PETR ŽÁKOVSKÝ, JIŘÍ HOŠEK, PATRICK BÁRTA

DUSSACKS WITH BROAD BLADES AND A PROBABLE METHOD OF THEIR MANUFACTURING

While making a list of medieval and post-medieval militaria found in the territory of the Czech Republic[1] we have been able to identify a special category or a certain type of dussacks[2] with identical typological characteristics, which include very similar size and possibly also construction.

The type can be described as a one-handed dussack with a relatively broad blade. The blade only slightly narrows towards the point, which was presumably axially situated and rather indistinct. The blade has two shoulders, which bear two shoulder-plates. The shoulder-plates were most likely corrugated. The shoulder-plates were attached to the blade by two rivets in the place of shouldering. The blade extends into the tang which is equipped with an obverse-side groove and holes. The holes served to fasten handle-scales of organic material to the tang with transversal rivets. Dussacks of this type have the tang shouldered at the end into a shank onto which a flat or block pommel was riveted. Dussacks of this type were certainly equipped with side guards but none of these have been preserved among the examples we have. At the moment, 15 fully documented specimens are available to us, along with several other examples found in scientific literature.

A preliminary comparison of all the specimens available to us made it clear that in nearly all cases the blades show very similar damage. The blades of almost all of these dussacks have been broken in the same way: more or less perpendicularly to the axis of the weapon. When the dussack found in the cadastre of Horákov underwent its restoration treatment, certain technology-characteristic marks became visible on the blade, pommel and tang, which allow us to speculate about the production methods and mistakes of the maker. The speculations eventuated into a detailed assessment of the weapons and a comprehensive analysis of methods used in their production. This paper presents the outcomes of the aforementioned analyses.

1. CATALOGUE

1.1. BOLERADICE (THE REGIONAL MUSEUM OF KLOBOUKY U BRNA, NO INV. NO.; FIGS. 1:B; 2:B; 5:K; 6:B)

The weapon was found in the cadastre of Boleradice at the beginning of the 20th c., most probably in the "Na hradě" location, since finds from this site were published in the regional Moravian almanac "Vlastivěda moravská" as early as 1909 and also later in an almanac devoted to the region of Hustopečsko. The authors briefly listed finds from the castle headland which were deposited at then recently founded museum in Klobouky u Brna. The authors wrote, verbatim: *"parts of beautiful ancient tiles, iron arrowheads, horseshoes, horse-bits, swords,*[3] *spurs, shackles, nicely elaborated iron*

[1] The list is being compiled by one of the assistants under the auspices of the Department of Archaeology and Museology of Masaryk University in Brno. The list primarily focuses on documenting single-edged weapons.

[2] We use this term, although in the English language literature these weapons can also be described as falchions. However, we consider falchion a peculiar type of a single-edged weapon with a hilt that is analogous to contemporary sword hilts.

[3] This term was most probably also used to label the dussack included in our current study.

spoons and fragments of containers" (Bukovanský 1909, p. 119; Brettschneider 1928, p. 83; Cetl 1928, p. 270). However, only very few of these objects have been preserved until today. Some of them are still deposited in the museum in Klobouky u Brna, while some others were transferred to the Museum in Mikulov at the end of the 1960s and are still deposited there (e.g. Ošmera 1972, pp. 48–49; Unger 1973, pp. 10–11; 1983, p. 14; Kordiovský 1979, p. 20; Hosák-Zemek 1981, p. 38; Klanicová 1998, p. 41; Žákovský 2008, p. 462).

The dussack is 535 mm long in total and weighs 596 g; its broken blade is 390 mm long and it features a narrow double-sided fuller near its back. The blade slightly narrows toward the point from the initial 51 mm to 50 mm by the breaking point. It becomes thinner in the same way from 6 to 3 mm. Two identical marks in the form of imperial orb are stamped on the reverse side[4] of the blade. There are fragmentarily preserved shoulder-plates, fastened with two rivets to the blade shoulders. The tang, 145 mm long, continuously narrows from 33 to 29 mm. Similarly, it also becomes thinner, from 9 to 6 mm. The tang features 5 rivet holes of 6 mm in diameter, and a groove on its reverse side. The end of the tang is shouldered into a shank onto which a pommel of 10×38×27 mm in size is riveted. A sample was taken from the blade of the weapon for a metallographic examination.[5]

Metallographic description (Fig. 8; 9): Area I shows a structure of tempered martensite with the hardness of 468±64 HV0.5. Area II shows a structure of ferrite and fine pearlite (bainite) with grain-size of ASTM 9 and carbon content max. 0.5 to 0.6 % C. Area III shows, in close proximity to the edge, a needle-like structure, which is rather resistant to etching and which transforms toward the middle part of the blade into a mixture of polyhedric grains of ferrite and pearlite (grain-size of ASTM 7); carbon content does not exceed values of 0.6 to 0.7 % C and gradually drops along the back of the blade. The hardness of Area III is 174±4 HV0.5. Area IV is ferritic (grain-size of ASTM 5; hardness of 156±31 HV0.5). Area V reveals a carburised zone. Area VI consists of tempered martensite (402±45 HV0.5) sporadically marked with grains of troostite and bainite; the narrow strip of Area VII shows a grainy structure with the level of carbon content being max. 0.6 % and grain-size of ASTM 9.

Assessment: The blade is of a good quality with a steel edge (approx. 25% volumetric part in the blade), a steel back (approx. 25% share), and iron middle portion. The entire blade was water quenched and then tempered.

1.2. HORÁKOV (PRIVATE COLLECTION; FIGS. 1: A; 2:A; 5:A)

The weapon was found by a Brno citizen Mr. J. Šimo near an old farm track in the cadastre of Horákov in 2005. In its close proximity, a spur and a horse-bit fragment were found as well, dating back to the 15th c. The weapon is now in the private collection of the finder, and hereby, we would like to thank him for providing us with information about the exact site of the discovery (Žákovský 2008, p. 462).

The dussack is 430 mm long in total and weighs 448 g. It features a 290 mm long fragment of a non-profiled blade. Its width gradually drops toward the broken point from 52 mm to 50 mm at the breaking point. It gets thinner in the same way, from 6 to 4 mm. Two rivets have been preserved on both sides

[4] Both reverse and obverse sides (reverse and obverse flats) of the blade (in German as Fechbüchern Flach) are defined by location of the blade sides (flats) towards the body axis of the weapon holder. If the weapon is held in the right hand so that the blade tip is directed against an opponent and the cutting edge is directed to the ground, then the side (flat) of the blade directed outside the body axis of the holder (i.e. the right side of the blade from the view of the holder) is the obverse (or outer or dorsal) side (flat) of the blade. In contrast, the other side (flat), which is directed inward toward the axis of the body of the holder (i.e. the left side of the blade from the view of the holder), is called reverse (or inner) side (flat). This can also be explained by position of the sides of the blade when sheathed in a scabbard, which is suspended on the left side of the weapon owner. In such a case, the obverse (or outer) side faces outwards from the body, while the reverse (inner) side faces towards the body.

[5] In order to confirm the findings mentioned below a metallographic examination was performed on some of the weapons. The analytical samples were taken from the examined blades using a circular saw, processed in a standard way (embedded in methacrylate resin, ground wet using a set of sandpapers, polished using diamond paste) and examined after etching with 3% Nital (detection of the character and distribution of the basic structure of the samples) and with Oberhoffer solution (detecting the welding lines and distribution of zones richer and poorer in phosphorus). The structure was observed and documented using an Olympus BX 60 microscope, which allowed us to record the images digitally with an Olympus Camedia 5050ZOOM camera. The microhardness was determined on the Vickers scale by ZWICK 3212 and Wilson Wolper 401MVD hardness testers with 0.5 and 0.2 kg load. Apart from samples documenting the condition of the blades, additional samples were taken from the Horákov and Věteřov dussacks to be annealed at 930°C for one hour and then cooled in the furnace for 12 hours. Thereafter, the annealed samples were used to determine the carbon content present in individual parts of the blades using metallography and image analysis.

Fig. 1. General view of the investigated dussacks: a – Horákov (private collection); b -Boleradice (The Regional Museum of Klobouky u Brna, No Inv. No.); c – Pitín, the extinct medieval village of Miřín (The Museum of Bojkovsko Region in Bojkovice, Inv. No. HB 302); d – unknown find place (The Museum of Moravian Slovakia in Uherské Hradiště, Inv. No. H 1803); e – unknown find place (The Moravian Museum in Brno, No Inv. No.); f – Věteřov (private collection); g – unknown find place (The National Museum in Prague, Inv. No. H2–186945); h – Pelechov (The Museum of Eastern Bohemia in Pardubice, Inv. No. MIL 2498); i – unknown find place (The National Museum in Prague, Inv. No. 6602); j – Staré Město (The Museum of Moravian Slovakia in Uherské Hradiště, No Inv. No.); k – Starý Jičín (Museum of Novojičínsko region in Nový Jičín, Inv. No. 3495); l – Rokštejn (The Vysočina Museum in Třebíč, Inv. No. HA 1270); m – Mstěnice (The Moravian Museum in Brno, Inv. No. 75203); n – unknown find place (The National Museum in Prague, Inv. No. 104169); o – Lovčičky (private collection)

Fig. 2. Details of the tangs of the investigated dussacks: a – Horákov (private collection); b – Boleradice (The Regional Museum of Klobouky u Brna, No Inv. No.); c – Pitín, the extinct medieval village of Miřín (The Museum of Bojkovsko Region in Bojkovice, Inv. No. HB 302); d – unknown find place (The Museum of Moravian Slovakia in Uherské Hradiště, Inv. No. H 1803); e – Rokštejn (The Vysočina Museum in Třebíč, Inv. No. HA 1270); f – unknown find place (The Moravian Museum in Brno, No Inv. No.); g – Věteřov (private collection).

of the blade at its shoulders, which served to fasten the shoulder-plates. The blade extends into a 140 mm long tang equipped with a groove in its reverse side. The tang slightly broadens towards the pommel, from 30 mm to 35 mm. Similarly, it also becomes thicker, from 6 to 8 mm. The tang features 6 rivet holes of 6; 6; 5; 4; 8 and 7 mm in diameter; the hole nearest the blade shoulders must have served to fasten a side guard. The end of the tang is shouldered into a shank onto which a flat pommel of 8 mm in height, 42 mm in width and 28 mm in thickness is riveted. A sample was taken from the blade of the weapon for a metallographic examination.

Metallographic description (Fig. 10; 11): Tempered martensite with the hardness of 524±17 HV0.2 was found in Area I (the cutting edge), though the examination also revealed a small spot of ferrite in the upper part of Area I. The carbon content in the cutting edge ranges from 0.45 to 0.75 % C. The middle part of the blade is delimited by Area II and Area III. In Area II, tempered martensite with a hardness of 433±30 HV (approx. 0.4 % C) is predominant with sporadic zones containing a certain amount of ferrite. Area III shows a fine-grained (ASTM 8) ferritic-pearlitic (bainitic) structure with the hardness of 150±7 HV0.2 and the carbon content max. 0.3 %

Fig. 3. Details of the tangs of the investigated dussacks: a – Lovčičky (private collection); b – Mstěnice (The Moravian Museum in Brno, Inv. No. 75203); c – unknown find place (The National Museum in Prague, Inv. No. H2–186945); d – unknown find place (The National Museum in Prague, Inv. No. 6602); e – Starý Jičín (Museum of Novojičínsko region in Nový Jičín, Inv. No. 3495); f – Staré Město (The Museum of Moravian Slovakia in Uherské Hradiště, No Inv. No.).

Fig. 4. Details of the tangs of the investigated dussacks with shoulder-plates preserved almost in their entirety: a – unknown find place (Národní muzeum Praha, inv. č. 104169); b – Pelechov (Východočeské muzeum Pardubice, Inv. No. MIL 2498)

C. Area IV, the back of the blade, shows a structure of tempered martensite with the hardness of 512±28 HV0.2 and the carbon content ranging from 0.5 to 0.6% C.

Assessment: The blade consists of a steel edge (approx. 10% volumetric part in the blade), a steel back (approx. 20% part), and a middle portion being steel in the place of the blade sampling; however, the carbon content might fluctuate along the length of the blade and, most likely, the middle portion was at least partially made of wrought iron. The heat treatment of the blade consisted of quenching in water followed by tempering.

1.3. LOVČIČKY (PRIVATE COLLECTION; FIGS. 1: O; 3:A, 5:B)

The weapon was found by Mr. J. Brůha with the help of a metal detector in the woods near a church in the cadastre of Lovčičky. The weapon is now in the private collection of the finder, whom we would like to thank for granting us access to the weapon and providing us with information about the exact location of its discovery.

The total length of the dussack fragment is 257 mm. The fragment features a 111 mm long part of the blade, whose width originally continuously narrowed towards its point that is now broken off – the blade width measured at the shouldering is 45 mm, whereas its width at the point where the blade broke is 43 mm

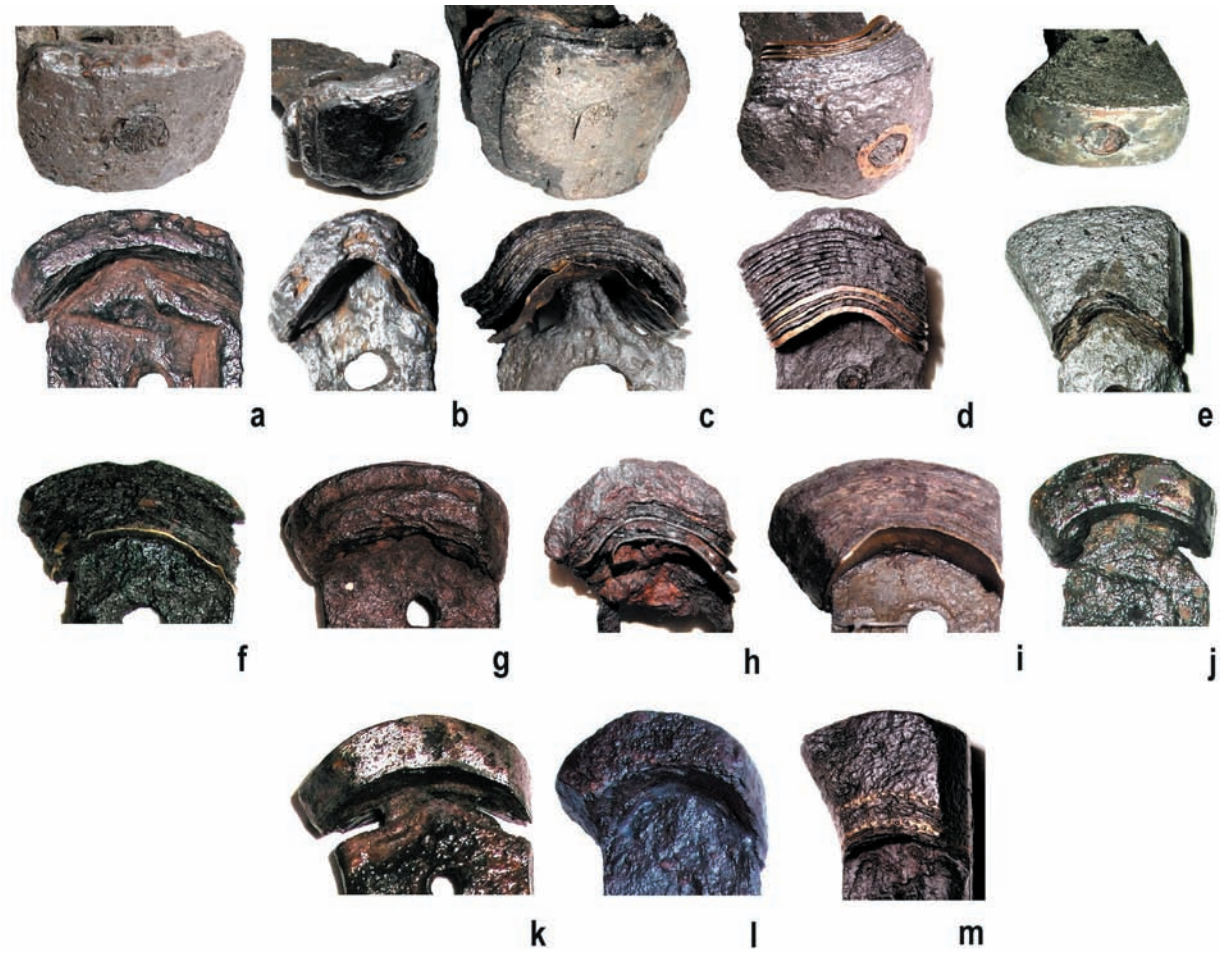

Fig. 5. Details of the pommels of the investigated dussacks: a – Horákov (private collection); b – Lovčičky (private collection); c – Mstěnice (The Moravian Museum in Brno, Inv. No. 75203); d – unknown find place (The National Museum in Prague, Inv. No. 104169); e – unknown find place (The National Museum in Prague, Inv. No. H2–186945); f – Staré Město (The Museum of Moravian Slovakia in Uherské Hradiště, No Inv. No.); g – Starý Jičín (Museum of Novojičínsko region in Nový Jičín, Inv. No. 3495); h – Rokštejn (The Vysočina Museum in Třebíč, Inv. No. HA 1270); i – unknown find place (The National Museum in Prague, Inv. No. 6602); j – Pitín, the extinct medieval village of Miřín (The Museum of Bojkovsko Region in Bojkovice, Inv. No. HB 302); k – Boleradice (The Regional Museum of Klobouky u Brna, No Inv. No.); l – unknown find place (The Museum of Moravian Slovakia in Uherské Hradiště, Inv. No. H 1803); m – Pelechov (The Museum of Eastern Bohemia in Pardubice, Inv. No. MIL 2498)

only. Accordingly the blade, 7–6 mm thick, gradually becomes thinner. The blade features a narrow but relatively deep fuller on both sides. The weapon was originally equipped with two shoulder-plates at the blade shoulders, as testified by two preserved rivets, whose purpose was to hold the shoulder-plates. The blade extends into a tang, which is 146 mm long. The tang broadens continually towards the pommel from initial 24 mm to 32 mm. The tang features an indistinctive reverse-side groove in which five rivet holes of 5, 8 and 10 mm in diameter are situated; original rivets had to serve both to hold handle scales and fasten the side guard. The end of the tang is shouldered into a shank onto which the strongly curved short pommel was riveted. The pommel is 9 mm long, 32 mm wide and 29 mm thick. Both the top surface and the edge of the pommel are decorated with four distinctive crosswise incisions. The weapon part weighs 258 g.

1.4. MSTĚNICE (THE MORAVIAN MUSEUM IN BRNO, INV. NO. 75203; DEPOSITED AT THE MUNICIPALITY OF HROTOVICE; FIGS. 1:M; 3:B; 5:C)

The dussack was found during a systematic archaeological excavation of a stronghold situated within the area of the perished village of Mstěnice u Hrotovic (Nekuda 1960, fig. III:a; 1961, p. 12; 1985, pp. 139–141, fig. 196:a).

The dussack part is 378 mm long in total and features a 235 mm long stub of an non-profiled blade which is 47 mm wide at its maximum. The blade probably gradually narrowed towards the broken

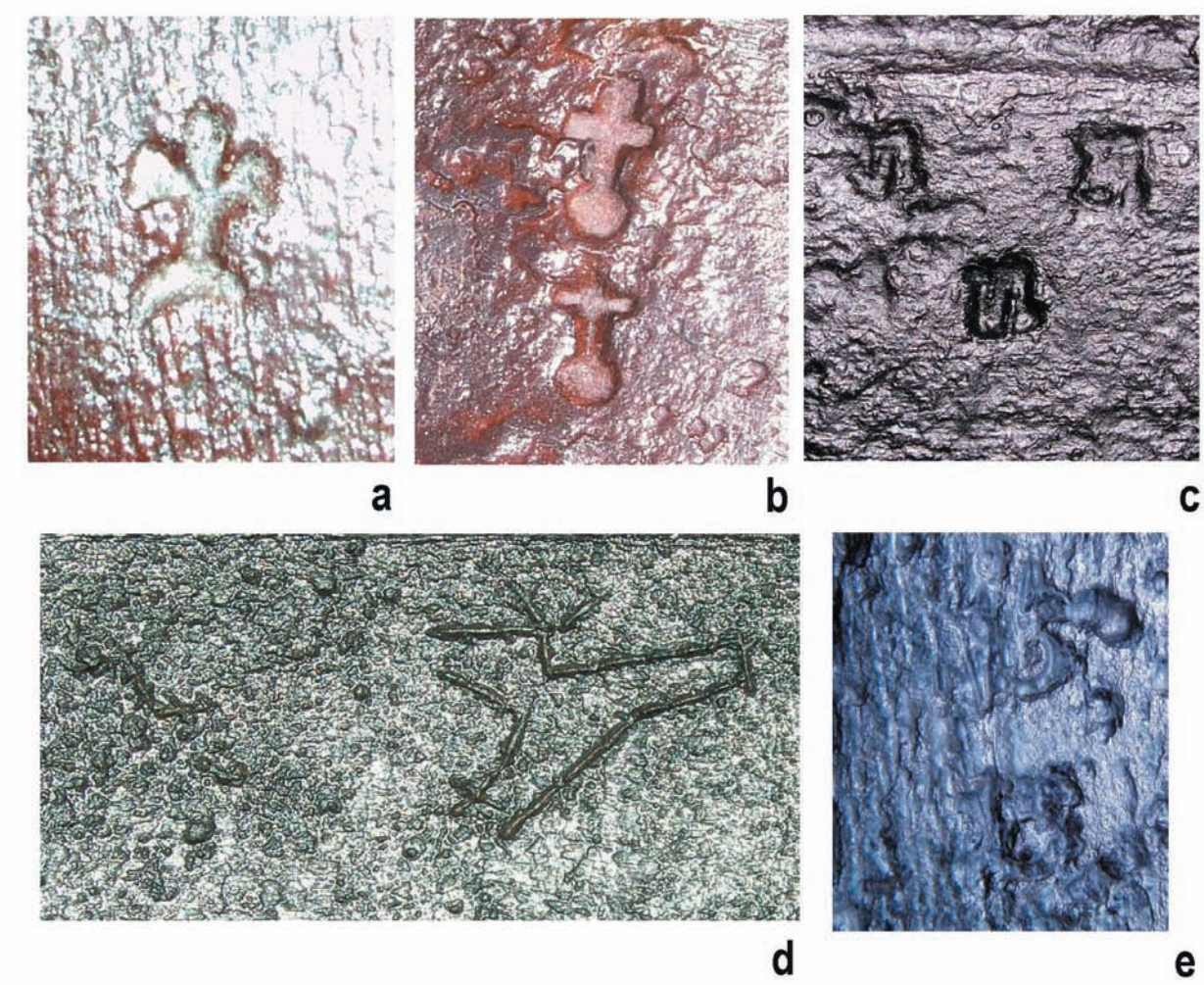

Fig. 6. Details of the marks on the investigated dussacks: a – unknown find place (The Moravian Museum in Brno, No Inv. No.); b – Boleradice (The Regional Museum of Klobouky u Brna, No Inv. No.); c – Pelechov (The Museum of Eastern Bohemia in Pardubice, Inv. No. MIL 2498); d – unknown find place (The National Museum in Prague, Inv. No. H2–186945); e – Věteřov (private collection)

point, since it is only 36 mm wide at the breaking point. Accordingly the blade gradually becomes thinner, from 6 to 2 mm. The indisputable absence of shoulder-plates is of interest. The blade with two shoulders extends into a tang, which is 143 mm long and broadens continually towards the pommel from 27 mm to 35 mm, while its thickness is invariably 7 mm. The tang features a front-side groove, distinctively bordered on one side, in which holes for rivets were situated. One of the rivets, of 15 mm in diameter, has been fully preserved; others have been preserved only partially, some not at all. The end of the tang is shouldered into a short shank with a distinctively stacked flattish pommel riveted onto it. The pommel is 9 mm long, 41 mm wide and 32 mm thick. The pommel features two crosswise grooves incised in its top surface. The pommel is equipped with a yellow metal washer on its bottom side. The weapon part weighs 247 g.

1.5. PELECHOV (THE MUSEUM OF EASTERN BOHEMIA IN PARDUBICE, INV. NO. MIL 2498; FIGS. 1:H; 4:B; 5:M; 6:C)

The weapon was found in the cadastre of Pelechov; no specific details of the circumstances and location of its finding are known.

It is one of the best-preserved dussacks of the examined type. The weapon is 798 mm long in total and features a 642 mm long damaged blade, whose width gradually narrows towards the broken tip from initially 68 mm to 58 mm. Accordingly the blade gradually becomes thinner, from 4 to 1 mm. The blade features a narrow fuller on both its sides situated near the back of the blade. The back is decorated with three embossed marks in the shape of a mirrored capital letter “N” or a horizontally positioned capital letter “S.” Moreover, the blade features almost perfectly preserved shoulder-plates, made of yellow

metal, which are fastened to the blade by two rivets. The folds of both shoulder plates are decorated with simple engraved grill grids. The folds also contain preserved petrified remnants of the original wooden handle scales. The shouldered blade extends into a tang, which is 156 mm long with the constant width of 34 mm along its whole length. Unlike the blade, the tang thickness continually and distinctively drops towards the pommel from original 8 mm to mere 2 mm. The tang features six rivet holes of 6 mm in diameter, which served for fastening the partially preserved wooden handle scales and a side guard. From the side guard, however, only a fragment of its neck 6 mm in diameter has been preserved. Also three rivet torsos have been preserved in the weapon handle showing that tubular rivets were used, made from coiled 1 mm thick iron sheet. The end of the tang is shouldered into a shank onto which a block pommel is riveted. The pommel is 36 mm long with faceted edges. Its width gradually grows on one side from 37 mm to final 47 mm on the top end. The thickness of the pommel is constant 33 mm along its whole length. The pommel is equipped with two plate inserts made of yellow metal, whose edges are decorated with hammered rings. The weapon part weighs 1034 g.

1.6. PITÍN (THE MUSEUM OF BOJKOVSKO REGION IN BOJKOVICE, INV. NO. HB 302; FIGS. 1:C; 2:C; 5:J)

The dussack was found by excavator operator B. Diatel from Rudimov during clearing the forest edge from individual trees in order to expand pastures in the area of "*Miřinky*" in 1970. The operator handed the weapon to Mr. J. Juračka, who delivered it to the museum collections in Bojkovice. This find initiated an archaeological surface survey in 1971 that evidenced a location of the extinct village of Miřín in the very area (Snášil 1972, pp. 112–113; Michna 1972, p. 318; Žákovský 2008, p. 462).

The dussack is 535 mm long and features a 390 mm long fragment of a non-profiled blade. The blade width gradually drops toward the broken tip from initial 57 mm to 40 mm at the breaking point. It becomes thinner in the same way, from 5 to 2 mm. Remnants of a shoulder-plate have been preserved on both sides of the blade at its shoulder. The shoulder-plate was fastened to the blade by two rivets. The blade with two shoulders extends into a tang, which is 145 mm long and it features a groove distinctively bordered on one side and situated on the obverse-side of the tang. The tang width slightly grows towards the pommel from 32 mm to 35 mm, while its thickness ranges between 7 and 6 mm. The tang features 6 holes of relatively constant diameter of 5 mm that originally served to fasten handle scales and a side guard. Also, torsos of three tubular iron rivets have been preserved in three of the holes. The tang is shouldered at the end into a short shank onto which a block pommel is riveted. The pommel is 14 mm long, 44 mm wide and 30 mm thick. The weapon weighs 555 g.

1.7. ROKŠTEJN (VYSOČINA MUSEUM IN TŘEBÍČ, INV. NO. HA 1270; FIGS. 1:L; 2:E; 5:H)

The weapon part was found during a survey led by Mr. B. Coufal, probably in the area of the upper palace and presumably within the time-horizon of the castle existence, which used to be dated between 1423–1432; however, the castle was still in use in 1465, as testified by written records.

The dussack part was shattered into several preserved fragments, which makes the metrical description difficult. This very fact has led some authors to claim wrongly that the fragments actually comprise remnants of two dussacks (Krejsová 2007, p. 267). A fragment of the blade with the tang and a part of the tang with a pommel serve best for measuring the weapon. The total length of the preserved fragments, when put together, can be estimated as 435 mm. The dussack fragments feature a 250 mm long part of a non-profiled, double-shouldered blade. The blade width gradually drops toward the broken point from 50 mm at its measurable maximum to its minimum of 32 mm at the breaking point. Accordingly the blade gradually becomes thinner, from 9 to 3 mm. Remnants of iron shoulder-plates have been preserved on both sides of the blade at its shoulder. The shoulder-plates were fastened to the blade by two rivets. The estimated length of the tang is 185 mm. Its width of 28 mm was presumably constant along the whole of the tang. Unlike the width of the tang, its thickness drops rather distinctively towards the pommel from initially 11 mm to final 3 mm. The tang features an indistinctive obverse-side groove with five rivet holes of 5 mm in diameter and with several remnants of rivets preserved. The rivets are tubular, made from coiled 1 mm thick iron sheet. Since the whole surface of the artefact crumbled in layers, lots of fragments varying in size have been preserved which originated both from the tang and the blade. The end of the tang was narrowed on both sides into a short thorn with a short distinctively stacked pommel riveted onto it. The pommel is 45 mm long, 41 mm wide and 19 mm thick. The pommel is decorated with a visually very effective ornament, based on alternating materials of different colours – there are two plates of yel-

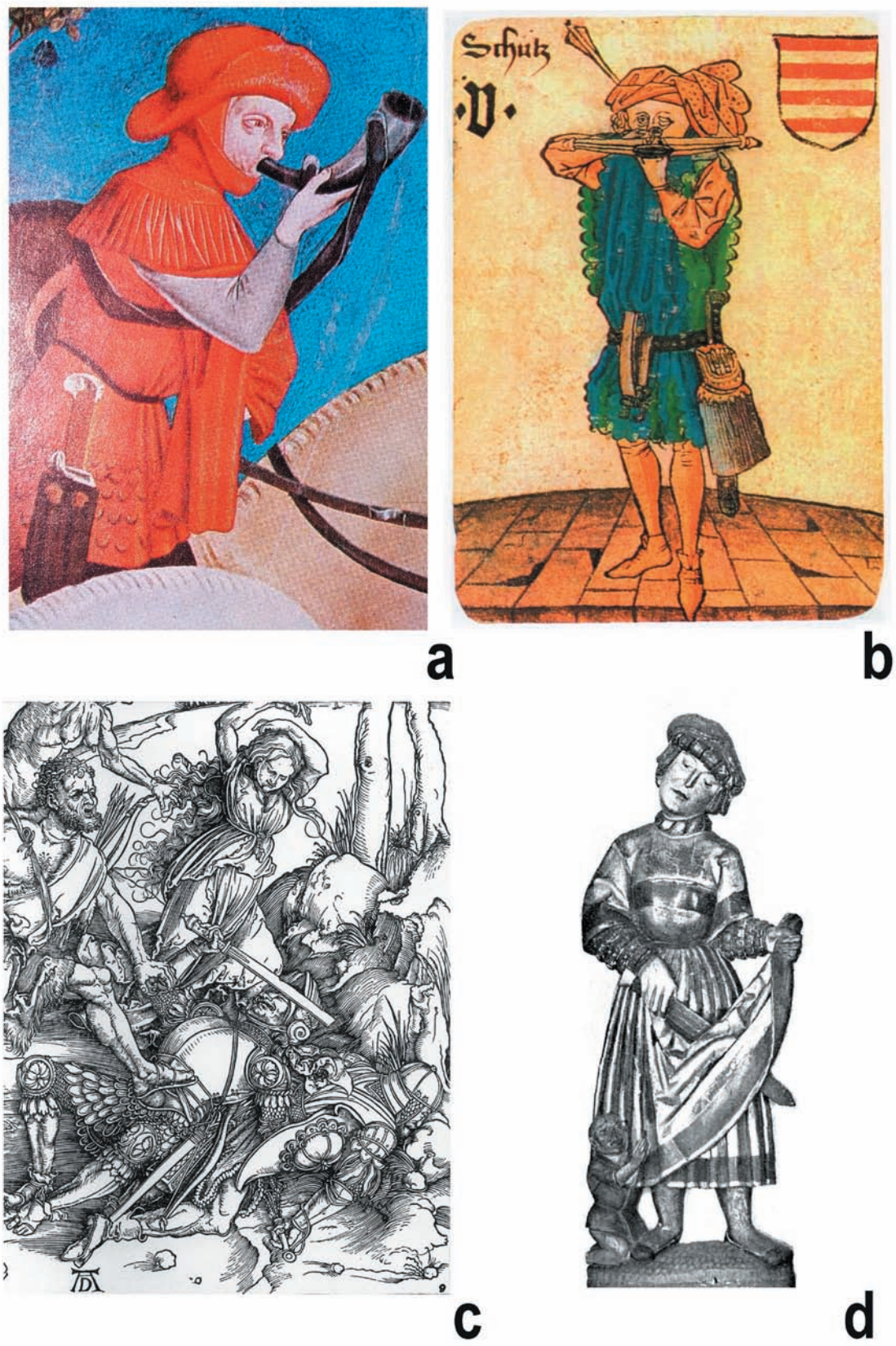

Fig. 7. Iconographic sources for the studied type of dussacks: a – A detail from a panel painting by the Master of the Polling Panels (from Nagy 1972, fig. 10); b – A playing card dating back to 1440–1445 from the collections of the Kunsthistorisches Museum in Vienna (author's archive); c – A woodcut by Albrecht Dürer depicting Hercules (e.g. Fischer 1938, Plate 3); d – the figure of St. Martin on the Altar of St. Wenceslas in Libkovice dating back to 1520s (from Opitz 1929, fig. 3:a)

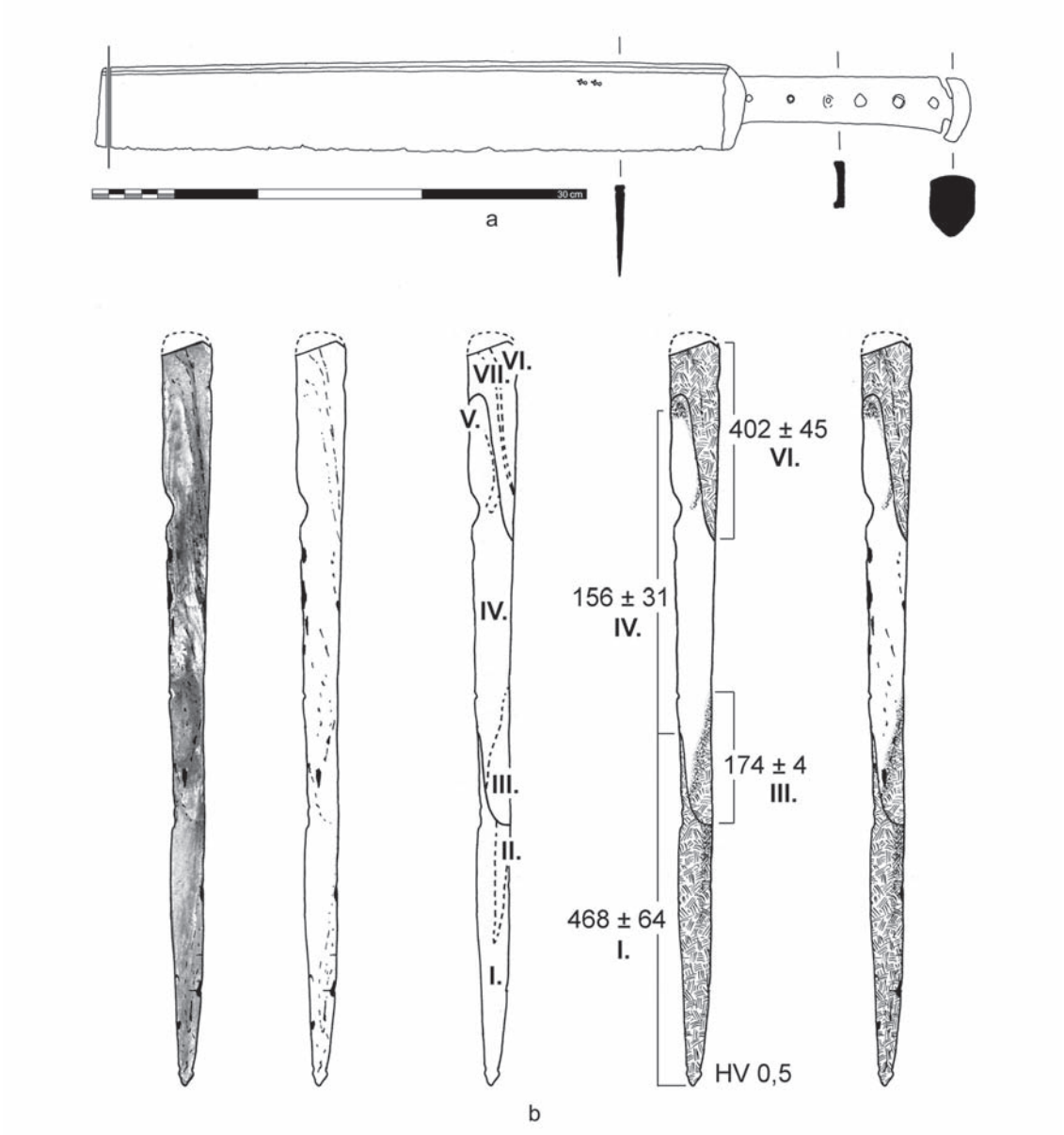

Fig. 8. The dussack from Boleradice: a – the dussack examined and the sampling method used; b – drawings of examined samples taken from the blade (from the left: after etching with Oberhoffer solution, a drawing of non-etched state (inclusions), distribution of described areas, schematic demonstration of structure and hardness, schematic demonstration of structure (with inclusions)

low metal inserted in the lower part of the pommel alternating with iron plates. The total weight of all preserved fragments that can be connected to the surveyed weapon is 234 g.

1.8. STARÉ MĚSTO (THE MUSEUM OF MORAVIAN SLOVAKIA IN UHERSKÉ HRADIŠTĚ, NO INV. NO.; FIGS. 1:J; 3:F; 5:F)

According to the fragmentary information which is available, the dussack was most probably found within the cadastre of Staré Město near Uherské Hradiště.

The preserved dussack part is 380 mm long in total and features a 260 mm fragment of a non-profiled blade. The blade width gradually drops towards the indistinct point situated in the axis of the blade from initial 47 mm to 39 mm at the beginning of the point. Two shoulder-plates were originally fastened to the blade at its shoulders, as testified by two preserved rivets, whose purpose was to hold the shoulder-plates. The blade with two shoulders extends into a tang, which is 120 mm long with constant width of 23 mm along its whole length. Its thickness ranges between 5 and 4 mm. The tang features an obverse-side groove

with six holes for rivets, of 7 mm in diameter, which served both to hold handle scales and fasten a side guard. The end of the tang was shouldered into a short shank with a distinctively 10 mm long stacked block pommel riveted onto it. Towards its top, the pommel width gradually grows on one side from 25 mm to final 35 mm, while its thickness is invariably 20 mm. The bottom side of the pommel is equipped with a yellow metal washer. The weapon weighs 285 g.

1.9. STARÝ JIČÍN (MUSEUM OF NOVOJIČÍNSKO REGION IN NOVÝ JIČÍN, INV. NO. 3495; FIGS. 1:K; 3:E; 5:G)

The dussack was supposedly found by Lieut. Bartoň within the territory of the castle of Starý Jičín in the 1930s (Knápek 2009, p. 175, fig. 1).

The almost completely preserved dussack is 470 mm long in total and features a 320 mm long non-profiled blade. The blade width gradually drops towards the indistinct point situated in the axis of the blade from initial 69 mm to 61 mm at the beginning of the tip. A robust protective ferrule with a faceted top edge is threaded and probably hammered on the blade shoulder. The blade with two shoulders extends into a tang, which is 150 mm long and broadens continually towards the pommel from initial 31 mm to 35 mm, while its thickness is invariably 6 mm. The tang features an obverse-side groove, distinctively bordered on one side. The tang is set with five holes for rivets of 6 mm in diameter, which served both to hold handle scales and fasten a side guard. The end of the tang was shouldered into a short shank which is shouldered on both sides and features a short block pommel 13 mm long. Towards its top, the pommel width gradually grows on one side from initial 37 mm to final 44 mm, while its thickness constantly stays 29 mm. The weapon weighs 531 g.

1.10. VĚTEŘOV (PRIVATE COLLECTION; FIGS. 1: F; 2:G; 6:E)

The weapon was found by Mr. K. Burian with the help of a metal detector in the cadastre of Věteřov between Věteřov and the village of Sobůlky in 2008. According to the finder, the weapon was found in a place with recognisable remnants of a hollow way. The weapon is now in the private collection of the finder, whom we would like to thank for access to the weapon and for providing us with information about the exact site of its discovery.

The dussack part is 582 mm long in total and features a 467 mm long fragment of a non-profiled blade. The blade width gradually drops toward the broken tip from initial 42 mm to 38 mm at the breaking point. It becomes thinner in the same way, from 8 to 3 mm. Remnants of embossed marks have been preserved on the back of the blade, which can be interpreted – with some imagination – as lower-case letter “h” or “b.” The indisputable absence of shoulder-plates is of interest. The blade with two shoulders extends into a tang, which is 115 mm long with constant width of 30 mm along its length. But its thickness gradually drops towards the broken pommel from initially 8 to 6 mm. The tang features an obverse-side groove with six holes for rivets of 4–6 mm in diameter, which served to fasten both handle scales and a side guard. There has been only a part of the seventh hole preserved at the edge where the rest of the tang broke off. The total weight of the weapon part is 495 g. A sample was taken from the blade of the weapon for a metallographic examination.

Metallographic description (Fig. 12; 13): Area I, which forms “coating” of the sample, shows a structure of tempered martensite with the hardness of 423±63 HV0.2 whose carbon content ranges from 0.4 to 0.5 % C; the cutting edge shows the hardness of around 400 HV0.2 (carbon content not determined). The tempered martensite is accompanied with sporadically scattered fine grains of troostite and, in one place on the back of the blade, ferrite. Area II shows a fine-grained ferritic-pearlitic (bainitic) structure (approx. ASTM 8) with a hardness of 179±3 HV0.2 and carbon content max. 0.15 % C. Area III shows a structure of ferrite with traces of pearlite; its hardness is 132±11 HV0.2, grain size ASTM 7–6. Area IV forms a bridge between the steel and iron parts and consists of martensitic structure extending from the border of Area I to the ferritic-pearlitic structure at the border of Areas II and III.

Assessment: The blade has an iron core (approx. 50% volumetric part in the blade) with a steel coating (it can be described as with steel sides as well). The blade was quenched and then tempered.

1.11. UNKNOWN FIND PLACE (THE MUSEUM OF MORAVIAN SLOVAKIA IN UHERSKÉ HRADIŠTĚ, INV. NO. H 1803; FIGS. 1:D; 2:D; 5:L)

Unfortunately, there is no information available regarding the location the weapon was found at. We can only presume it was found somewhere in the outer vicinity of the city of Uherské Hradiště (Žákovský 2008, p. 462).

The dussack is 516 mm long in total and features a 364 mm long fragment of a non-profiled blade. The blade width gradually drops toward the broken point from initial 56 mm to 45 mm at the breaking point. Accordingly the blade gradually becomes thinner,

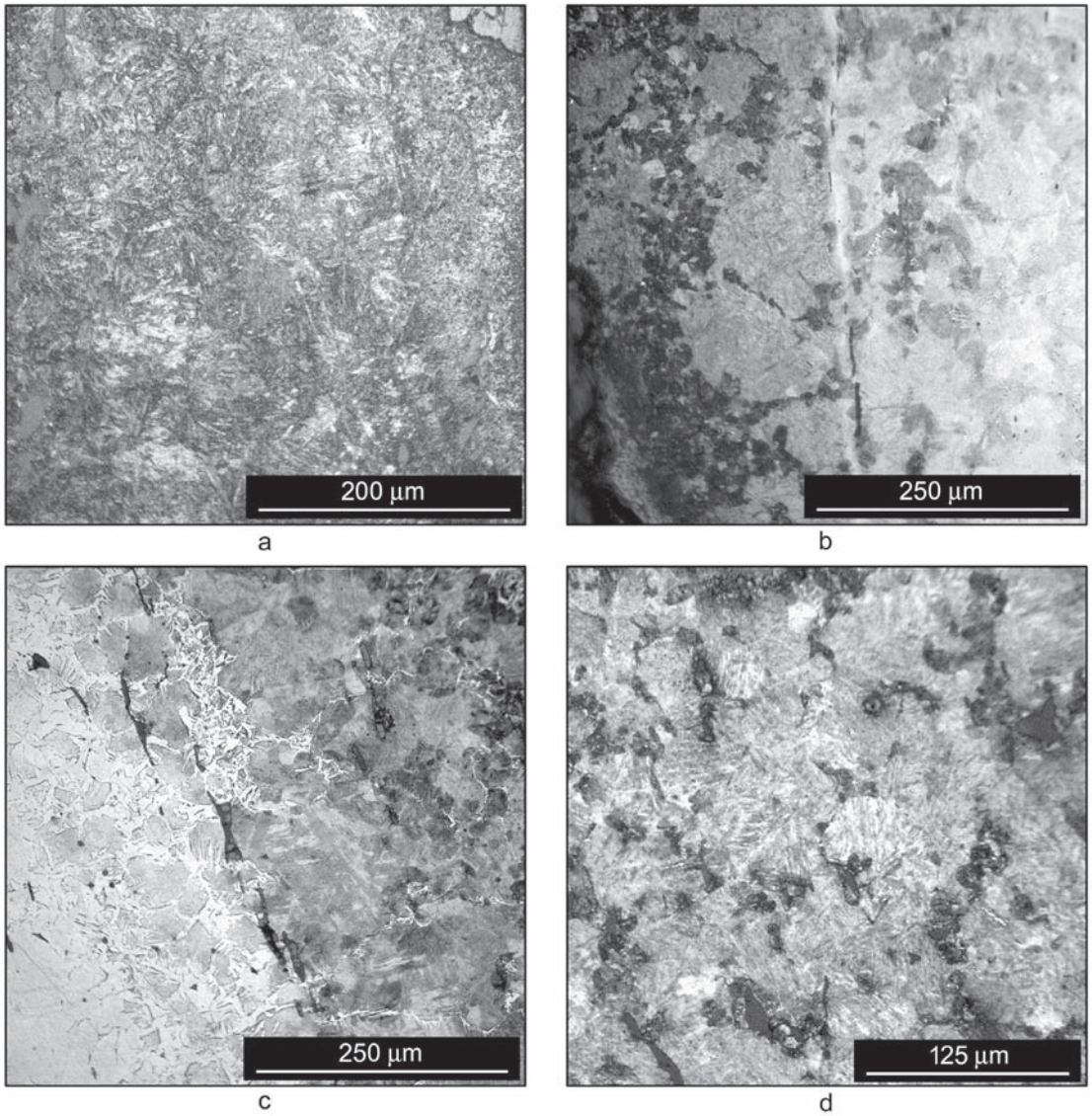

Fig. 9. The dussack from Boleradice: a – tempered martensite in the cutting edge of the blade (Area I); b – a needle-like structure of the blade in Area III near the welding line; c – a bridge between steel and iron parts of the blade in Areas IV and V; d – martensitic structure of Area VI

from 5 to 2 mm. Remnants of shoulder-plates have been preserved at the blade shoulder. The shoulder-plates were originally fastened to the blade by two rivets. The blade extends into a tang, which is 152 mm long and broadens slightly towards the pommel from initial 27 mm to 35 mm, while the thickness of the tang stays almost constantly 7 mm along its length. The tang features four rivet holes of 5 mm in diameter situated in an indistinctive groove; original rivets served to fasten both handle scales and a side guard. The tang is shouldered into a short shank onto which a short block is riveted. The pommel is 16 mm long, 45 mm wide and 31 mm thick. The total weight of the weapon is 598 g.

1.12. UNKNOWN FIND PLACE (THE MORAVIAN MUSEUM IN BRNO, NO INV. NO.; FIGS. 1:E; 2:F; 6:A)

Same as with the previous specimen, there is no evidence regarding the location the weapon was found at. We can only presume, hypothetically, that the weapon was probably found in the region of South Moravia (Žákovský 2008, p. 462).

The dussack part is 495 mm long in total and features a 364 mm long fragment of a non-profiled blade. The blade width gradually drops towards the broken point from initial 51 mm to 38 mm at the breaking point. Accordingly the blade gradually becomes thinner, from 6 to 3 mm. Marks in the shape

of fleur-de-lis or imperial orb are embossed in the upper part of the back of the blade. Iron shoulder-plates were fastened on the blade at its shoulder by two rivets. Large remnants of these shoulder-plates have been preserved on the weapon. The blade with two shoulders extends into a tang, which is 131 mm long and broadens continually towards the pommel from 28 to 34 mm, while its thickness varies between 7 and 8 mm. The tang features three rivet holes of 13 and 9 mm in diameter located in an obverse-side groove distinctively bordered on one side. The rivet holes served to fasten both handle scales and a side guard. The tang is shouldered into a short shank 16 mm long onto which a pommel used to be riveted, now lost. The dimensions of the shank suggest that the pommel was 15 mm long. The weapon part weighs 454 g.

1.13. UNKNOWN FIND PLACE (THE NATIONAL MUSEUM IN PRAGUE, INV. NO. H2–186945; FIGS. 1:G; 3:C; 5:E; 6:D)

The weapon was purchased by the National Museum in Prague for its collections in 2002; however no information about the location the weapon was found at were available.

The preserved dussack is 798 mm long in total and it features a 629 mm long, slightly damaged non-profiled blade. The blade width gradually drops towards the indistinct point situated in the axis of the blade, from the initial 51 mm to the final measurable 12 mm. The blade becomes thinner in the same way, from 5 to 1 mm. The blade was provided with an engraved and originally undoubtedly inlaid mark, which can be identified as part of a mark in the shape of the "Passau wolf." Remnants of iron shoulder-plates have been preserved at the shoulders of the blade. The shoulder-plates were fastened to the blade by two rivets. The blade extends into a tang, which is 169 mm long and narrows slightly but continually towards the pommel from initially 30 to 29 mm, while its thickness varies between 7 and 6 mm. The tang features an obverse-side groove with seven rivet holes of 7–5 mm in diameter, which served to fasten both handle scales and a side guard. The end of the tang is shouldered into a short shank onto which a 34 mm long pommel with faceted is riveted. The pommel width gradually grows on one side from the initial 32 mm to final 44 mm. By contrast, its thickness gradually declines towards the end from 22 mm to final 20 mm. The weapon weighs 748 g.

1.14. UNKNOWN FIND PLACE (THE NATIONAL MUSEUM IN PRAGUE, INV. NO. 104169; FIGS. 1:N; 4:A; 5:D)

The dussack part comes from the old collections of the institution. Unfortunately no information about the location the weapon was found at is available (Petráň 1985, p. 729, fig. 618; Dolínek-Durdík 1995, pp. 87–89, fig. 100).

The preserved dussack part is 310 mm long in total and it features a 156 mm long fragment of a non-profiled blade. The blade width gradually drops toward the broken tip from initial 70 mm to 64 mm at the breaking point. Accordingly the blade gradually becomes thinner, from 5 to 3 mm. Both yellow metal shoulder-plates, fastened to the blade at its shoulder by two rivets, have been almost completely preserved. Folds of the shoulder-plates are decorated with engraved diagonal lines. The blade with two shoulders extends into a tang, which is 154 mm long and broadens continually towards the pommel from 33 mm to 36 mm, while its thickness varies between 6 and 5 mm. The tang features an indistinctive obverse-side groove with six rivet holes of 6 mm in diameter, which served both to hold handle scales and fasten a side guard. Torsos of three iron rivets have been preserved in three of the holes; the rivets, which can be described as tubular, were made from coiled 1 mm thick iron sheet. The end of the tang is shouldered into a short shank onto which a short, layered block pommel is riveted. The pommel is 24 mm long, 44 mm wide and 28 mm thick. The pommel is decorated with a very impressive ornament, made by alternating materials of different colours – there are three plates made of yellow metal inserted in the lower part of the pommel alternating with iron plates. The top side of the pommel is decorated in a simple way: the riveted end of the shank was underlain with a yellow metal washer. The total weight of the weapon part is 472 g.

1.15. UNKNOWN FIND PLACE (THE NATIONAL MUSEUM IN PRAGUE, INV. NO. 6602; FIGS. 1:I; 3: D; 5:I)

The dussack was donated to the collections of the National Museum in Prague by the Czech Society of Antiquaries in 1906; however, no information regarding location of the find was then supplied.

The almost completely preserved dussack is 413 mm long in total and features a 281 mm long blade. The blade width gradually drops towards the indistinct tip situated in the axis of the blade from initial 56 mm to 49 mm at the beginning of the tip. Similarly the blade becomes thinner, from 6 to 3 mm. The blade

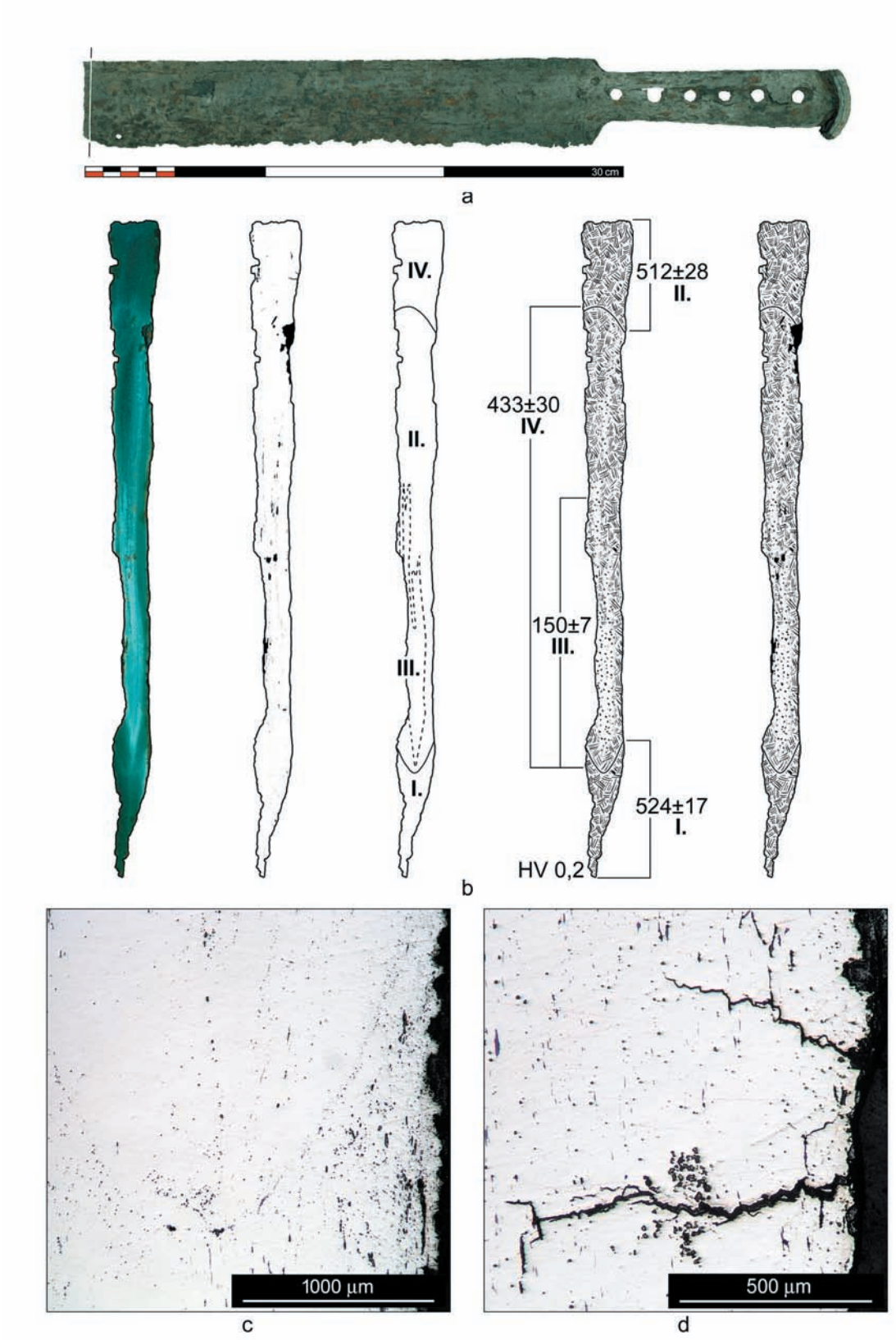

Fig. 10. The dussack from Horákov: a – the dussack examined and the sampling method used; b – drawings of examined samples taken from the blade (from the left: after etching with Oberhoffer solution, a drawing of non-etched state (inclusions), distribution of described areas, schematic demonstration of structure and hardness, schematic demonstration of structure (with inclusions); c – inclusions delimiting the welding line that connects the cutting edge to the middle portion of the blade; d – lateral cracks in the back of the blade; non-etched (c, d)

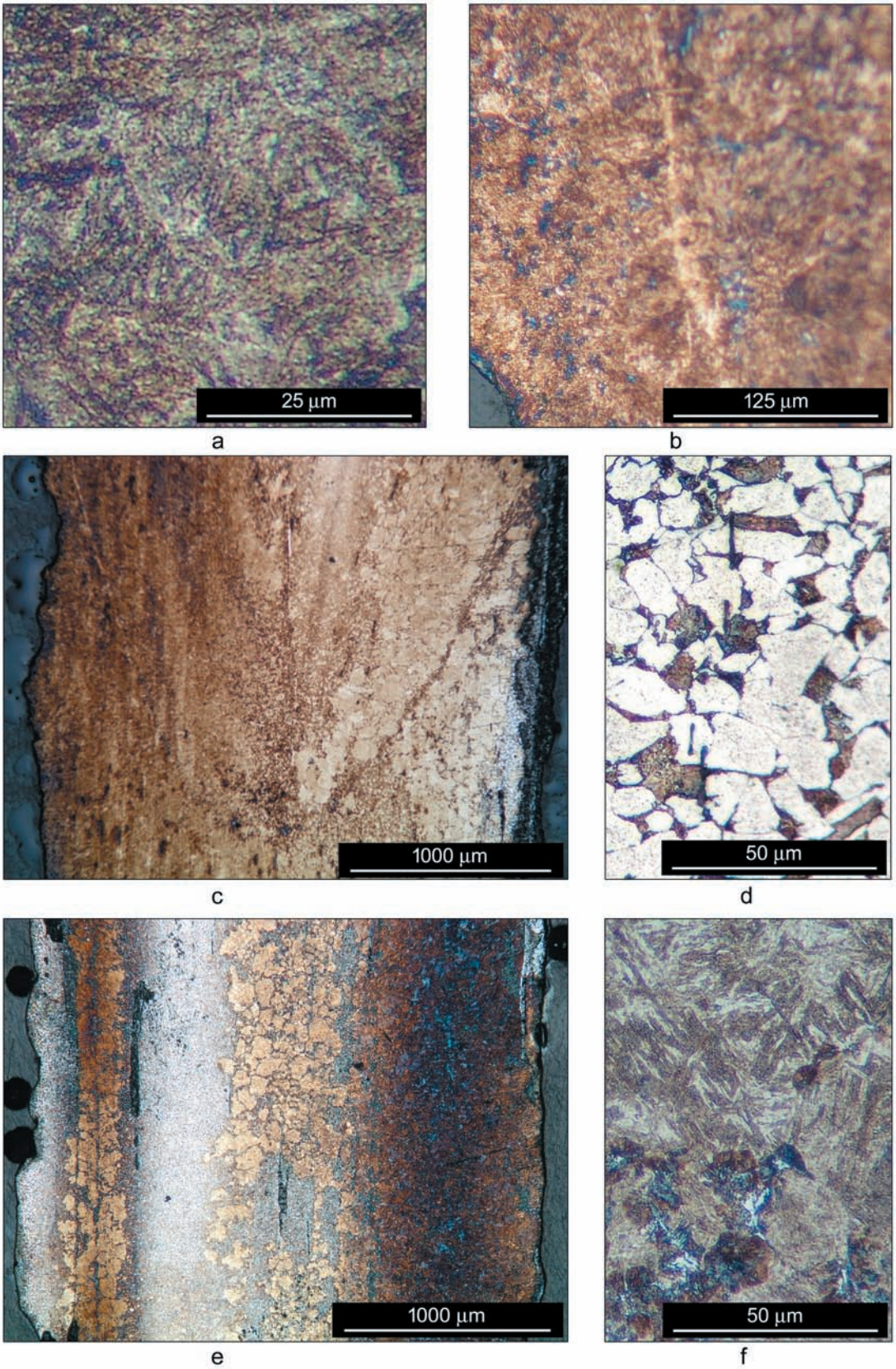

Fig. 11. The dussack from Horákov: a – tempered martensite in the cutting edge of the blade (Area I); b – distinguishable welding line delimiting the connection of the cutting edge to the middle portion of the blade; c – the connection of the cutting edge to the middle portion of the blade; d – ferritic-pearlitic (bainitic) structure in Area III; d –the layering of the middle portion of the blade (Areas II and III); f – tempered martensite with a small amount of ferrite and fine-grained pearlite or bainite; etched with Nital (a, d, f) and with Oberhoffer solution (c, e)

is equipped with a narrow fuller on both sides; the fuller ends in the last fifth of the blade length. The weapon has undergone conservation treatment, which entirely denuded the metallic surface and allows to optically distinguish the parts consisting of quenched steel from the parts made of iron. This helped to assess the way of blade manufacturing – a steel cutting edge and a steel back were welded onto an iron middle portion. Moreover, the blade features both almost perfectly preserved shoulder-plates, which are fastened to the blade by two rivets at the blade shoulders. The blade extends into a tang, which is 132 mm long and it broadens slightly but continually towards the pommel from initial 24 mm to final 28 mm. Unlike the width of the tang, its thickness drops rather distinctively towards the pommel from the initial 9 to 3 mm. The tang features an obverse-side groove, distinctively bordered on one side, with five rivet holes of 5–6 mm in diameter, which served to fasten both handle scales and a side guard. The end of the tang is shouldered into a short shank with a block distinctively stacked pommel riveted onto it. The pommel is 15 mm long. Towards its top, the pommel width gradually grows on one side from initial 32 mm to final 41 mm, while its thickness is invariably 25 mm. The pommel is equipped with a yellow metal washer on its bottom side. The weapon weighs 497 g.

2. BLADES

One of the characteristic features of the analysed dussacks is a rather broad blade, whose maximum width measured at the blade shoulder ranges between 40 and 70 mm. This makes them a group with the broadest type of blade ever for which L. Marek coined the term Type II blades (Marek 2008, pp. 49–55). Most blades of this type that have been documented so far are not profiled in any way (neither fullered nor grooved) as can be also seen on the dussacks from the Horákov area (Fig. 1:a), the historical village of Miřín (Fig. 1:c), Mstěnice (Fig. 1:m), Rokštejn (Fig. 1:l) or Věteřov (Fig. 1:f). Nearly all of the examples from unknown find places listed in this paper feature a non-profiled blade as well (Fig. 1:d,e,g,n). Also dussacks from Havraň (Brych 1998; fig. 4:6), Týřov (Durdík 1976, p. 69, Table XXVII), and Sułów (Marek 2008, p. 54; fig. 54:a), or a dussack from an unknown find place in the collection of the Polish Army Museum in Warszawa (Marek 2008, p. 49; fig. 46:b), and the Museum of Archaeology in Wrocław (Marek 2006, p. 203; 2008, p. 54; fig. 55b) were equipped with similar non-profiled blades. Only few blades are known to exist featuring one double-sided shallow and narrow – and thus probably scraped – fuller situated near the back of the blade. So far, such dussacks have been documented in the areas of Boleradice (Fig. 1:b), Pelechov (Fig. 1:h), and Lovčičky (Fig. 1:o). Broad blades with a single fuller situated near the back of the blade can also be found on dussacks from Wrocław-Poświętne (Marek 2008, pp. 53–54; fig. 54:b) or on pieces from unknown find places in the collection of the Bayerisches Nationalmuseum in Munich (Marek 2008; fig. 45:b), and the Polish Army Museum in Warszawa (Marek 2008, p. 49; fig. 46:a). Also the blade of the dussack whose discovery is usually ascribed to the excavations F. X. Franz carried out at Lopata Castle in the region of Pilsen is equipped with a single fuller (Novobilský 1995, p. 24; Frýda 1996, p. 532; Plate XCVIII). The exact location of this find is however disputable (e.g. Macháček 1926, p. 34).

Also the rather rarely found massive knife-like dussacks should fall into this category of dussacks as they share the same type of handle construction (including the dimensions) with the one-handed dussacks discussed above. Also the width of their blades ranges between 40 to 70 mm while their length ranges between 310 and 260 mm as may be concluded from the three pieces documented so far. The similarity of these knife-like weapons to the one-handed dussacks of the examined type is so close that in some cases it was not possible to determine whether the given blade fragment was a specimen of the knife-like or the one-handed dussack form. This refers to the dussack fragments from Lovčičky (Fig. 1:o), Mstěnice (Fig. 1:m), Rokštejn (Fig. 1:l), and above all to the fragment from an unknown find place in the collection of the National Museum in Prague (Fig. 1: n). Also the majority of the knife-like dussacks are equipped with unfullered blades. In principle, only the dussack from an unknown find place in the collection of the National Museum in Prague features a single double-sided and narrow fuller (Fig. 1:i).

The blades of this type, as far as we can see on the completely preserved pieces, had only an indistinct, usually even directly curved point, thus emphasizing their primary cutting function – this being true also about all for the knife-like forms mentioned above. Such a blade can also be found for example on a completely preserved dussack of the type in question

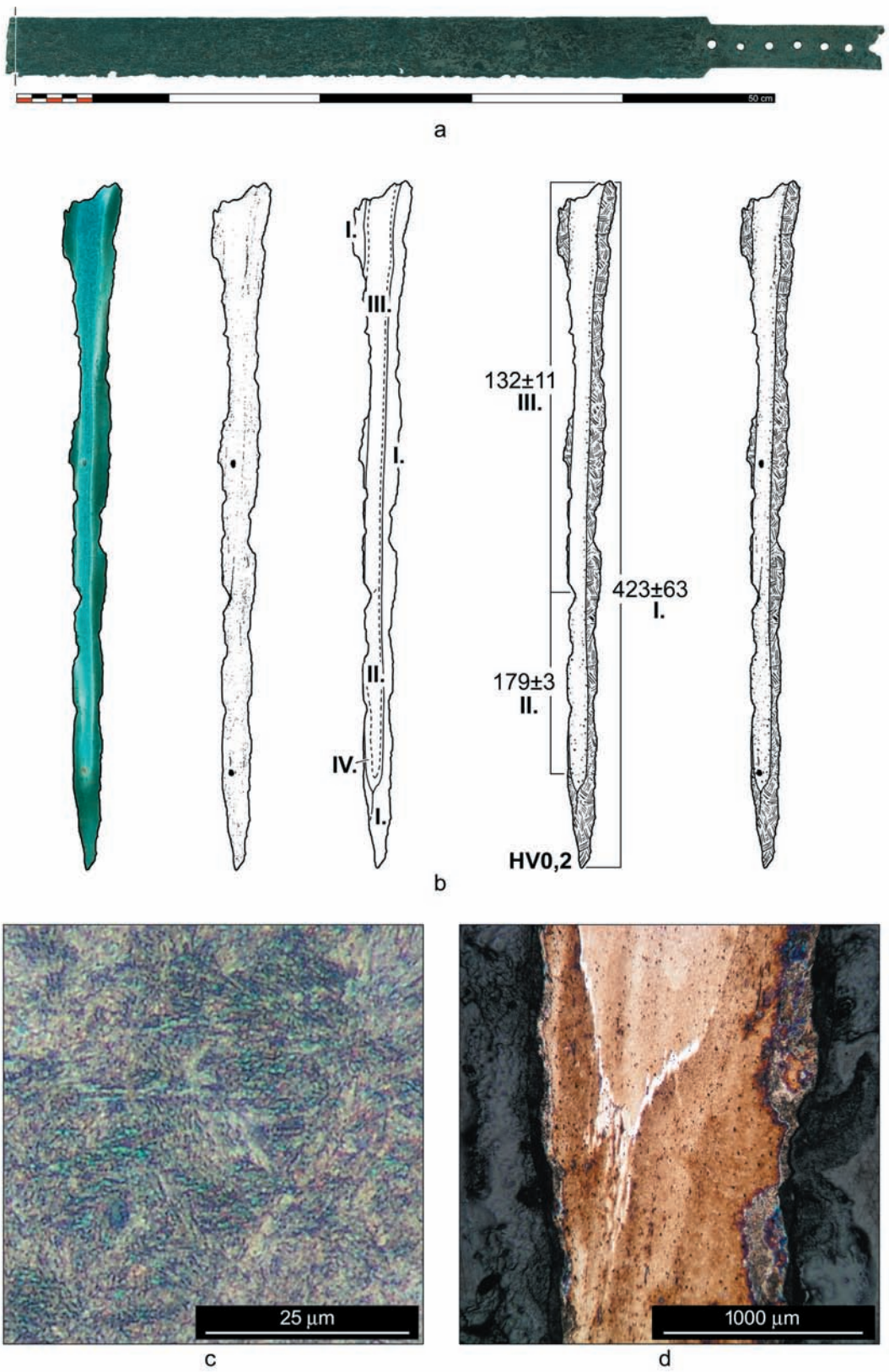

Fig. 12. The dussack from Věteřov: a – the dussack examined and the sampling method used; b – drawings of examined samples taken from the blade (from the left: after etching with Oberhoffer solution, a drawing of non-etched state (inclusions), distribution of described areas, schematic demonstration of structure and hardness, schematic demonstration of structure (with inclusions); c – tempered martensite in the cutting edge of the blade (lower part of Area I); d – welding lines (in the area of the cutting edge) between the steel coating of the blade and its core; non-etched (c, d)

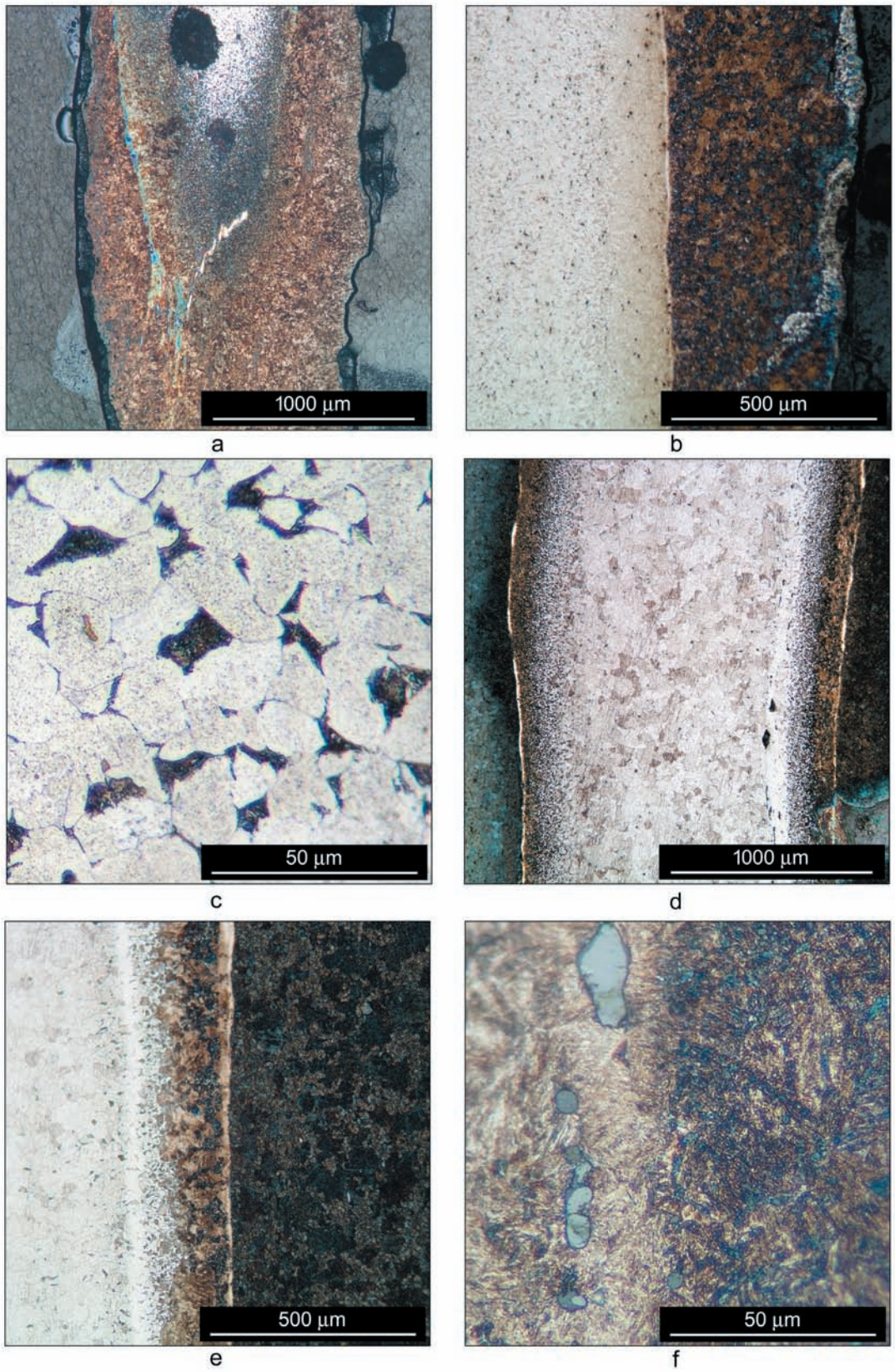

Fig. 13. The dussack from Věteřov: a – welding lines between the steel coating of the blade and its core in the area of the cutting edge; b – the dividing line between the steel coating (Area I) and the blade core (Area II); c – the ferritic-pearlitic (bainitic) structure in Area II; d – the ferritic core (Area III) between the steel sides of the blade (Area I); e – a close-up view of the connection of Area I to Area III via Area IV; f – tempered martensite in the back of the blade; etched with Nital (a, c-f) and with Oberhoffer solution (b)

Fig. 14. Selected details of the dussack from Horákov: a – layering visible under the pommel; b – a quenching crack in the cutting edge of the dussack

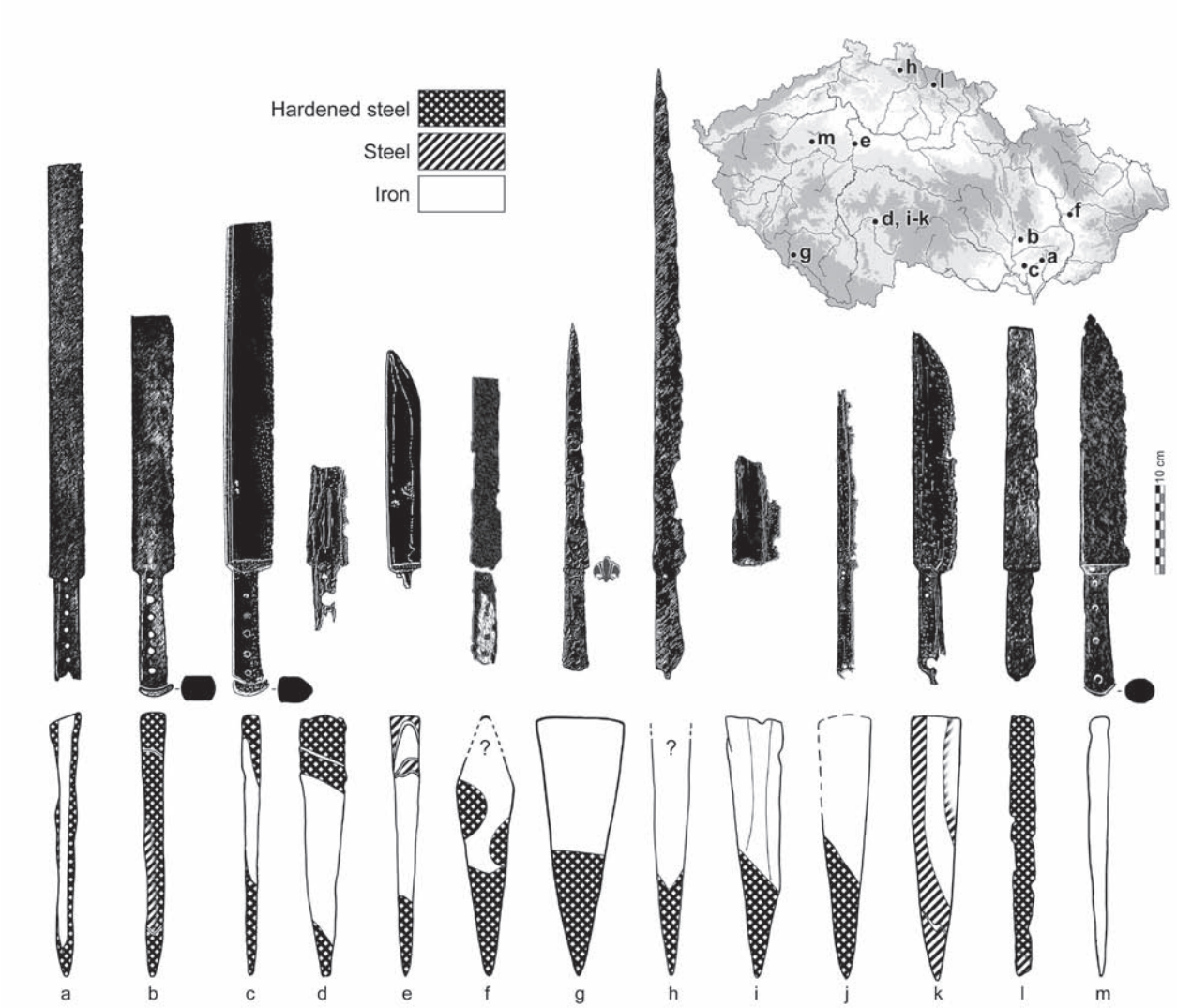

Fig. 15. An overview of metallographically examined dussacks from the area of the Czech Republic: a – Věteřov; b – Horákov; c – Boleradice; d – Sezimovo Ústí (698); e – Praha (650); f – Přerov; g – Horská Kvilda; h – Liberec; i – Sezimovo Ústí (697); j – Sezimovo Ústí (696); k – Sezimovo Ústí (693); l – Dolní Štěpanice; m – Krásná dolina; (d: Pleiner 2003, pp. 176, 183; Krajíc 2003, p. 128; e: Pleiner 1991, pp. 249–253; g: Hošek-Kudrnáč 2005; h: Hošek 2003, pp. 110–112; i, j, k: Pleiner 2003, pp. 175–176, 183; Krajíc 2003, pp.148–149, 129; l: Hošek 2003, p. 86; m: Malý 1973, pp. 18–19; Pleiner 1970, pp. 491, 514)

in the collection of the Armeemuseum in Ingolstadt (Ritter von Kern 1997, p. 59), or on a dussack which was most likely discovered as part of the research of F. X. Franz at Lopata Castle in the region of Pilsen (Novobilský 1995, p. 24; Frýda 1996, p. 532; Plate XCVIII). The blades of a richly embellished dussack from the collection of Zvíkov Castle (Žákovský 2008, pp. 461–469) and a dussack from the collection of Malbork Castle (Chodyński 2003, pp. 84, 86) fall within the same category, even though their hilts have slightly different forms of decoration. However, the blades of most dussacks of the type in question are damaged in a similar manner, where the blades are broken more or less perpendicularly to the axis of the weapon. In one case the weapon may have been damaged by accident; however, since all the documented dussacks, and other pieces described in literature (e.g. Brych 1998; fig. 4:6; Marek 2008; fig. 45:n, 46:a, 54, 55:b) are damaged in nearly the same way, there must be a generally applicable cause of such damage. Opening discussions of potential causes showed that this kind of damage may be related to problems with the actual process of production and the ensuing reliability of single-edged blades; as specific production issues are related to each kind of product, and weapons with longer single-edged blades are not an exception to this rule. Let us take a more detailed look at the method of production of dussack blades and related production problems.

Metallographic examination and restoration survey showed that dussack blades were as a rule made by welding rods of hard steel and soft iron together in several different combinations (see fig. 16). Three techniques have been identified so far in the case of longer blades (as depicted in fig. 16:a, b, c). What they have in common is a steel element on the back side. Considering the current stage of research it is not easy to find an explanation why steel was welded on the back. The aim might have been to make the back harder in view of the expected practical application of the future weapon. The hardened steel back would certainly have been more useful in various fencing actions known thanks to their description in many fightbooks of German origin (Fechtbücher) where the back of the blade was being used (the opponent risked a damage to the cutting edge of his weapon). It also might have been a way of increasing the overall content of steel in the blade in order to reinforce it (if the blade has a prevailing content of iron, it is easy to bend even after quenching). To use a certain share of steel between the cutting edge and the back, in order to reinforce the blade, was beneficial also with regard to the potential emergence and development of cracks. If a crack began to propagate in the quenched structure of the blade (when quenched or used), it could be countered or stopped by the ductile structure of the middle portion made of iron (Fig. 16: e,d). Thus, the reinforced blade was protected from the unfavourable effects of cracks better than if the cutting edge was made from a single massive bar of steel or if it was an all-steel blade (Fig. 16:c, d). The production of blades according to diagrams on fig. 16:a, b, c would have probably had specific reasons – being an optimum way of meeting the demands on the weapon: its use, reliability and manufacturability. For it was not an easy task to make longer single-edged blades. There were two fundamental problems– the first one was related to defects such as cracks and splits appearing in the metalduring hammering, quenching or thereafter. The second problem was the uncontrollable change in the shape of the weapon upon quenching.

Splits and cracks had the greatest impact on manufacturability and reliability of the weapon. They can be classified into defects caused by hammering or by quenching, according to the production phase in which they appeared. During hammering it is first of all longitudinal cracks that appear due to improper welding of individual sections of the blade-billet (however, these are rare) and lateral cracks caused mainly by overheating of the material. Lateral cracks are more common and usually can be found on the back (see fig. 10:d). The probable cause is that overheated and cracked material (overheating most frequently happens during heating to a high welding temperature) can be joined back together again by repeated welding and thorough hammering. If the raw product has cracks on the side of what is to become the edge, they may be removed by the process described above; while on the back where no major hammering is possible any more cracks are hard to remove. Generally, the above blacksmithing defects may appear in all the types of forging, and they are not exclusive to single-edged blades. The second type of defect, more serious in view of the product's characteristics, is lateral cracks caused by stress during quenching. The cracks caused by quenching are thinner than those caused by overheating, and usually curved in different ways (Fig. 14:b). The quenching of axially asymmetrical objects is quite complicated and there is a great risk of not only crack formation but also of an uncontrollable change in shape of the product. Let us now take a look at what happens during ordinary quenching of a single-edged blade (i.e. held perpendicularly to the water surface). The blade is heated to the quenching temperature (which

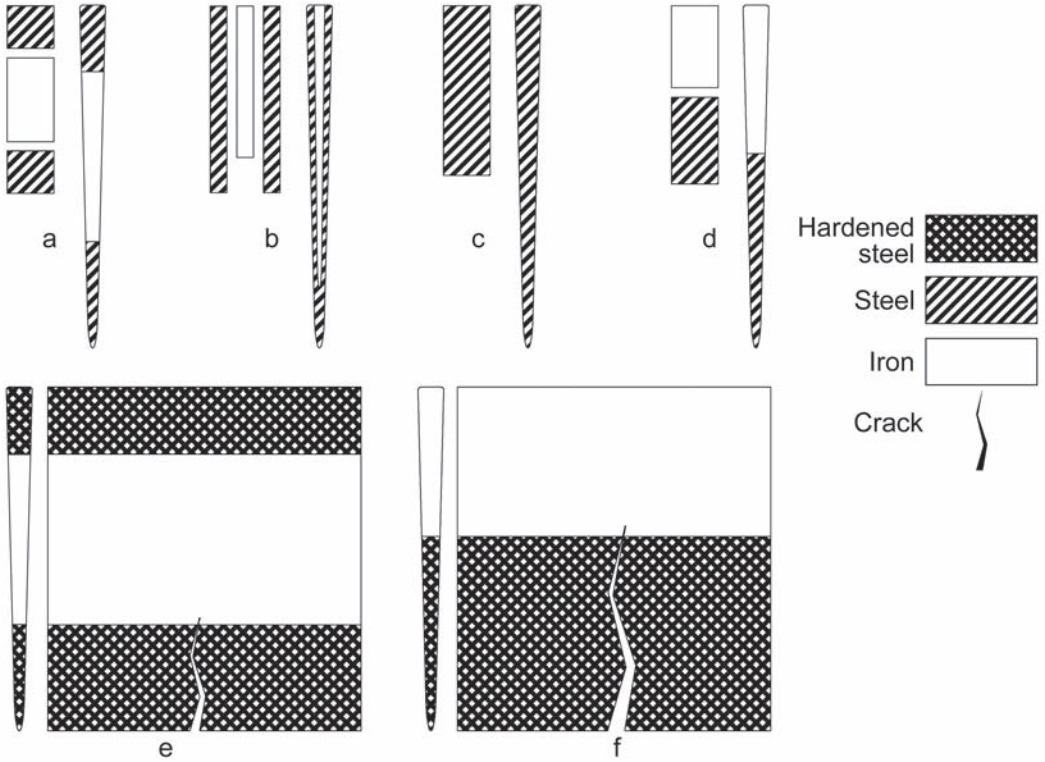

Fig. 16. Various combinations of iron and steel used in dussack blade construction (a–d), an example of the extent of damage caused by a crack that is extending from the steel cutting edge (e–f)

is usually 820–850 °C for carbon steel up to 1% C– fig. 17:t_0), as a result of thermal expansion the volume of the product increases and the blade grows longer. When immersed in the quenching bath, the volume of the blade decreases as a result of thermal contraction, and thus the blade becomes shorter. If cooled (quenched) quickly, a temperature gradient is developed across the section of the artefact[6], i.e. individual parts of metal in the section of the blade differ in temperature, and thus also in specific volume dependent on thermal contraction of the metal. The thin cutting edge cools down and shortens faster than the more massive back. Thus, tensile thermal stress is induced in the cutting edge, while thermal pressure stress appears in the back; the dissimilarity of stress distribution across the blade is balanced by partially elastic and partially plastic deformation, the sign of which is the bending of the blade (Fig. 17: t_1). If the temperature of the edge drops below a certain limit (Ms temperature), it once again starts to grow longer as hard and wear-resistant (though brittle) martensite is being created that has a larger specific volume than austenine at the same temperature (on fig. 17 in time t_1 to t_2); thus, tensile stress in the cutting edge is reduced. As the back cools down a bit slower it is gradually shortened by the thermal contraction of the material and elongated by austenite transformation (in time t_3 to t_4). With the end of austenite transformation other significant changes in specific volumes occur in the cutting edge and back (Fig. 17: t_4); and if at this moment the growing tensile stress in the edge is higher than its resistance to tensile stress, cracks are formed. When cooled completely, the blade returns to its original condition (Fig. 17: $t > t_5$) or is slightly bent because unlike in the untempered state the back might now be slightly shorter because in the first phase of cooling it may have been plastically deformed by thermal pressure stress.

If the inner stress of the material caused by quenching is too high, the blade may break. The stress intensity and change in the shape of the product upon quenching depend first of all on the quenching temperature (higher temperature = higher stress), on the difference between the width of the back and the cutting edge (bigger difference = higher stress), on the kind of quenching bath (faster quenching bath = higher stress), and on the type of steel used (higher carbon content = higher stress).

A very effective practical measure that eliminates the risk of crack formation or secondary change of the blade shape is to heat up the blade in the forge hearth with the cutting edge facing down. This way,

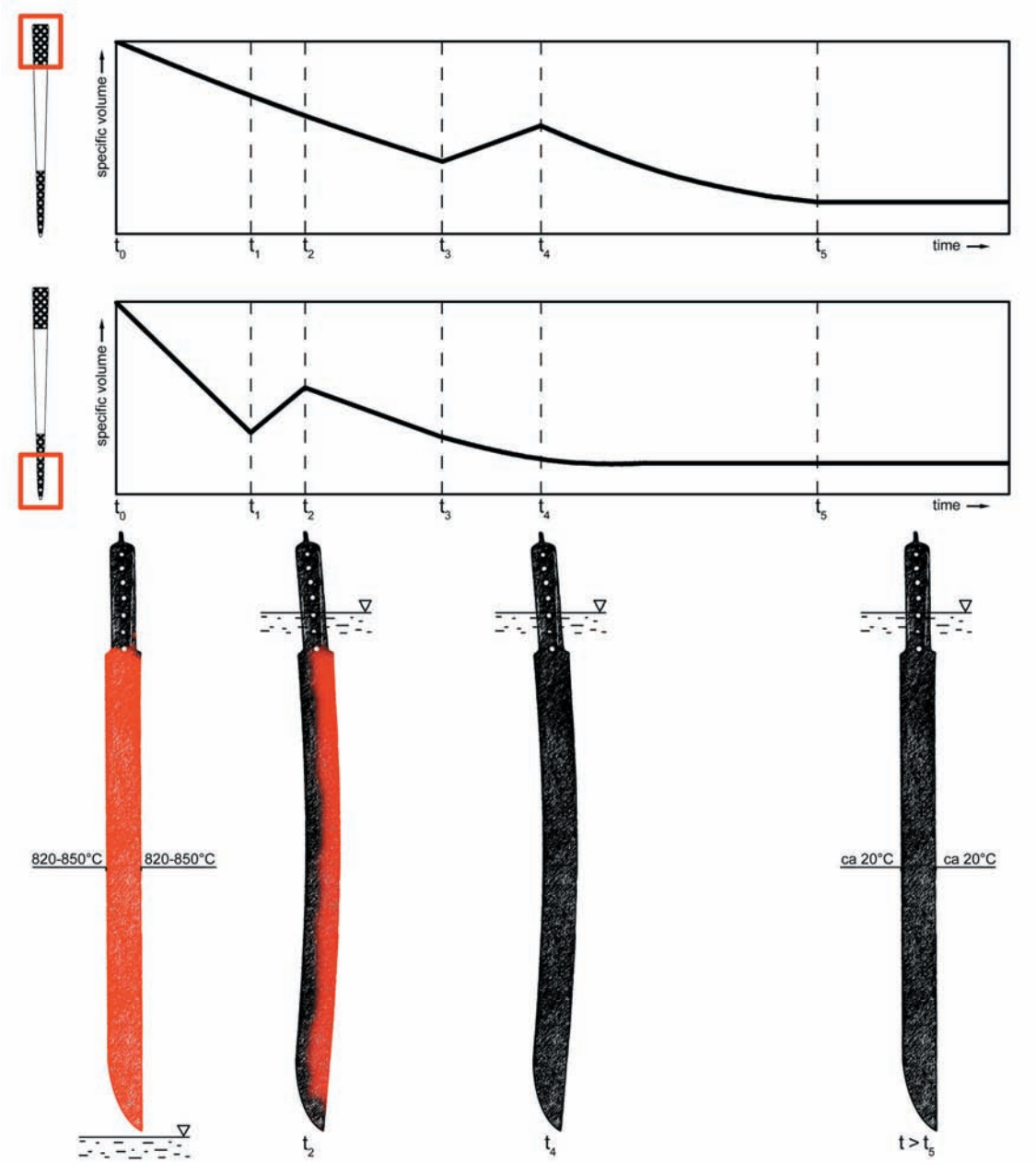

Fig. 17. Course of changes in the specific volume of the blade and cutting edge during complete heating-up and quenching

at the moment the cutting edge reaches the tempering temperature, the temperature of the body of the blade is some 150 to 200 °C lower (and the back of the blade is not austenitised). Upon heating and due to the different temperatures in the cutting edge and the back, the blade is slightly bent (Fig. 18: t_0). After immersion in the quenching bath the same processes happen as in the first case (shortening and hardening of the cutting edge, back deformation, cooling down of the back, and return to the original shape), however, the inner stress, and thus the risk of cracking, is smaller thanks to the lower temperature of the back. However, in this way the back is not hardened.

3. SHOULDER-PLATES

One of the characteristic features which are typical of the examined type of dussacks is the absence of cross-guards, which can be claimed with absolute certainty as almost all of the abovementioned examples – the knife-like dussacks alike – feature fragments of shoulder-plates. The only exception in the examined collection of weapons is the fragment of a dussack found in the cadastre of Věteřov (Fig. 2:

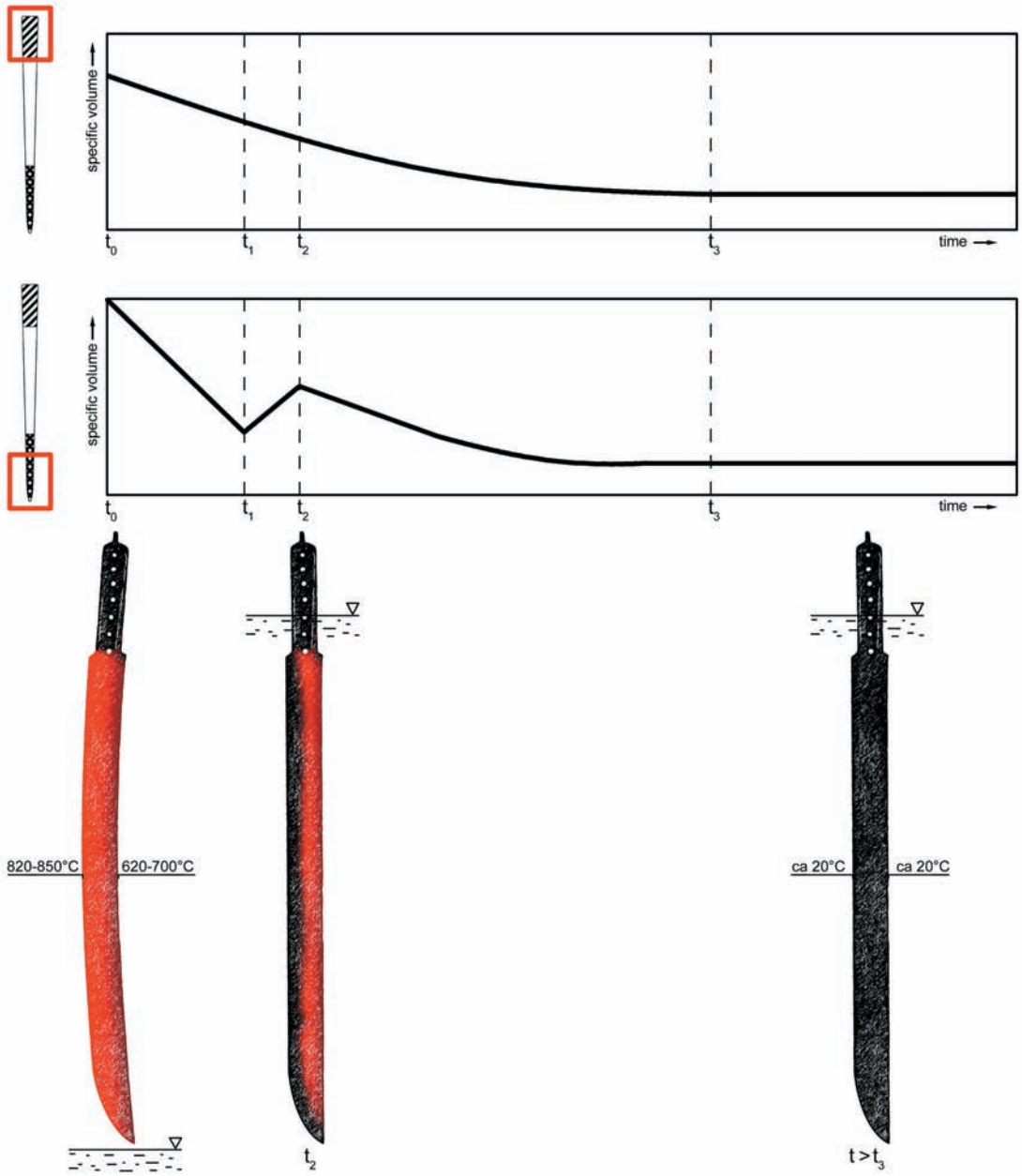

Fig. 18. Course of changes in the specific volume of the blade and cutting edge during partial heating-up and quenching

g), as the weapon shows absolutely no traces of this functional attribute. In general, when the dussacks documented so far were equipped with cross-guards, they did not feature shoulder-plates. It is thus possible to conclude that this attribute was used only on dussacks without a cross-guard, including robust knife-like dussacks with broad blades. Under no circumstances, however, we should consider the shoulder-plates a substitute for a cross-guard. First, it would be highly illogical to think so, since it is only exceptionally that the width of the shoulder-plates overreaches the width of the blade and, secondly, the very constructional characteristics of shoulder-plates do not allow it. Shoulder-plates were shaped from iron or yellow-metal sheets most often thick less than 1.5 mm. These fragile components could not possibly withstand the collision with an opponent's blade during combat action and would be immediately distorted and damaged. Their function thus must be looked for elsewhere. Clearly, one of the reasons of their application was the manufacturer's effort to decorate the weapon in some, at least simple, manner. Especially if the shoulder-plates are made of yellow metal sheets, it is undeniable that this weapon part has a certain visual appeal. In case of these shoulder-plates the decorative effect was compounded by

engravings on the folds with diagonals or cross grid, as can be seen on the best preserved specimens, such as the dussacks from Pelechov (Fig. 4:b), Lopata (Novobilský 1995, p. 24; Frýda 1996, p. 532, Plate XCVIII), Petrkov (Durdík 1983, p. 7, Plate VIII, fig. 2) or fragments of an dussack from an unknown find place in the collections of the National Museum in Prague (Fig. 4:a).

The decorative function of this weapon part, however, was probably not primary, because in that case it would not be present on almost all types of one-handed dussacks originally not equipped with cross-guards, including robust knife-like dussacks with broad blades. Therefore, shoulder-plates certainly had a practical function, which has not yet been fully disclosed. Apparently, the component served as a protection to the lower end of handle-scales, terminating the handle optically. The role of shoulder-plates as a kind of shock damper, which would serve to absorb energy resulting from a clash of two blades in combat action or from striking a hard obstacle with the blade and thereby prevent lengthwise splitting of the weapon handle (Žákovský 2008, p. 463), has not yet been fully proved.

Also, one of the future research goals should be to determine whether the cavities created by the S-shaped coiling of the plates used to be filled or empty. It seems at this point that the cavities used to be filled, as can be seen on the dussacks from Pelechov (Fig. 4: b) and from the collections of the National Museum in Prague (Fig. 4:a). But determining whether the preserved substance comprises residues of handle-scales or some other material is very difficult. Only a find of a dussack with completely preserved handle may present us with the final answer to this question.

The fragility of shoulder-plates is best illustrated by the fact that only very rarely they were preserved in their entirety (Figs. 2:e–f; 3:d, 4:a, b). Mostly only tiny fragments of shoulder-plates have been preserved on dussack blades (Fig. 2:b-d, 3:c), or their presence on the weapon is testified to by the presence of two rivets or mere rivet holes (e.g. Marek 2008, p. 49; Žákovský 2008, p. 463), via which the shoulder-plates were originally fastened to the blade (Figs. 2:a; 3:a, f).

The knife-like dussack from Starý Jičín (Fig. 3: e) features a preserved shoulder-plate of a somewhat different design. It seems that in this case the shoulder-plate is formed by a component of forged iron threaded onto the dussack blade and forge-welded to the tang and blade. Alternatively the shoulder-plate could consist of two counterparts which were fixed to the blade and then forge-welded into one component. This kind of weapon components is relatively rare on dussacks, especially on one-handed dussacks. It will suffice to mention here a solitary find of this component during the archaeological survey research of the Upper Palace of Rokštejn Castle, which is – unlike the piece from Starý Jičín – set with a hole for attaching a side-guard thorn (e.g. Měřínský 2007, p. 112, fig. 62:12; Krejsová 2007, p. 270, fig. 1), while the side-guard thorn was fastened above the shoulder-plate in the case of the examined piece.

4. TANGS AND POMMELS

A rather uniform type of tang is a defining feature of the studied type of wide, only slightly narrowing blades. All of the dussacks of the studied type that have been documented so far feature a blade with two shoulders and a scale-tang. The length of the tang ranges between 170 mm and 120 mm, including the knife-like dussacks. The extreme tang length of the dussack from Rokštejn is highly disputable, considering the weapon's state of preservation. As a rule, the tang width of the dussacks mentioned in this paper grows towards the pommel and only sporadically stays constant along the whole of the tang. Almost all the dussacks registered so far that belong to the studied type feature a more or less distinctive groove in the tang with a clear-cut border on one or both sides. The only exception is a dussack from the Museum of Archaeology in Wrocław, featuring a tang with a rectangular profile running along its whole length (Marek 2006, p. 203; 2008, p. 54, fig. 55:b).

Roughly round rivet holes of varying diameters were notched and punctured in the obverse-face groove. The rivet holes served to fasten handle scales while the lowermost one was used to hold a side guard. However, this functional attribute has not been completely preserved on almost any of the dussacks documented so far, which is very interesting. The only exception is a dussack from the collections of the Bavarian Army Museum in Ingolstadt, which is equipped with a funnel-like side-guard thorn (Ritter von Kern 1997, p. 59). Some side guards have been preserved only in the form of broken thorn necks, which served to fasten the side guards to the tang (Fig. 2:b; 4:b).

The upper part of the tang of each of the dussacks of this type documented so far is double-shouldered into a shank with a pommel riveted onto it. The pommel forms can vary. Two basic types of pommel form occur. One type is represented by flat pommels approximately 10 mm long (Plates 5:a, c, f, k), some of which are decorated with deep crosswise incisions on the top side. The pommel of the dussack from Lovčičky is an excellent example of this type (Fig. 5:b). The thickness of the pommels, not exceeding 35 mm, also serves to indicate the maximum original thickness of the handle-scales of these dussacks. This type of pommel form can be often found on other types of one-handed dussacks as well, e.g. see dussacks from Dolany (Burian 1960, p. 211; Žákovský 2010), Gajary (Polla 1962, fig. 5:1), Hrubá Voda and Jevíčko (Žákovský 2010).

The other type of pommel forms most often used on the examined type of dussacks are block pommels. In some cases, their width gradually grows on one side towards the top. These pommels represent a kind of developmental form antecedent to flat beak pommels. Similarly to the first pommel type, the block pommels are often found on other types of one-handed dussacks. Pommel finds from Sion Castle (e.g. Janská 1964, p. 252, fig. 3:1; 1965, Table X:2), Děvín (Polla, Egyházy-Jurkovská 1975, fig. 10:1), Czersk (Gembarzewski 1936, p. 41, fig. 20; Meyer 1937, p. 25, fig. 1:a; Nadolski 1978, p. 39, Table 24; Gajda 1986, p. 34, Table 6) or Templštejn (Žákovský 2011) are excellent examples.

One of the defining features the aforementioned pommel types share is a distinctive stacking pattern (e.g. see fig. 14:a). While there could be a purely practical reason for manufacturing pommels or their parts by stacking together individual metal plates, the stacking admittedly offered a certain capacity for creating visually attractive variants. Combinations of iron and yellow metal plates (e.g. see the dussack from an unknown find place with Inv. No. 104169, fig. 1:n) and hypothetically also layers of iron/steel with high and low content of phosphorus (which formerly served as the basic material for pattern-welding) were easily available. However, there is no historical evidence proving that phosphorus-rich iron was used for decoration purposes; this possibility could only be confirmed by follow-up metallographic research.

5. MARKS

Several dussacks of the studied type feature makers' marks. If a dussack is held with its point pointing away from the holder, then it is the left side of the blade which is called a 'reverse' side and which bears the marks. In addition, the marks are always situated near the blade-shouldering, close to the back of the blade or – if the blade is fullered – close to the fuller. It is quite interesting that all the marks are located on the left side, i.e. on the less exposed side of the blade seen from the point of view of onlookers, which is directly opposite to other long-bladed weapons of the Middle Ages and the post-medieval period, where the marks mostly appeared on the obsverse sides of the blades, as would be expected. On the other hand, similarly to the case of the dussack blades, blades of medieval and post-medieval knives bear marks, as a rule, on the reverse side (e.g. Cowgill-de Neergaard-Griffiths 2003, p. 17–24). Also the way the marks were made on almost all the dussacks documented so far is the same as on Bohemian and Moravian knives from the same period, i.e. the marks were in the overwhelming majority stamped. When compared to contemporary swords, which in overwhelming majority bear engraved and/or inlaid marks, this fact is somewhat surprising and probably suggests again that there is a so far unspecified but generally valid principle at play. Perhaps this discrepancy indirectly reflects some information about dussack manufacturers. As is well known, both sword-makers and knife-makers[7] were primarily engaged in manufacturing dussacks and they often pursued legal disputes concerning competence of their competitors. So far records dating back to 1419 and 1456 which mention dussack -makers, i.e. *cordifex*, Mikołaj and Łukasz seem to be unique (e.g. Szymczak 1990, pp. 262–263; 2003, pp. 154–156). A rather daring and even in future only hardly provable, yet very attractive hypothesis could be formulated based on observations of individual occurrences and types of dussack marks. Dussacks with stamped marks could be considered products of knife-makers. Apart from the fact that it was the reverse side that served as the 'marking side' and that the marks were usually stamped, this hypothesis would also be supported by rather small dimensions of the marks documented so far, as the stamps used for dussacks would fit to stamp also smaller artefacts, such as knives and scissors. In this context it would be highly desirable in the future to create a detailed inventory of marks used by sword-makers and knife-makers on

various products and compare them with the marks found on the weapons studied in this paper. Perhaps it would be possible to find several identical marks, which would confirm the hypothesis. The hypothesis is also consistent with widespread stamped marks represented by single characters, which can be found on contemporary knives on a large scale. This type of marks is represented in our sample collection by stamped marks in the shape of a mirrored capital "N" or a horizontally positioned capital "S" as seen on the blade from Pelechov (Fig. 6: c). A very similar mark is stamped on the blade of a beautiful dussack with a shuttle-like guard and a flat beak pommel from Gorzow Śląski in Poland (Marek 2004, p. 47). Remnants of two stamped letters have been preserved on the dussack from the cadastre of Věteřov, which can be interpreted – with some imagination – as lower-case letters "h" or "b" (Fig. 6:e). Similar, not entirely identifiable letters can be found on a dussack from an unknown find place in the collection of the Museum of Zagłębie in Będzin (Swaryczewski-Ścibałło 1979, pp. 41, 144). Also marks in the form of fleur-de-lis or imperial orb, such as those on the dussack from Boleradice (Fig. 6:b) and the dussack from an unknown find place in the collection of the Moravian Museum in Brno (Fig. 6:a), were popular among knife-makers.

In contrast to that, dussacks fitted with engraved and inlaid marks might be viewed as products of sword-makers. Only a very few dussacks fitted with such marks have been documented in the territory of Moravia and Bohemia so far. In fact, only three such pieces are now available for analysis. The dussack blade obtained from the site of the defunct Carthusian monastery in Dolany bears a mark in the form of a split ring (Burian 1960, p. 211; Žákovský 2010). This hypothesis would also be supported by the fact that the other two dussacks are fitted with marks in the form of a wolf running to the left, which have traditionally been associated with sword-makers of Passau (e.g. Aleksić 2007, pp. 123–125; Žákovský 2008; Michalak, Wawrzyniak 2009, p. 206; further references are available). A beautiful, almost entirely preserved dussack from an unknown find place in the collection of the Regional Museum in Olomouc and also one of the dussacks examined in this paper (Fig. 6:d) bear these "Passau wolf" marks. Another significant feature is that engraved marks – in contrast to stamped marks – are nearly always found on the right sides of the blades. The only exception is represented by one of the two dussacks from unknown find places in the collection of the National Museum in Prague (Fig. 6:d), where the mark is engraved in the left side of the face. Engraved and inlaid marks are also documented on the falchion from Poręba Wielka, which is, however, equipped with a double-edged, most probably secondarily used sword blade (e.g. Gajda 1986, p. 32, Plate 4; Głosek 1992, Marek 2004, p. 49), so even though this weapon features the hilt construction typical of dussacks (i.e. a flat beaked pommel decorated with four rosettes, a transversally riveted tang and a shuttle-like cross-guard), classifying this artefact as a dussack is highly disputable. This also applies to the weapon acquired at Zborów near Kalisz, Poland (Teske 2003; Marek 2008, fig. 41:f), or weapons from unknown find places in the collection of the Polish Army Museum in Warszawa (Marek 2008, p. 46, fig. 41:b, e).

Should the proposed hypothesis be accepted as true, it would be possible to claim that the vast majority of dussacks with marked blades were produced in knife-blade making workshops while only a small part in sword-blade making workshops. It is however necessary to point out again that the primary goal of proposing this hypothesis was to provoke a discussion on the subject and no claim for general validity is made. It must be also said that the vast majority of nearly 300 dussacks that have been documented within the area of the former Czechoslovakia lack any marks whatsoever and we are thus unable to say anything more specific about their provenance.

6. Dating of the studied type of dussacks

Dating the dussacks of the studied type is a project beset with obstacles, because there is yet not a single specimen available which is clearly dated by its stratigraphy. Considering the fact that the vast majority of the weapons were found before WWII or even before WWI, we value all information specifying at least approximate locations of the finds; in many cases we lack any information whatsoever. The very location of the find is a precious clue to the approximate dating of each weapon.

Some of the dussacks of the studied type were found outdoors, in places where no former settlement was discovered nor any other archaeological material documented. Due to this we have only a few specimens, found in areas of former and now defunct aristocratic residences or extinct villages, which can be used to help us date the weapons more precisely. These are the dussack fragments from Rokštejn Castle, Týřov, Starý Jičín and Lopata Castle or the weapons found in the area of the extinct villages of Miřín near Pitín and Mstěnice near Hrotovice.

The first written records of the extinct village of Miřín near Pitín date back no farther than the beginning of the 16th c., describing it as extinct for the first

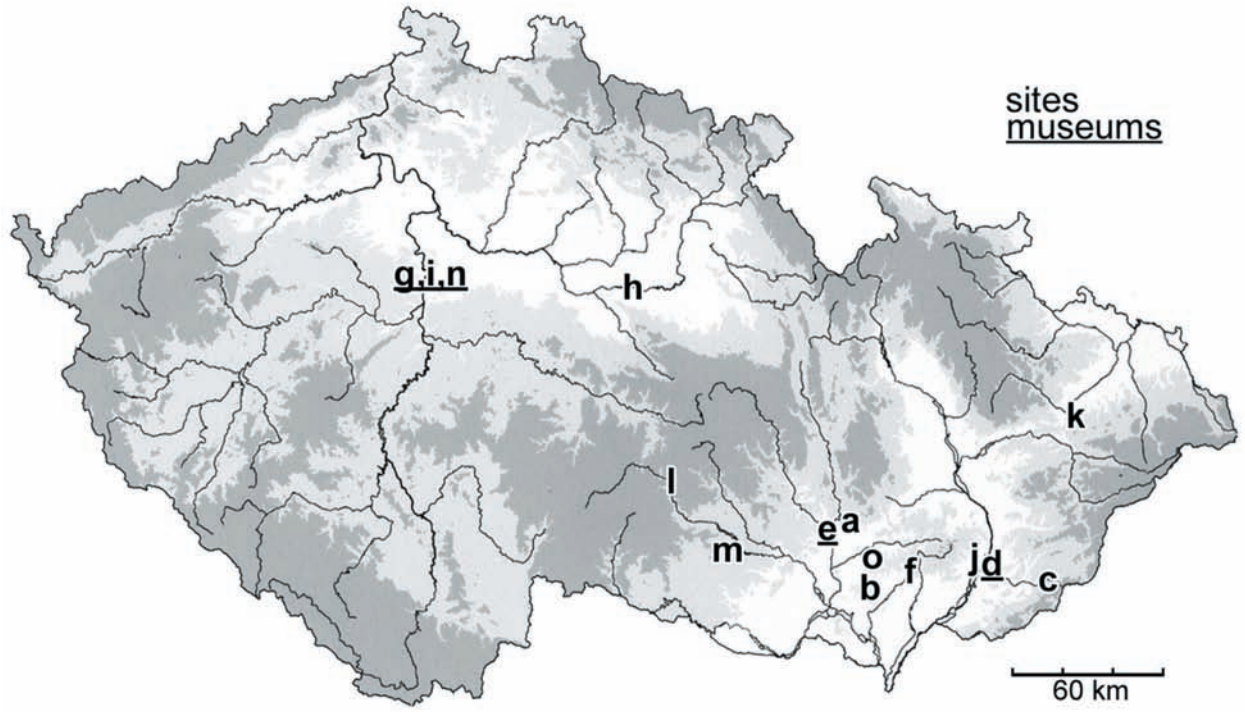

Fig. 19. Map showing where the investigated dussacks were excavated or where they are deposited: a – Horákov (private collection); b – Boleradice (The Regional Museum of Klobouky u Brna, No Inv. No.); c – Pitín, the extinct medieval village of Miřín (The Museum of Bojkovsko Region in Bojkovice, Inv. No. HB 302); d – unknown find place (The Museum of Moravian Slovakia in Uherské Hradiště, Inv. No. H 1803); e – unknown find place (The Moravian Museum in Brno, No Inv. No.); f – Věteřov (private collection); g – unknown find place (The National Museum in Prague, Inv. No. H2–186945); h – Pelechov (The Museum of Eastern Bohemia in Pardubice, Inv. No. MIL 2498); i – unknown find place (The National Museum in Prague, Inv. No. 6602); j – Staré Město (The Museum of Moravian Slovakia in Uherské Hradiště, No Inv. No.); k – Starý Jičín (Museum of Novojičínsko region in Nový Jičín, Inv. No. 3495); l – Rokštejn (The Vysočina Museum in Třebíč, Inv. No. HA 1270); m – Mstěnice (The Moravian Museum in Brno, Inv. No. 75203); n – unknown find place (The National Museum in Prague, Inv. No. 104169); o – Lovčičky (private collection).

time as early as 1518. The extinction is attributed to military actions during the Bohemian-Hungarian War (e.g. Kučera 1888, p. 176; Hosák 1938, p. 433; 1967, p. 203; Nekuda 1961, pp. 133–134; Snášil 1972, pp. 112–113; Michna 1972, p. 318; Hosák-Šrámek 1980, p. 78). Therefore the dussack found at the site of the extinct village of Miřín near Pitín most likely dates back to the 2nd half of the 15th c. It is possible to similarly date the dussack found in the territory of the extinct village of Mstěnice within the time-horizon of existence of the stronghold.[8] The village was probably destroyed in 1468 during Matthias Corvinus' campaign against Třebíč (e.g. Nekuda 1960, fig. III: a; 1961, p. 12; 1985, pp. 139–141, fig. 196:a). Dating the dussack obtained in the territory of Týřov Castle is even more difficult. The castle was founded as early as the 1st half of the 13th c. and it was in use until 1575, when it was abandoned according to written records (e.g. Durdík 1999, p. 569). The dussack thus can be dated only approximately, to the 15th c. or to the beginning of the 16th c. The dating is similarly approximate with the knife-like dussack which was found within the territory of the castle of Starý Jičín. Occupancy of this castle territory is documented by written records from the 1st half of the 13th c. till the end of the 18th c. (e.g. Turek 1965, p. 4; 1978, pp. 89–90; Plaček 2001, pp. 584–587). The situation is the same when trying to date the dussack from the castle of Boleradice, since the first written record of the castle dates back to 1373 and the castle presumably ceased to exist in the 1530s, since it is described as having been desolate in 1536 (e.g. Bukovanský 1909, p. 125; Nekuda 1969, p. 355; Kordiovský 1979, p. 20; Plaček 2001, p. 109). The dussack, which was found in the picturesque ruins of Rokštejn Castle in the Jihlava region can be dated somehow more precisely. Unfortunately, the discovery took place before a systematic archaeological survey. The castle was founded around 1270 and it is assumed to have been abandoned between 1520 and 1530 (e.g. Plaček

2001, pp. 538–542; Měřínský 2007, p. 55), however, the possibility that at least part of the castle complex was still in use during the 2nd half of the 15th century cannot be completely ruled out. Based on this information, the dussack from Rokštejn Castle can be generally dated to the 15th c. The almost completely preserved dussack of the studied type which was allegedly found by F. X. Franz in the castle of Lopata in the Pilsen region between 1885–1887 can be dated prior to 1433 because the castle site, whose origins go back to 1370s, was destroyed in February of 1433 by a Hussite army (e.g. Novobilský 1995, pp. 22–23; Frýda 1996, p. 532; Durdík 1999, p. 347). It is however important to point out that the localisation of the studied artefact is rather problematic, because when the finds of F. X. Franz were passed by Arnošt Waldstein to the care of the Pilsen Museum in the early 20th c., no information on their provenance was available (e.g. Macháček 1926, p. 34).

If the above mentioned findings are to be summarised, it can be said that the studied type of dussacks generally dates to the course of the 15th c., though most of the weapons rather come from its second half. However the possibility that in rare cases the studied dussack type was still used in the early decades of the 16th c. cannot be excluded. This conclusion is further supported by relatively rare sources of iconographic evidence depicting the studied type of dussacks. One of the sources is the Altar of St. Wenceslas in Libkovice dating back to the 1520s (e.g. Opitz 1929, p. 526, fig. 3:a; Žákovský 2008, fig. 3:a). The painting depicts the figure of St. Martin cutting his cloak with a dussack with a wide blade, a relatively insignificant point and a block pommel (Fig. 7:d). Another depiction of a similar dussack with an analogical and even typically broken blade can be found on Albrecht Dürer's woodcut of Hercules, where the dussack is held by one of Hercules' opponents (e.g. Fischer 1938, Plate 3; fig. 7:c). A set of playing cards dated to 1440–1445 from the collection of the Kunsthistorisches Museum in Vienna includes one showing a very realistic picture of a crossbowman armed with a dussack of the studied type (Edler von Franzenshuld 1884, Plate 2; fig. 7:b). And finally, a magnificent panel painting from the 2nd half of the 15th c. with a motif of hunters on horseback by the Master of the Polling Panels (e.g. Nagy 1972, fig. 10; fig. 7:a), shows an unusually realistically depicted knife-like dussack with a wide blade, strikingly similar to the abovementioned weapons from Staré Město, Starý Jičín and to one of the two dussacks from unknown find places in the collection of the National Museum in Prague.

CONCLUSIONS

Summarising the abovementioned observations, it can be stated that the studied type of dussacks generally dates to the course of the 15th c, with a peak in the second half of the century. However the possibility that in rare cases the studied weapon type was still used in the early decades of the 16th century cannot be ruled out. One of the characteristic features which are typical of the examined type of dussacks is a significant, rather wide blade, whose width narrows towards the point only very slightly and which is in almost all cases broken in a similar way. As far as this characteristic damage to the blade of the examined type of dussacks is concerned, it is possible to eliminate both combat action and coincidence as primary causes. The damage must be due to the complicated process of manufacturing of such blades, in particular difficult heat treatment often causing manufacturing defects. The most serious problem in terms of manufacturability and reliability of the weapon was the increased risk of emergence of quenching cracks. Despite the fact that the tips and sometimes even larger parts of the blade were broken off on virtually all documented pieces of the long variant of the examined dussack type, the dussack-blade smiths cannot be considered second-class craftsmen. The fact that these weapons will be more often found damaged or destroyed than fully functional is the very nature of these mostly incidental finds. The production of these weapons most probably took place somewhere in Central Europe, while we should not get mislead by the information in the attached map (Fig. 19) which, rather than showing the highest occurrence of this type of dussacks reflects the current state of research on the subject and the degree of processing of museum and private collections. Perhaps it will be possible to substantially extend and revise the details and conclusions in the future thanks to the ongoing cataloguing of medieval and early modern weapons found in the territory of the former Czechoslovakia. It is thus necessary to understand this paper as a preliminary evaluation of the studied material, far from expressing ultimate and generalised conclusions.

Tab. 1: Dimensions of the examined dussacks.

Location	Total length	Weight	Blade			Tang			Pommel		
			Length	Width	ThickNess	Length	Width	Thickness	Length	Width	Thickness
Boleradice	535	596	390	51–50	6–3	145	33–29	9–6	10	38	27
Horákov	430	448	290	52–50	6–4	140	30–35	6–8	8	42	28
Lovčičky	257	258	111	45–43	7–6	146	24–32	8–6	9	32	29
Mstěnice	378	247	235	47–36	6–2	143	27–35	7	9	41	32
Pele-chov	798	1034	642	68–58	4–1	156	34	8–2	36	37–47	33
Pitín	535	555	390	54–40	5–2	145	32–35	7–6	14	44	30
Rok-štejn	435	234	250	50–32	9–3	185	28	11–3	45	41	19
Staré Město	380	285	260	47–39–1	6–3	120	23	5–4	10	25–35	20
Starý Jičín	470	531	320	69–61–1	5–2	150	31–35	6	13	37–44	29
Věteřov	582	495	467	42–38	8–3	115	30	8–6	–	–	–
nn, MZM Brno	495	454	364	51–38	6–3	131	28–34	8–7	15	–	–
nn, NM Prague	413	497	281	56–49–1	6–3	132	26–28	9–3	15	32–41	25
nn, NM Prague	798	748	629	51–12	5–1	169	30–29	7–6	34	32–44	22–20
nn, NM Prague	310	472	156	70–64	5–3	154	33–36	6–5	24	44	28
nn, SM Uh. Hradiště	516	598	364	56–45	5–2	152	32–35	7	16	45	31

BIBLIOGRAPHY

Aleksić M.
2007 *Mediaeval Swords from Southeastern Europe. Material from 12th to 15th Century*, Belgrade.

Brettschneider V.
1928 *Stručný obraz Hustopečska z doby předhistorické,* (in:) Hustopečsko. Domovopisný sborník, Hustopeče, pp. 73–83.

Brych V.
1998 *Hmotná kultura středověké tvrze v Čechách,* (in:) Encyklopedie českých tvrzí, Vol. I. *(A-J),* Praha, pp. 47–83.

Bukovanský K. J.
1909 *Klobucký okres. Vlastivěda moravska,* Brno.

Burian V.
1960 *Nálezy z husitského opevnění kartouzky v Dolanech u Olomouce*, Archeologické Rozhledy, Vol. XII, pp. 204–212.

Cetl F.
1928 *Boleradice,* (in:) Hustopečsko. Domovopisný sborník, Hustopeče, pp. 271–272.

Chodyński A. R.
2003 Broń i barwa w czasach krzyżackich od XIII do połowy XVI wieku, Malbork.

Cowgil, DeNeegaard M., Griffiths N.
2003 *Knives and Scabbard,* London.

Dolínek V., Durdík J.,
1995 *Historische Waffen,* Hanau.

Durdík, T.
1976 *Nálezy z hradu Týřova I. Katalog starších sbírek,* Zprávy Československé společnosti archeologické, Vol. XVIII/3–6.
1983 *Středověké zbraně. Sbírky Okresního muzea v Chrudim,* Chrudim.
1999 *Ilustrovaná encyklopedie českých hradů*, Praha.

Edler von Franzeschuld E. H.
1884 *Ein höfisches Kartenspiel des XV. Jahrhunderts,* Jahrbuch der Kunsthistorischen Sammlungen des allerhöchsten Kaiserhauses, Vol. II, pp. 96–110.

Fischer O.
1938 *Albrecht Dürer. Samtliche Holzchnitte.* Berlin.

Frýda F.
1996 *Militari,* (in:) Gotika v západních Čechách (1230––1530) II, Praha, pp. 531–535.

Gajda P.
1986 *Kordy i tasaki w zbiorach polskich z okresu średniowiecza i początków XVI wieku*, Unpublished MA thesis, Institute of Archaeology of the University of Łódź. Łódź.

Gembarzewski B.
1936 *Przyczynki do historji średniowiecznej broni siecznej polskiej lub z Polską związanej*, Broń i Barwa, Vol. III, pp. 34–42.

Głosek M.
1992 *Interesujący zabytek broni białej z Poręby Wielkiej*, Rocznik Sądecki, Vol. XX, pp. 35–40.

Hosák L.
1938 *Historický místopis země Moravskoslezské*, Praha.
1967 *Historický místopis Moravy a Slezska v letech 1848–1960. Úvodní svazek*, Ostrava.

Hosák L., Šrámek R.
1980 *Místní jména na Moravě a ve Slezsku*, Vol. II *(M-Ž)*, Praha.

Hosák L., Zemek M. (eds.)
1981 *Hrady, zámky a tvrze v Čechách, na Moravě a ve Slezsku*, Vol. I. *Jižní Morava*, Praha.

Hošek J.
2003 *Metalografie ve službách archeologie*, Praha – Liberec.

Hošek J., Kudrnáč J.
2005 *K novým nálezům na Horské Kvildě*, Archeologia Technica, Vol. 16, pp. 16–22.

Janská E.
1964 *Jan Roháč na Sióně*, Historie a vojenství, Vol. 1964, pp. 225–261.
1965 *Hrad Jana Roháče z Dubé Sión*, Sborník Oblastního muzea v Kutné Hoře, řada A – Historická 6–7, Kutná Hora.

Klanicová E.
1998 *Archeologická sbírka muzea v Kloboukách,* (in:) Klobouky u Brna. Město, dějiny, krajina a lidé, Klobouky u Brna, pp. 41–55.

Knápek A.
2009 *Tesáky ze Starého Jičína*, Vlastivědný sborník Novojičínska, Vol. 58, pp. 175–178.

Kordiovský E.
1979 *Boleradický hrad*, Malovaný kraj, Vol. XV/3, p. 20.

Krajíc
2002 *Středověké železné sekery ze slezských hradů a nové nálezy z hradu Quingburgu (kat. úz. Heřmanovice)*, Sborník bruntálského muzea, Vol. 2002, pp. 17–30.

Krejsová J.
2007 *Dochované fragmenty tesáků z hradu Rokštejna*, Archeologické výzkumy na Vysočině, Vol. 1, Jihlava-Havlíčkův Brod-Pelhřimov-Třebíč-Brno, pp. 267–276.

Kučera J.
1888 *Zaniklé osady bývalého panství světlovského na mor. Slovensku*, Časopis Vlasteneckého spolku muzejního v Olomouci, Vol. V, pp. 176–177.

Macháček F.
1926 *Městské historické museum a městský archiv roku 1911–1925*, Sborník Městského historického musea v Plzni, Vol. IX, pp. 1–57.

Marek L.
2004 *Przyczynek do poznania broni białej wrocławskiej piechoty z XIV-XVI wieku,* (in:) J. Piekalski, K.Wachowski (eds.), Wrocław na przełomie średniowiecza i czasów nowożytnych. Materialne przejawy życia codziennego, (= Wratislavia Antiqua, Vol. 6), pp. 41–56.
2006 *Średniowieczne i nowożytne kordy ze Śląska*, Acta Militaria Mediaevalia, Vol. II, pp. 189–206.
2008 *Broń biała na Śląsku. XIV-XVI wiek (= Wratislavia Antiqua, Vol. 10),* Wrocław.

Měřínský, Z.
2007 *Hrad Rokštejn. Dějiny, stavební vývoj a výsledky čtvrtstoletí archeologického výzkumu 1981–2006,* Brno.

Nadolski A. (ed.)
1978 *Broń średniowieczna z ziem polskich. Katalog*, Łódź.

Nagy D. I.

1972 *Hunting in art,* Budapest.

Nekuda V.
1960 *Zaniklá středověká osada Mstěnice u Hrotovic na Moravě*, Časopis Moravského muzea v Brně, Vol. XLV, pp. 143–163.
1961 *Zaniklé osady na Moravě v období feudalizmu*, Brno.
1969 *Vlastivěda moravská. Břeclavsko*, Brno.
1985 *Mstěnice. Zaniklá středověká ves u Hrotovic. Hrádek – tvrz – dvůr – předsunutá opevnění*, Brno.

Malý V.
1973 *Metalografický rozbor tesáku z Krásné doliny u Rakovníka,* Studie a zprávy Okresního muzea Praha – východ, Vol. 1973/6, pp. 15–21.

Meyer S.
1937 *O kordelasach*, Broń i Barwa, Vol. IV, pp. 25–32.

Michalak A., Wawrzyniak P.
2009 *Między bronią a narzędziem, czyli w co przekuto miecz ze Świebodzina?,* Acta Militaria Mediaevalia, Vol. V, pp. 197–212.

Michna P.
1972 *Přehled archeologických výzkumů na Moravě za rok 1971*, Vlastivědný věstník moravský, Vol. XXIV, pp. 310–324.

Novolibský M.
1995 *Hrad Lopata u Šťáhlav*, Plzeň.

Opitz J.
1929 *Gotické malířství a plastika severozáp. Čech na výstavách v Mostu a Chomutově 1928 II,* (in:) Gotická plastika severozápadních Čech od r. 1450–1550, Umění II, Praha, pp. 526–550.

Ošmera J.
1972 *Od Hradské cesty: Prameny k dějinám a současnosti Žarošic a okoli. Sbornik. Roč. 1970,* pp. 46–50.

Petráň J. (ed.)
1985 *Dějiny hmotné kultury I. Kultura každodenního života od 13. do 15. století*, Praha.

Plaček M.
2001 *Ilustrovaná encyklopedie moravských hradů, hrádků a tvrz,* Praha.

Pleiner R.
1970 *Středověká výroba smoly v Krásné Dolině u Rakovníka,* Památky Archeologické, Vol. LXI, pp. 472–518.
1991 *Die Technik der Schmiede im Mittelalterlichen Prag*, Archaeologica Pragensia, Vol. 11, pp. 239–287.
2003 *Metalografický rozbor středověkých železných nástrojů ze Sezimova Ústí,* (in:) R. Krajíc (ed.), Sezimovo Ústí. Archeologie středověkého poddanského města, Vol. 3/II. Praha-Sezimovo Ústí-Tábor.

Polla B.
1962 *Pamiatky hmotnej kultúry 15. storočia z Posádky pri Gajaroch,* Zborník Slovenského národného múzea, Vol. LVI = História, Vol. 2, pp. 107–140.

Polla B., Egyházy-Jurovská B.
1975 *Stredoveké pamiatky hmotnej kultúry z archeologických výskumov na Devínskom hrade*, Zborník Slovenského národného múzea, Vol. LXIX = História, Vol. 15, pp. 97–168.

Ritter von Kern G.
1997 *Bauernwehr oder Hauswehr,* (in:) Ritter, Burgen und Dörfer. Mittelalterliches Leben in Stadt und Land. Sonderausstellung zum 650. Todestag Konrads II. von Schlüsselberg. Tüchersfeld, p. 59.

Snášil R.
1972 *Povrchový průzkum na zaniklé středověké vesnici Miřín u Pitína*, Přehled výzkumů 1971, pp. 112–113.

Swaryczewski A., Ścibałło F.
1979 *Katalog zbiorów broni i uzbrojenia w Muzeum w Będzinie*, Katowice.

Szymczak J.
1990 *Organizacja produkcji i ceny uzbrojenia*, (in:) Nadolski A. (ed.), Uzbrojenie w Polsce średniowiecznej 1350–1450, Łódź, pp. 208–382.
2003: *Producenci i organizacja produkcji uzbrojenia*, (in:) A. Nowakowski (ed.), Uzbrojenie w Polsce średniowiecznej 1450–1500, Toruń, pp. 131–226.

Teske G.
2003 *Późnośredniowieczna broń biała ze Zborowa koło Kalisza*, Rocznik Kaliski, Vol. 29, pp. 237–242.

Turek A.
1965 Starý Jičín, Ostrava.
1978 *Hrad a panství Starý Jičín*, Nový Jičín.

Unger J.
1973 *Středověké nálezy v Kloboukách u Brna*, (in:) 70 let založení muzea, Klobouky u Brna, pp. 10–12.
1984 *Archeologická expozice*, (in:) Život a kultura lidu na brněnském Kloboucku. Stálá expozice národopisu a archeologie, Klobouky u Brna, p. 14.

Žákovský P.
2008 *Tesáky ze sbírek Státního hradu Zvíkova,* Castellologica Bohemica, Vol. 11, pp. 461–472.
2008a *Středověká a raně novověká militaria ze sbírek Městského muzea v Moravském Krumlově,* (in:) L. Přikrylová, A. Hrbáčková (eds.), 100 let založení muzea v Moravském Krumlově 1907–2007, Moravský Krumlov, pp. 61–69.
2008b *Značené vrcholně a pozdně středověké dlouhé meče ze sbírek Městského muzea v Broumově*, Archaeologia Historica, Vol. 33, pp. 471–490.
2010 *Středověká militaria ze sbírek Městského muzea v Počátkách*, Archeologické výzkumy na vysočině 2, (in print).
2011 *Středověké a raně novověké chladné zbraně ze sbírek Městského muzea v Moravském Krumlově*, (in:) Z. Měřínský (ed.), *Hrad jako technický problém. Technologie a formy výstavy středověkých opevněných sídel*, Archaeologia mediaevalis Moravica et Silesiana, Vol. II/2010, pp. 127–188.

Petr Žákovský, MA
Masaryk University
Faculty of Arts
Department of Archaeology and Museology
1 A. Nováka St.
CZ 602 00 Brno, Czech Republic
zakovsky.p@volny.cz

Ing. Jiři Hošek, Ph.D
Institute of Archaeology
of the Czech Academy of Science
Prague
4 Letenská St.
118 01 Praha 1, Czech Republic
hosek@arup.cas.cz

Patrick Bárta
TEMPL – replics of historical arms, Czech Republic
templ@templ.net