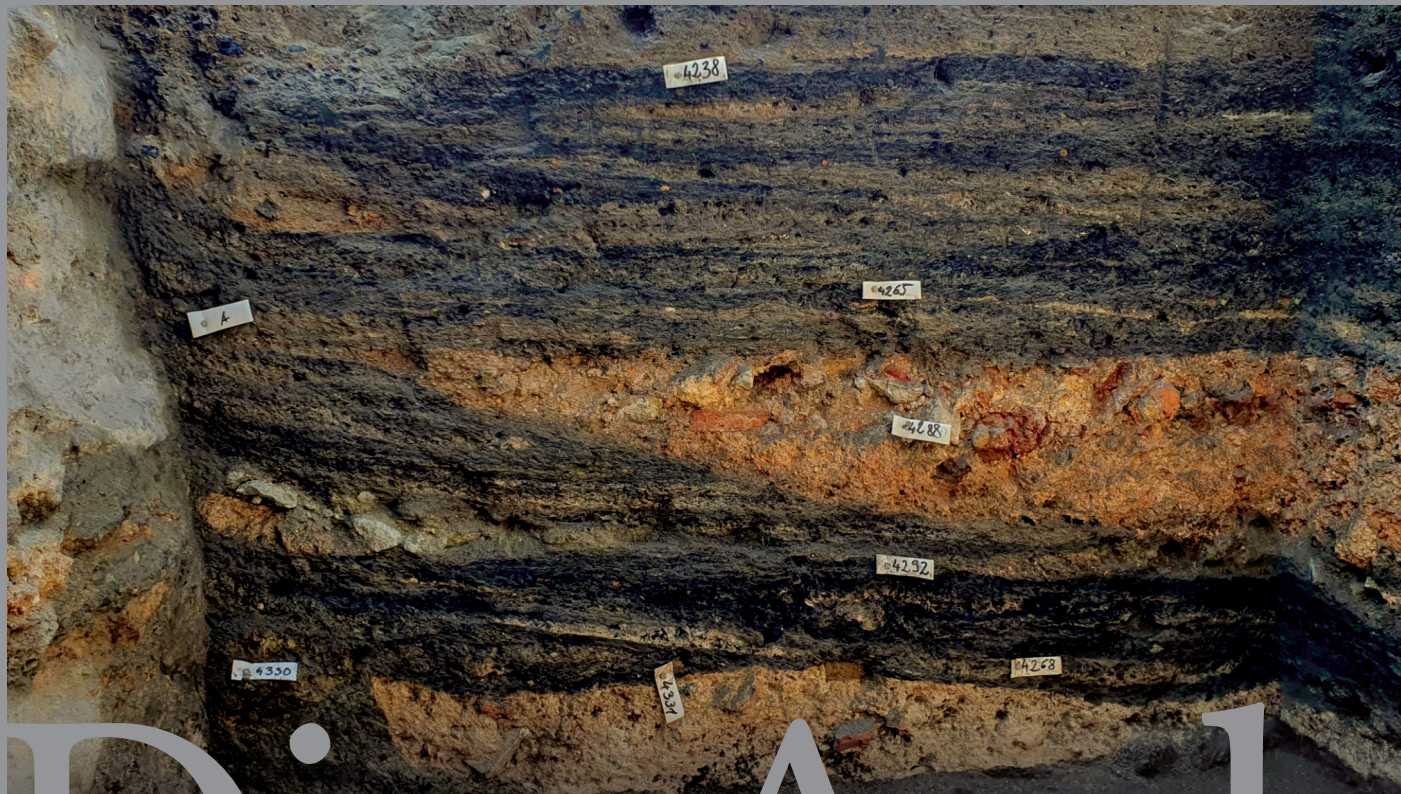


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The concept of the ancient homeland of the Fenno-Ugric-speaking peoples
in light of complex research

Kartal

A fragmented hoard under a broken pot

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Abstract: In 2019, a new Late Bronze Age (LBA) assemblage from Völgy-dűlő at Kartal (Pest County) was added to the number of bronze hoards excavated in the framework of community archaeological programmes in Hungary. This unique assemblage was deposited beneath two fragments of a pot, originally arranged regularly. The Carpathian Basin-style objects in the Kartal hoard date to several periods from Br D to Ha B1; based on their typo-chronological analysis, their deposition may have taken place in the latter. The chronological characteristics of the Kartal find, a deposition comprising old-style jewellery, suggest the assemblage is a multi-period hoard. The signs of use, essentially abrasions and microwear traces, also indicate that some objects had been used even for a relatively long time before deposition. The breaking of the deposited ingots and bronze objects was deliberate and probably did not occur simultaneously, and most of these finds were still usable preceding their breaking. The Kartal hoard may have been deliberately assembled by a small community. The hoarded objects may represent different aspects of a Bronze Age community, who, according to our current knowledge of the topography of the era, deposited their votive assemblage far from any LBA settlements.

Keywords: hoards, Late Bronze Age, Carpathian Basin, context, use-wear analysis

Introduction

Hungary is one of the East Central European countries where community archaeology programmes have led to significant discoveries in the last decade, resulting in thousands of stray finds, new sites, and assemblages, including numerous hoards from all across the country. The Ferenczy Museum Centre (FMC) is a major driving force of such programmes, and the hoard presented in this paper from the Völgyi-dűlő in Kartal (101323¹) is one of the new discoveries (Figs 1–8).

Völgyi-dűlő lies south of Kartal village, on the west side of a hill sloping towards Emse Creek.² According to a report by Róbert Patay, who carried out a rescue excavation at the site, the hoard was found by József Mezei and Balázs Kakukk, two volunteer metal detectorists of FMC, on 27 September 2019. Upon discovering the potsherds and bronze objects at a depth of approximately 35–38 cm, the detectorists stopped digging, reburied the finds, and contacted the archaeologists of FMC a few days later. Róbert Patay led a rescue excavation on the site on 2 October with field technician Balázs Dákó, GIS expert Péter Szőcs, the finders, and a volunteer, Zoltán Bodnár. The team opened

1 Identification number in the National Register of Archaeological Sites in Hungary.

2 To protect the site from illicit metal detectorists, the exact topographic data of the findspot are not published here. These details are available in the reports written by Róbert Patay (PATAY 2019a; PATAY 2019a).

a small sondage trench (2.4 × 1.4 m) and found the first objects approximately 25–38 cm below the modern surface. During the rescue excavation, no traces of any archaeological features were observed. Further items have been found under and around the large fragments of a pot, the highest *in situ* sherd of which was discovered at a depth of ca. 38–48 cm from the current surface. A socketed axe fragment was found west-north-west (at 260°) at a distance of 114 cm from the hoard, at a depth of 38 cm (Fig. 2.11). The lowermost item discovered was a socketed axe fragment under the hoard, at a depth of ca. 52 cm from the current surface. No other bronze or ceramic objects were found in the immediate vicinity of the hoard.³

Typochronology

The hoard from Kartal consists of 94 bronze objects (Figs 1–6, Fig. 7.70–94) and the fragments of a ceramic pot (Fig. 7.95, Fig. 8). The hoard comprises mainly plano-convex ingots (Fig. 4.41–46, Figs 5–6) and lumps (Fig. 7.70–89); besides, it also includes other metallurgy-related objects, such as a casting jet (Fig. 7.94) and bar ingots (Fig. 7.90–91), as well as a socket-end fragment of a socketed chisel (Fig. 2.14). Apart from these, socketed axes (Fig. 1.3–7, Fig. 2.8–13) and sickles (flanged sickles: Fig. 3.19–21, 24–32; sickle blades: Fig. 3.17–18, 22–23; knobbed sickle: Fig. 3.16) are the most numerous types. A sword blade (Fig. 1.1) and a spearhead (Fig. 1.2) represent weapons, and a winged axe (Fig. 2.15) the multi-functional tool-weapon category. Different types of jewellery make up a minor group, consisting of a ring (Fig. 4.33), a bracelet (Fig. 4.34), a spiral armlet (Fig. 4.35), a pin (Fig. 4.36), a wire ring (Fig. 4.37), and a phalera (Fig. 4.38).

Sword

A small, bent, broken sword blade was found in the Kartal hoard (Fig. 1.1). Based on its shape and the outline groove along its edges, it likely comes from the lower part of the blade, slightly above the tip. The exact type of this weapon fragment or whether it was part of a specimen with a metal or a flanged hilt cannot be determined.

Spearhead

The spearhead from the Kartal hoard has a pronounced midrib (Fig. 1.2). The extra ribs on this part run along the midrib and end at the line of the lower part of the blade. Such spearheads belong to Bader's Variant B of Group C;⁴ based on finds from Füzesabony-Öregdomb and Kölesd (Nagyhangos), the type variant appeared first during the Middle Bronze Age (MBA) (around the Br B1 phase).⁵

Spearheads like the one from Kartal were certainly produced in the Carpathian Basin based on the casting moulds from Oşorhei (Br D–Ha A1),⁶ a settlement of the Gáva pottery style from Polgár M3/1 (Ha A2–Ha B1),⁷ and the Urnfield phase of the Zalaszentiván-Kisfaludi-hegy hilltop site.⁸ During the LBA, they mainly appear in hoards dated between the Ha A1 and Ha B1 periods.⁹ Such

3 PATAY 2019a; MELLÁR – PATAY 2021, 44. Socketed axe fragment No. 11 could be part of the hoard; it may have been dislocated by ploughing.

4 SOROCEANU 1997, 399–400; BADER 2015, 376, Tab. 1.16.

5 HAMPEL 1903, Fig. 4.2; SZATHMÁRI 2018, Fig. 3.3.

6 HAMPEL 1886, Pl. 2.6.

7 V. SZABÓ 2004, Fig. 8.2.

8 SZÁRAZ 2017, Fig. 4.

9 GEDL 2008, 66–67; BADER 2015, 376, Tab. 1.16; TARBAY 2019, Pl. 14.28e–f; TARBAY 2022c, 33–34, Fig. 2.1.



Fig. 1. The Kartal hoard.

spearheads were present in a vast territory between the Carpathian Basin and West Central Europe. The dating of the finds varies by country, according to the local chronological systems. Fig. 9 presents an updated list of analogies discovered in Albania,¹⁰ Bosnia and Herzegovina (Br D–Ha A1),¹¹ Bulgaria,¹² the Czech Republic (Br D2/Ha A1, Ha B1),¹³ Croatia (Phase II–III),¹⁴ Germany (Br D–Ha A, Ha A),¹⁵ Hungary (Br B1, Br D–Ha B1),¹⁶ Poland (Period IV),¹⁷ Romania (Ha A1–Ha B1),¹⁸ Serbia (Phase II–III),¹⁹ Slovakia (Br D/Ha A1–Ha A2/Ha B1),²⁰ Switzerland,²¹ and Ukraine (Br C2/D–Ha A1).²² Several more pieces may belong to this type, but their published illustration is unsuitable for precise typological identification.²³

Also, this spearhead type is not entirely homogenous. The pieces classified there feature variety in the cross-section of the midrib (rectangular, round, rhomboid) and the shape of the blade (leaf-shaped, lozenge-shaped), details that cannot be clearly observed from the published illustrations. Some spearheads have cast vertical midribs, while others lack this trait completely. The sockets of certain spearheads are richly decorated. Apart from these differences, there are specimens with rare or unique typological traits, such as the three spearheads with rectangular-profile midribs and flame-shaped blades from Křenovice, Neszmély, and Románd.²⁴ A spearhead from Celldömölk-Ság Hill has a leaf-shaped blade decorated with outline ribs and a protruding midrib with additional vertical and horizontal ribs. This spearhead and its analogy from Škocjan represent a hybrid of different styles, a Carpathian spearhead variant and the so-called Lüneburger spearheads dated from Br B1 to Br D–Ha A1 (Period III).²⁵ Another unique spearhead with outline ribs along its blade is known from the Velem-Szent Vid Ia hoard. A casting mould from Zavadovka in Ukraine, far from

- 10 CEKA 1974, Pl. 6.
- 11 KÖNIG 2004, Pl. 1.5.
- 12 LESHTAKOV 2011, Fig. 3.9, Fig. 4.10, Fig. 4.12.
- 13 ŘÍHOVSKÝ 1996, Pl. 11.98–100, Pl. 21.233–234; SALAŠ 2005, Pl. 246B.3; KYTLICOVÁ 2007, Pl. 162A.4; CHVOJKA 2009, 467, Pl. 85.11.
- 14 VINSKI-GASPARINI 1973, Pl. 72.5, Pl. 97.11.
- 15 JACOB-FRIESEN 1967, Pl. 106.4; VON BRUNN 1968, Pl. 44.4, Pl. 169.8; GEBHARD – LFD 1996, Fig. 100.16; HUNDT 1997, Pl. 59.10; KREUTLE 2007, Pl. 116E, Pl. 168A.4.
- 16 DORNER 1884, Pl. E.5; CATALOGUE EGGER 1891, Pl. 5.38; JÓSA 1902, Pl. 1.14, 16; MISKE 1907, Pl. 32.7; PAULÍK 1965, Pl. 18.3; PATEK 1968, Pl. 43.2, 4; MOZSOLICS 1973, Pl. 15.7, Pl. 57A.7; KEMENCZEI 1984, 375, 429, Pl. 165.31, Pl. 219A.1,3; MOZSOLICS 1985a, 118, Pl. 5.10, Pl. 144.17–18, 22, Pl. 150.2–6, Pl. 196.2, Pl. 200.17, Pl. 240.8, Pl. 246.9; B. HELLEBRANDT 1986, Fig. 4.1; TÁRNOKI 1987, Pl. 7.9; BADER 1991, Pl. 73C.1; MOZSOLICS 2000, Pl. 4.17; ALMÁSSY *et al.* 2001, Pl. 1.5; ILON 2013, 102–103, Pl. 49.174, Pl. 52.174; TARBAY 2017, Fig. 5.4; TARBAY 2018, Pl. 32.4, Pl. 380.5; TARBAY 2019, Pl. 1.1; V. SZABÓ 2019, Fig. 35, Fig. 132; TARBAY 2022b, Fig. 1.3; TARBAY 2022b, Pl. 11.69, Pl. 15.1; TARBAY *et al.* 2023, Fig. 3.9; TARBAY *in press*, Fig. 1.1.
- 17 GEDL 2008, Pl. 25.278, 284, Pl. 26.290–291.
- 18 NESTOR 1935, Fig. 2.3, Fig. 3.4; PETRESCU-DÎMBOVIȚA 1977, Pl. 117.6, Pl. 125.16, Pl. 202.4, Pl. 251.3, Pl. 339.10; BEJINARIU 2007, Pl. 15.77.
- 19 VASIĆ 2015, Pl. 5.64–65, Pl. 7.94, 96–97, Pl. 8.98, 100–102, 107–108, Pl. 9.116, 118.
- 20 NOVOTNÁ 1964, Pl. 8.2; PAULÍK 1965, Pl. 5.7,10; NOVOTNÁ 1970, Pl. 55B.4–5; BARTÍK *et al.* 2013, Pl. 3.2; MITÁŠ *et al.* 2018, Fig. 3, Pl. 2.3–4,6; NOVOTNÁ – KVIETOK 2018, Pl. 3.1–2,4.
- 21 TAROT 2000, Pl. 33.217.
- 22 KOBAL' 2000, Pl. 34B.9,11–12, Pl. 38B.5, Pl. 56A.19, Pl. 65A.2, Pl. 101E.2; KLOCHKO – KOZYMENKO 2017, 200, Fig. 26.
- 23 See KOHLBACH 1900, 83, Pl. 1.12; MOZSOLICS 1973, Pl. 62.3, Pl. 74.4; PETRESCU-DÎMBOVIȚA 1977, Pl. 293.10, Pl. 297.5; ENĂCHIUC 1995, Fig. 2.11; SOROCEANU 1996, Fig. 12.1; KOBAL' 2000, Pl. 54B.9; TARBAY 2018, Pl. 245.2–5,7.
- 24 PATEK 1968, Pl. 43.1; ŘÍHOVSKÝ 1996, Pl. 11.102; MOZSOLICS 2000, Pl. 84.5.
- 25 JACOB-FRIESEN 1967, Pl. 99.3–13, Pl. 100.1,4,7; PATEK 1968, Pl. 33.11; LAUX 2012, 35–39; LAUERMANN – RAMMER 2013, Pl. 103.1; TERŽAN *et al.* 2016, Pl. 1.1.



Fig. 2. The Kartal hoard.

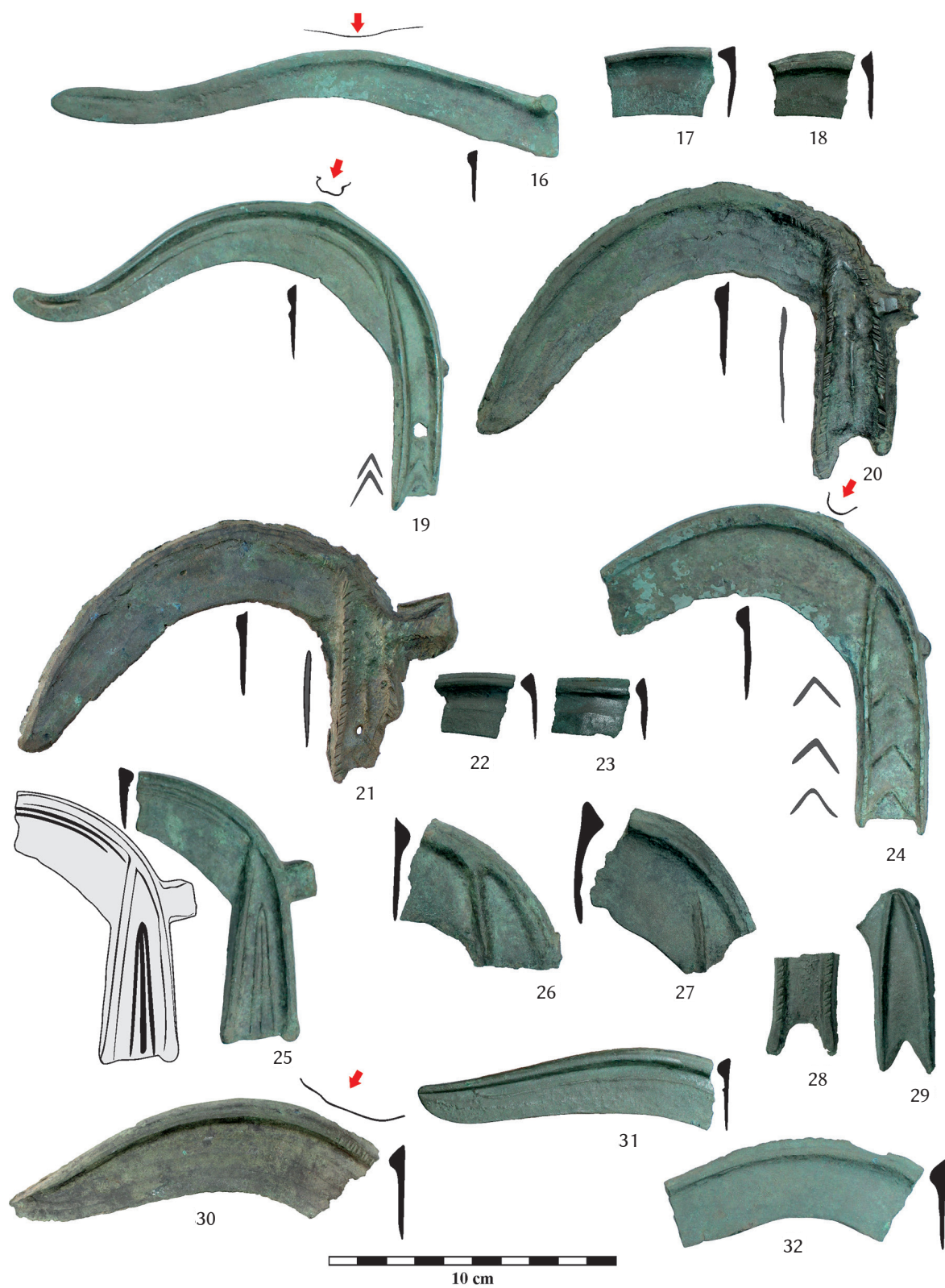


Fig. 3. The Kartal hoard.

Velem-Szent Vid, depicts a similar spearhead.²⁶ The spearhead from Kartal represents the most common variant of this weapon type. Even checked against close analogies, these spearheads are unsuitable for accurate dating because they were made, used, and deposited in several periods. The most likely dating of the piece in focus is between Ha A1 and Ha B1.

Winged axe

The winged axe (Fig. 2.15) has a medium-sized, concave butt, rounded wings, and a fan-shaped blade. Its wings are slightly faceted due to hammering. It is a *mittelständige Lappenbeil* with analogies of Mayer's Freudenberg type from Austria (Bad Aussee, Stadelbach, 'Austria', Thalheim-Aschet, Reisingberg); unfortunately, all of them are undatable stray finds.²⁷ Further examples of winged axes similar to the one found at Kartal can also be mentioned from Moravia (Ha A1),²⁸ Germany (Ha A1),²⁹ Hungary (Ha A1),³⁰ Romania (Ha A1),³¹ Slovakia,³² Slovenia (Ha A),³³ Moldova (Br D–Ha A1),³⁴ and Croatia (Br D–Ha A1 – Ha A2),³⁵ their dating generally representing the Ha A1 period. The winged axe is at least one or two phases older than the rest of the finds in the assemblage.

Socketed axes

The Kartal hoard comprised ten socketed axes and fragments (Fig. 1.3–7, Fig. 2.8–13). Only a few could be classified (Fig. 1.4–7, Fig. 2.8–9, 13), while the rest were too fragmented for typochronological analysis (Fig. 2.10–12). Almost all socketed axes with well-recognisable typological traits belong to the Debrecen type (Fig. 1.4–7, Fig. 2.8–10),³⁶ they can be classified more finely based on their cast rib patterns.

The patterns of four axes (Fig. 1.5–7, Fig. 2.8) are identical, consisting of three longitudinal, a Y-shaped, and two side ribs. The analogies to this Ha B1 decoration type, sporadically present between Austria and Romania (Fig. 10.5–8), were collected in a recent study about the Kemendollár hoard from Transdanubia.³⁷

A socketed axe (Fig. 1.4) has a similar pattern combination but with a wide Y-shaped rib.³⁸ Such axes can be mentioned from Tiszaszőlös I and Tiszavasvári-Téglagyár II, two Ha B1 hoards from northeast Hungary.³⁹ Further examples of this decoration combination were found on socketed axes in hoards at Biatorbágy-Herceghalom and Csabdi (with a slightly T-shaped rib) in Transdanubia.

26 MISKE 1907, Pl. 30.13; KLOCHKO 1995, 110, Fig. 18.4.

27 MAYER 1977, Pl. 34.496–497, 499–500, Pl. 35.511.

28 SALAŠ 2005, Pl. 253B.3.

29 PÁSZTHORY – MAYER 1998, 95–98, Pl. 34.503.

30 MÉSZÁROS 1972, Fig. 5.1; MOZSOLICS 1985a, Pl. 41.1, Pl. 76.1–2, Pl. 169.1; TÁRNOKI 1987, Pl. 8.4; MAKKAY 2006, Pl. 14.121.

31 PETRESCU-DÎMBOVIȚA 1978, Pl. 166.136–138.

32 NOVOTNÁ 1970, Pl. 16.296.

33 TERŽAN 1995, Pl. 60.1.

34 DIACONU – SÎRBU 2021, 167, Fig. 1, Pl. 2.2.

35 VINSKI-GASPARINI 1973, Pl. 76.2, Pl. 95.1.

36 DERGAČEV 2002, 174–176. Fragments from the Kartal hoard belonging to this type: Nos 3, 10; non-classifiable axes: Nos 11–12.

37 TARBAY 2021, Pl. 1.4B; TARBAY 2022a, 129–130.

38 See BOROFFKA – RIDICHE 2005, 181, Fig. 8.

39 TARBAY 2018, Pl. 379.A2, Pl. 382.12.

The time of deposition of both socketed axes was corrected to the period mentioned above.⁴⁰ Further examples of similarly decorated Debrecen-type axes beyond the territory of Hungary are known from the Kapelna (Phase IV) hoard in northern Croatia and the Mačkovac hoard (Phase IV) in Bosnia and Herzegovina (Fig. 10.4).⁴¹

One of the Debrecen-type socketed axes is decorated with a longitudinal rib, an Y-shaped, and two side ribs (Fig. 2.9). This axe has only a few analogies, including a Debrecen-type socketed axe with a faceted collar from the Late Urnfield settlement at Celldömölk-Ság Hill.⁴² The pattern also appears on the side of a socketed axe fragment in the Badacsonymaj-Korkován-hegy hoard (Ha B1) and a coeval hoard from Szarvas in the Southern Hungarian Plain.⁴³ The axe from the Syrovín hoard (Ha B2) in Moravia is also similar to the one from Kartal, except for featuring an additional side rib.⁴⁴ Another example is a socketed axe in the Wolfsthal hoard (Ha B2) in Austria (Fig. 10.9).⁴⁵

The Debrecen-type axes in the Kartal hoard can be dated generally to the Ha B1 period, with a few analogies (Fig. 1.4, Fig. 2.9) pointing towards the Ha B2. These axes seem to be among the youngest (Ha B1) of the assemblage.

The chisel-like socketed axe (Fig. 2.13) can be classified into the group of undecorated Palota-bozsok-type axes⁴⁶ with a loop, the analogies of which have been collected in the publication of the Hévízgyörk hoard: Boldești, Dârja, Jászkarajenő, Krásna Hôrka, Mileni, Nagydobsza, Sălcioara, Șpălnaca II, and ‘Szabolcs County’ (Fig. 10.13). Typochronologically, the axe cannot be dated more precisely than Ha A2–Ha B1 periods.⁴⁷

Socketed chisel

The Kartal hoard includes a chisel with a thick collar and a broken blade (Fig. 2.14). Socketed chisels lack relative chronological value as they are a common tool type in the Carpathian Basin and Central Europe.⁴⁸ As the blade of the chisel in the Kartal hoard is missing, it is not possible to identify its close analogies.

Knobbed sickle

The Kartal hoard contains a knobbed sickle (Fig. 3.16) with a straight butt and a thick, curved back. Use-related changes in the form of the blade must be considered when classifying such a find, and the knobbed sickle from Kartal was in the final stage of its use-life: its blade is narrow, rather straight than curved, and the tip is heavily hammered and bent.⁴⁹

Similar sickles were scattered over the Carpathians Basin in the LBA, and pieces akin to the knobbed sickle from Kartal can be considered frequent. The list of analogies can be narrowed down based on the shape of the base and the position of the knob (at the end of the back). Identical tools can

40 TARBAJ 2018, 482–488, 494–497, 683, 687, Pl. 14.7, Pl. 38.6, Pl. 379.A2, Pl. 382.12.

41 VINSKI-GASPARINI 1973, Pl. 110.14; KÖNIG 2004, Pl. 50A.7.

42 PATEK 1968, Pl. 31.6.

43 TARBAJ 2018, Pl. 2.14, Pl. 296.6. A new socketed axe of this type was found in Hoard V of Somló Hill in 2024.

44 SALAŠ 2005, Pl. 428.5.

45 LAUERMANN – RAMMER 2013, Pl. 50.1.

46 DERGAČEV 2002, 176.

47 See TARBAJ 2021, 54–55.

48 See BĂLAN 2009.

49 JAHN 2013, 64, Fig. 2.25; FEJÉR 2017, 342, Fig. 2.

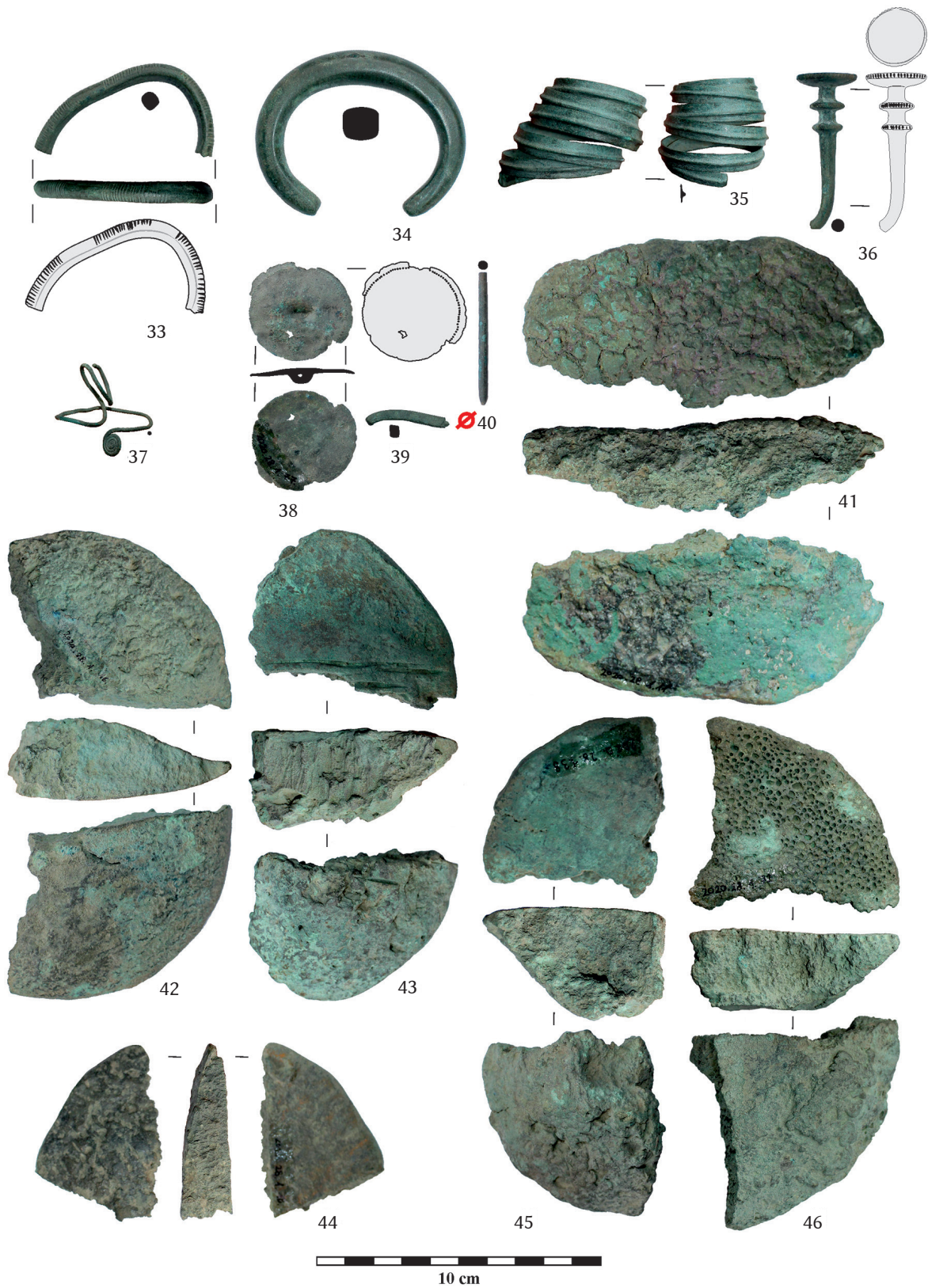


Fig. 4. The Kartal hoard.

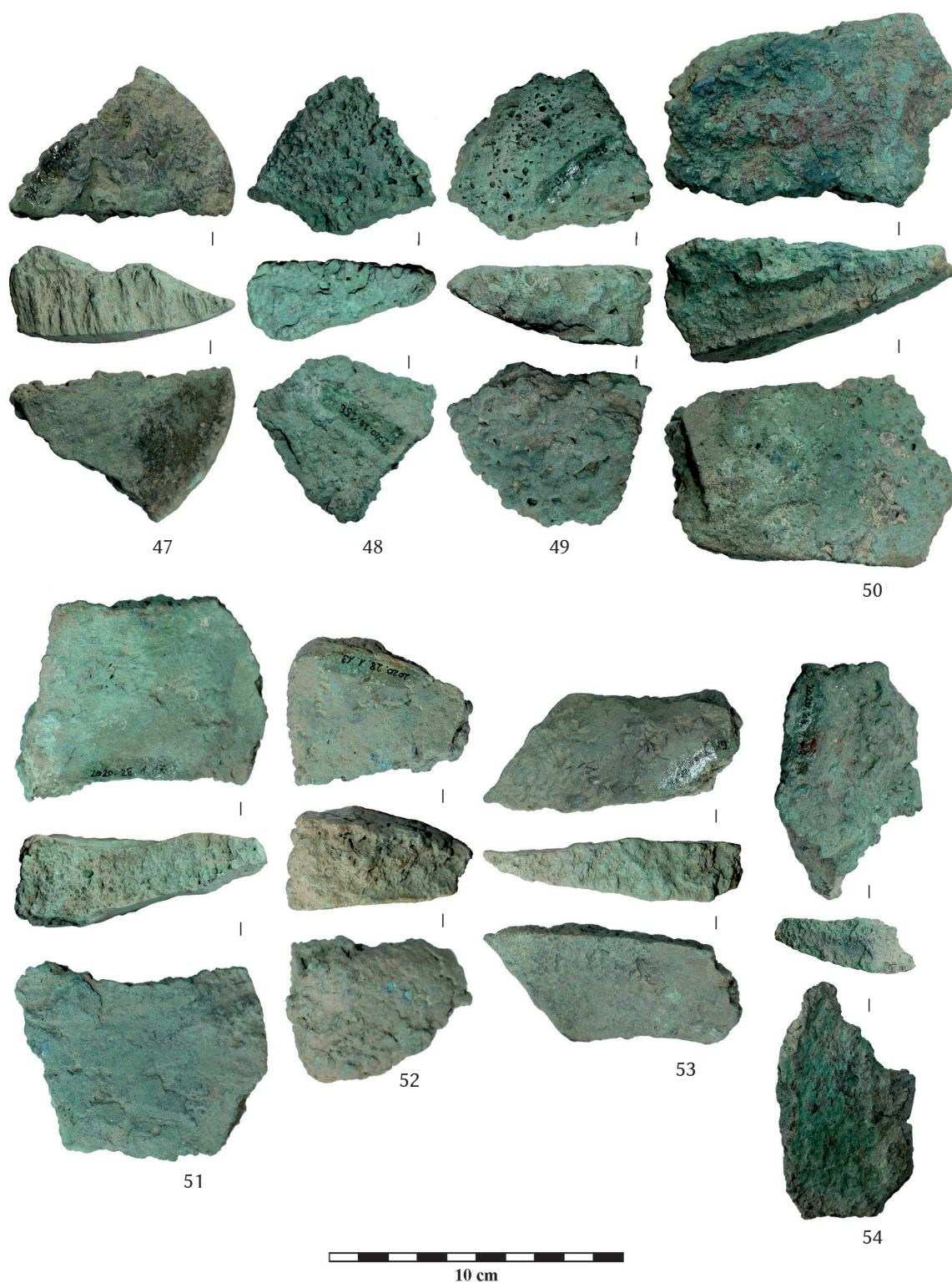


Fig. 5. The Kartal hoard.

be mentioned from Hungary (Br D – Ha B1),⁵⁰ Ukraine (Ha A1 – Ha A2),⁵¹ Romania (Br D–Ha A1 – Ha A2),⁵² the Czech Republic (Br C2 – Ha A2–Ha B1),⁵³ Germany (Br C2),⁵⁴ Austria,⁵⁵ Switzerland,⁵⁶ Slovakia (Ha A1),⁵⁷ Poland (Period III–IV),⁵⁸ Northern Croatia (Phase II),⁵⁹ and Serbia (Phase II) (Fig. 11.16).⁶⁰ The dating of the analogous finds covers a long period between Br C2 and Ha B1, many dated to around the Br D–Ha A1. Most pieces known from Hungary belong to the Ha A1 period, with only a handful deposited in younger assemblages. Generally, this tool type represents a relatively old tool style in the assemblage.

Flanged sickles

A total of sixteen flanged sickles and fragments can be found in the Kartal hoard. Only five could be classified (Fig. 3.19–21,24–25), while the rest are smaller and larger blade and handle fragments (Fig. 3.17–18,22–23,26–32).

One of the flanged sickles has a curved blade and slightly slant flanges (Fig. 3.19); its tang is decorated with two chevrons and has a forked end. The tang bears a small spur and a hole for fastening an organic grip around it. As these elements and the chevron pattern do not appear together on any similar sickle, this piece counts as unique. Similar sickles without chevron-shaped ribs are also rare; Pavlin mentions a perhaps identical one from Različica (2.C.1.H.m.1d).⁶¹

Another flanged sickle (Fig. 3.24) has a straight tang with a small spur, a forked end, straight inner ribs, and three cast chevrons that make it unique. A similarly decorated tang fragment of a flanged sickle is known from the Uioara de Sus (Ha A1) hoard in Romania.⁶² Another flanged sickle from Brvnište (Ha A2) bears a similar but more elaborate decoration of seven chevron motifs.⁶³ Based on these analogies, the flanged sickle could be dated to the Ha A phase.

A flanged sickle (Fig. 3.25) is decorated with a straight rib on the tang and two on the blade, completed on the tang by a pattern comprising an elongated chevron and a longitudinal straight rib. Its tang ends straight; it has a large spur on the handle. Flanged sickles similar in shape and decoration

50 PINTÉR 1899, Pl. 2.1, 3; JÓSA – KEMENCZEI 1965, Pl. 4.13; MOZSOLICS 1973, Pl. 57B.8; KEMENCZEI 1984, 399, Pl. 189.8; MOZSOLICS 1985a, Pl. 172.6, Pl. 176.3–5,8, Pl. 180.12, Pl. 206.26,30; MOZSOLICS 2000, Pl. 70.5, Pl. 80.17; MAKAY 2006, Pl. 15.130; V. SZABÓ 2016, Fig. 34; TARBAY 2018, Pl. 122.51.

51 ŽUROWSKI 1949, Pl. 17.8; KOBAL' 2000, Pl. 53.64,71, Pl. 74.22.

52 PETRESCU-DÎMBOVIȚA 1978, 137, Pl. 101.13, Pl. 145.205, Pl. 146.211, 215, Pl. 211A.9, Pl. 215B.4, Pl. 278.66; SOROCEANU 1981, Fig. 4.15–16; ȘADURSCHI 1989, Fig. 1.4–5; KEMENCZEI 1991, Fig. 4.5–6; KACSÓ 2007, Pl. 2.4; KACSÓ 2009, Pl. 16.2.

53 ŘÍHOVSKÝ 1989, Pl. 8.107, Pl. 9.117; BLAŽEK *et al.* 1998, 155, Pl. 15.69; SALAŠ 2005, Pl. 17.13, Pl. 105.13–15, Pl. 189.32, Pl. 239.18; KYTLICOVÁ 2007, Pl. 10.24, Pl. 27.78, Pl. 41B.11, Pl. 44.22, Pl. 55.57, Pl. 68.72–73, 76, Pl. 76.281, Pl. 177A.8–9.

54 PRIMAS 1986, Pl. 7.111,113,115,117.

55 PRIMAS 1986, Pl. 19.315; WINDHOLZ-KONRAD 2008, Fig. 53.

56 PRIMAS 1986, Pl. 5.89.

57 FURMÁNEK 2006, Pl. 4.69–70,72, Pl. 5.84,88–89, Pl. 6.96,99,101–104.

58 GEDL 1995, Pl. 3.37,39, Pl. 7.95,108.

59 VINSKI-GASPARINI 1973, Pl. 29.12.

60 JOVANOVIĆ 2010, Pl. 7.22.

61 PAVLIN 2023, 243, No. 841.

62 PETRESCU-DÎMBOVIȚA 1978, Pl. 182.507–508.

63 NOVONTÁ 2006, 92, Pl. 25.418.

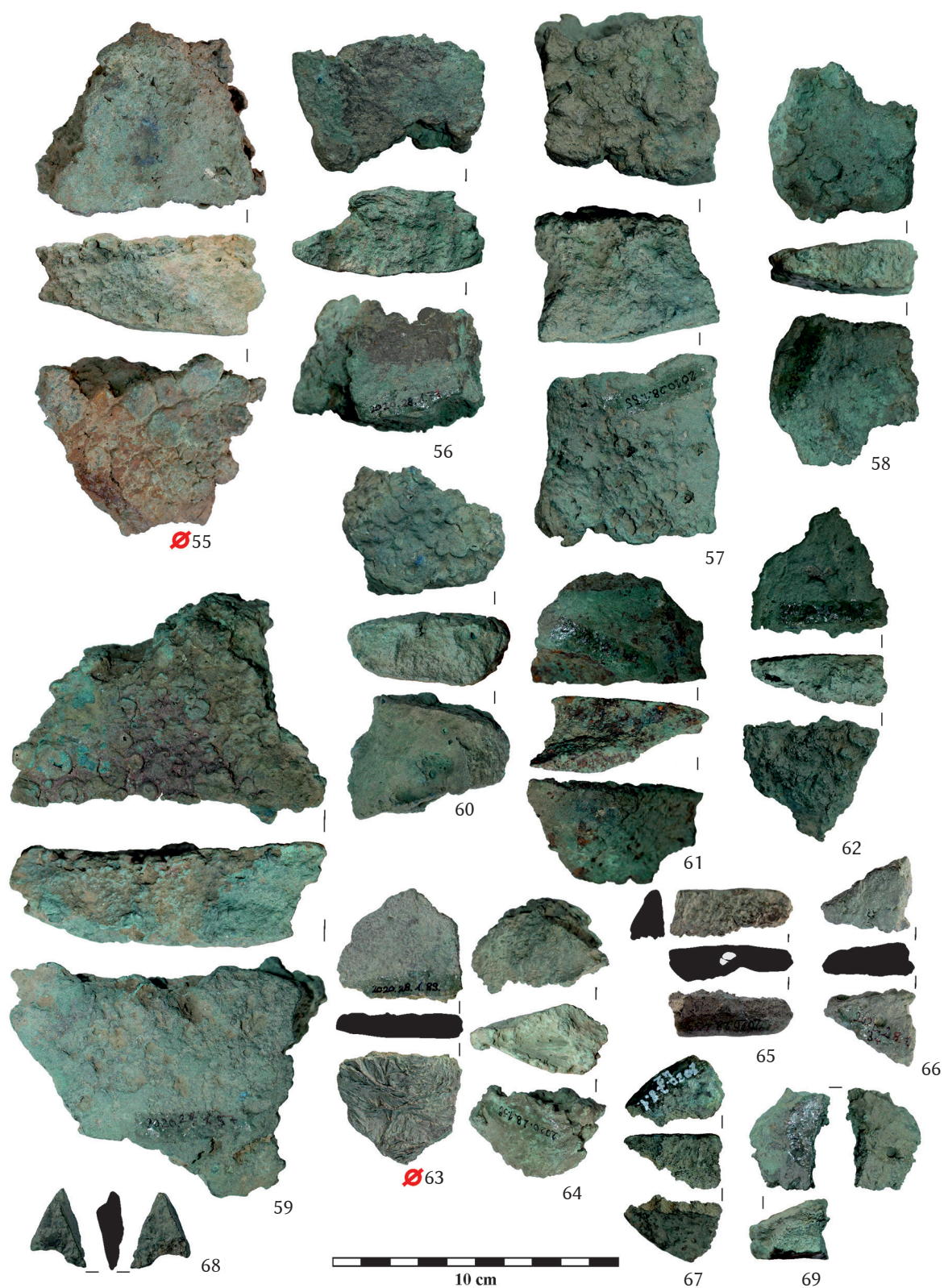


Fig. 6. The Kartal hoard.

appear in the Ha A1 material (e.g., Apagy,⁶⁴ Kemece I⁶⁵), but identical pieces are difficult to find; a single piece may be mentioned from the Ha A1 hoard of Pécs-Makárhegy II.⁶⁶

The handles of two flanged sickles (Fig. 3.20–21) are decorated with a straight rib along the blade-side edge of the tang and another along its middle; their tangs have a forked and a curved ending, respectively. The ribs were decorated after casting with short, oblique cuts. Dergačev and Bočkarev classified similar sickles from the Carpathian Basin as Pécs type or Pécs variant.⁶⁷ Pavlin distinguished between three flanged sickle type variants similar to the Kartal specimen: 3.A.0.1c, 3.A.0.1.d, and 3.A.0.1f. However, the ending of the tang cannot be identified due to casting defects (incomplete casting, flashes), which prevents their precise classification; they might fall into either category (3.A.0.1c–d, f) mentioned above. In light of all known analogies, sickles with such tang decoration and a rib along the edge-side rim of the tang are characteristic essentially of the Ha A1 period.⁶⁸

Annular ring

The hoard contains a rhomboid-sectioned ring fragment decorated with a line bundle (Fig. 4.33), likely from an annular ring of the Visuia type, which usually has a rounded or rhomboid profile. Such annular rings are generally undecorated, but a few examples are elaborate, featuring line bundle patterns and cross-hatched triangles. Similar rings are predominant in the Ha B1 period in the eastern part of the Carpathian Basin.⁶⁹

Bracelet

The thick, undecorated bracelet with blunt terminals and a faceted body (Fig. 4.34) likely had a hexagonal or octagonal section that became eroded in use. Carol Kacsó found similar bracelets in the Crăciunești hoard and listed analogies from northeast Hungary and Transylvania.⁷⁰ Jovan Kolešin published a similar bracelet from Hoard I of Krčedin, dating them between the Br D and Ha A1 periods based on analogies from the northern Balkans and the Carpathian Basin.⁷¹ A glimpse at the genealogies mentioned by Kacsó and Kolešin⁷² reveals that bracelets similar to the ones in the Kartal hoard are known from Br C2/D – Ha A1 contexts in northeastern Hungary (Br D),⁷³ Romania (Br D),⁷⁴ Serbia (Ha A1),⁷⁵ and Transcarpathia (West Ukraine) (Br C2/D – Br D) (Fig. 12.34).⁷⁶ The analogies also indicate that the heavily worn bracelet in the Kartal hoard is as old as it looks; it could be made between the Br C2/D – Ha A1 phases, very likely around the Br D.

64 MOZSOLICS 1985a, Pl. 181.6.

65 MOZSOLICS 1985a, Pl. 188.10.

66 MOZSOLICS 1985a, Pl. 48.5.

67 DERGAČEV – BOČKAREV 2006, 346–351.

68 DERGAČEV – BOČKAREV 2006, 346–351; PAVLIN 2023, 101–102, 120, Maps 51–53.

69 See TARBAY 2022b, 80–81, Fig. 11.

70 KACSÓ 1990, 242.

71 KOLEDIN 2021, 14, Pl. 16.2.

72 KACSÓ 1990, 242; KOLEDIN 2021, 14.

73 JÓSA – KEMENCZEI 1965, Pl. 72.70; MOZSOLICS 1973, 156, Pl. 33.21, Pl. 63.2, Pl. 64.1,5, Pl. 65.4; KEMENCZEI 1984, 124–125, Pl. 58D.2, Pl. 59A.4; MOZSOLICS 1985a, 121.

74 MOZSOLICS 1973, Pl. 49.10; KACSÓ 1990, Fig. 1.2.

75 KOLEDIN 2021, Pl. 16.2.

76 KOBAL' 2000, Pl. 45.6, Pl. 94.B.6, Pl. 95.D, Pl. 97.49–50, Pl. 100.4.



Fig. 7. The Kartal hoard.



Fig. 8. The Kartal hoard.

Spiral armlet

The Kartal hoard also includes a small spiral armlet with rounded ends and a flat, ribbed body (Fig. 4.35). Several different spiral bracelets, usually also decorated with ribs, are known from the LBA Carpathian Basin, but the piece from Kartal differs completely due to the shape of its endings and size. A few similar objects also appear in the Middle Bronze Age record; Hänsel called these ‘*ein-fache Blechspiralen mit Mittelrippe*’, mentioning three examples from the area of Hungary (Dunaújváros-Kosziderpadlás, Hoard I (Br B1), the Kölesd-Hangospusztá hoard (Br B1), and Rimavská Sobota, Hoard II (Br B1), an unpublished specimen from Majcichov, and a large spiral, different from the Kartal piece, from Lovas.⁷⁷ Similar armlets also appear in LBA contexts but not typically in the Carpathian Basin. An example is the much larger spiral armlet in the Vajdácska (Br D) hoard.⁷⁸ A further example can be mentioned from the Kraski hoard in Poland, an ornament hoard with a spearhead dated to Period III (Br D/Ha A1).⁷⁹

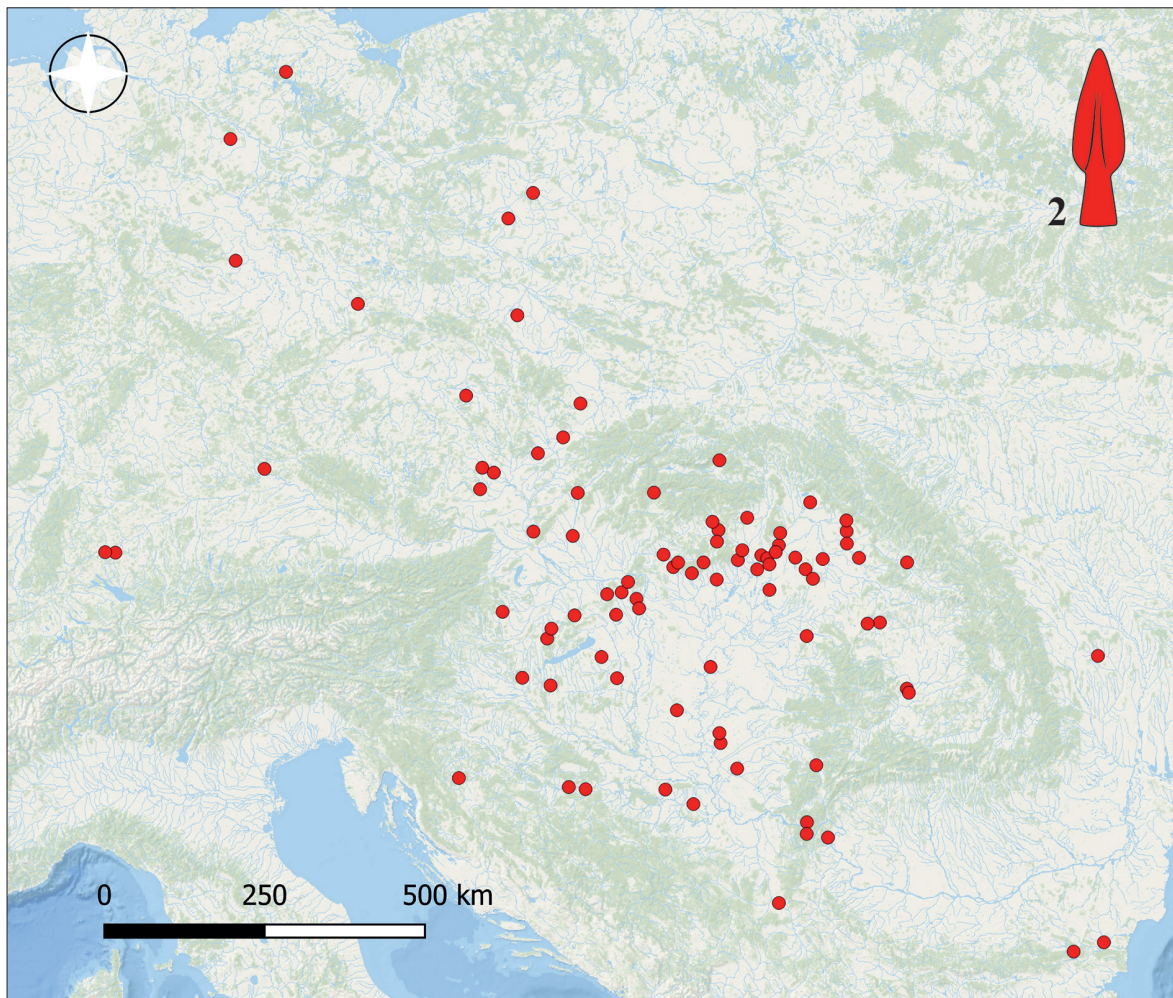


Fig. 9. Distribution of analogies to spearhead No. 2 in the Kartal hoard (see footnotes 10–22).

77 HÄNSEL 1968, 105, List 105, Map 23; MOZSOLICS 1967, Pl. 32.3–4, Pl. 46.20–21; FURMÁNEK 1977, 273, Pl. 29.11.

78 KEMENCZEI 1981, Pl. 4.2.

79 JASNOSZ *et al.* 1959, Pl. 18(2).4–5. A small bracelet with a similar design to the one in the Kartal hoard was found in Grave 769 of the Opatów cemetery, dated around Period II–III; see GEDL 1975, Pl. 41.7.

Pin⁸⁰

The disc-headed pin with two incised knobs (Fig. 4.36) belongs to the group of signet pins (*Petschaftkopfnadeln* or Vyšný Kubín type).⁸¹ It was bent and broken, damaged in use, and also intentionally damaged before deposition. Such manipulations are not rare among similar finds at all. For example, the Keszőhidegkút hoard contains a similarly manipulated find,⁸² and similar pins belong to the uncertain hoard from Nógrádmarcfal.⁸³ Kemenczei published another example, a stray find from the area of Szerencs, part of the Dr. László Petrikovics Collection.⁸⁴ Novotná mentions similar finds from Slovakian graves, which were also manipulated as part of the cremation or funeral.⁸⁵ Typologically, this pin is much older than most finds in the Kartal hoard. Pins with signet-shaped heads tend to appear in assemblages dated between the Br D and Ha A1 periods (mainly the Ha A1) in Serbia, Hungary, Slovakia, and Austria.⁸⁶ A pin similar to the one from Kartal but with two knobs was found in the Futog hoard in Serbia, assigned to Hoard Horizon II, corresponding to the Br D/Ha A period.⁸⁷ Another undecorated example, a stray find, is known from the Liptovský Mikuláš-Ondrašová cemetery in Slovakia.⁸⁸

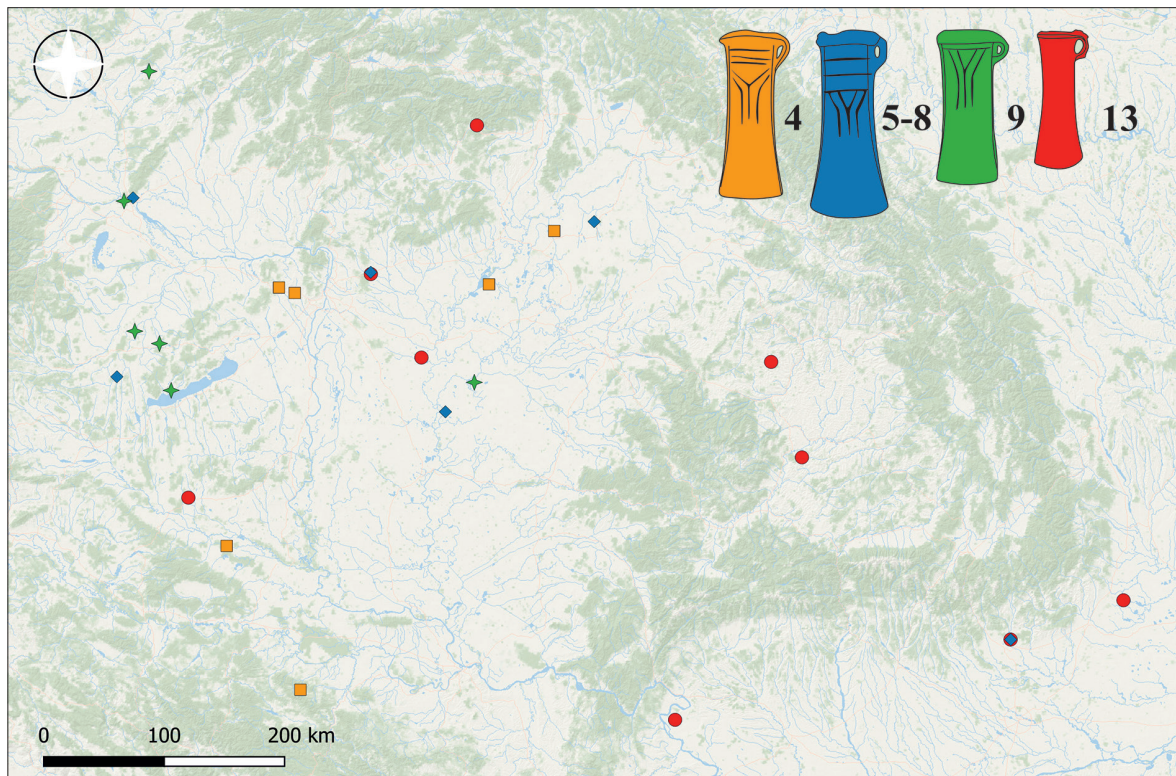


Fig. 10. Distribution of analogies to socketed axes Nos. 4–9 and 13 in the Kartal hoard (see footnotes 37, 39–45, 47).

80 The hoard also contains a broken pin shaft of a small pin or brooch (Fig. 4.40).

81 NOVOTNÁ 1980, 85–87.

82 MOZSOLICS 1985a, Pl. 35.10.

83 MÁRTON 1911, 324, Nos 6–7; TARBAY 2018, 608–609, Pl. 246.22–23.

84 KEMENCZEI 1969, 33, Pl. 21.2.

85 NOVOTNÁ 1980, 86.

86 PITTIONI 1941, 93, Pl. 16.11; KEMENCZEI 1965, Pl. 5.5; KEMENCZEI 1969, Pl. 21.2; ŘÍHOVSKÝ 1979, 109–110; NOVOTNÁ 1980, 85–87; MOZSOLICS 1985a, Pl. 35.10, Pl. 164.11; VASIĆ 2003, 42–43; JOVANOVIĆ 2010, 41, Pl. 39.304.

87 VASIĆ 2003, Pl. 16.218.

88 NOVOTNÁ 1980, 86, Pl. 22.510.

Spiral ring

The Kartal hoard contains a small spiral ring made of round metal wire, ending in spiral discs (Fig. 4.37). The object is fragmentary; thus, the exact shape and number of the wires in the spiral is unknown. Originally, it may comprised only one. This ornament was likely a finger ring with two spiral discs, similar to the ones recently found *in situ* on the hand of the deceased in a grave at Sükösd.⁸⁹ This kind of jewellery was in vogue in the Carpathian Basin, especially the territory of Hungary, at the end of the MBA and the first half of the LBA (Br B2–Br D). Their hoarding started to decline after the Br D, and, except for a few finds from Ha A1 assemblages like Lengyeltóti III and Peterd, similar rings are no longer present in younger hoards in the region.⁹⁰ It is reasonable to assume that this spiral ring represents the same period in the Kartal hoard as the bracelet (Fig. 4.34), very likely the Br D, if not an older one.

Phalera

The Kartal hoard contains one medium-sized, flat phalera with a loop and an edge decorated with punched dots (Fig. 4.38). Undecorated variants of the type, with straight or slightly convex surfaces, are known all around Central Europe, including Bosnia and Herzegovina (Ha A1),⁹¹ Croatia (Phase II),⁹² Bohemia (Br D – Ha A2),⁹³ Slovenia,⁹⁴ Serbia,⁹⁵ Hungary (Ha A1 – Ha B1),⁹⁶ Austria (Br D/Ha A1 – Ha A1),⁹⁷ Poland,⁹⁸ Ukraine (Ha A2),⁹⁹ and Romania (Br D – Ha B1).¹⁰⁰ Casting moulds of this type were unearthed in Lužice in the Czech Republic and Łojewo in Poland.¹⁰¹ The artefact is difficult to date as it was common in the Ha A1 or Phase II (Br D–Ha A1), but some specimens were hoarded and deposited in younger assemblages in the Ha A2 and B1. The decoration around the edge of the Kartal phalera is rare, with only three analogies, from Brodski Varoš (Phase II – Br D–Ha A1),¹⁰² Nadap (Ha A1),¹⁰³ and Arsura.¹⁰⁴ The phalera from Kartal likely belongs to the Ha A1 period.

89 PÁSZTOR *et al.* 2022, 98, Fig. 5.3–11.

90 MOZSOLICS 1973, 54; KILIAN-DIRLMEIER 1980, 249–250; MOZSOLICS 1985a, Pl. 61.12, Pl. 108.4; SOROCEANU 2023, 50. A typochronological framework and a comprehensive list of known analogies were published by Tudor Soroceanu, which renders describing these in detail (including the pieces from Hungary) unnecessary; see SOROCEANU 2023, 54–75.

91 KÖNIG 2004, Pl. 19.78–80.

92 VINSKI-GASPARINI 1973, Pl. 30B.1, Pl. 45.14, 19–21, Pl. 49.10, Pl. 53.17, Pl. 57.19–21, Pl. 66.33, Pl. 71.15–16, 23, Pl. 73.15, Pl. 74D.3, Pl. 86.4; KARAVANIĆ 2009, Pl. 71.26–27.

93 SALAŠ 2005, Pl. 199A.100, Pl. 217.229, 237–239, Pl. 268.25, Pl. 314.59–61; KYTLICOVÁ 2007, Pl. 23.20.

94 STARÈ 1975, Pl. 41.9.

95 TODOROVIĆ 1977, 46.

96 MOZSOLICS 1985a, Pl. 107.5, Pl. 108.18–19, Pl. 140.17, Pl. 164.3, Pl. 207.12; TARBAJ 2018, Pl. 277.14, Pl. 365.117–118, Pl. 427.289, 292, Pl. 450.14.

97 TRNKA 1982, Pl. 1.5; HELGERT 1995, Pl. 4.1.

98 COFTA-BRONEWSKA 1996, Fig. 4.1.

99 KOBAL' 2000, Pl. 79B.9, 15–16.

100 PETRESCU-DÎMBOVIȚA 1978, Pl. 31.14–16, Pl. 53.48–49, Pl. 79B.16, Pl. 159A.12, Pl. 248A.31–32; ENĂCHIUC 1995, Fig. 6, Fig. 14.53–58.

101 COFTA-BRONEWSKA 1996, Fig. 4.1; BLAŽEK *et al.* 1998, Pl. 7.24.

102 VINSKI-GASPARINI 1973, Pl. 57.13–14.

103 MAKKAY 2006, Pl. 29.308.

104 LEAHU 1997, Fig. 4.5.

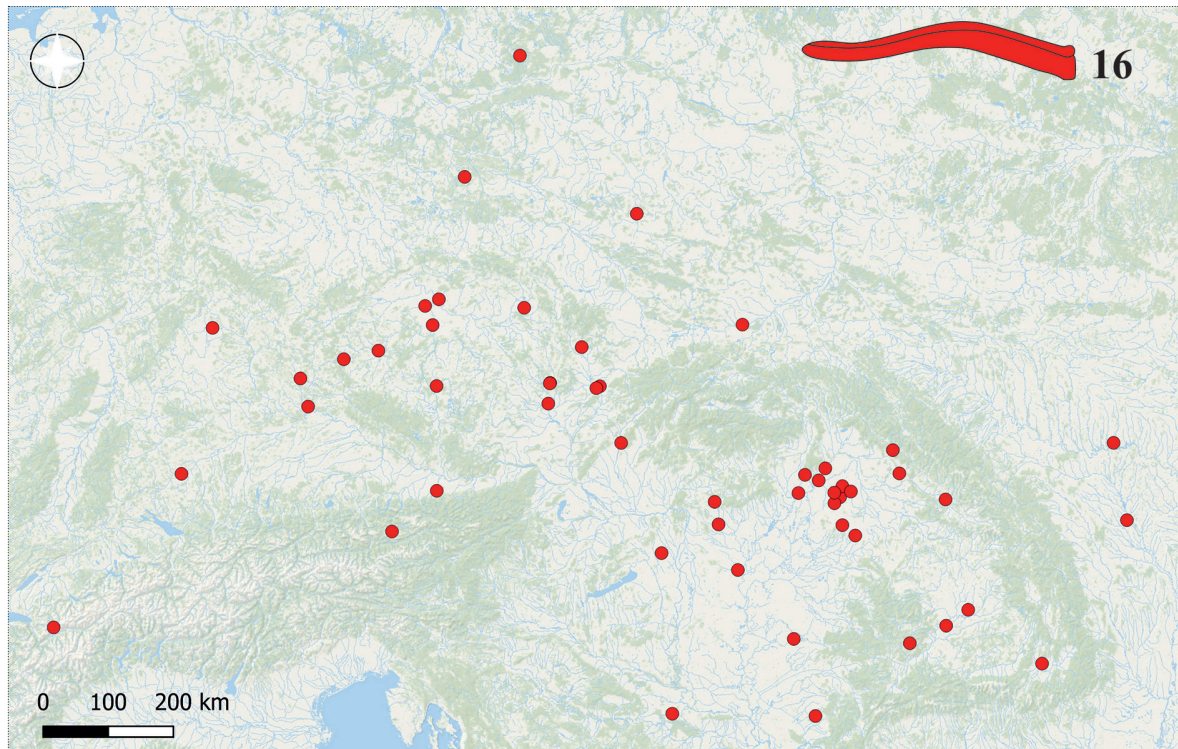


Fig. 11. Distribution of analogies to knobbed sickle No. 16 in the Kartal hoard (see footnotes 50–60).

Bar ingots

Different bar ingots can be found in the Kartal hoard: ones with a semi-oval profile and a hammered spine (Fig. 7.91) and ones with an oval section and a hammered body (Fig. 7.90). The different bar ingot variants are metallurgical objects commonly appearing in numerous Carpathian hoards; they are either byproducts of casting (superfluous melt cast in a practical shape) or real ingots easy to be recast in crucibles or hammered into objects, usually rings or bracelets.¹⁰⁵ Without elemental composition analysis, it is difficult to determine to which type the ingots in the Kartal hoard may belong.

Plano-convex ingots

The Kartal hoard contains several plano-convex ingots (Fig. 4.41–46, Figs 5–6), intentionally broken into diverse pieces (halves, quarters, edge fragments, and body fragments from the middle or edge part). Due to their fragmented state, the original size of most is difficult to reconstruct. Based on the dimensions and weight of the half-fragment (Fig. 4.41) and some of the quarters (Fig. 4.42–43, 45–46), the biggest ingots could be around 130–150 mm in diameter and weigh between 1 and 2 kg. These dimensions are similar to the Velem and Lovasberény types defined by Zoltán Czajlik, which were common in the LBA.¹⁰⁶ One ingot was likely flat (Fig. 6.63); complete examples of this variant are known from the Keszölc and Budakeszi hoards.¹⁰⁷

Casting jet

The Kartal hoard contains a long casting jet (Fig. 7.94). The inner side of the jet is slightly curved, suggesting that it may belonged to a casting made in a two-piece mould with a casting core, and

105 See MOZSOLICS 1985b, 32–33; CZAJLIK 2012, 74; TARBAY 2014, 218–219.

106 CZAJLIK 2012, 68–70.

107 TARBAY 2014, Fig. 71.84; TARBAY 2022c, Pl. 5.47.

this jet is the melt that solidified in the pouring cup around the core.¹⁰⁸ Such pouring cups were most likely used to cast socketed axes, socketed chisels, and spearheads.

Metal lumps

The Kartal hoard includes several different lumps (Fig. 7.70–89), either atypical fragments of plano-convex ingots or byproducts of casting (e.g., Fig. 7.83). Three (Fig. 7.70–71, 73) consist of small fused lumps, which probably dropped to the same place during casting. One is clearly splashed and solidified melt (Fig. 7.89).

Pot with knobs

The fragmented ceramic pot that covered the hoard is a common LBA type (Fig. 7.95, Fig. 8). It has a slightly everted rim with three horizontal knobs pointing outwards. This barrel-shaped vessel can be classified as Variant VI.A2 in the typology of the Urnfield cemetery of Békásmegyer. Knobbed pots appear in general in the Br D/Ha A1 phase and are still produced in the Early Iron Age (EIA). Based on their distribution, they cannot be considered culture-specific.¹⁰⁹ One of the oldest examples was found in a Hajdúbagós–Cehăluș settlement at Nyíregyháza–Oros (ca. Br D – Ha A1).¹¹⁰ This pot type appears in the pottery of the Kyjatice (e.g., Radzovce Graves 440 and 694 [Ha B1], Sajószentpéter–Vízmű)¹¹¹ and Lausitz cultures (e.g., Háj Graves 42, 45, 57, 63, and 73, Opava–Kateřinky Grave 94). Except for Radzovce (F11 type), the neck of these vessels is concave rather than straight.¹¹² With predecessors in the Tumulus culture and the Proto-Gáva phase,¹¹³ the type also appears in the Gáva culture; examples can be mentioned from Baks (Ha A2–Ha B1)¹¹⁴ and Pócspetri (with a thin rim).¹¹⁵ It also appears in West Ukraine; a fine example is known from the Gáva–Holihrad cemetery of Sopit.¹¹⁶ Pots representing an evolved version of a Transdanubian Tumulus culture type appear in Grave 105 in the Urnfield cemetery of Budapest–Békásmegyer (mentioned above); these pieces were dated to the Ha A2 period based on the analogy of a pot in the Jászkarajenő hoard.¹¹⁷ The dating of this vessel is challenging because it cannot be dated more precisely than the Br D/Ha A1 and Ha B1 periods.

Unclassifiable objects

Three small fragments of rectangular-sectioned bars (Fig. 4.39, Fig. 7.92–93) are difficult to classify due to their fragmentary state; they can be semi-finished products, bar ingots hammered into wires, or fragments of rectangular bracelets with rectangular profiles (e.g., Lovasberény type).

108 WANZEK 1989, 49, Fig. 5.8. A similar casting jet is known from Biatorbágy–Herceghalom (TARBAY 2018, Pl. 30.174).

109 Reviewed by KALICZ-SCHREIBER *et al.* 2010, 255; MARKOVÁ 2011, 48.

110 MARTA *et al.* 2010, 29, 65–69, Typological plate 1.3, Pl. 10.1, Pl. 12.6 (Type 3 pots).

111 KEMENCZEI 1984, Pl. 94.14, Pl. 94.29; MARKOVÁ 2011, 48, 66, Fig. 5.10; FURMÁNEK *et al.* 2016, 170, 254, Pl. 55.12, Pl. 92.15.

112 HRUBEC – KUJOVSKÝ 1994, Pl. 5.1, 12, Pl. 7.11, Pl. 8.7, Pl. 9.9; JUCHELKA 2007, Pl. 3.6; MARKOVÁ 2011, 48; FURMÁNEK *et al.* 2016, Fig. 5.F11.

113 CSÁNYI 1980, Fig. 8.7; V. SZABÓ 2002, 12, Fig. 5.17, 25; KALICZ-SCHREIBER *et al.* 2010, 255.

114 KÓSA 2020, 28, Fig. 13.E.2, Fig. 50.3.

115 KALLI 2012, Pl. 4.5.

116 KRUSĚLNICKA 1979, 80, Fig. 2.9.

117 KUSTÁR 2000, Pl. 12.2; KALICZ-SCHREIBER *et al.* 2010, 255, Pl. 51.4. Mozsolics dated the pot from Jászkarajenő to the Gáva II phase (ca. Ha A2–Ha B1) but emphasised the uncertainty of a dating in the absence of the find (as it went missing); see MOZSOLICS 1985a, Pl. 272.6. A repeated analysis of the metal finds of the Jászkarajenő hoard revealed it being a multi-period assemblage. The oldest objects can be dated to the Br D/Ha A1, several are characteristic of the Ha A and Ha A2/Ha B1, while the youngest of the Ha B1 period (TARBAY 2018, 536–547). The pot could belong to any of the phases reflected by the metal finds.

The dating of the Kartal hoard

The relative dating of the Kartal hoard is based on close analogies from the Carpathian Basin and beyond. The datable objects deposited in this hoard do represent more than one phase (Fig. 12). Some represent multiple phases, such as the spearhead (Fig. 12.2): Br B1 – Ha B1 (mainly Ha A1 – Ha B1), the knobbed sickle (Fig. 12.16): Br C2 – Ha B1 (mainly Br D – Ha A1), the phalera (Fig. 12.38): Br D – Ha B1 (likely Ha A1), and the ceramic pot (Fig. 12.95) mainly Br D – Ha A1 – Ha B1. A few objects that can be considered older than the youngest in the deposit: the bracelet (Fig. 12.34): Br D, the spiral ring: MBA, Hungarian LBA/Br B2 – Ha A1 (mainly Br D), the pin with a signet-shaped head (Fig. 12.36): Br D/Ha A1, the winged axe (Fig. 12.15): Ha A1, the flanged sickle (Fig. 12.24): Ha A, another flanged sickle (Fig. 12.25): Ha A1, and some more flanged sickles (Fig. 12.20–21): Ha A1.

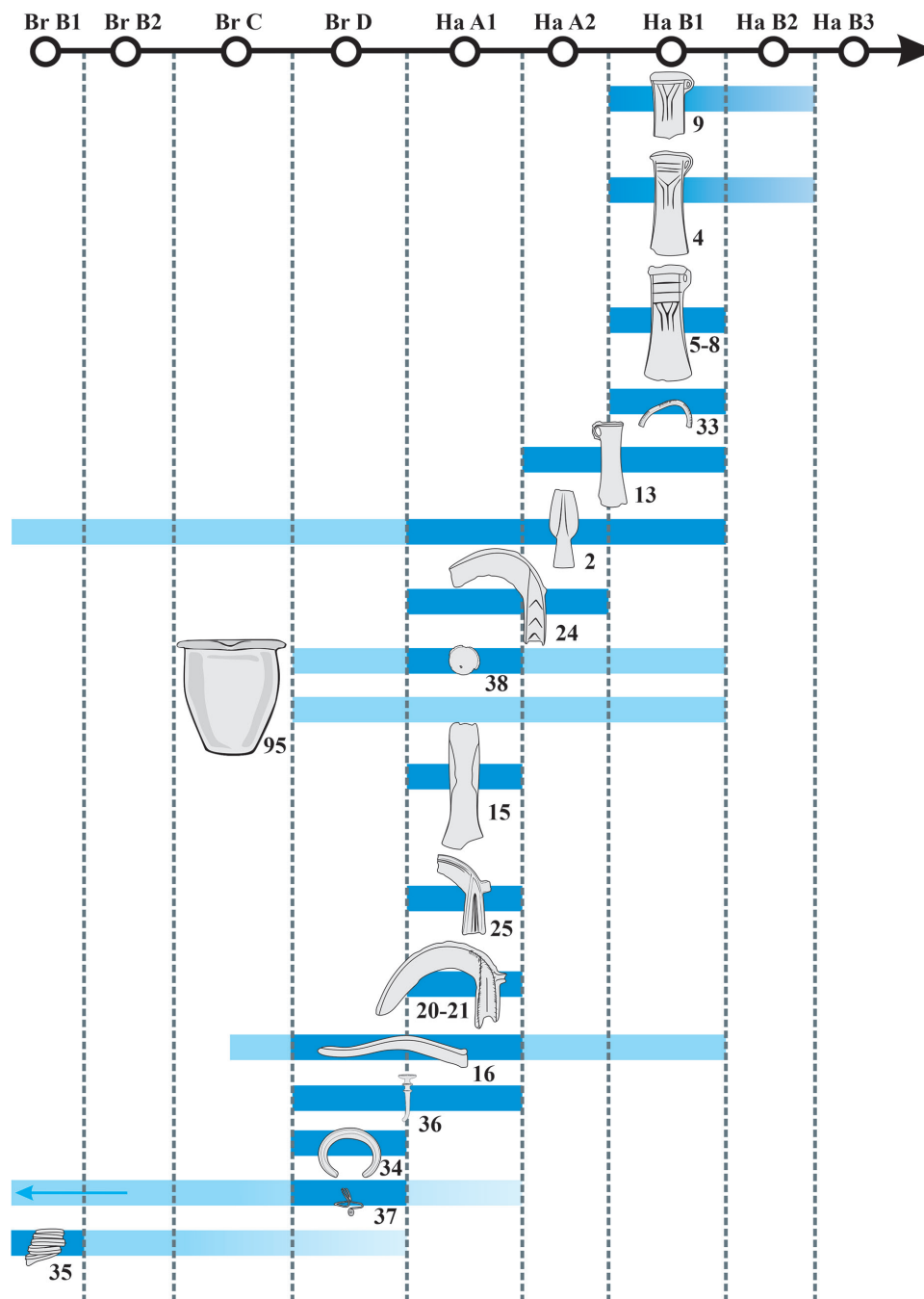


Fig. 12. Relative chronological positions of datable objects in the Kartal hoard.

The spiral armlet (Fig. 12.35) is likely an out-of-time object, as its best analogies are known from the end of the MBA, around the Br B1 period. Two analogies from around the Br D and Period III (Br D/Ha A1) suggest a younger dating. The Palotabozsok-type axe (Fig. 12.13) cannot be dated more precisely than the Ha A2 – Ha B1 periods. The youngest objects in the assemblage, such as the Debrecen-type axes with three different types of rib (Fig. 12.4–9) and the Visuia-type annular ring (Fig. 12.33), represent the Ha B1 period.

The Kartal hoard belongs to a deposition type that Hungarian research traditionally dates to the Ha A2 period after the schemes of von Brunn, Mozsolics and Kemenczei, interpreting it as a transitional material containing objects characteristic of both the Ha A1 (Kisapáti–Lengyeltóti Phase/Kurd Horizon/Hoard Phase II) and the Ha B1 (Rohod–Szentcsanak Phase/Hajdúböszörmény Horizon/Hoard Phase IV).¹¹⁸ In light of a recent and comprehensive reassessing of the so-called ‘Gyermely hoards’ from Hungary, this theory cannot be accepted¹¹⁹ and it seems more likely that, as it was proposed by Hansen,¹²⁰ most of these finds were deposited in the Ha B1 (except for the ones with a completely uncertain context, unsuitable for dating or assigning the finds to a particular phase, either older or younger). Based on their components, most of these hoards represent multiple periods; the Kartal hoard is an excellent example of that, clearly demonstrating that these assemblages are the result of a complex and long (Br D – Ha B1) hoarding of objects, concluding with their depositing in the Ha B1, rather than a mixture of two different eras. Broken and heavily worn jewellery representing older phases (such as the Br D) and potential archaicas make up the oldest group, while sickles and the winged axe represent the Ha A1 period. The youngest objects are socketed axes, while the Visuia-type ring points already towards the Ha B1 period. These finds were very likely the possessions of several people in different generations, accumulated in different places and coming together in the deposition.

Use-wear

Except for the handle fragment of a flanged sickle (Fig. 3.29), all tools, weapons, and ornaments were identified as finished products, i.e. these objects went through all production phases following casting. The different types of casting defects, such as incomplete casting (Fig. 1.5, Fig. 2.14), mismatch (Fig. 1.2,5, Fig. 2.8–9,13), misrun (Fig. 1.7, Fig. 2.8,10), shrinkage (Fig. 3.20), porosity (e.g., Fig. 2.9,12), and core shift (Fig. 2.11) were either tolerated or ignored by the craftsmen. The most characteristic traces related to the post-casting treatment phase on artefacts of the Kartal hoard are traces of cold hammering and possible annealing along the wider and narrow sides of the cutting edges of axes (e.g., Fig. 1.1,4–7, Fig. 2.8,13,15) and the sickle (e.g., Fig. 3.16–24,27–28,30,32). Hammering traces also appear on the collars of these axes (e.g., Fig. 2.9–10).

Four socketed axes are identical in dimensions and style (Fig. 1.5–7, Fig. 2.8), also featuring the same flaw (the lowest horizontal rib is slightly oblique), which may indicate that all were made in the same heat-resistant and reusable moulds made of soapstone or other stones with similar characteristics or their ceramic, sand, or wax moulds were made using the same model. Mismatch defects are an argument for casting moulds because the wax model can be repaired if its execution is not pleasing, while patterns on a mould are hard to correct. These axes were deposited in the same hoard after some use. They had circulated together before deposition and had probably been used by the people of the same household or settlement.¹²¹ The connection between the objects is also reflected in their position within the hoard: they have been found in the same northeastern part of the hoard, some next to each other (Figs 23–27).

118 VON BRUNN 1968; MOZSOLICS 1985a; KEMENCZEI 1996.

119 TARBAY 2015; TARBAY 2018; TARBAY 2020.

120 HANSEN 1994, 397–405; HANSEN 1996.

121 The phenomenon has known analogies, e.g., the sickles in the Ha B1 Kenderes hoard; see MOZSOLICS 2000, 53.

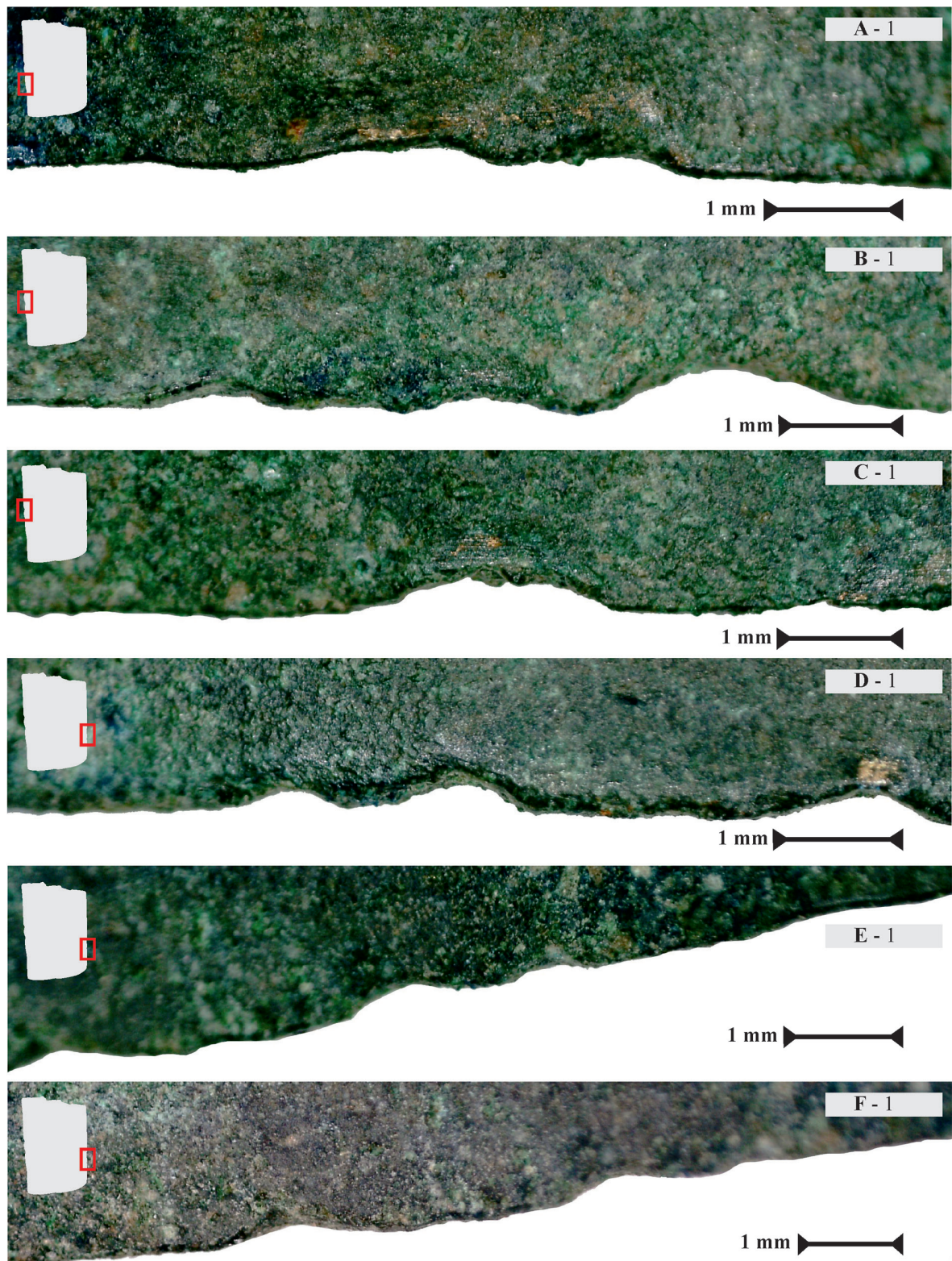


Fig. 13. Use-wear marks: A–F– chips.

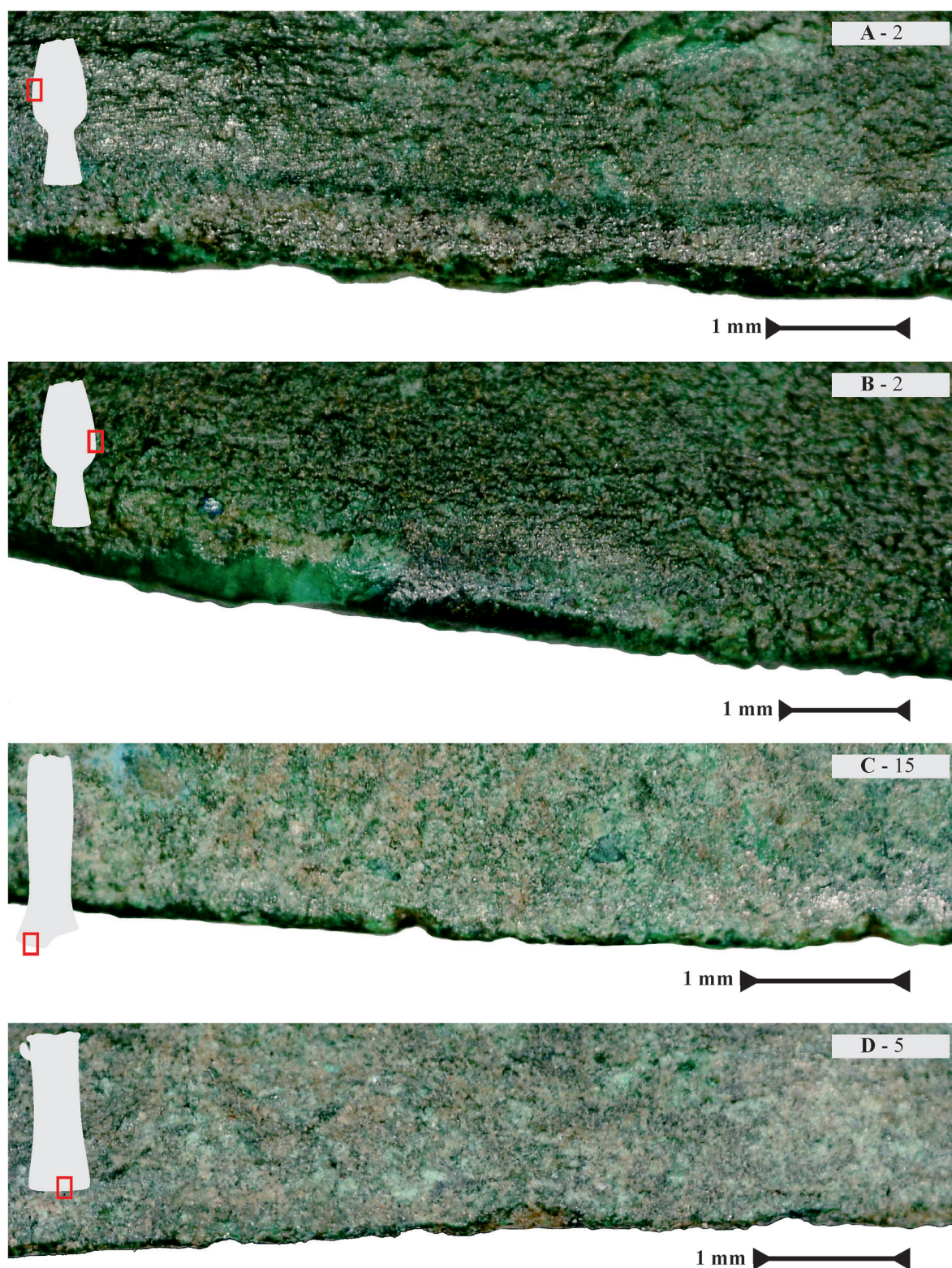


Fig. 14. Use-wear marks: A – chips, B – flattening, C–D – chips.

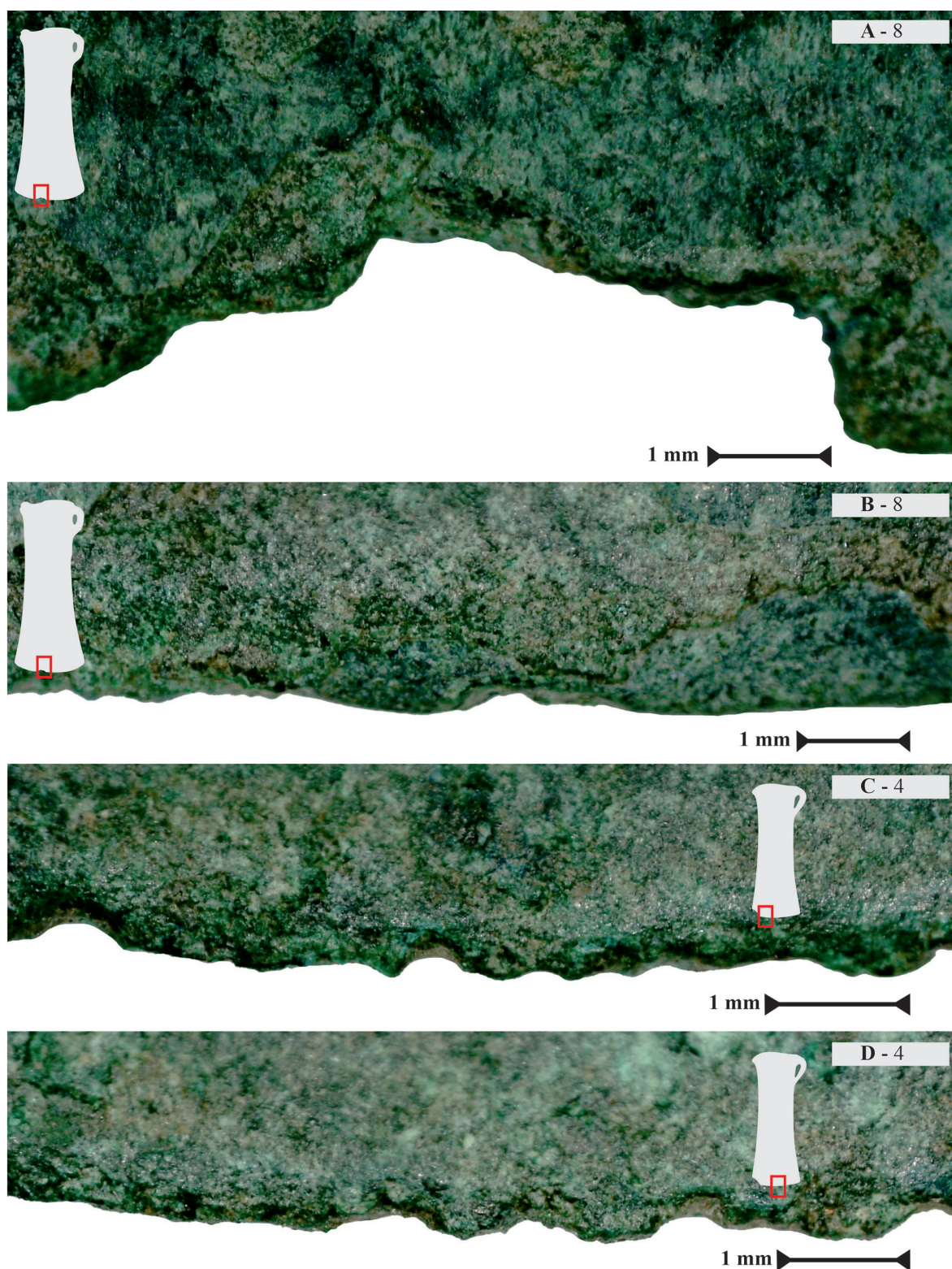


Fig. 15. Use-wear marks: A – multiple notches, B – chips, C – chips and notches, C-D – notches.

Several finished items in the Kartal hoard feature no use-wear traces (Fig. 22) due essentially to fragmentation. The blades of many sickles and socketed tools, the part with potential microwear traces, are missing (e.g., Fig. 1.3,6–7, Fig. 2.9,14, Fig. 3.28). Some of these objects are too fragmentary and represent too small of the functional part of the original weapon to draw a valid conclusion on how worn the original blade was.

Complete items and relatively large fragments with more or less preserved cutting edges were suitable for use-wear analysis. Use-wear traces fall into two distinct categories. The first includes traces related to prehistoric use, usually small microdamage along the cutting edges of tools and weapons, while the second collects traces related to a possible long and/or intensive use, i.e. worn damages and surfaces and changes in the initial shape of the artefact (e.g., reshaped blades, shortened tips, etc.) (Fig. 22).

Small chips or dents were observed along the cutting edge of the sword, which experimental archaeological research often relates to edge-on-edge contact, slashing, and cutting (Fig. 13.A–F).¹²² The spearhead also shows a chip or a dent similar to the ones on the sword (Fig. 14.A) and flattening, usually associated with blocking or impact on flat surfaces (Fig. 14.B). Based on archaeological experiments, these traces may be the result of use in combat.¹²³ The cutting edges of some socketed axes feature chips (Fig. 14.D, Fig. 15.B–C, Fig. 16.B), single notches (Fig. 15.C–D, Fig. 16.A,C–D), multiple notches (Fig. 15.A) or their combination.¹²⁴ Like socketed axes, the winged axe also has a small chip along its blade (Fig. 14.C). The blade of a socketed axe is asymmetrical due to repeated reshaping by hammering. The sickles show different intensity use; the ones with narrow, reshaped blades (Fig. 3.16,19,25) were potentially used for long periods. Also, a variety of micro use-wear traces, such as chips (Fig. 17.B, Fig. 18.B,D, Fig. 21.A) and notches (Fig. 17.C, Fig. 18.A,C, Fig. 19.A, Fig. 20.A–C, Fig. 21.B–D) can be observed on the rest of the sickles; some notches show heavy wear (Fig. 19.B–C, Fig. 21.C–D) or terminate in cracks (Fig. 19.A). Worn edges and narrow blades are also present (Fig. 17.A).¹²⁵ The intact bracelet, which likely had an octagonal-shaped cross-section when it was cast, also features heavy wear that resulted in the rounding of its edges (Fig. 4.34).

The rest of the finds are ingots of the plano-convex or bar types. The surfaces of the rods (Fig. 7.92–93) are hammered; they can be either broken fragments of finished or unfinished products made of bar ingots. As mentioned, the hoard contains several lumps, either byproducts of casting or unidentifiable small plano-convex ingot fragments.

Fragmentation

Unlike most hoards found in Hungary, the assemblage from Kartal was excavated, which makes it a perfect candidate for reliable fragmentation analysis, as the objects suffered no post-recovery damages,¹²⁶ i.e., intentional modern breaking or bending. Besides, their position upon discovery indicates that modern agricultural work did not scatter all of them over the field or break them further.

The Kartal hoard is a heavily fragmented assemblage. Out of the 94 metal artefacts, only eleven are complete (~12%), including the casting jet, which was created by breaking it off the sprue. Fragmenta-

122 BRIDGFORD 2000, 105, Pl. 3.3; BELL 2019, 153, Fig. 10.1c; GENTILE – VAN GIJN 2019, 136–137, Fig. 5.B; HERMANN *et al.* 2020, 26, 32, 93, Fig. 4.13, Fig. 4.32, Fig. 4.187.

123 ANDERSON 2011, 604, Fig. 6; GENTILE – VAN GIJN 2019, 137, Fig. 6.A–B, Fig. 9.C–D; HERMANN *et al.* 2020, 37, 52, Fig. 4.47–48, Fig. 48.88. Similar traces were observed on other Carpathian spearheads: TARBAY *et al.* 2024, Fig. 2.7.

124 ROBERTS – OTTAWAY 2003, 126–127, Fig. 25; SYCH 2014, Fig. 2; TARBAY 2022c, Pl. 80; DOLFINI *et al.* 2023.

125 JAHN 2013, 64–68, Fig. 2.25–2.27; MCCLENDON 2015, 84–86; FEJÉR 2017, 342, Fig. 2.

126 Individual objects were photographed in an unrestored state. None of them, even the ones that were removed from their original position by the finders, showed traces of post-recovery damage.

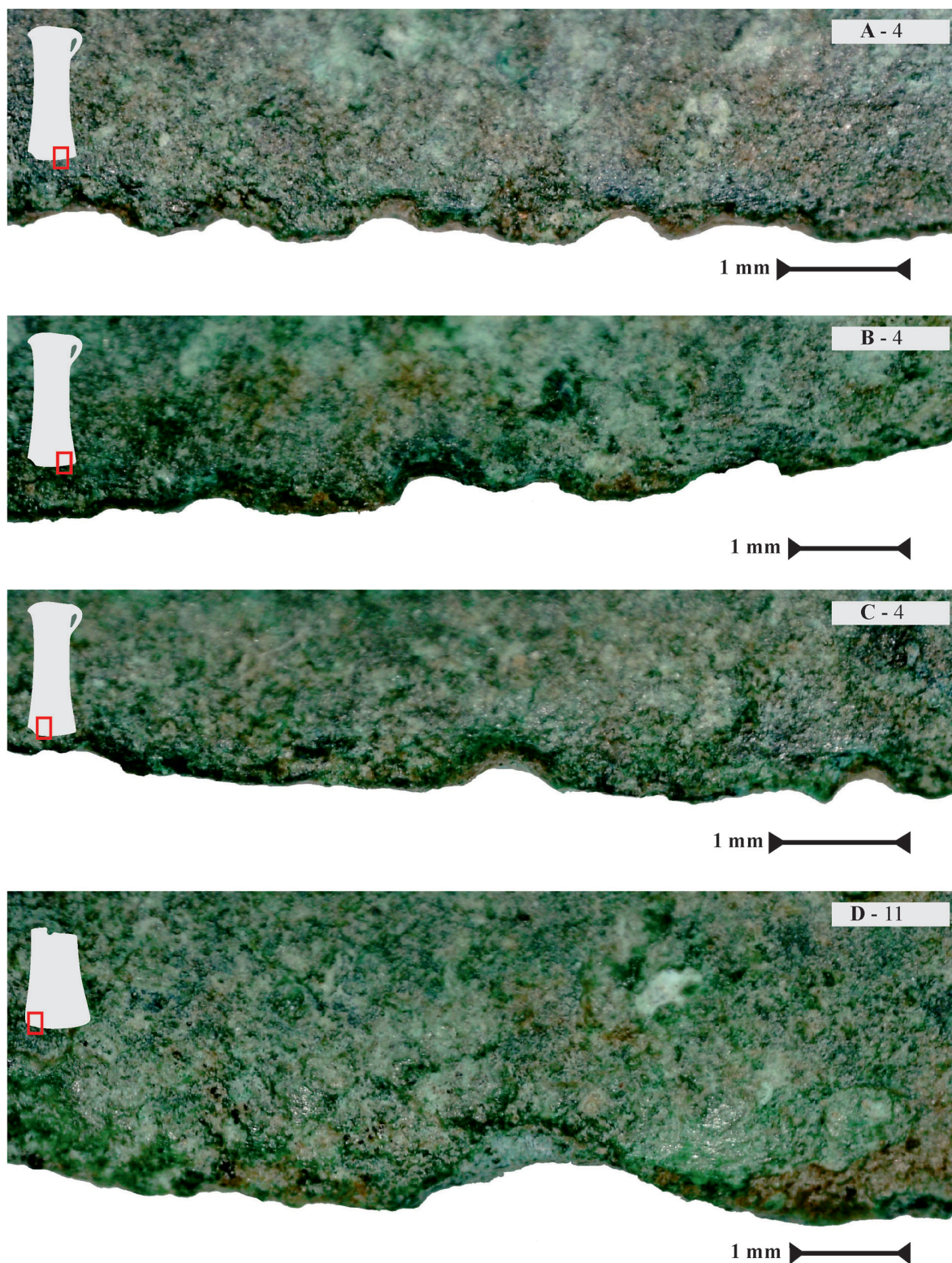


Fig. 16. Use-wear marks: A – notches, B – chips and notches, C–D – notches.

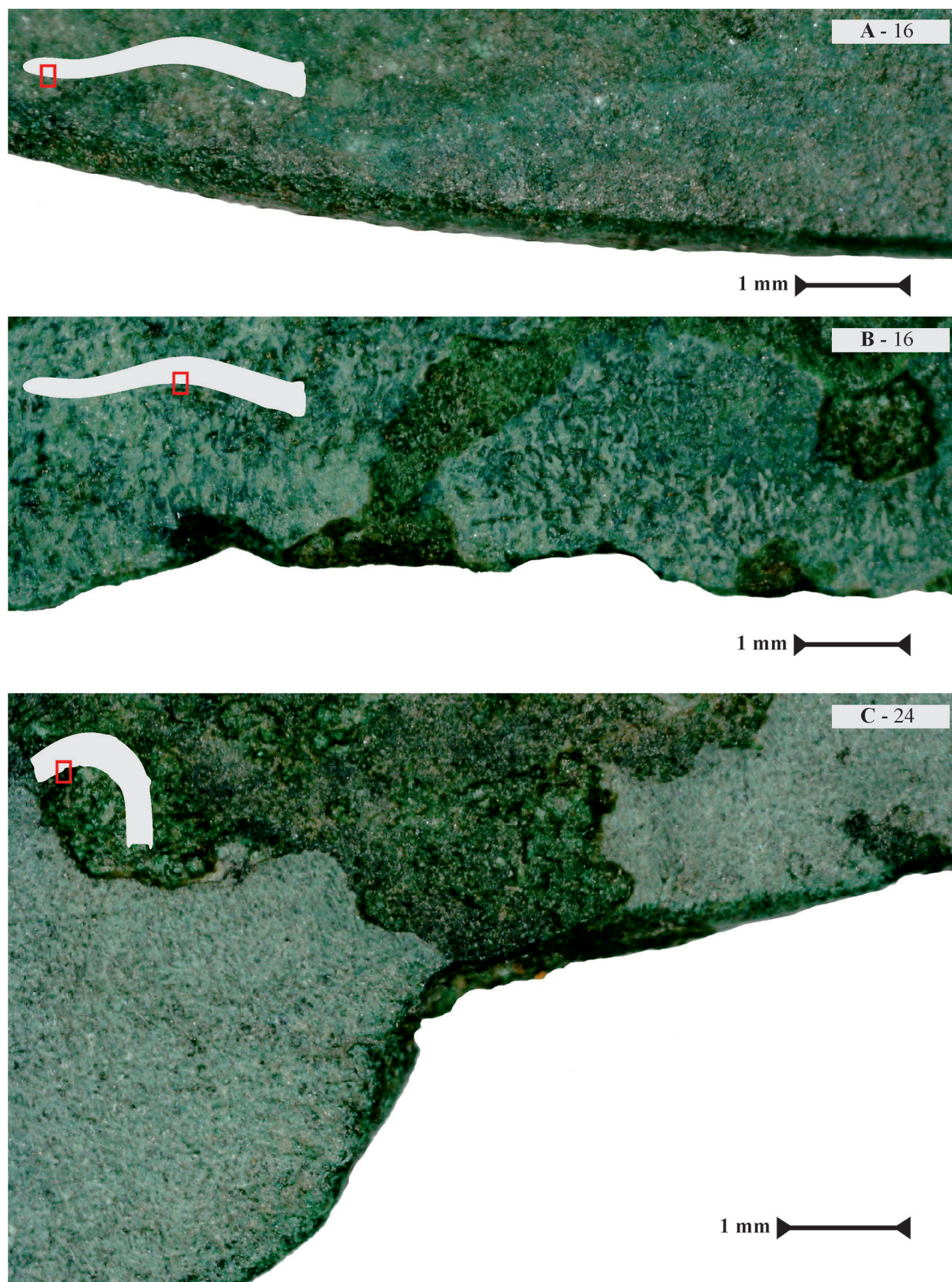


Fig. 17. Use-wear marks: A – worn edge, B – chips, C – notch.

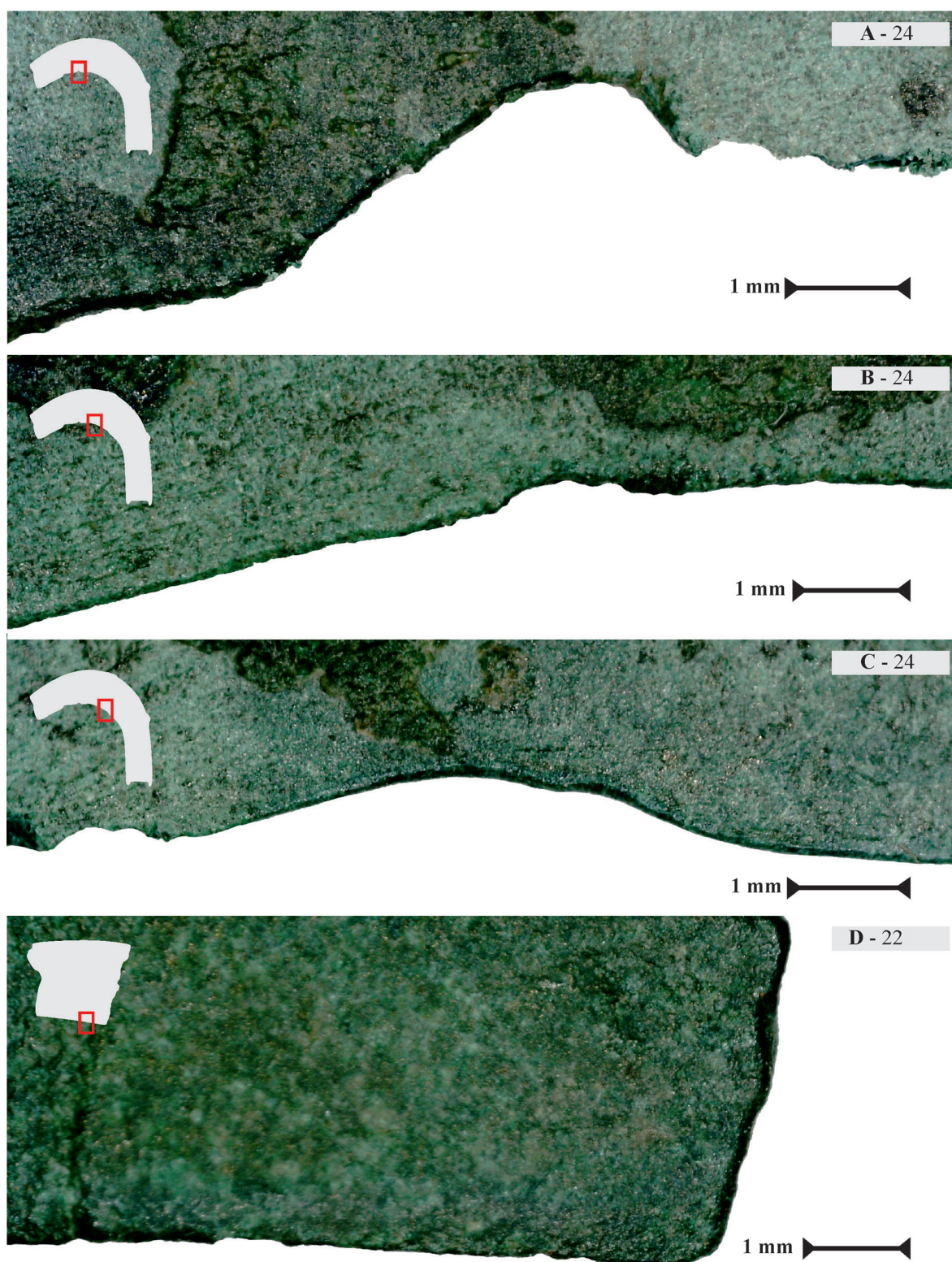


Fig. 18. Use-wear marks: A – notch, B – chips, C – notch, D – chip.

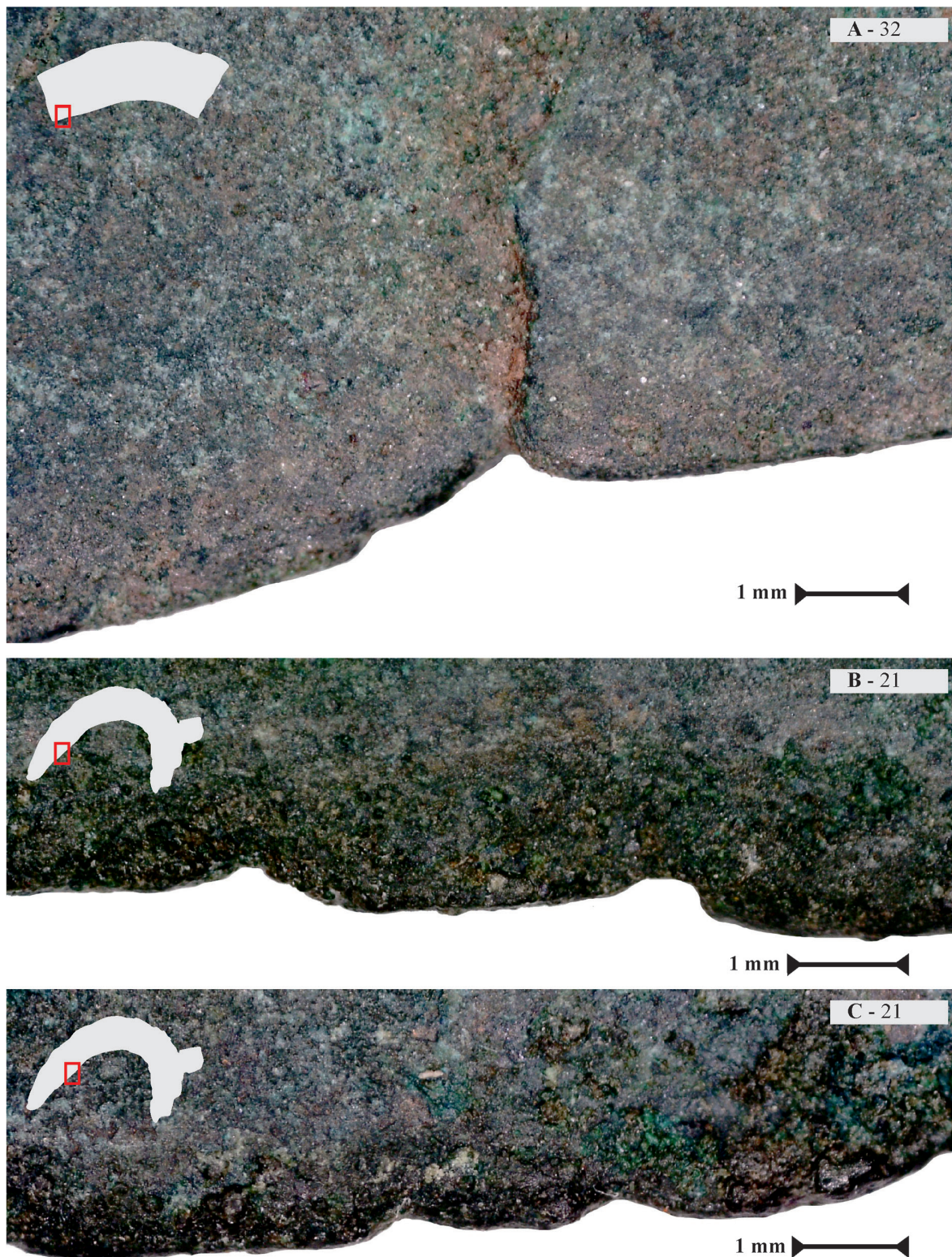


Fig. 19. Use-wear marks: A – notch, B–C – worn notches.

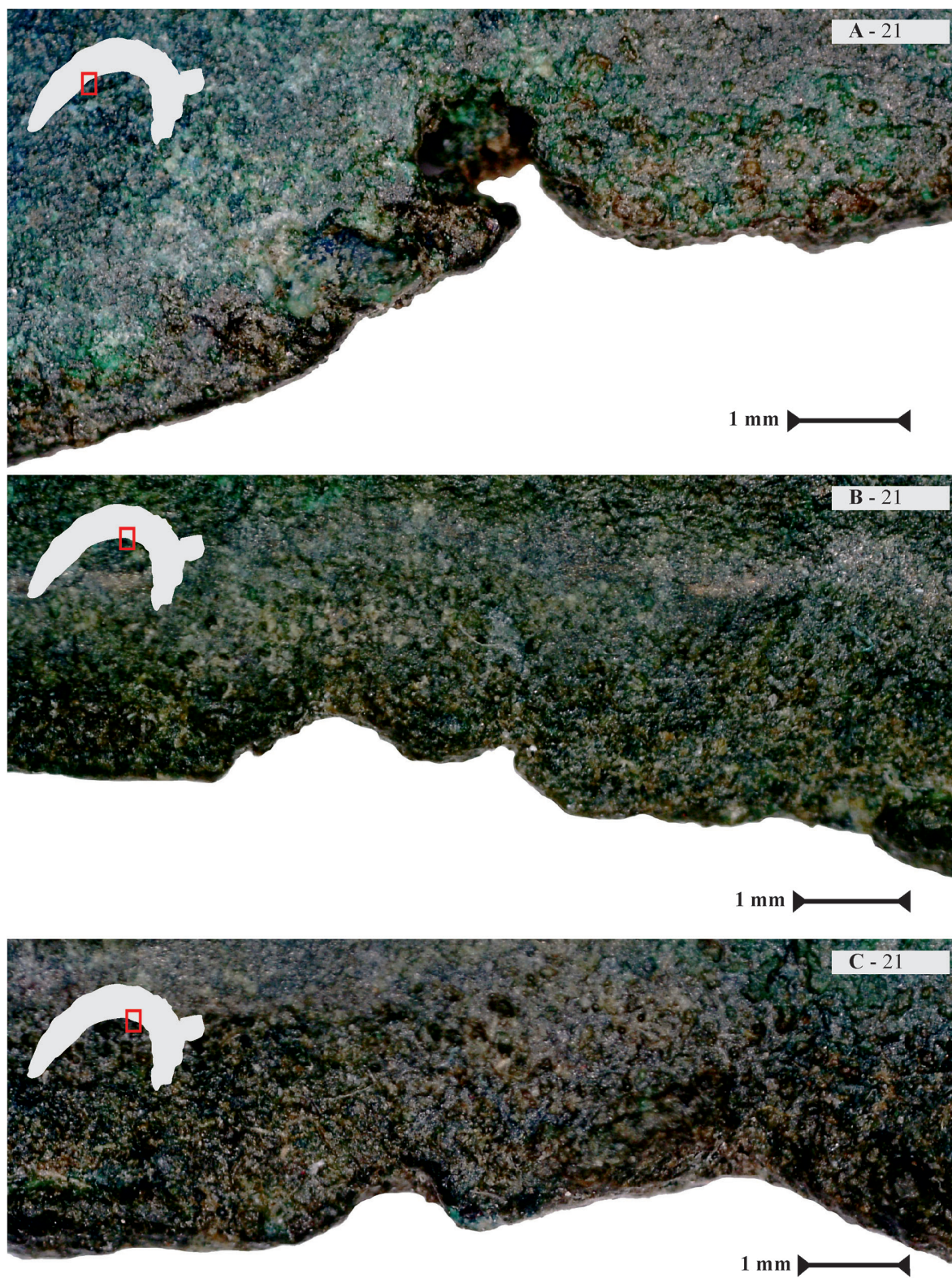


Fig. 20. Use-wear marks: A–C – notches.

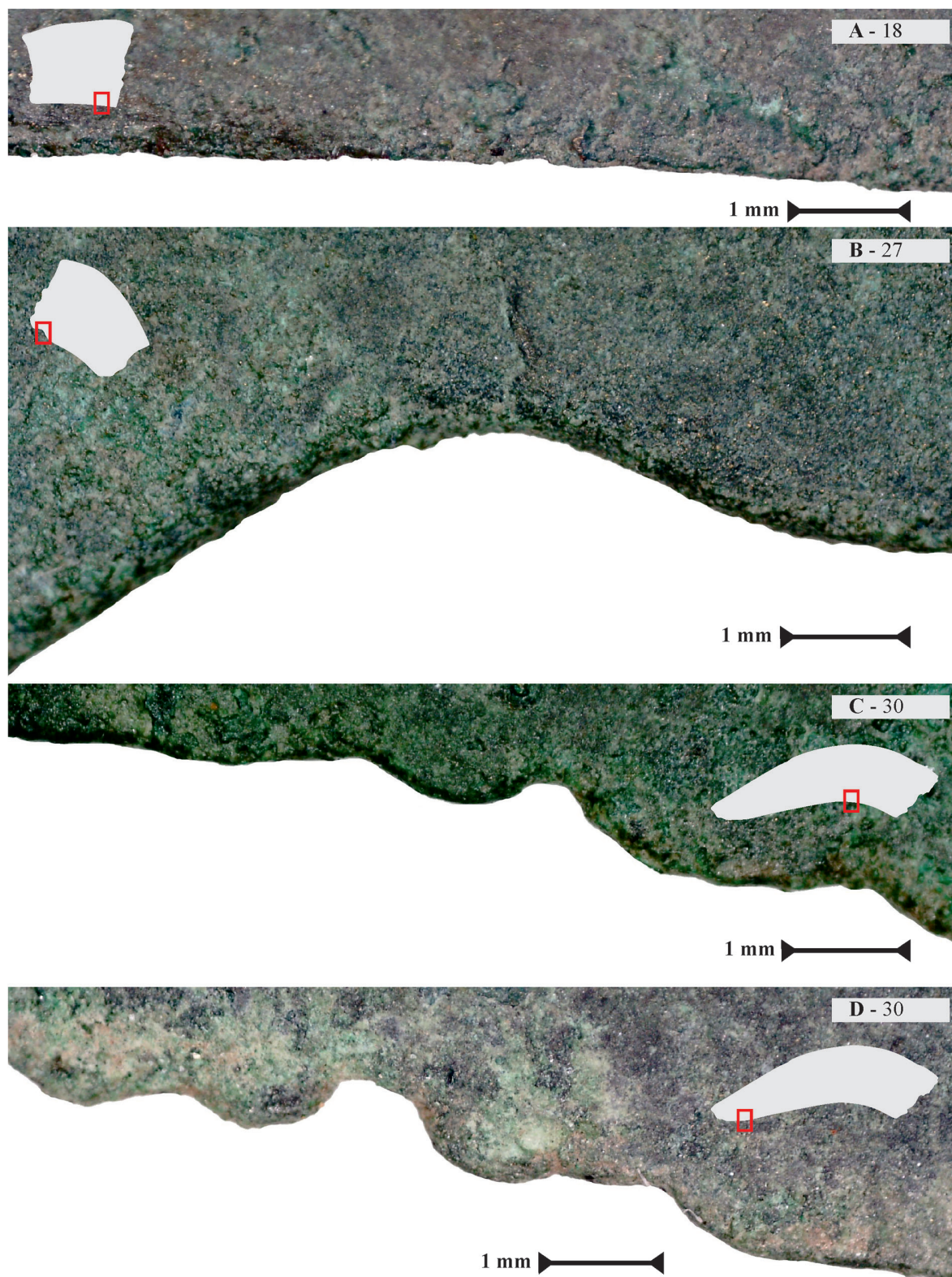


Fig. 21. Use-wear marks: A – chip, B–D – notches.

tion affects all technological groups, including ingots, as-casts, finished, and used items. The weight of the smallest fragment is 2.3 g (Fig. 7.75), while the largest is slightly heavier than 1 kg (Fig. 6.59). Only a few finds—three byproducts (Fig. 12.83,89,94), four sickles (Fig. 12.16,19–21), two socketed axes (Fig. 12.5,8), a bracelet (Fig. 12.34), and a spiral armlet (Fig. 12.35)—remained complete. The whole fragmented hoard weighs over ca. 15.9 kg. The heaviest objects are the ingots, some socketed axes, the winged axe, and the large sickles. Several plano-convex ingots weigh near or above half a kilogram (Fig. 4.45–46, Fig. 5, Fig. 6.55–59). These plano-convex and bar ingots were broken very likely in the foundry, accumulated by the respective owners, and finally deposited in this hoard. A fine example of this process is plano-convex ingot No. 43 (Fig. 4.43), which features large and deep chips in the flat and convex surfaces along the breakage surfaces, the traces of misshits with a socketed or winged axe.¹²⁷ This kind of partitioning is usually done when the ingots have just been cast and part of the object is still liquid and easier to cut into pieces. The rest of the ingots bear hammer marks (Fig. 4.45–46, Fig. 5.51–53, Fig. 6.55,57–59,61),¹²⁸ which in some cases intensify at the centre of the plano-convex ingots, suggesting the application of a heat-breaking technique reconstructed excellently by Daniel Modl.¹²⁹ Hammer marks are also visible on the bar ingots (Fig. 7.90–91). These can also be associated with partitioning, but they can also be the result of a manufacturing process when the bar ingots were hammered into rods and finished products. The Kartal hoard is dominated by objects (ingots, byproducts) that are essentially raw materials for casting. Considering their fragmented state, they were likely picked from the raw material deposit of the workshop where they had been broken into pieces for remelting.

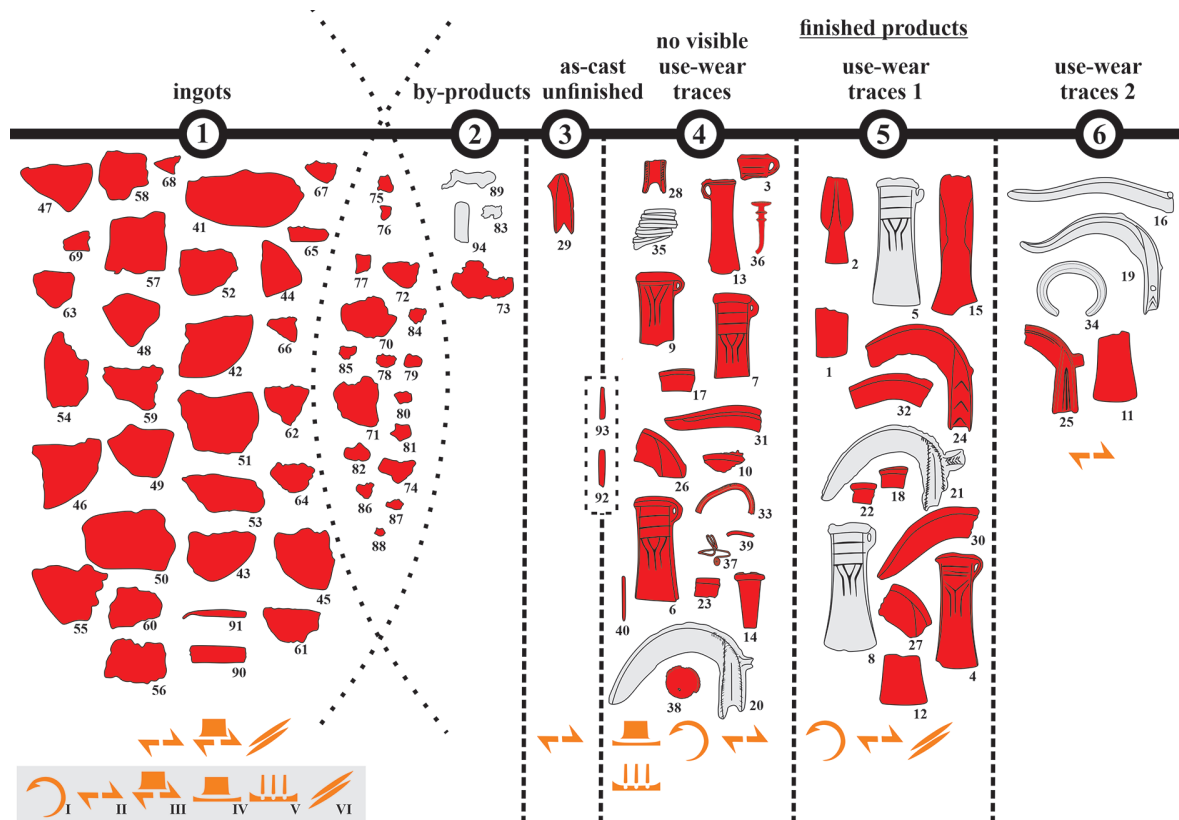


Fig. 22. Technological classification and fragmentation of the artefacts of the Kartal hoard. I – bending, II – breakage, III – multi-fragments, IV – hammer marks, V – tool marks, VI – chisel or axe blade marks, red – fragmented objects, grey – complete objects.

127 MODL 2010, Fig. 12; NESSEL 2014, Fig. 7; TARBAY 2021, Fig. 10.2–3.

128 MODL 2010, Fig. 7; NESSEL 2014, Fig. 3; TARBAY 2021, Fig. 10.2,5–6.

129 NESSEL 2014; MODL 2019.

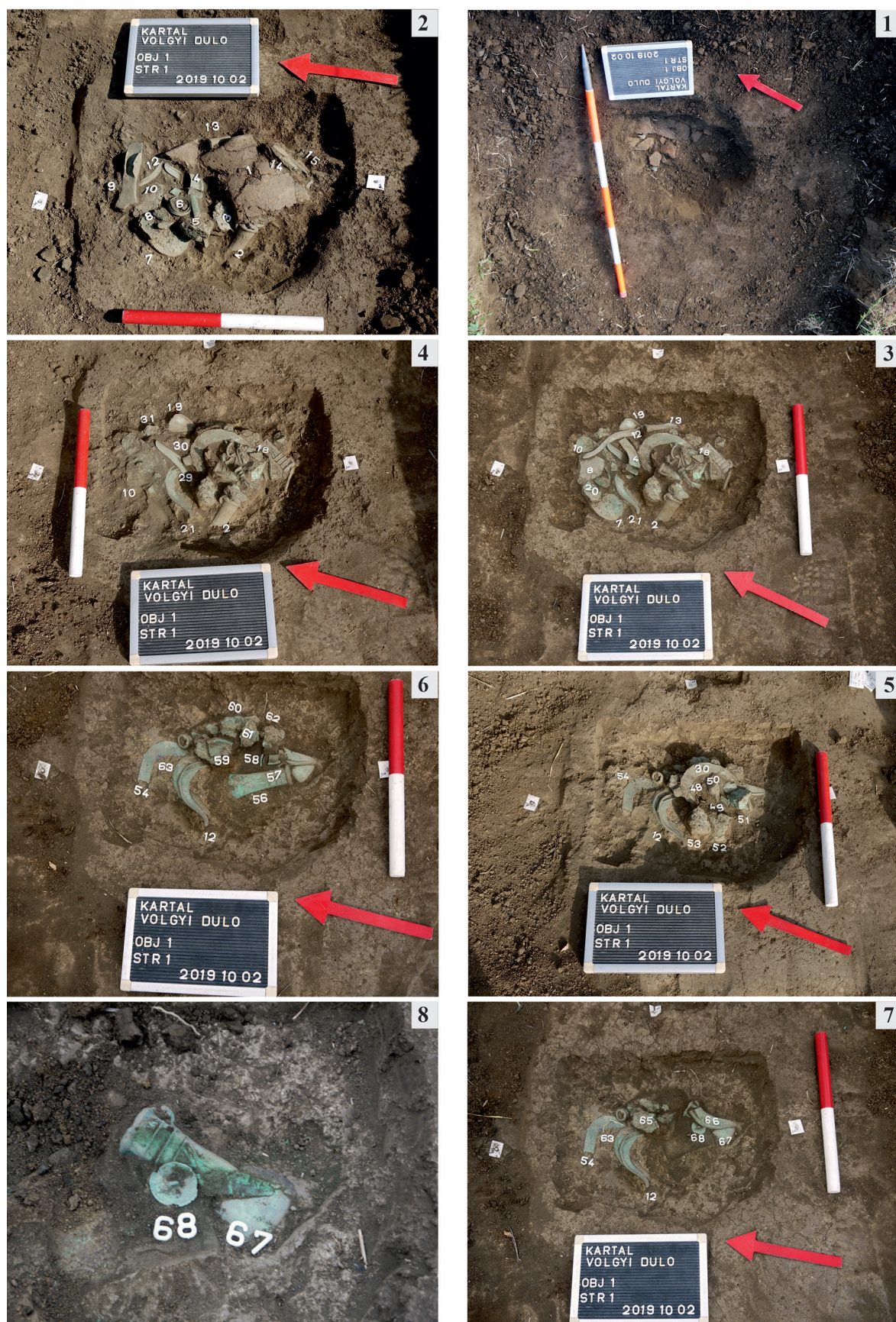


Fig. 23. Selection of excavation photos of the hoard (photos by Róbert Patay).

The rest of the finds are as-casts (Fig. 3.29), finished products, and objects potentially used to different degrees (use-wear mark types 1 and 2). The breakage shapes and surfaces of the hoarded objects suggest that they do not result from daily use. Only a few axes have damaged edges (Fig. 2.8,13), which could be the result of misuse or rough handling, while the rest indicate deliberate fragmentation. The attempt to refit the objects resulted in no matching fragments; all finished products are likely individual fragments of different artefacts (that should be further investigated by elemental-compositional analysis to reveal non-matching pieces made of identical material). Apart from the fragmented state of most finished products (the result of breaking), there is hardly any extra manipulation to be observed on the items; neither of them was bent into a U-shape or folded. Bending always appears combined with breaking and can be observed along the breakage surfaces, suggesting that it probably occurred when the objects were fragmented into pieces. Additional fragmentation could be observed in three cases, hammer marks were found near the breakage surfaces in a few cases, and a sickle fragment features a potential chisel mishit mark near the breakage surface (Fig. 3.30). The repoussé-decorated phalera also bears several marks of a tool with a blunt round head (Fig. 4.38), likely an awl-like object. One of the socketed axe fragments (Fig. 2.10) was flattened by hammering.

Use-wear analysis can nuance the fragmentation pattern of the finished products in the Kartal hoard. Although it contains some potentially long-used objects and a significant proportion of the finds is suitable for use-wear analysis based on microtraces, the deposited bronzes were generally not exhausted by use and still fit for their original purpose. Perhaps the best examples are the large, long-bladed axes with almost intact blades. Some objects that could be used and repaired even in their present broken state (Fig. 1.4–5, Fig. 2.8, Fig. 2.13, Fig. 3.16,19–21,24) or reused after some modification, like the bladeless axes (Fig. 1.6–7), which are known from the local archaeological record to have been reused as hammers.

The way in which the large ceramic storage pot (Fig. 7.95, Fig. 8) was deposited revealed additional information on the fragmentation of the non-metal components of the Kartal hoard. Ceramic pots, either intact or broken, are usually the containers of the metal hoards in depositions in the Carpathian Basin, but in this case, the position of the sherds tells otherwise. Based on their find position, what is now several potsherds broken by the weight of the earth can be roughly reconstructed as two large, broken fragments of the same storage pot that covered the hoard. No additional sherds have been found under the metal items, supporting this reconstruction. The condition of the pottery makes it unsuitable for revealing further evidence of how and when it broke.

Results in context

Even if the Kartal hoard includes some common supraregional types, it essentially consists of Carpathian-style objects, suggesting that the depositors may originate from this area. The Kartal hoard is also a multi-period assemblage¹³⁰ because while several objects were deposited around Ha B1, a handful of objects are characteristic of the Ha A and even the Reinecke Br D periods. The different types of jewellery, dated to diverse periods, are an excellent example (Fig. 12). The jewellery items that could be considered ‘old’ at the time of deposition may have had an important symbolic meaning for the depositors. These artefacts may have been heirlooms, important objects worn and passed down through several generations; they could also be links, remainders of someone long deceased or an important member of the community.¹³¹ The tools are more homogenous in this respect; sickles seem to be characteristic of the Ha A1 and Ha A2 periods, while socketed axes are

130 See HANSEN 2016, 194–197; KNIGHT 2022a.

131 BRÜCK 2006, 80; BRÜCK 2016, 81–82; VACHTA 2016, 110; BRADLEY 2017, 149; KNIGHT 2022a.

generally younger (Ha B1); moreover, some of them (Fig. 1.5–7, Fig. 2.8) form a close group because they could have been made in the same mould. They may have been used by the members of the same household prior to their internment.

Time can be perceived by use-wear analysis, the results of which support the hypothesis that the studied finished products in this hoard could have been used to different intensities before they were chosen for being deposited together with a large number of ingots and a few metallurgical byproducts. These objects took part in people's lives before they became a fragmented hoard, but it is important to emphasise that they did not reach their final state of usability; only a few objects, like the knobbed sickle (Fig. 3.16), were near that. By intentionally breaking them and removing them from circulation by depositing them, the owners interrupted the use-life of these tools when assembling the Kartal hoard.

The Kartal hoard is heavily fragmented, with only a few items not broken into pieces; it still has considerable weight in this state.¹³² The fragmentation of the assemblage reflects professional execution and could have been done at a different time before hoarding. Ingots are the best example of this, as they were probably split into pieces in the workshop as part of their normal use, while the breaking of the finished products was intentional and not use-related.¹³³ There is barely any trace attesting to additional manipulation or violent destruction; the observed marks are related to the process of breaking, such as mishits with tools, hammer impacts, or bending to facilitate breakage.¹³⁴

After processing the excavation photos and reports, the hoard in its find context was reconstructed to the best possible extent¹³⁵ in digital drawing (Fig. 23 and Fig. 24–28).¹³⁶ The position of most objects could be reconstructed; however, agricultural activity may have affected some. As Róbert Patay mentioned in his excavation report, a plano-convex ingot was found further away, dragged from the hoard by ploughing.¹³⁷ Also, pottery in the topmost level was found in small fragments, flattened possibly by the pressure of the soil through millennia and/or the tractors weighing several tonnes that passed above them. This likely affected not only the pots but also the metal objects, at least in the upper part of the hoard, which may have slid apart.

In theory, the arrangement of hoarded objects may reflect three different patterns: 1) the objects are grouped by type; 2) fragmented and intact objects are separated; and 3) objects are grouped by their technological characteristics. Accordingly, the reconstruction of the Kartal hoard was supported by use-wear and typochronological results that helped reveal additional connections between the deposited objects.

- There are some regularities in the arrangement of the same type of objects, like sickles, socketed axes and plano-convex ingots. Two sickles (Fig. 3.19–20) were placed one on another, and an additional sickle (Fig. 3.24) was found close to them in the northwest. Sickles (Fig. 3.16,31–32) in higher parts of the hoard were above this group. Plano-convex ingot fragments and lumps (e.g., Fig. 4.41–43,45, Fig. 5.47,50–51,54, Fig. 6.60, Fig. 7.70–72) were

132 The total weight of the Kartal hoard can be rounded up to 16 kg, which is roughly enough to cast 32 socketed axes weighing over 500 g.

133 MODL 2010; MODL 2019; KNIGHT 2022b.

134 NEBELSICK 2000; REZI 2011; KNIGHT 2019.

135 The position of those objects found by the metal detectorists (Nos 1–4, 12, 40, 55, 63, 73–74, 82, 85–88, 91–92, 95) is either unknown or uncertain. There are also a few, usually small objects, whose identification on the excavation photographs was not possible because only atypical parts of them were visible.

136 PATAY 2019a; PATAY 2019b.

137 PATAY 2019a; PATAY 2019b.

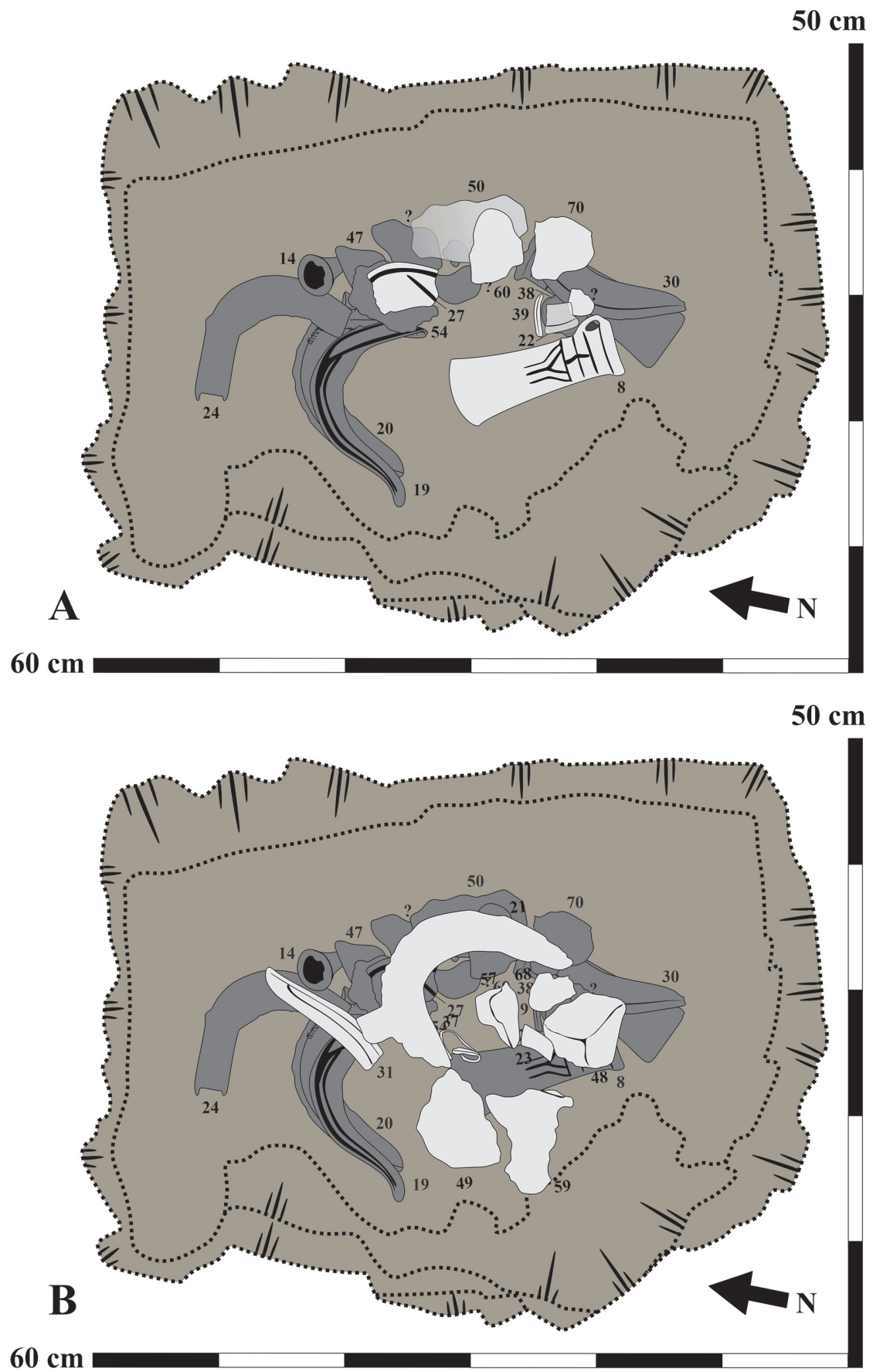


Fig. 24. A-B – Reconstruction of the hoard based on excavation photos.

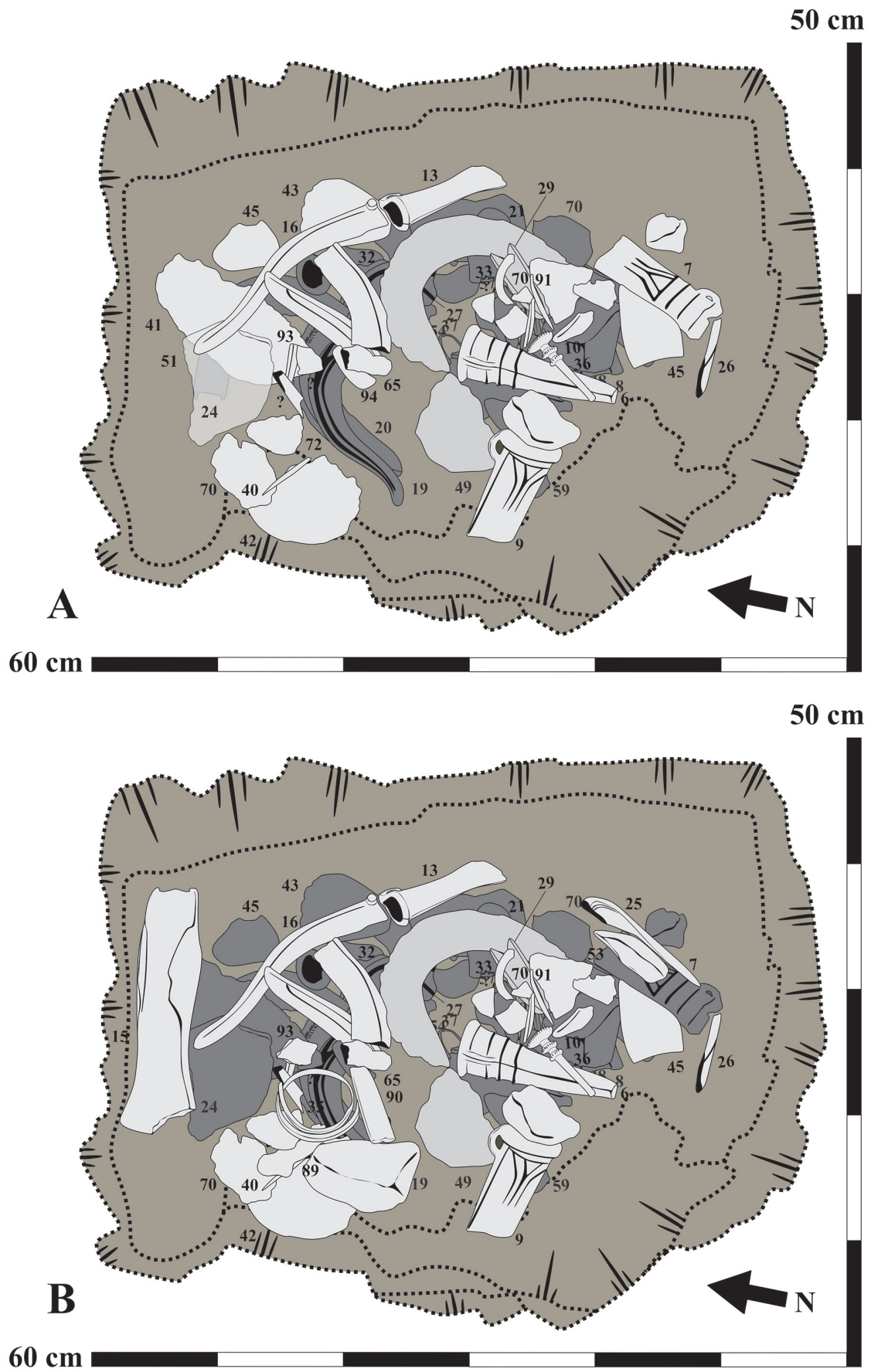


Fig. 25. A–B – Reconstruction of the hoard based on excavation photos.

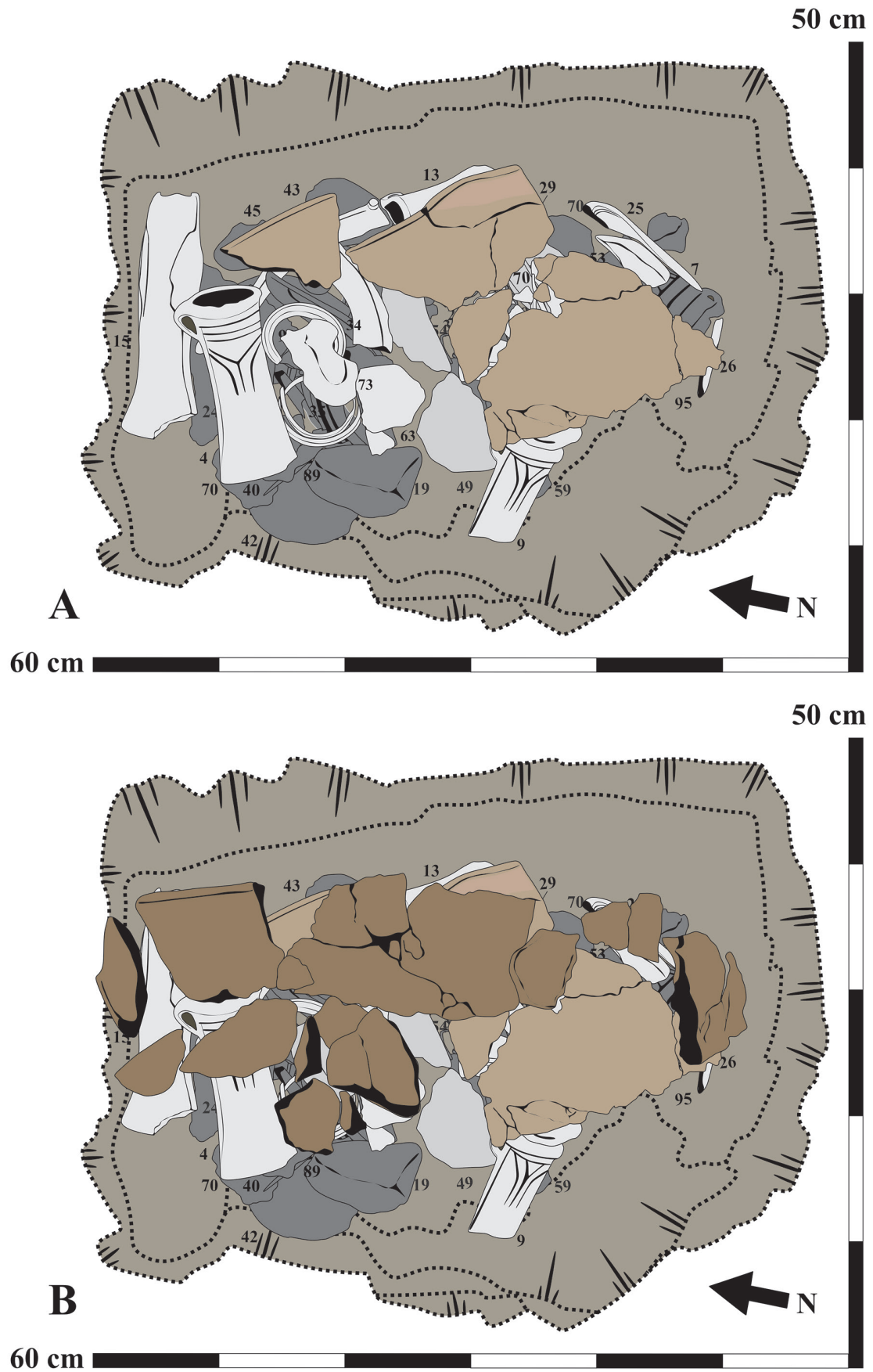


Fig. 26. A–B – Reconstruction of the context based on excavation photos.

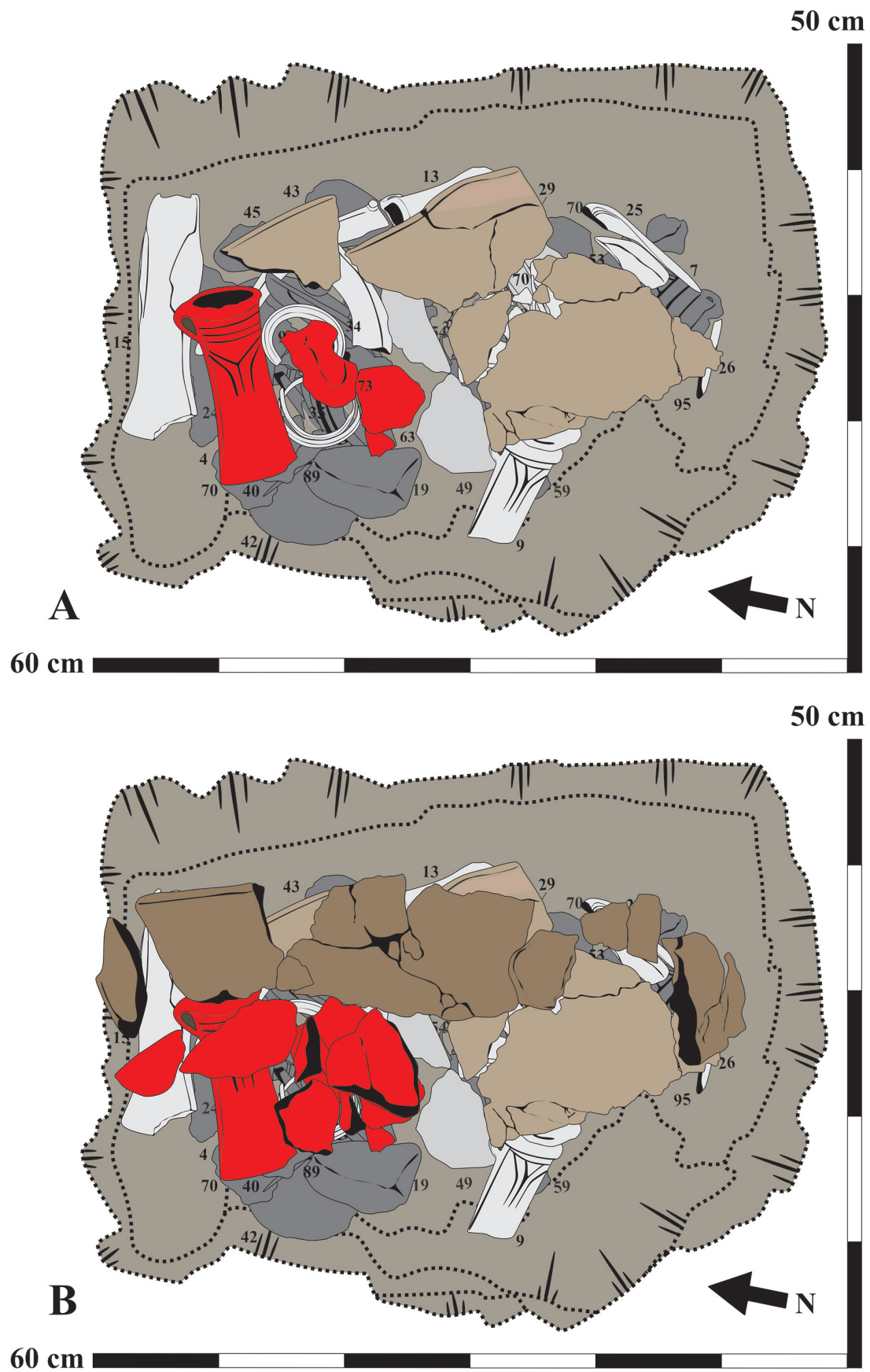


Fig. 27. A–B – Reconstruction of the hoard based on excavation photos (objects removed by the finders are marked with red).

concentrated on the northwestern and northeastern periphery of the hoard, mainly in the lower part. Socketed axes (Fig. 1.5–7, Fig. 2.8–9), of which some four had been made in the same mould, were clustering on the southern periphery of the heap.

- Initially, technological grouping may played a role in the arrangement of the objects. Plano-convex ingots and lumps form a circle, but the lower part of this cluster was at different depths. Finished products and objects in different stages of use were concentrated in the central part of the hoard (Fig. 28).
- There is no specific place for intact objects; these were discovered either at the bottom or the middle of the heap.
- The act of deposition concluded by covering the metal finds with two large fragments of the same ceramic pot (Fig. 7.95, Fig. 8), partially on each other.

The structure of the Kartal hoard may feature regularities,¹³⁸ but these are now difficult to discern due to taphonomic reasons (mentioned above) and that the finders removed some items. One can only state that the hoard, in its state upon discovery, was the remnant of a potentially regularly deposited hoard in which certain objects (sickles No. 19 and 20) were placed one on top of another and the position of certain types (sickles, axes, plano-convex ingots) show, in general, concentration or regularities. Covering the fragmented hoard with (originally two) fragments of the same pot was also intentional.

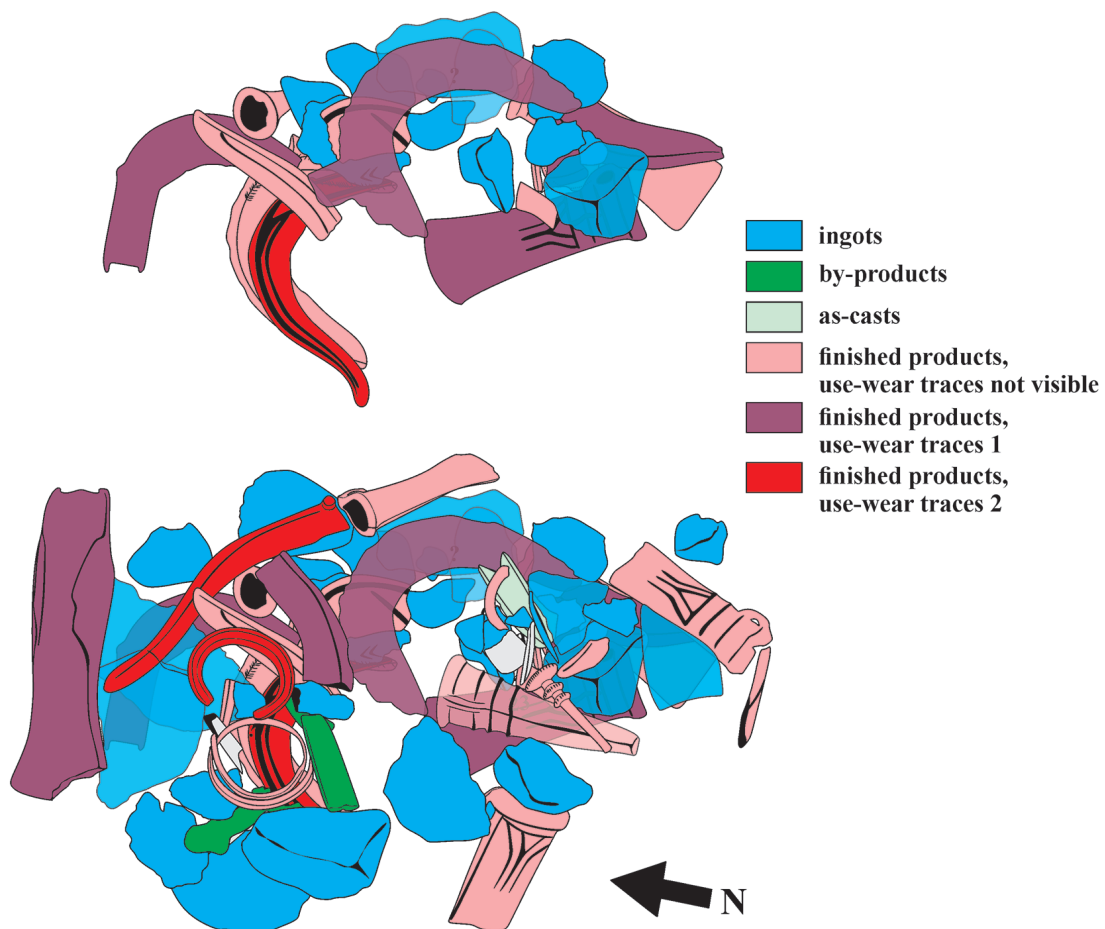


Fig. 28. Distribution of use-wear stages amongst the objects in the Kartal hoard.

138 See SOROCEANU 1995.

Kartal is not the only LBA hoard from this period. A hoard was deposited in a LBA settlement at Hévízgyörk,¹³⁹ less than 6 km from Kartal. An incomplete assemblage without data on its find context is known from the path of the railroad line at Hatvan.¹⁴⁰ Whether the place of deposition of the Kartal hoard was a special area is hard to tell based on the information on the site available today, requiring further systematic field surveys in the future. Only a few sites are known in the vicinity of the hoard (Völgyi-dűlő: ID 21981, Emse-völgy: ID 26143), and these are not dated more precisely than Bronze Age based on IVO (the national register of archaeological sites in Hungary).¹⁴¹ As mentioned, Róbert Patay found no traces of potsherds or archaeological features indicating a settlement in the close vicinity of the hoard, and metal detector surveys in the area provided no metal finds either, suggesting that the hoard was potentially deposited in a special area, the vicinity of the settlement or a prominent point in the ancient landscape.¹⁴² The exact relationship between this find and the contemporary LBA settlement network is a topic for future research.

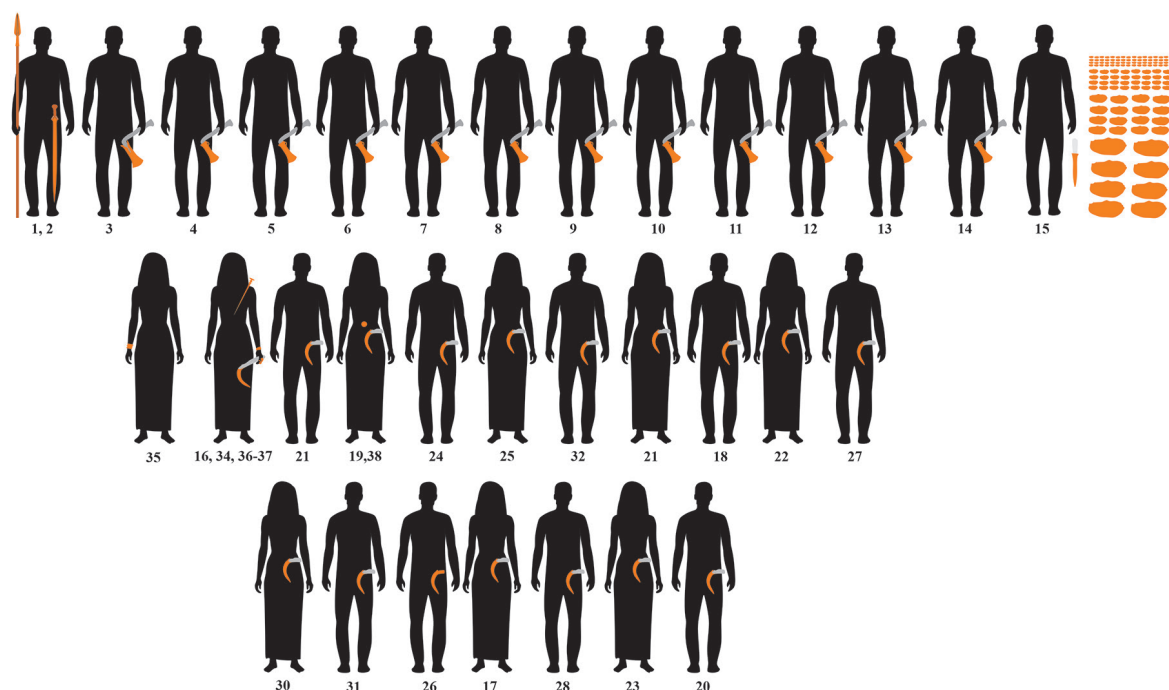


Fig. 29. An imaginary Late Bronze Age community behind a hoard like the one found at Kartal.

LBA people may have had settlements in the vicinity of the hoard, but its close area seems to have been uninhabited. At the same time, the composition of the deposition reflects the members of the community who once resided in this area. The items in the Kartal hoard were likely not possessed by a single person but by a small group; thus, this ‘community hoard’¹⁴³ represents multiple individuals symbolised by objects in the act and result of hoarding (Fig. 29). The assemblage may be broken down to associative find groups that also appear in other LBA hoards in the Carpathian Basin,¹⁴⁴ such as the group of artefacts representing a strong metallurgical-demiurgic component,¹⁴⁵ comprising pieces that very likely came directly from the craftsmen (lumps, broken jets, and the

139 TARBAY 2021.

140 KEMENCZEI 1990.

141 <https://www.oeny.hu/oeny/ivo/> (accessed: 25 July 2024).

142 BALLMER 2010; PATAY 2019a; PATAY 2019b; MELLÁR – PATAY 2021, 44–45.

143 NEEDHAM 1988, 246; FONTIJN 2002, 270; BRÜCK 2011, 394–398; VACHTA 2016, 101–108.

144 MELLÁR – PATAY 2021, 45.

145 TERŽAN 1996, 258; TERŽAN 1999, 123.

professionally partitioned plano-convex ingots, the heaviest of in the group). Objects related to the warrior identity (which had such a lavish representation in the Br D/Ha A1 phase) are now only present as a set of fragmented items: a spearhead, a sword, and a winged axe that may have also been used in combat. As mentioned, the personal ornaments may be assembled from different sets dating back to several periods and reflecting the attachment of the people who assembled the Kartal hoard to the past.¹⁴⁶ Socketed axes and sickles have also unlikely been used by only a single person but symbolise a small group of individuals.

Catalogue¹⁴⁷

1. Sword (2020.28.1.80) (not *in situ*). Blade fragment of a sword with two outline grooves. Bent and broken. The cutting edge is hammered, featuring chips. 53.83 × 35.83 mm, th. 6.02 mm, wt. 50.8 g. Classification: finished, used product (Fig. 1.1).
2. Spearhead (2020.28.1.7) (not *in situ*). Spearhead with a short conical socket, a leaf-shaped blade, an emphasised midrib, and two peg holes. The rim of the socket is cut; a misrun is visible along one of the peg holes. Bent and broken. Marks related to flattening and small chips can be observed along the cutting edges. L. 94.78 mm, w. (blade) 35.83 × 15.05 mm, w. (socket) 24.94 × 24.31 mm, wt. 80.6 g. Classification: finished, used product (Fig. 1.2).
3. Socketed axe (2020.28.1.86) (not *in situ*). Socket fragment of a socketed axe with a loop and a thick collar; the socket is decorated with two horizontal ribs. 45.84 × 29.57 mm, w. (collar with a loop) 45.98 × 31.81 mm, wt. 41.2 g. Classification: finished product with no visible use-wear marks (Fig. 1.3).
4. Socketed axe (2020.28.1.82) (not *in situ*). Socketed axe with a thick collar and a loop, decorated with three horizontal, a Y-shaped, and two side ribs. The blade is fan-shaped and hammered, and the cutting edge is fragmented and notched. L. 126.91 mm, di. (rim with a loop) 54.73 × 39.08 mm, w. (blade-socket interface) 35.79 × 18.95 mm, w. (blade) 47.15 mm, wt. 322.5 g. Classification: finished, used product (Fig. 1.4).
5. Socketed axe (2020.28.1.1) (*in situ* 1). Socketed axe with a thick collar and an incomplete loop (casting defect). Decorated with three horizontal, a Y-shaped, and two side ribs. The blade is leaf-shaped. The rim is incompletely cast, and the casting is mismatched. The blade is hammered. Small chips are visible along the cutting edge. L. 139.70 mm, w. (collar with the loop) 52.79 × 36.66 mm, w. (blade-socket interface) 41.60 × 18.77 mm, w. (blade) 53.19 mm, wt. 489.3 g. Classification: finished, used product (Fig. 1.5).
6. Socketed axe (2020.28.1.47) (*in situ* 1). Socketed axe with a thick collar and a loop, decorated with three horizontal, a Y-shaped, and two side ribs. Part of the blade broke off. Featuring a horizontal/vertical mismatch defect, a crack on the collar (caused by hammer impact), and a hammered cutting edge. L. 114.55 mm, w. (collar with the loop) 54.62 × 42.47 mm, w. (blade-socket interface) 39.13 × 26.33 mm, wt. 433.4 g. Classification: finished product with no visible use-wear marks (Fig. 1.6).
7. Socketed axe (2020.28.1.23) (*in situ* 1). Socketed axe with a thick collar and a loop. Decorated with three horizontal, an Y-shaped, and two side ribs. Misrun defect on the rim, the blade is broken. The narrow sides are hammered. L. 98.33 mm, w. (with the loop) 53.92 × 41.62 mm, w. (blade-socket interface) 42.55 × 13.53 mm, wt. 357.7 g. Classification: finished product with no visible use-wear marks (Fig. 1.7).
8. Socketed axe (2020.28.1.62) (*in situ* 1). Socketed axe with a thick collar and a loop. Decorated with three horizontal, an Y-shaped, and two side ribs. Its loop is bent; the axe has a fan-shaped blade. Featuring misrun and mismatch defects and a hammered edge. With a large notch and chips along the cutting edge. L. 141.04 mm, w. (collar with the loop) 53.25 × 41.43 mm, w. (blade-socket interface) 38.32 × 25.20 mm, w. (blade) 58.77 mm, wt. 449 g. Classification: finished, used product (Fig. 2.8).
9. Socketed axe (2020.28.1.12) (*in situ* 1). Socketed axe with a thick collar and a loop. Decorated with three horizontal, an Y-shaped, and two side ribs. Featuring misrun and mismatch defects and a hammered edge. L. 80.96 mm, w. (with a loop) 54.18 × 38.92 mm, w. (blade-socket interface) 38.62 × 19.95 mm, wt. 245.9 g. Classification: finished product with no visible use-wear marks (Fig. 2.9).

¹⁴⁶ BRÜCK 2006, 79; BRÜCK 2016, 83.

¹⁴⁷ Small fragments with dirt (0.4 g) inventoried under No. 2020.28.1.35 are not catalogued. Abbreviations: *in situ* 1 = *in situ*, an approximate position can be identified; *in situ* 2 = *in situ*, the position cannot be identified; L.: length; W.: width; Di.: diameter; Th.: thickness; Wt.: weight.

10. Socketed axe (2020.28.1.44) (*in situ* 1). Rim fragment of a socketed axe with one rib. Flattened, casting seams visible along the rim; the outline under the collar is rounded (misrun defect); hammering marks on the collar. 45.22 × 21.67 mm, th. 5.88–2.95 mm, wt. 16.9 g. Classification: finished product with no visible use-wear marks (Fig. 2.10).
11. Socketed axe (2020.28.1.79) (*in situ* 2). Blade fragment of a socketed axe with core shift defect, a hammered blade, an asymmetrical cutting edge, and a chip on the cutting edge. L. 77.18 mm, w. (blade-socket interface) 36.60 × 19.70 mm, wt. 204.3 g. Classification: finished, heavily used product (Fig. 2.11).
12. Socketed axe (2020.28.1.81) (not *in situ*). Blade fragment of a socketed axe with core shift and porosity defects and a hammered, flat edge. 55.50 × 50.70 mm, w. (blade-socket interface) 38.90 × 18.96 mm, wt. 162.4 g. Classification: finished product with no visible use-wear marks (Fig. 2.12).
13. Socketed axe (2020.28.1.2) (*in situ* 1). Oval-sectioned socketed axe with a thick collar, a loop, and a fan-shaped blade. The cutting edge is fragmentary. With a mismatch defect, the riser and jet traces are still on the loop. The cutting edge is hammered along the narrow sides. L. 103.73 mm, w. (collar with the loop) 38.29 × 27.03 mm, w. (blade-socket interface) 24.61 × 8.76 mm, wt. 102.1 g. Classification: finished product with no visible use-wear marks (Fig. 2.13).
14. Socketed chisel (2020.28.1.78) (*in situ* 1). Socketed chisel with a thick collar; its edge is broken. Incomplete defect and removed jet traces on the rim. L. 60.92 mm, collar 33.63 × 33.64 mm, blade 14.92 × 12.40 mm, wt. 66.8 g. Classification: finished product with no visible use-wear marks (Fig. 2.14).
15. Winged axe (2020.28.1.3) (*in situ* 1). Winged axe with a broken blade and wings, a concave butt, and a fan-shaped blade. The cutting edge is hammered, featuring chips. L. 153.03 mm, th. (butt) 34.24 × 5.81 mm, th. (wings) 37.19 × 36.47 mm, th. (blade) 33.13 × 15.46 mm, w. (blade) 49.45 mm, wt. 462.6 g. Classification: finished, used product (Fig. 2.15).
16. Knobbed sickle (2020.28.1.4) (*in situ* 1). Knobbed sickle with a long, narrow, straightened, hammered blade with a worn tip and chips along the middle of the cutting edge. L. 181.01 mm, w. 32.87 mm, th. (back) 5.16 mm, th. (blade) 1.67 mm, wt. 63.7 g. Classification: finished, heavily used product (Fig. 3.16).
17. Sickle blade (2020.28.1.27) (*in situ* 2). Blade fragment of a sickle. Hammered. 39.24 × 24.69 mm, th. (back) 5.82 mm, th. (blade) 0.85 mm, wt. 15.3 g. Classification: finished product with no visible use-wear marks (Fig. 3.17).
18. Sickle blade (2020.28.1.49) (*in situ* 2). Blade fragment of a sickle with a hammered and sharpened edge, hammering marks on its back, and chips along the cutting edge. 31.06 × 24.67 mm, th. (back) 3.96 mm, th. (blade) 1.45 mm, wt. 9.9 g. Classification: finished, used product (Fig. 3.18).
19. Flanged sickle (2020.28.1.5) (*in situ* 1). Flanged sickle with a peg hole, a slightly curved handle, a spur, and a rib along the back, featuring a casting jet stub at the centre of the blade. Its handle is decorated with two cast-on chevrons, and the cutting edge is narrow and hammered. Bent. 154.93 × 110.38 mm, th. (back) 6.99 mm, th. (blade) 2.33 mm, wt. 92.8 g. Classification: finished, heavily used product (Fig. 3.19).
20. Flanged sickle (2020.28.1.70) (*in situ* 1). Flanged sickle with a forked handle, a spur, and a vertical rib between the straight ribs on the handle. Its cutting edge is hammered. With casting seams along its outline and a shrinkage defect on the backside. 154.35 × 95.35 mm, th. (back) 4.04 mm, th. (blade) 1.15 mm, wt. 122.2 g. Classification: finished product with no visible use-wear marks (Fig. 3.20).
21. Flanged sickle (2020.28.1.37) (*in situ* 1). Flanged sickle with a spur and a straight inner rib; the handle end is concave. The cast incomplete handle is decorated with a vertical rib; it is notched. The sickle has casting seams around the outline, its blade is hammered, with notches and worn notches along the cutting edge. The spur was a casting jet. 156.82 × 101.05 mm, th. (back) 4.31 mm, th. (blade) 2.12 mm, wt. 135 g. Classification: finished, used product (Fig. 3.21).
22. Sickle blade (2020.28.1.63) (*in situ* 1). Blade fragment of a sickle with a hammered, chipped cutting edge. Bent and broken. 28.70 × 23.43 mm, th. (back) 4.84 mm, th. (blade) 0.94 mm, wt. 9.8 g. Classification: finished, used product (Fig. 3.22).
23. Sickle blade (2020.28.1.54) (*in situ* 1). Blade fragment of a sickle with a hammered edge and back. Bent, the breakage surface is sharp. 28.08 × 22.70 mm, th. (back) 3.61 mm, th. (blade) 1.33 mm, wt. 10 g. Classification: finished product with no visible use-wear marks (Fig. 3.23).
24. Flanged sickle (2020.28.1.6) (*in situ* 1). Flanged sickle with a handle with a straight end, three cast-on chevrons, and a spur. Its tip is broken. The cutting edge is hammered. Bent, broken, with a jet at the middle of the blade. With chips and large worn notches along the cutting edge. 117.23 × 116.37 mm, th. (back) 5.82 mm, th. (blade) 1.95 mm, wt. 103.4 g. Classification: finished, used product (Fig. 3.24).

25. Flanged sickle (2020.28.1.20) (*in situ* 1). Flanged sickle with a straight blade, a spur, vertical ribs on the handle, and a double rib along the back of the narrow blade. Bent. 66.13 × 96.63 mm, th. (back) 5.11 mm, th. (blade) 1.38 mm, wt. 73.9 g. Classification: finished, heavily used product (Fig. 3.25).
26. Flanged sickle (2020.28.1.40) (*in situ* 1). Blade and handle a fragment of a sickle with a straight inner rib and a spur. 57.51 × 49.84 mm, th. (back) 5.71 mm, th. (blade) 1.74 mm, wt. 43 g. Classification: finished product with no visible use-wear marks (Fig. 3.26).
27. Flanged sickle (2020.28.1.65) (*in situ* 1). Blade and handle a fragment of a sickle with a straight inner rib. The cutting edge is hammered and has a worn notch. Bent, broken. 53.56 × 59.09 mm, th. 6.59–1.79 mm, wt. 41.5 g. Classification: finished, used product (Fig. 3.27).
28. Flanged sickle (2020.28.1.46) (*in situ* 2). Forked handle fragment with notched ribs of a flanged sickle, with hammering marks on the end part. 36.73 × 25.91 mm, th. 5.36–1.82 mm, wt. 12.1 g. Classification: finished product with no visible use-wear marks (Fig. 3.28).
29. Flanged sickle (2020.28.1.51) (*in situ* 1). Forked handle fragment of a flanged sickle with a V-shaped rib and an incompletely cast spur. Bent and broken. 66.12 × 27.69 mm, th. 4.61–1.47 mm, wt. 23.4 g. Classification: as-cast (Fig. 3.29).
30. Flanged sickle (2020.28.1.76) (*in situ* 1). Blade fragment of a sickle with a hammered cutting edge with worn notches. Bent and broken, with chisel or axe marks concentrating on its back. 131.55 × 41.98 mm, th. (back) 4.91 mm, th. (blade) 1.43 mm, wt. 53.2 g. Classification: finished, used product (Fig. 3.30).
31. Flanged sickle (2020.28.1.36) (*in situ* 1). Flanged sickle blade fragment with an inner rib. 105.43 × 28.86 mm, th. (back) 4.35 mm, th. (blade) 1.55 mm, wt. 33.5 g. Classification: finished product with no visible use-wear marks (Fig. 3.31).
32. Flanged sickle (2020.28.1.14) (*in situ* 1). Blade fragment of a flanged sickle with a jet trace on its back. Its cutting edge is hammered and sharpened, featuring a V-shaped notch and a crack. Bent, broken. 92.68 × 38.26 mm, th. (back) 6.18 mm, th. (blade) 1.23 mm, wt. 44.2 g. Classification: finished, used product (Fig. 3.32).
33. Ring (2020.28.1.48) (*in situ* 1). Diamond-profile ring with incised line bundles. Bent, the break surface is sharp. 64.60 × 34.91 mm, th. 5.6 × 6.66 mm, wt. 23.9 g. Classification: finished product with no visible use-wear marks (Fig. 4.33).
34. Bracelet (2020.28.1.8) (*in situ* 1). Round-profile bracelet with blunt terminals and a hammered body. Its surface is heavily worn. 75.77 × 60.62 mm, th. 13.66 × 12.70 mm, wt. 138 g. Classification: finished, heavily used product (Fig. 4.34).
35. Spiral armlet (2020.28.1.9) (*in situ* 1). Spiral armlet with a rib and a blunt terminal. H. 47 mm, w. 53.80 mm, di. 42.12 × 42.12 mm, wt. 64.5 g. Classification: finished product with no visible use-wear marks (Fig. 4.35).
36. Pin (2020.28.1.10) (*in situ* 1). Disc-headed pin with three knobs. The edges of the disc and the knobs bear incised decoration. The shaft is bent and broken. 57.22 mm, disc 21.34 × 22.18 mm, shaft 4.58 × 4.55 mm, wt. 21.5 g. Classification: finished product with no visible use-wear marks (Fig. 4.36).
37. Wire ring (2020.28.1.53) (*in situ* 1). Wire ring ending probably in two spiral discs. 35.30 × 32.54 mm, th. 1.51 × 1.51 mm, wt. 3.2 g. Classification: finished product with no visible use-wear marks (Fig. 4.37).
38. Phalera (2020.28.1.77) (*in situ* 1). Phalera with one loop and repoussé patterns along its edges; it features toolmarks. 37.32 × 36.03 mm, th. 5.08–0.50 mm, wt. 4.1 g. Classification: finished product with no visible use-wear marks (Fig. 4.38).
39. Bar (2020.28.1.64) (*in situ* 1). Rectangular-profile bar. Bent, broken. L. 30.09 mm, th. 5.2 × 3.69 mm, wt. 3.8 g. Classification: finished product with no visible use-wear marks (Fig. 4.39).
40. Wire (2020.28.1.87) (not *in situ*). Round-profile wire or pin shaft. L. 47.97 mm, th. 3.06 × 3.04 mm, wt. 3.4 g. Classification: finished product with no visible use-wear marks (Fig. 4.40).
41. Plano-convex ingot (2020.28.1.11; A) (*in situ* 1). Edge fragment of a plano-convex ingot. 130.04 × 64.79 mm, th. 33.45 mm, wt. 646.4 g. Classification: ingot (Fig. 4.41).
42. Plano-convex ingot (2020.28.1.16) (*in situ* 1). Quarter fragment of a plano-convex ingot with a crack at its middle. 80.50 × 72.30 mm, th. 33.93 mm, wt. 741.4 g. Classification: ingot (Fig. 4.42).
43. Plano-convex ingot (2020.28.1.24) (*in situ* 1). Quarter fragment of a plano-convex ingot with axe blade marks. 75.18 × 57.30 mm, th. 36.39 mm, wt. 535.2 g. Classification: ingot (Fig. 4.43).

44. Plano-convex ingot (2020.28.1.18) (*in situ* 2). Quarter fragment of a plano-convex ingot. 63.33 × 47.34 mm, th. 18.48 mm, wt. 155.6 g. Classification: ingot (Fig. 4.44).
45. Plano-convex ingot (2020.28.1.38) (*in situ* 1). Quarter fragment of a plano-convex ingot with hammer marks on its flat side. 63.98 × 65.08 mm, th. 37.55 mm, wt. 487.2 g. Classification: ingot (Fig. 4.45).
46. Plano-convex ingot (2020.28.1.72) (*in situ* 2). Quarter fragment of a plano-convex ingot with a hammer mark at the centre. 75.62 × 69.98 mm, th. 29.42 mm, wt. 477 g. Classification: ingot (Fig. 4.46).
47. Plano-convex ingot (2020.28.1.74) (*in situ* 1). Edge fragment of a plano-convex ingot. 78.34 × 60.09 mm, th. 31 mm, wt. 358.1 g. Classification: ingot (Fig. 5.47).
48. Plano-convex ingot (2020.28.1.56) (*in situ* 1). Edge fragment of a large plano-convex ingot. 66.10 × 65.80 mm, th. 27.83 mm, wt. 349 g. Classification: ingot (Fig. 5.48).
49. Plano-convex ingot (2020.28.1.58) (*in situ* 1). Edge fragment of a large plano-convex ingot. 71.41 × 67.01 mm, th. 30.80 mm, wt. 430.2 g. Classification: ingot (Fig. 5.49).
50. Plano-convex ingot (2020.28.1.66) (*in situ* 1). Edge fragment of a plano-convex ingot, slightly rectangular. 101.20 × 70.19 mm, th. 38.29 mm, wt. 881.3 g. Classification: ingot (Fig. 5.50).
51. Plano-convex ingot (2020.28.1.17) (*in situ* 1). Edge fragment of a plano-convex ingot with hammer marks. 87.77 × 70.13 mm, th. 34.45 mm, wt. 692.2 g. Classification: ingot (Fig. 5.51).
52. Plano-convex ingot (2020.28.1.13) (*in situ* 2). Body fragment of a plano-convex ingot with hammer marks. 64.84 × 51.22 mm, th. 34.07 mm, wt. 421.8 g. Classification: ingot (Fig. 5.52).
53. Plano-convex ingot (2020.28.1.19) (*in situ* 2). Edge fragment of a plano-convex ingot with several hammer marks. 90.12 × 40 mm, th. 19.66 mm, wt. 247.4 g. Classification: ingot (Fig. 5.53).
54. Plano-convex ingot (2020.28.1.73) (*in situ* 1). Edge fragment of a large plano-convex ingot. 82.78 × 50.58 mm, th. 30.94 mm, wt. 344.4 g. Classification: ingot (Fig. 5.54).
55. Plano-convex ingot (2020.28.1.83) (not *in situ*). Fragment of a large plano-convex ingot. Layered, featuring hammer marks near its former centre. 82.62 × 74.48 mm, th. 37.07 mm, wt. 664.5 g. Classification: ingot (Fig. 6.55).
56. Plano-convex ingot (2020.28.1.71) (*in situ* 2). Body fragment of a plano-convex ingot. 68.89 × 46.71 mm, th. 31.12 mm, wt. 365.2 g. Classification: ingot (Fig. 6.56).
57. Plano-convex ingot (2020.28.1.55) (*in situ* 1). Body fragment of a large plano-convex ingot with a hammer mark at its one-time centre. 66.14 × 60.89 mm, th. 46.57 mm, wt. 765.1 g. Classification: ingot (Fig. 6.57).
58. Plano-convex ingot (2020.28.1.52) (*in situ* 2). Edge fragment of a plano-convex ingot with hammer marks at its one-time centre. 53.35 × 51.86 mm, th. 18.84 mm, wt. 199.9 g. Classification: ingot (Fig. 6.58).
59. Plano-convex ingot (2020.28.1.57) (*in situ* 1). Body fragment of a large plano-convex ingot with a hammer mark on its flat surface. The one-time centre is cracked due to a hammer impact. 110.89 × 81.62 mm, th. 38.80 mm, wt. 1018.5 g. Classification: ingot (Fig. 6.59).
60. Plano-convex ingot (2020.28.1.67) (*in situ* 1). Body fragment of a plano-convex ingot. 58.24 × 41.20 mm, th. 24.04 mm, wt. 218.7 g. Classification: ingot (Fig. 6.60).
61. Plano-convex ingot (2020.28.1.41) (*in situ* 2). Edge fragment of a plano-convex ingot with hammer marks at the centre. 62.90 × 40.59 mm, th. 26.39 mm, wt. 194.1 g. Classification: ingot (Fig. 6.61).
62. Plano-convex ingot (2020.28.1.43) (*in situ* 2). Edge fragment of a plano-convex ingot. 47.01 × 48.83 mm, th. 19.21 mm, wt. 108.1 g. Classification: ingot (Fig. 6.62).
63. Plano-convex ingot (2020.28.1.89) (not *in situ*). Quarter fragment of a flat plano-convex ingot. 45.07 × 40.43 mm, th. 8.18 mm, wt. 55.3 g. Classification: ingot (Fig. 6.63).
64. Plano-convex ingot (2020.28.1.39) (*in situ* 2). Fragment of a plano-convex ingot. 49.23 × 31.73 mm, th. 25.37 mm, wt. 103.8 g. Classification: ingot (Fig. 6.64).
65. Plano-convex ingot (2020.28.1.33) (*in situ* 1). Edge fragment of a plano-convex ingot. 44.40 × 18.14 mm, th. 11.76 mm, wt. 32.5 g. Classification: ingot (Fig. 6.65).
66. Plano-convex ingot (2020.28.1.34) (*in situ* 2). Edge fragment of a plano-convex ingot. 32.77 × 22.24 mm, th. 10.41 mm, wt. 23.9 g. Classification: ingot (Fig. 6.66).
67. Plano-convex ingot (2020.28.1.42) (*in situ* 2). Edge fragment of a plano-convex ingot. 35.34 × 22.51 mm, th. 19.54 mm, wt. 35.1 g. Classification: ingot (Fig. 6.67).
68. Plano-convex ingot (2020.28.1.50) (*in situ* 1). Edge fragment of a plano-convex ingot. 27.71 × 20.67 mm, th. 8.53 mm, wt. 9.6 g. Classification: ingot (Fig. 6.68).

69. Plano-convex ingot (2020.28.1.59) (*in situ* 2). Body fragment of a plano-convex ingot from a part near the edge. 36.66 × 27.44 mm, th. 22.03 mm, wt. 75.6 g. Classification: ingot (Fig. 6.69).
70. Lump (2020.28.1.25) (*in situ* 1). Fused lumps. 60.48 × 44.63 mm, th. 17.60 mm, wt. 92.1 g. Classification: ingot/byproduct (Fig. 7.70).
71. Lump (2020.28.1.68) (*in situ* 2). Amorphous lump consisting of fused lumps and a droplet. 46.67 × 52.66 mm, th. 20.84 mm, wt. 90.3 g. Classification: ingot/byproduct (Fig. 7.71).
72. Lump (2020.28.1.26) (*in situ* 1). Bronze lump fragment. 39.82 × 28.80 mm, th. 21.45 mm, wt. 78.8 g. Classification: ingot/byproduct (Fig. 7.72).
73. Lump (2020.28.1.84) (not *in situ*). Bronze lump, consisting of fused, small lumps. 68.03 × 42.11 mm, th. 24.20–9.23 mm, wt. 92.7 g. Classification: byproduct (Fig. 7.73).
74. Lump (2020.28.1.88) (not *in situ*). Lump fragment with edges. 40.25 × 33.21 mm, th. 9.69 mm, wt. 31.5 g. Classification: ingot/byproduct (Fig. 7.74).
75. Lump (2020.28.1.11; B) (*in situ* 2). Flat lump. 18.07 × 18.51 mm, th. 1.95 mm, wt. 2.3 g. Classification: ingot/byproduct (Fig. 7.75).
76. Lump (2020.28.1.11; C) (*in situ* 2). Small lump. 15.34 × 12.46 mm, th. 5.67 mm, wt. 3.5 g. Classification: ingot/byproduct (Fig. 7.76).
77. Lump (2020.28.1.22) (*in situ* 2). Small lump fragment. 22 × 17.30 mm, th. 5.71 mm, wt. 10.4 g. Classification: ingot/byproduct (Fig. 7.77).
78. Lump (2020.28.1.60) (*in situ* 2). Amorphous lump fragment. 22.14 × 14.78 mm, th. 11.88 mm, wt. 13.2 g. Classification: ingot/byproduct (Fig. 7.78).
79. Lump (2020.28.1.61) (*in situ* 2). Amorphous lump fragment. 19.54 × 15.75 mm, th. 9.37 mm, wt. 8.2 g. Classification: ingot/byproduct (Fig. 7.79).
80. Lump (2020.28.1.69) (*in situ* 2). Edge fragment of a lump. 21.05 × 16.66 mm, th. 9.4 mm, wt. 13.1 g. Classification: ingot/byproduct (Fig. 7.80).
81. Lump (2020.28.1.75) (*in situ* 2). Lump fragment. 23.86 × 19.95 mm, th. 6.9 mm, wt. 10.9 g. Classification: ingot/byproduct (Fig. 7.81).
82. Lump (2020.28.1.85) (not *in situ*). Edge fragment of a plano-convex ingot. 28.24 × 19.94 mm, th. 13.98 mm, wt. 20.2 g. Classification: ingot/byproduct (Fig. 7.82).
83. Lump (2020.28.1.28) (*in situ* 2). Amorphous bronze lump. 22.66 × 16.03 mm, th. 11.62–4.23 mm, wt. 6.9 g. Classification: byproduct (Fig. 7.83).
84. Lump (2020.28.1.29) (*in situ* 2). Flat lump fragment. 19.36 × 18.82 mm, th. 7.14 mm, wt. 7.5 g. Classification: ingot/byproduct (Fig. 7.84).
85. Lump (2020.28.1.30) (not *in situ*). Lump fragment. 19.07 × 15.06 mm, th. 7.86 mm, wt. 6 g. Classification: ingot/byproduct (Fig. 7.85).
86. Lump (2020.28.1.90) (not *in situ*). Fragment of a lump. 19.09 × 19.20 mm, th. 9.79 mm, wt. 5.9 g. Classification: ingot/byproduct (Fig. 7.86).
87. Lump (2020.28.1.91) (not *in situ*). Bronze lump. 19.61 × 11.49 mm, th. 6.57 mm, wt. 3 g. Classification: ingot/byproduct (Fig. 7.87).
88. Lump (2020.28.1.92) (not *in situ*). Fragment of a small lump. 11.39 × 8.54 mm, th. 4.17 mm, wt. 1 g. Classification: ingot/byproduct (Fig. 7.88).
98. Lump (2020.28.1.21) (*in situ* 1). Long, amorphous lump. 58.55 × 22.17 mm, th. 6.66 mm, wt. 20.7 g. Classification: byproduct (Fig. 7.89).
90. Bar ingot (2020.28.1.15) (*in situ* 1). Semioval-profile bar ingot, broken, with hammer marks on its back. L. 61.28 mm, w. 16.97 × 9.27 mm, wt. 72.9 g. Classification: ingot (Fig. 7.90).
91. Bar ingot (2020.28.1.45) (*in situ* 2). Long, thin, round-profile bar ingot. Broken. L. 69.12 mm, th. 7.21 × 5.25 mm, wt. 11.4 g. Classification: ingot (Fig. 7.91).
92. Rod (2020.28.1.93) (not *in situ*). Hammered fragment of a rectangular-profile bronze rod (bracelet?). L. 40.99 mm, th. 6.24 × 4.20 mm, wt. 8.6 g. Classification: finished product with no visible use-wear marks or unfinished product (Fig. 7.92).
93. Rod (2020.28.1.31) (*in situ* 1). Hammered fragment of a rectangular-profile bronze rod (bracelet?) with a tapered end. L. 35.46 mm, th. 5.44 × 5.55 mm, wt. 6.7 g. Classification: finished product with no visible use-wear marks or unfinished product (Fig. 7.93).

94. Casting jet (2020.28.1.32) (*in situ* 1). Long casting jet. L. 43.97 mm, w. 16.02 × 7.65 mm, wt. 23.5 g. Classification: byproduct (Fig. 7.94).
95. Ceramic pot (2020.28.1.94) (*in situ/not in situ*). Fifty-five rim and wall fragments of a large, thick-walled ceramic pot with a slightly everted, thick rim. Originally, the vessel had four oval knobs protruding horizontally outward of the rim. The surface is light brown and orange outside and grey inside. It was made from clay tempered with sand and gravel. The original diameter of the rim was approximately 315 mm. Rim fragment (95/1): 254.84 × 121.36 mm, wall th. 10.33 mm (Fig. 8.95/1); rim fragment (95/2): 250 × 94.97 mm, wall th. 10.11 mm (Fig. 7.95/2); rim fragment (95/3, two matching fragments): 131.64 × 66.76 mm, wall th. 11.14 mm (Fig. 8.95/3); rim fragment (95/4): 97.88 × 66.28 mm, wall th. 9.51 mm (Fig. 8.95/4); wall fragment (95/5): 84.71 × 87.47 mm, wall th. 13.31 mm; wall fragment (95/6): 73.28 × 51.44 mm, wall th. 13.93 mm; wall fragment (95/7): 92.84 × 78.85 mm, wall th. 14.46 mm; wall fragment (95/8): 97.44 × 83.80 mm, wall th. 10.93 mm (Fig. 8.95/8); wall fragment (95/9): 121.80 × 74.23 mm, wall th. 11.74 mm (Fig. 8.95/9); wall fragment (95/10): 99.13 × 48.78 mm, wall th. 11.38 mm; wall fragment (95/11): 82.91 × 56.92 mm, 9.6 mm; wall fragment (95/12): 72.39 × 54.46 mm, 11.65 mm; wall fragment (95/13): 62.76 × 57.10 mm, 12.85 mm; wall fragment (95/14): 72.17 × 58.27 mm, 12.42 mm; wall fragment (95/15): 97.46 × 81.52 mm, 13.62 mm (Fig. 8.95/15); wall fragment (95/16): 77.37 × 58.37 mm, 15.13 mm; wall fragment (95/17): 81.76 × 64.73 mm, 8.92 mm; wall fragment (95/18): 65.35 × 55.13 mm, 10.07 mm; wall fragment (95/19): 69.93 × 43.29 mm, 10.92 mm; wall fragment (95/20): 54.37 × 48.91 mm, 12.77 mm; wall fragment (95/21): 64 × 52.18 mm, 10.72 mm; wall fragment (95/22): 61.13 × 41.47 mm, 11.05 mm; wall fragment (95/23): 68.44 × 44.57 mm, 10.66 mm; wall fragment (95/24): 59.26 × 47.53 mm, 11.04 mm; wall fragment (95/25): 71.72 × 43.27 mm, 11.48 mm; wall fragment (95/26): 55.63 × 37.82 mm, 10.43 mm; wall fragment (95/27): 55.30 × 45.29 mm, 12.43 mm; wall fragment (95/28): 46.30 × 48.28 mm, 10.75 mm; wall fragment (95/29): 42.49 × 37.01 mm, 14.55 mm; wall fragment (95/30): 36.78 × 52 mm, 12.17 mm; wall fragment (95/31): 47.72 × 36.82 mm, 10.93 mm; wall fragment (95/32): 46.37 × 40.57 mm, 12.38 mm; wall fragment (95/33): 67.44 × 40.86 mm, 11.98 mm; wall fragment (95/34): 49.21 × 34.09 mm, 11.44 mm; wall fragment (95/35): 43.91 × 44.79 mm, 15.25 mm; wall fragment (95/36): 46.19 × 39.38 mm, 12.39 mm; wall fragment (95/37): 50.46 × 34.61 mm, 10.15 mm; wall fragment (95/38): 46.80 × 44.96 mm, 11.22 mm; wall fragment (95/39): 40.49 × 41.01 mm, 12.65 mm; wall fragment (95/40): 47.84 × 30.62 mm, 11.16 mm; wall fragment (95/41): 36 × 31.15 mm, 8.94 mm; wall fragment (95/42): 27.52 × 28.46 mm, 11.60 mm; wall fragment (95/43): 34.25 × 42.23 mm, 13.01 mm; wall fragment (95/44): 38.49 × 30.85 mm, 13.08 mm; wall fragment (95/45): 34.53 × 35.97 mm, 11.02 mm; wall fragment (95/46): 30.01 × 33.82 mm, 11.92 mm; wall fragment (95/47): 30.12 × 31.17 mm, 11.97 mm; wall fragment (95/48): 34.87 × 31.08 mm, 10.41 mm; wall fragment (95/49): 32.10 × 22.10 mm, 11.83 mm; wall fragment (95/50): 41.54 × 30.61 mm, 13.04 mm; wall fragment (95/51): 36.80 × 24.24 mm, 12.48 mm; wall fragment (95/52): 31.06 × 30.79 mm, 10.21 mm; wall fragment (95/53): 27.70 × 16.18 mm, 12.02 mm; wall fragment (95/54): 21.28 × 21.77 mm, 10.13 mm; wall fragment (95/55): 46.09 × 34.19 mm, 10.59 mm.

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