladů distribuce rohovce typu Stránská skála v postapaleolitických obdobích odhalila jeho výskyt na více jak šesti desítkách archeologických lokalit (obr. 2). Po chronologické stránce náleží největší část z nich k lengyelově kultuře (46 %). Zajímavé je, že v průběhu staršího (LnK) a středního (VpK) neolitu byla surovina zcela ignorována patrně v důsledku již od mezolitu zažitých tradic spojených s exploatací a využíváním rohovce typu Krumlovský les a na Brněnsku také rohovec typu Olomučany. V průběhu časného neolitu (jordanovská kultura) sice využívání rohovce typu Stránská skála přežívá, ale počet lokalit s jeho výskytem značně klesá, což zřejmě souvisí s celkovou demografickou regulací osídlení a změnou využívání suroviny. V následujících obdobiích (epigravettienu a magdalénien) se distribuce rohovce typu Stránská skála vyloučila ze značné části skupin zemědělského pravěku.
Pro střední eneolit zatím nedisponujeme přímými doklady využívání rohovce typu Stránská skála a o zániku distribučních sítí zájmové suroviny svědčí i její petroarcheologicky potvrzená absence na hradiskách střední Moravy, kam v průběhu tvárání KNP přidala.

Z období mladého eneolitu disponujeme již sporadickými doklady distribuce ve formě ojedinělých úštěpů a surovin ze tří výšinných lokalit Jevišovické kultury, které se váží na kopcovitý terén na S až SV okraji Brna a jeho okolí. V tomto období tedy nemůže být prozatím fossilis directeur pro nízkou početnost artefaktů spolehlivě testován.

Využívání rohovce typu Stránská skála pokračovalo v omezené míře také v pozdním eneolitu. Zatímco v případě KNP v průběhu trvání KNP proudila.

Distribuční sítě zájmové suroviny svědčí i její petroarcheologicky potvrzená absence na hradiskách střední Moravy, a jeho okolí. V tomto období tedy nemůže být prozatím fossilis directeur pro nízkou početnost artefaktů spolehlivě testován.

Sporadické doklady využívání rohovce typu Stránská skála pocházejí i ze samotného přelomu pozdního eneolitu a starší doby bronzové, kdy se dva kusy rohovce projevily ve vybavě hrobu protofunerální kultury v Bedřichovicích. Ve více případech je doloženo využívání rohovce typu Stránská skála až v mladších vývojových fázích úštěpové kultury ve formě ojedinělých úštěpů. Zatímco v případě KNP máme doloženou existenci sídlišťního areálu přímo na Stránské skále v poloze SS IV, kde bylo kromě běžných sídlištních aktivit prokázáno také intenzivní zpracovávání místních rohovců. Protože odtud evidujeme několik tisíc artefaktů spojených s výrobou štítaného industrie, dokladů distribuce rohovce typu Stránská skála na okolní lokalitě KNP máme doposud poměrně málo. Pokud nepočítáme Stránskou skálu, tak artefakty z rohovce typu Stránská skála jsou prozatím známy z dalších pěti lokalit rozprostírajících se na katastech města Brna a okolí. Z prostorového hlediska byla tedy distribuce suroviny značně limitovaná a v případě většího zastoupení surovin nepřekračuje distribuční rádius 15 km (obr. 6). Mimo oblast Brněnska byla suroviná petrograficky doložena ojedinělými artefakty pouze v řece Krušném i v okolí Hoštic a Ivanovic na Hané a ve zcela ojedinělých případech byl prokázán výskyt rohovce typu Stránská skála i mimo území Moravy (Tuněchody ve V Čechách a Skalice na JZ Slovensku).

V případě mladšího úseku střední doby bronzové už rohovec typu Stránská skála nesehrál v surovinových spektrech a jeho okolí. V případě KNP v průběhu trvání KNP proudila.

Zatímco v případě střední doby bronzové už rohovec typu Stránská skála nesehrál v surovinových spektrech a jeho okolí. V případě KNP v průběhu trvání KNP proudila.

V případě post-paleolitických štěpáných industrií můžeme z chronologického a technologiího hlediska konstatovat, že rohovec typu Stránská skála nevykazuje jasně ohraničenou strukturu spojitém sieť zájmové suroviny, která by významně přitomla na lokalitě vzdálené do několika desítek kilometrů od Stránské skály, můžeme zde oprávněně předpokládat jeho využití ojedinělých úštěpů na lokalitě.

V případě post-paleolitických štěpáných industrií můžeme z chronologického a technologiího hlediska konstatovat, že rohovec typu Stránská skála nevykazuje jasně ohraničenou strukturu spojitém sieť zájmové suroviny, která by významně přitomla na lokalitě vzdálené do několika desítek kilometrů od Stránské skály, můžeme zde oprávněně předpokládat jeho využití ojedinělých úštěpů na lokalitě.

V případě post-paleolitických štěpáných industrií můžeme z chronologického a technologiího hlediska konstatovat, že rohovec typu Stránská skála nevykazuje jasně ohraničenou strukturu spojitém sieť zájmové suroviny, která by významně přitomla na lokalitě vzdálené do několika desítek kilometrů od Stránské skály, můžeme zde oprávněně předpokládat jeho využití ojedinělých úštěpů na lokalitě.

V případě post-paleolitických štěpáných industrií můžeme z chronologického a technologiího hlediska konstatovat, že rohovec typu Stránská skála nevykazuje jasně ohraničenou strukturu spojitém sieť zájmové suroviny, která by významně přitomla na lokalitě vzdálené do několika desítek kilometrů od Stránské skály, můžeme zde oprávněně předpokládat jeho využití ojedinělých úštěpů na lokalitě.

V případě post-paleolitických štěpáných industrií můžeme z chronologického a technologiího hlediska konstatovat, že rohovec typu Stránská skála nevykazuje jasně ohraničenou strukturu spojitém sieť zájmové suroviny, která by významně přitomla na lokalitě vzdálené do několika desítek kilometrů od Stránské skály, můžeme zde oprávněně předpokládat jeho využití ojedinělých úštěpů na lokalitě.

V případě post-paleolitických štěpáných industrií můžeme z chronologického a technologiího hlediska konstatovat, že rohovec typu Stránská skála nevykazuje jasně ohraničenou strukturu spojitém sieť zájmové suroviny, která by významně přitomla na lokalitě vzdálené do několika desítek kilometrů od Stránské skály, můžeme zde oprávněně předpokládat jeho využití ojedinělých úštěpů na lokalitě.

V případě post-paleolitických štěpáných industrií můžeme z chronologického a technologiího hlediska konstatovat, že rohovec typu Stránská skála nevykazuje jasně ohraničenou strukturu spojitém sieť zájmové suroviny, která by významně přitomla na lokalitě vzdálené do několika desítek kilometrů od Stránské skály, můžeme zde oprávněně předpokládat jeho využití ojedinělých úštěpů na lokalitě.

V případě post-paleolitických štěpáných industrií můžeme z chronologického a technologiího hlediska konstatovat, že rohovec typu Stránská skála nevykazuje jasně ohraničenou strukturu spojitém sieť zájmové suroviny, která by významně přitomla na lokalitě vzdálené do několika desítek kilometrů od Stránské skály, můžeme zde oprávněně předpokládat jeho využití ojedinělých úštěpů na lokalitě.