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THE LATE BRONZE AGE CASTING MOULDS FROM POROSZLÓ-APONHÁT

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Three stone casting moulds are known from the Late Bronze Age mega-settlement of Poroszló-Aponhát, discovered in 1969 and 1971 during excavations led by Pál Patay. The moulds were made of different types of stone, all examined by petrographic analysis. Due to the 'dig in spits' excavation method, two moulds were found in diverse arbitrary spit levels, while one could be connected to a pit. This article discusses their exact location, material, possible use, and potential analogies. In addition to an analysis of the site that relied on nearby raw materials, we also present a collection of all settlements with metalworking activity of the period (Fig. 7). The results show that Poroszló-Aponhát was one of the leading settlements of the Ha B1 period in many respects, including metallurgy.

Mindössze három kő öntőforma ismert Poroszló-Aponhát késő bronzkori megatelepüléséről, melyek 1969 és 1971-ben kerültek napvilágra, Patay Pál ásatásai során. Az öntőformák különböző típusú kőzetekből készültek, melyeket petrográfiai vizsgálatnak is alávetettünk. Az ásónyomos feltárási módszer következtében két öntőforma a mélyülés során a különböző rétegekből került elő, míg az egyik gödörhöz köthető. Az alábbi cikk az öntőformák pontos előkerülési helyéről, anyagáról, feltételezhető használatáról és lehetséges párhuzamairól számol be. A közeli kőnyersanyagra támaszkodó lelőhely elemzése mellett összegyűjtöttük a korszak összes fémmegmunkálással jellemezhető települését (7. kép). Az eredmények alapján Poroszló-Aponhát a Ha B1-es időszak egyik kiemelkedő települése volt, a fémfeldolgozás terén is.

Keywords: *casting moulds, petrographic analysis, Late Bronze Age, Carpathian Basin*

Kulcsszavak: *öntőformák, petrográfiai elemzés, késő bronzkor, Kárpát-medence*

After several field walking sessions and previous research, two seasons of planned excavations were carried out in Poroszló-Aponhát (*Fig. 1*) (see Patay 1976, 193–201). During these excavations, three stone moulds for casting were discovered in 1969 and 1971. The fieldwork was led by Pál Patay, and the moulds became part of the collection of the Hungarian National Museum. Patay previously mentioned the moulds in his preliminary report in 1976, but they were not further examined, and the illustrations are rather small: "Sehr bedeutend sind die auf der Siedlung gefundenen Gießformen trotz dessen, das eine jede von ihnen fragmentiert ist. Die eine ist wahrscheinlich die Form einer Nadel, die andere die eines verzierten Tüllenbeils mit geradem Rand (Abb. 4:2), die dritte vermutlich die Form eines Schwertes oder Dolches mit Griffangel (Abb. 4:7)." (Patay 1976, 200). Burger Wanzek also referred to these moulds in his publication in 1989, but his analysis did not cover all aspects (Wanzek 1989, 49, 203, no. 66). Gábor V. Szabó evaluated all three moulds in his doctoral dissertation but only briefly analysed them (V. Szabó 2002, 61, Fig. 41). Later, Bálint Péterdi also included two of the moulds in his research, in which

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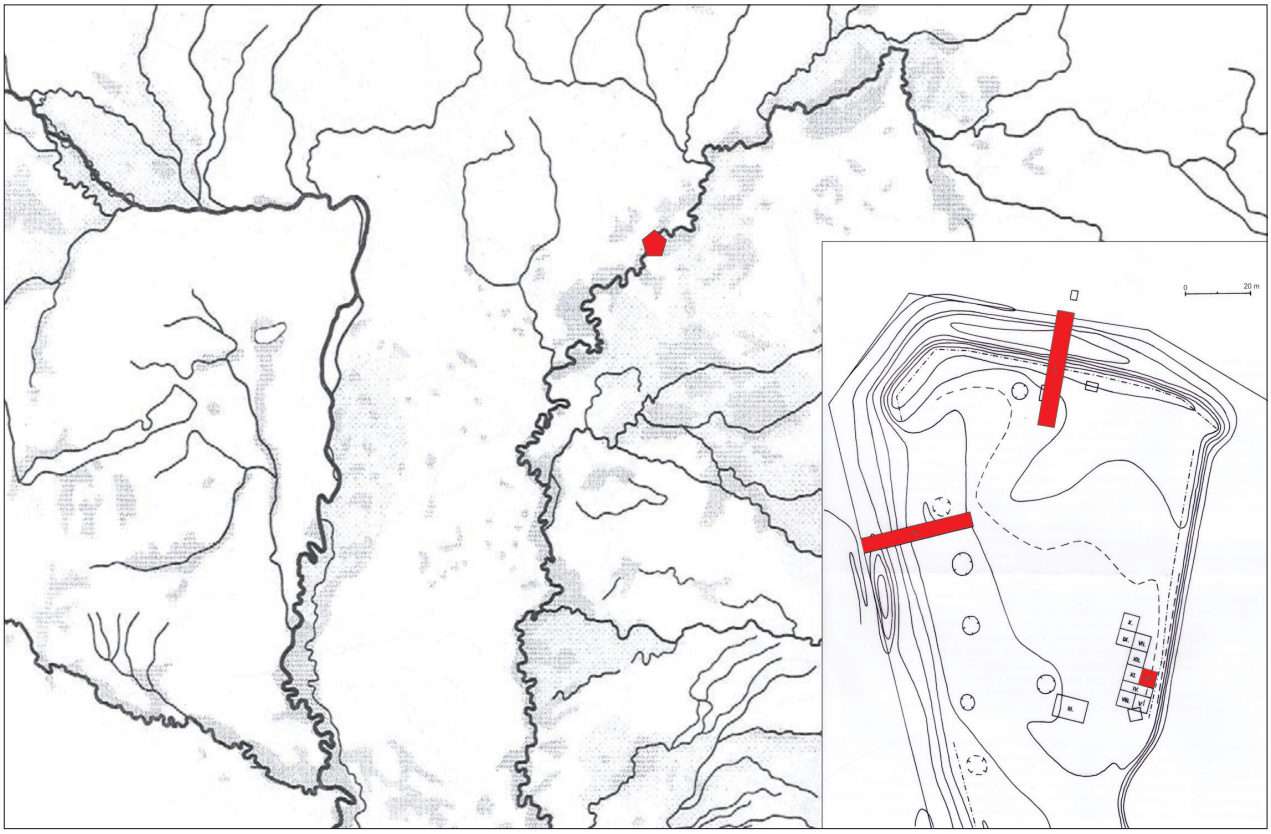

Fig. 1 The position of Poroszló-Aponhát in the Carpathian Basin and the location of the three moulds in Trenches I, II and VI (based on the excavation documentation from 1969 and 1971)
1. kép Poroszló-Aponhát elhelyezkedése a Kárpát-medencében és a három öntőforma előkerülési helye az I., II. és VI. szelvényben (az 1969-es és 1971-es ásatási dokumentáció alapján)

Fig. 2 Pit 'J', where the socketed axe mould was found (marked by a red arrow in the background; photo: Pál Patay, 1969)
2. kép A 'J' gödör, melyből a tokosbalta öntőforma előkerült (piros nyíllal jelölve a háttérben; fotó: Patay Pál, 1969)

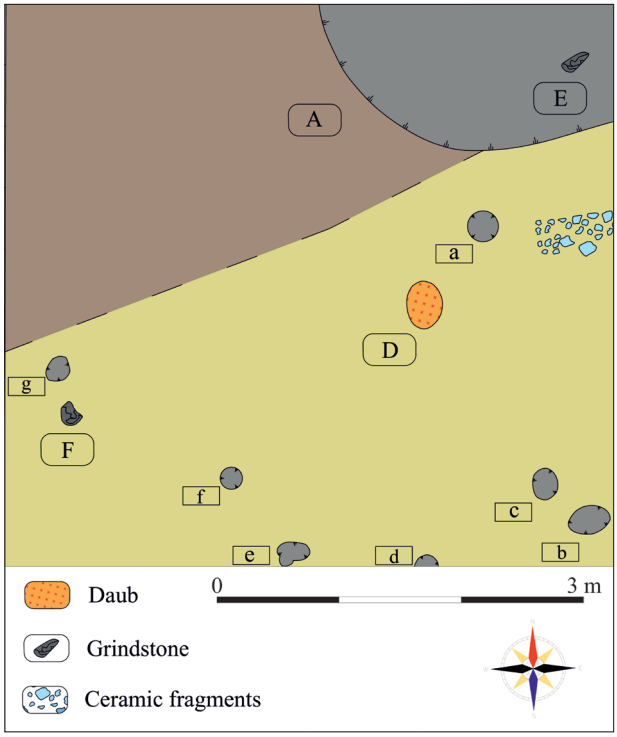

Fig. 3 The surface of the fourth spade layer of Trench VI (based on the surface drawing from 1971)
3. kép A negyedik ásónyom felszínrajza a VI. szelvényben (az 1971-es felszínrajz alapján)

he defined the exact types of stone (Péterdi 2004, 515, Tab. VIII, 4). However, one mould was left out of his study (*Fig. 12, 2, Fig. 16*).

Since the aforementioned publications included either no illustrations or only low-resolution and inapplicable pictures, it was necessary to republish these artefacts. Besides, a more detailed analysis was also important as some of these moulds came from a closed context, which is exceptional with such finds.

In the framework of the National Institute of Archaeology fellowship programme, Poroszló-Aponhát is currently being researched, and this article presents some particular preliminary results of the work related to a specific topic.

Description of the objects

Mould no. 1.
The first mould (HNM Inv. no. 1971.1.32) (*Fig 12, 1, Fig. 14*) was found in the topmost arbitrary spit level in the central part of the first and largest trench in 1969. There is no further information about its exact location, but based on the inventory book, only four potsherds were found in the mould's immediate vicinity and 78 more in the entire top level.

This mould is a fragmented half of a two-piece stone casting mould, featuring probably the negatives of two pin shafts, one of which seems unfinished. It includes a hemispherical pouring cup that can be observed above the deeper, complete negative. On the narrow side of the mould, there is also a small carved fitting mark, which helped the craftsman to put the parts of the two-piece mould into the correct position and keep them fixed while casting, thus minimising the negative effects of a mismatch defect (Tarbay 2019, 10).

The deeper negative seems to have a rhombus cross-section, which is interesting as all known pin shafts are round. If pins were cast in this shape, the shafts must have been hammered round. Alternatively, this mould was used for casting wires. However, the pins on this site are all round (see Patay 1976, Fig. 5).

It is unclear whether this mould was burned or not, but macroscopically, it seems unused. It was made of sericite aleurolite rich in mica and clay (Péterdi 2004, 507, Tab. VIII, 1, Tab. IX, 3). Length: 7.6 cm; Width: 4.7 cm; Thickness: 2.3–2.9 cm; Weight: 125.7 g.

Mould no. 2.
The second mould (HNM Inv. no. 1971.1.1093) (*Figs 13 and 15*) was found in the second trench also in 1969, in Pit 'J', a rather shallow, round feature with straight walls (*Fig. 2*). Despite its depth, it contained 65 potsherds (*Fig. 18, 1–8, Fig. 19, 2–8*), a ceramic spoon, a miniature vessel, a loom weight, and a ceramic disc.

This mould is fragmented but rather massive and heavy. It had to be, as it had to hold a large cast without cracking. Its back is rough and unworked. It is a fragmented half of a two-piece stone mould of a socketed axe, with the pouring cup at the loop and space for a casting core to be inserted into the socket-side end. It was also fitted with a long, loaf-shaped riser that runs from the loop parallel to the main axis of the axe body.

The negative depicts a Debrecen-type socketed axe with a thick collar and a loop. The collar is slightly facetted by ribs. The rib decoration on the narrow sides consists of three horizontal and four curved ribs. Some fitting marks can be observed along the axe's narrow sides.

Macroscopical observations suggest that this mould was probably in use for some time, and some burn marks are also visible on its surface. It was

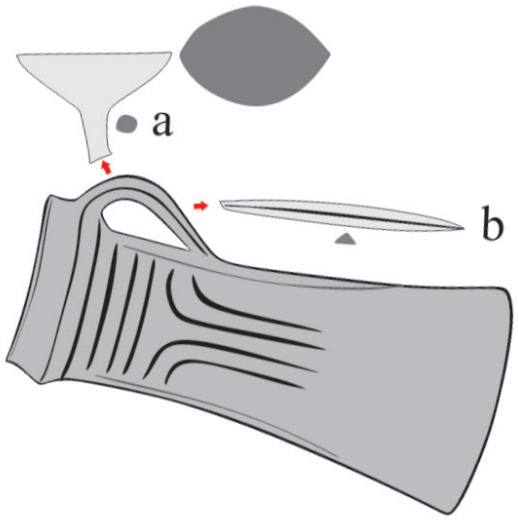

Fig. 4 The reconstruction of the socketed axe that was cast in Mould no. 2; a: casting jet on the loop and the direction of casting; b: riser (drawing: J. G. Tarbay)
4. kép A 2. öntőformában öntött tokosbalta rekonstrukciója; a: öntőcsap a fülön és az öntés iránya; b: légző (rajz: Tarbay J. G.)

made of grey sandstone rich in mica. By the fracture surfaces, it has green-brown-yellow weathering spots (Péterdi 2004, 507, Tab. VIII, 1, Tab. IX, 5). Length: 12.4 cm; Width: 9.1–12.3 cm; Thickness: 4.2–5.6 cm; Weight: 1077.7 g.

Mould no. 3.
This mould (HNM Inv. no. 1974.1.234) (*Fig. 12, 2, Fig. 16*) was found in the fourth arbitrary spit level of Trench VI (*Fig. 3*) in 1971. It was not further specified exactly where the mould was found within the trench. Altogether, 123 potsherds were discovered at this level. The field documentation reveals no more than that the mould came from the infill of this artificial layer.

Mould no. 3 was part of a two-piece stone casting mould of a flange-hilted sword with a cast peg hole and another object, probably a bracelet or saw. It is a recycled and reused piece. The original mould had to be a cuboid, 50–80 cm long, relatively narrow stone suitable for casting swords. It was a two-piece

Fig. 5 The Debrecen-type socketed axe from Lovasberény (Fejér County) (Szent István Király Museum, Székesfehérvár, photo: J. G. Tarbay)
5. kép A lovasberényi (Fejér vármegye) Debrecen-típusú tokosbalta (Szent István Király Múzeum, Székesfehérvár, fotó: Tarbay J. G.)

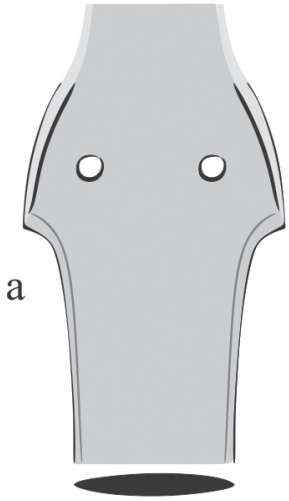

Fig. 6 The reconstruction of the flange-hilted sword that was cast in Mould no. 3 (drawing: J. G. Tarbay)
6. kép A 3. öntőformában öntött nyélnyújtványos kard rekonstrukciója (rajz: Tarbay J. G.)

closed mould with two negatives. At least four slant risers were created along the blade of the sword negative, which broke into large pieces during the casting process. It can also be observed that the sides of the mould were very finely worked, carefully shaped, and thoroughly smoothed. Probably because the craftsman put a lot of effort into the first mould, it provided good quality raw material for the second one as well.

The other negative features a conical pouring cup and a completely smooth surface. It could have been an elongated object with a blade in a two-piece casting mould with a one-side negative, as only some burn marks show the cast item's outline. The recovered sword mould fragment provided the flat part with half of a single pouring cup carved into it, while the negative must have been carved into the other, lost half of the mould. It was perhaps a saw blade or some kind of sheet metal bracelet.

It can be assumed that the first object cast in this mould was the sword. When the mould broke into several pieces, most likely during casting, it was recycled, and this fragment was reworked for casting another object. It is important to note that the fracture at the bottom of the mould occurred during the second casting.

The sword may have been a flange-hilted specimen with a rivet hole cast on its shoulder. The possibility that it was a metal-hilted sword can be ruled out since it has a rim around its outline that originally kept the organic parts in place.

The mould was made of sandstone or aleurolite. Length: 5.6 cm; Width: 5 cm; Thickness: 1.4–1.6 cm; Weight: 53.8 g.

Macroscopic observations

Mould no. 1.
Mould no. 1 is a relatively well-polished mould; however, less effort has been put into smoothing the backside, which is slightly irregular but without affecting the functionality of the object. It does not seem to have been burned, which makes it probable that the mould was not used. One of the pin shaft negatives has not been completely carved out, indicating that the piece is likely to be unfinished.

Mould no. 2.
Mould no. 2 is a rather robust, thick-walled specimen, which is necessary for large and heavy castings such as socketed axes. Only the side with the negative was smoothed completely, while all the others were left unworked. The axe was cast with a casting core. The molten material was filled from the direction of the loop, as attested by the pouring cup there (*Fig. 4*). It was a widespread technological solution at the time to cast socketed axes by filling the mould in the direction of the loop. Another Debrecen-type axe mould of similar construction and style is known from Somotor (Slovakia) (Wanzek 1989, 49; Pančíková 2008, 134, Fig. 4, 1).

There is a small loaf-shaped riser at the bottom of the axe's loop. An analogy to this technical solution appears on another socketed axe mould from Pleniţa (Boroffka – Ridiche 2005, Fig. 6, 1). Aside from the Romanian find, risers appear in the Carpathian Basin separately as individual artefacts (e.g., Kunmadaras-Repülőtér Ha B1 hoard) and as individual negatives (without being connected to any larger item in the mould). In the latter case, they could have also served as miniature ingots (see Nessel 2017, 255–259; Tarbay 2022, 63, Pl. 2, 58–60 with further references).

Mould no. 3.
It can be seen from the elaboration of the mould that this piece has been given the most care of the three. This mould is relatively thin, with nicely finished and smooth surfaces. The amount of extra work put into its preparation probably reflects the importance of the object – a sword – cast in it; it cannot be ruled out that its sides were given extra polishing during secondary shaping.

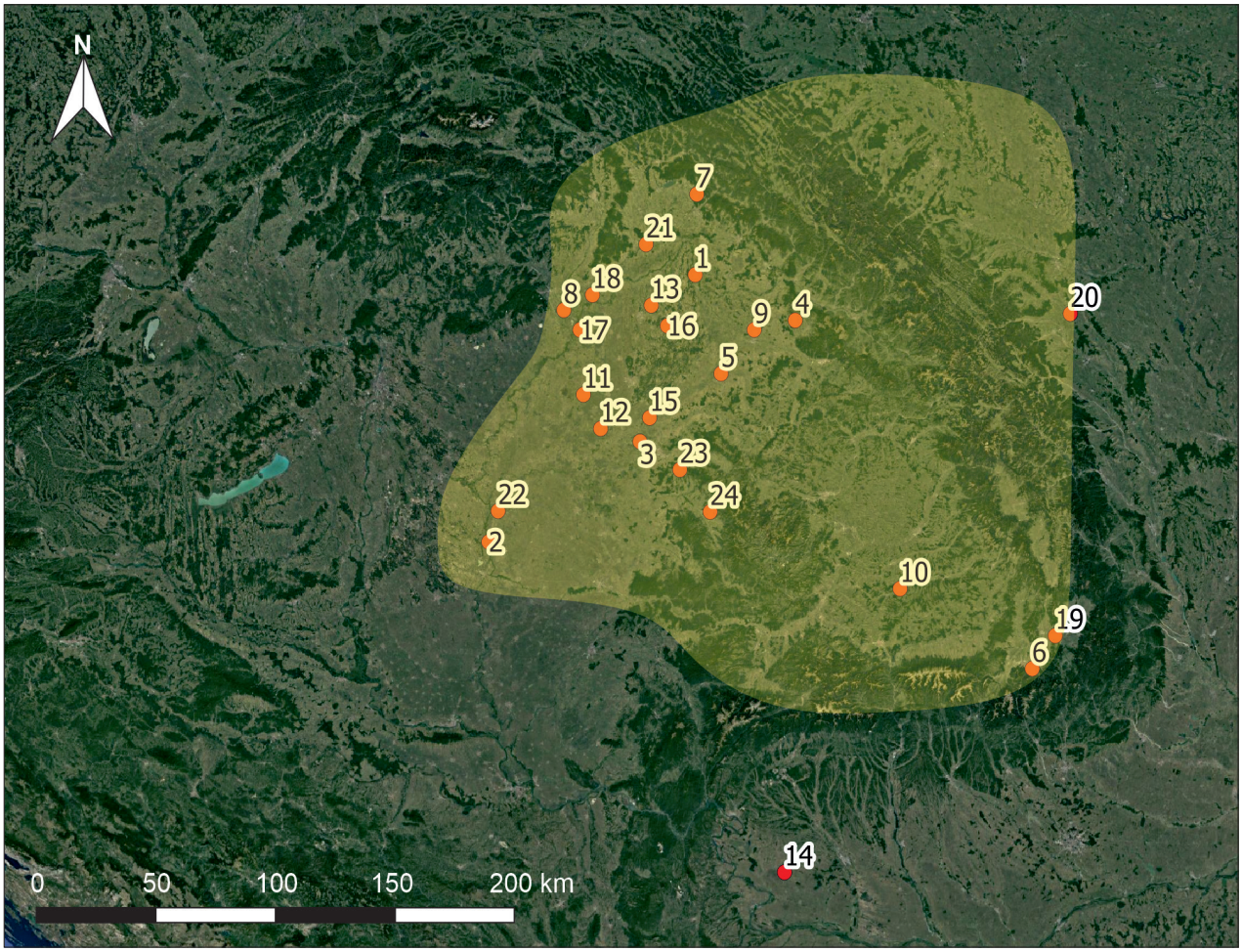

Fig. 7 The distribution of metalworking settlements from the Ha B1 period. 1: Aranyosapáti; 2: Baks-Temetőpart; 3: Biharkeresztes-Láncos major; 4: Călineşti-Oaş; 5: Căuaş-Sigethiu; 6: Cernatu; 7: Köröm-Kápolna-domb; 8: Koromľa; 9: Lazuri; 10: Mediaş vicinity; 11: Nádudvar-Halomzug 2; 12: Nagyrábé 1; 13: Nyírtura 1; 14: Plenița; 15: Pocsaj; 16: Pócspetri; 17: Polgár M3-1; 18: Prügy-Tökföld; 19: Reci; 20: Siret; 21: Somotor; 22: Szentes-Nagyhegy; 23: Tăşad; 24: Teleac
7. kép A fémművességgel jellemezhető, Ha B1-es korú települések elterjedése

A dense row of obliquely positioned risers line along the blade of the sword. This solution is also known from other sword moulds, e.g., Piverone (Italy) or Pobit Kamak (Br D – Bulgaria) (Bianco Peroni 1970, Pl. 25; Leschtakow 2019, Fig. 8, Fig. 53). Risers (feeders) were used during casting to eliminate cavity formation due to shrinkage. Swords were long castings with a high risk of that, and craftsmen sought ways to avoid this defect. Similar solutions are also used for other long castings, such as large spears (e.g., Crévic et al. 1990, 60, Fig. 3a–b).

Black and completely white marks indicate that the object was used. It can also be observed that a so-called mismatch defect occurred during the casting of the sword due to the mould halves having shifted or the negatives did not align perfectly. The blade line, burned beyond the incised area, also indicates mismatched casting.

The third described mould from Poroszló is a recycled object; technologically, it has an analogy from Velem-Szent Vid (Vas County) (Foltiny 1958, 5, Pl. 1, 7; Kemenczei 1988, 75, Pl. 46, 407; Wanzek 1989, 205, Pl. 50, 1a–b; Fekete 2004, 162, Fig. 5). One side of the piece from Velem features the upper part of a negative for casting a Ha B1 socketed axe, while the end of the handle of a flange-hilted sword appears on the other. Even the characteristics of secondary breaking are identical.

Based on the finds from Poroszló and Velem, it seems that the relatively long (50–80 cm) sword moulds were recycled in the metal workshops. Sandstone moulds break quite easily into smaller pieces after the first or second casting, but their other, smooth sides can still be used after carving new negatives into them. It is also visible on the piece from Poroszló that all the broken edges were re-shaped

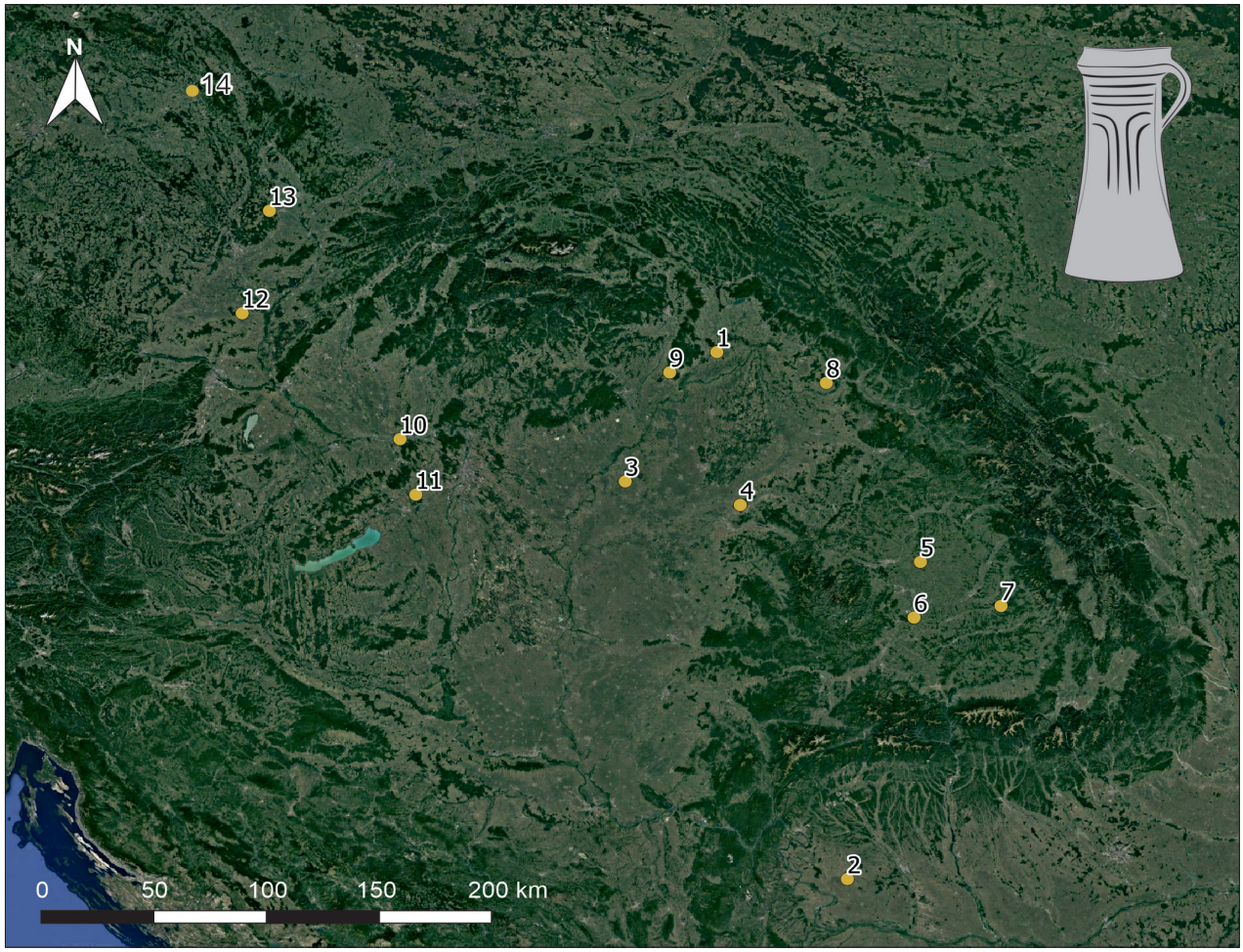

Fig. 8 The distribution of similarly decorated Debrecen-type axes to the one that was cast in Mould no. 2. 1: Somotor; 2: Pleniţa; 3: Kunmadaras-Repülőtér; 4: Sălard; 5: Suatu; 6: Spălnaca; 7: Sângeorgiu de Pădure; 8: Oleshnyk; 9: Tállya-Óvár; 10: Neszmély-Felsősziget; 11: Lovasberény; 12. Herrnbaumgarten; 13: Zărovice-Hamry 3; 14: Nové Město nad Metují
8. kép A 2. öntőformában öntött, Debrecen típusú tokosbalta stíluspárhuzamainak elterjedése

and polished as part of the creation of the second mould. Since the negative of the new object is not complete either, it is very likely that the current state of the mould is the result of the second (or third) casting or has taphonomic reasons.

Typochronology

Mould no. 1.
The lack of pinheads on the negative renders this casting mould unsuitable for in-depth typological characterisation. It could belong to any pin type found at the settlement of Poroszló-Aponhát (Patay 1976, Fig. 5; V. Szabó 2002, Fig. 41).

Mould no. 2.
The mould depicts a Debrecen-type socketed axe (*Fig. 7*), one of the most common axe groups during the Late Bronze Age in the Carpathian Basin (Dergačev 2002, 174–176). At the time of the Gáva pottery style, these axes became defining elements of the local Ha B1 hoards (Mozsolics 2000, 24). Their fine periodisation is possible through the analysis of cast rib patterns. Burger Wanzek sorted the pattern combination of the Poroszló mould into this 2.b.6.c combination group, whose main characteristic is the double-curved pattern (*Doppeltbogige Verzierung*) (Wanzek 1989, 111). Of his list, we consider only those finds that are decorated with three horizontal ribs and four curved ribs, thus being completely similar to Poroszló.

Some analogies to the Poroszló-Aponhát mould were found in the area of the Gáva pottery style; all these fell into the group mentioned above of Debrecen-type axes. Analogies to this decoration combination are known from a Ha B1 hoard from

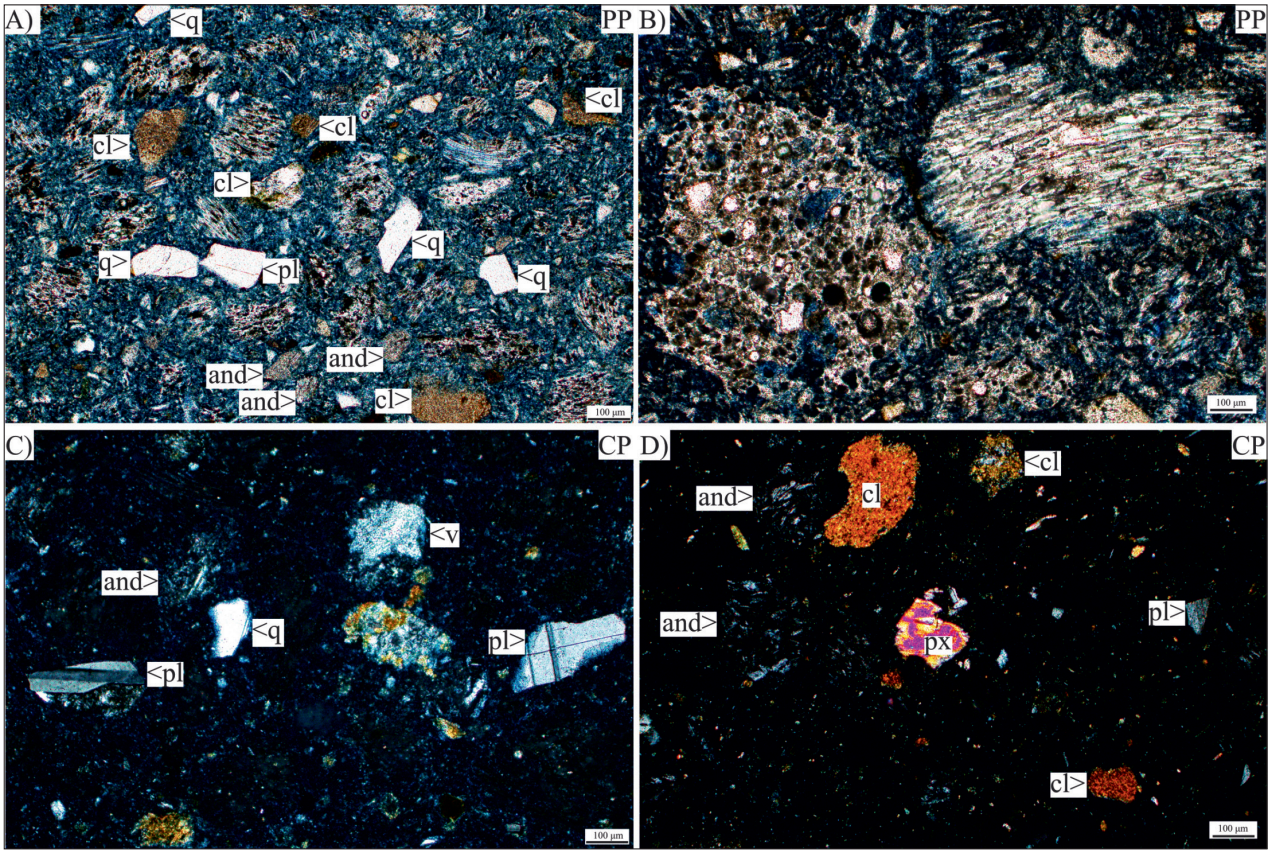

Fig. 9 The microscopic images of Mould no. 1 (photos: D. G. Miklós). A: textural photo; B: 2 pieces of pumices; C: plagioclase clasts; D: pyroxene fragments (Legend: and: andesite; cl: claystone; pl: plagioclase; px: pyroxene; q: quartz; v: volcanite)

9. kép Az 1. öntőforma mikroszkópos felvételei (Fotók: Miklós D. G.). A: átfogó szöveti kép; B: 2 darab horzsakő; C: plagioklász klasztok; D: piroxén töredék (Jelkulcs: and: andezit; cl: agyagkő; pl: plagioklász; px: piroxén; q: kvarc; v: vulkanit)

Sălard in Transylvania (Petrescu-Dîmboviţa 1978, 144, Pl. 238C, 2; Dietrich 2021, 641, Pl. 591, 2540). It is possible that the Ha B1 hoards from Suatu and Şpălnaca I also contain similar axes, but their illustrations are unclear (Petrescu-Dîmboviţa 1978, 144–146, Pl. 242, 12, Pl. 244, 11; Dietrich 2021, 642, Pl. 591, 2546). The small axe found in the Sângeorgiu de Pădure hoard represents a late Ha B2 analogy (Rezi 2017, Fig. 1, 4). Axes with similar decoration were selected for the Ha B2 bronze hoard from Oleshnyk (I), Transcarpathia in Western Ukraine (Kobaľ 2000, 91, Pl. 88, 23–24). The axe from the north-eastern Hungarian Ha B2 hoard of Tállya-Óvár is also related to the Poroszló mould (V. Szabó 2019, Fig. 105).

The second group of analogies comprises stray finds and ones discovered west of the distribution area of the Gáva pottery style. The westernmost appearance of similar axes is in the territory of today's Czech Republic, Austria, and Italy. An identical socketed axe mould is known from the Urnfield period settlement of Neszmély-Felsősziget. This object was found in a pit (*Grube 2 in Schnitt I*) along with Urnfield period potsherds, animal bones, and antler objects (Patek 1961, 57, 60, Pl. 28, 8). Mould no. 2 also has another analogy in the territory of the Transdanubian Urnfield culture: the Lovasberény hoard (Fejér County) contains a unique Debrecen-type socketed axe (*Fig. 5*). One side of this tool bears a rib pattern consisting of three horizontal ribs, an Y rib, and two side ribs, while the other features three horizontal ribs and four curved ribs, a pattern identical to the axe of the mould from Poroszló-Aponhát. This hoard has been recently dated to the Ha B1/(Ha B2) period by one of the authors after re-analysing the complete assemblage (Tarbay 2018, 570, Pl. 160, 32).

An identical axe was found in the Herrnbaumgarten hoard in Austria, dated to the Ha B2 period (Mayer 1977, 195–198, Pl. 80, 1109). A socketed axe from the Žárovice-Hamry 3 hoard can also be related to Poroszló. This Moravian find was dated to the Ha B1 period by local research (Říhovský 1992, 221,

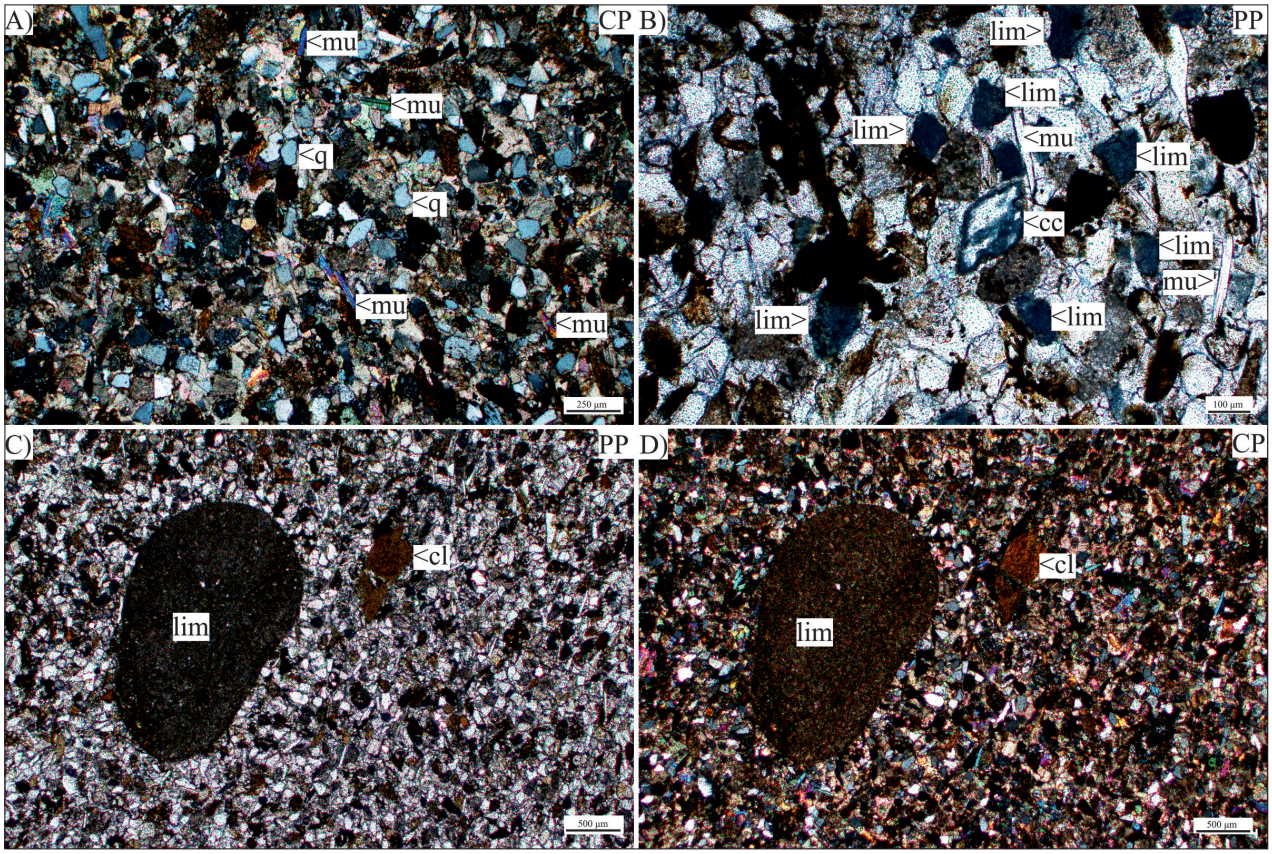

Fig. 10 Microscopic image of Mould no. 2 (photos: D. G. Miklós). A: textural photo; B: microporous calcite and limestone grains; C: limestone and claystone grains (PP); D: limestone and claystone grains (CP)
(Legend: cc: calcite; cl: claystone; lim: limestone; mu: muscovite; q: quartz)
10. kép A 2. öntőforma mikroszkópos felvételei (Fotók: Miklós D. G.). A: átfogó szöveti kép; B: mikroporózus kalcit és mészkőszemcsék; C: mészkő- és agyagkőszemcsék (1N); D: mészkő- és agyagkőszemcsék (+N)
(Jelkulcs: cc: kalcit; cl: agyagkő; lim: mészkő; mu: muszkovit; q: kvarc)

Pl. 56, 820). Examples were also found west of the Carpathian Basin, including the area of the Czech Republic, settled by the people of the Lausitz culture at the time: Nové Město nad Metují 1 (Kytlicová 2007, 286, Pl. 182C, 2). Carancini also mentions an unprovenanced socketed axe from Italy from the collection of the Armeria di Castel Sant'Angelo, Roma, which seems like one that would have been cast in the mould from Poroszló-Aponhát (Carancini 1984, 144, Pl. 120, 3721). An unprovenanced axe from the former Samuel Egger Collection can also be mentioned as an analogy (Catalogue Egger 1891, Pl. 3, 28).

In conclusion, the axe negative has fine analogies in Transylvania (Romania), Transcarpathia (Western Ukraine), Transdanubia (Western Hungary), Austria, the Czech Republic, and Italy, a significant number of them from outside the core area of the Gáva pottery style. The chronological position of these axes is the Ha B1 period. We can assume that their deposition continued in the Ha B2 period based on the Sângeorgiu de Pădure, Tállya-Óvár, Oleshnyk I, and Herrnbaumgarten hoards.

Mould no. 3.

This mould fragment has a negative for the handle and the upper part of a flange-hilted sword. Only one positive peg hole is visible on the hilt part (*Fig. 6)*. The flange was carved deeper along the shoulder. Despite the numerous swords from the core area of the Gáva ceramic style (Kemenczei 1988; Bader 1991; Kemenczei 1991; Kobal' 2000, 31–33), as far as we are aware, only one other fragmented sword mould was found there, the one in Feature 4 of the settlement at Polgár M3 site no. 1 (V. Szabó 2002, 60, Fig. 203, 2). Most flange-hilted sword moulds were found in Transdanubian Ha A–Ha B1 Urnfield centrums like Velem-Szent Vid (Foltiny 1958, 5, Pl. 1, 7; Kemenczei 1988, 75, Pl. 46, 407; Fekete 2004, 162, Fig. 5; Ilon 2015, Pl. 18, 6; Ilon 2018, 120, Fig. 3, 4)

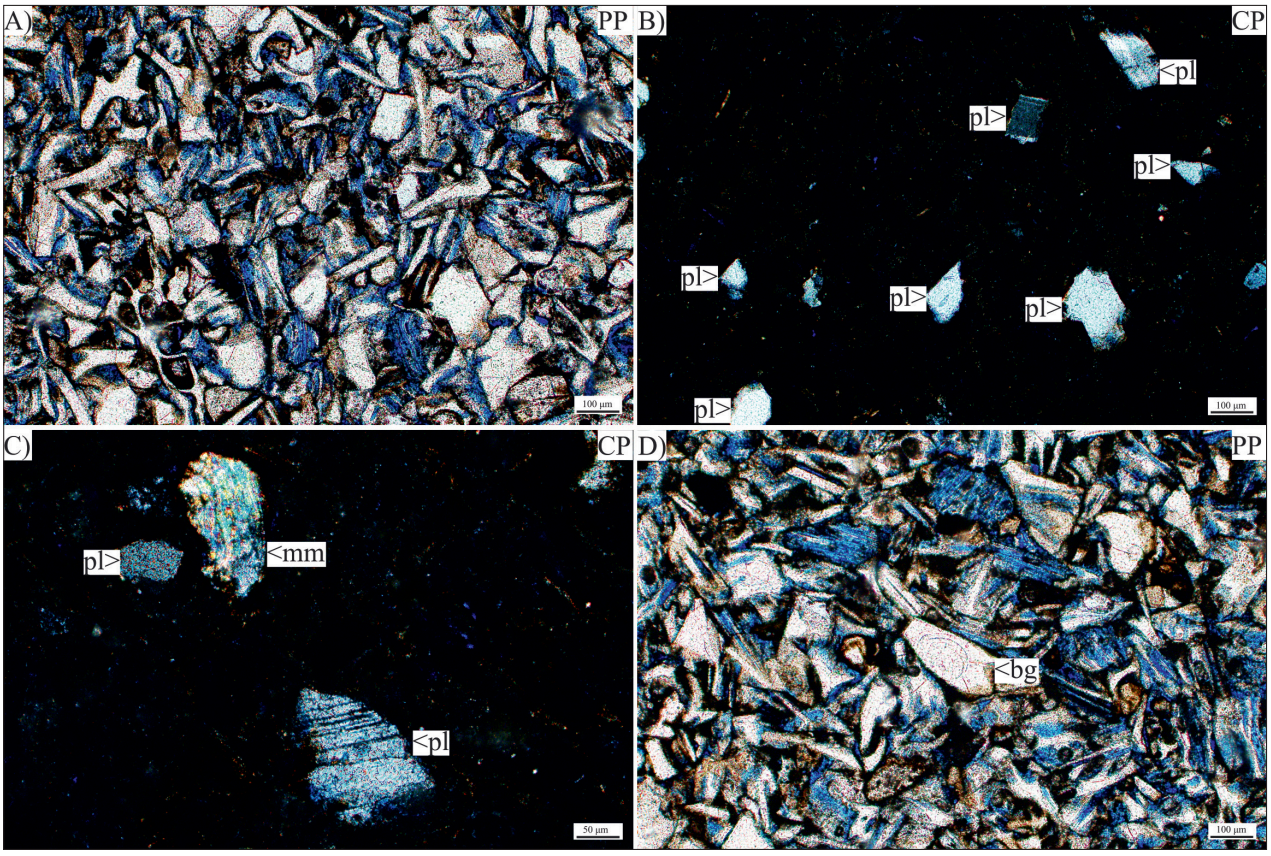

Fig. 11 Microscopic images of the Mould no. 3 (Photos: D. G. Miklós). A: textural image; B: plagioclase clasts in glassy groundmass; C: plagioclase and metamorph fragment; D: burnt glass clast
(Legend: bg: burnt glass clast; mm: metamorph fragment; pl: plagioclase)
11. kép A 3. öntőforma mikroszkópos felvételei (Fotók: Miklós D. G.). A: átfogó szöveti kép; B: plagioklász klasztok üveges alapanyagban; C: plagioklász és metamorf törmelék; D: égett üveg törmelék
(Jelkulcs: bg: égett üveg törmelék; mm: metamorf törmelék; pl: plagioklász)

or Várvölgy-Nagyláz-hegy (Ilon 2015, Pl. 18, 4). Gábor Ilon also mentions a Ha A1 (Type A, Variant 4) sword mould from Keszthely (Kemenczei 1988, 49–50; Ilon 2015, 238, Pl. 18, 10). The fragment from Poroszló-Aponhát is too small for a reconstruction of the exact sword type, especially as it provides no information about the shape of the tang and the blade as well as the number of peg holes. Its curved shoulders suggest that this mould may belong to Tibor Kemenczei's Type F, specimens of which were deposited between the Ha A2 and Ha B1 periods (Kemenczei 1988, 70–71).

Ceramic material from the surroundings of the moulds

As mentioned above, only four pottery fragments were found in the immediate vicinity of the first mould, while 78 fragments were recovered from the uppermost arbitrary spit level of Trench I. However, as the total area of this trench is approximately 200 m^2, only the four potsherds recovered from the closest of the mould's find spot are evaluated here. Two fragments belong to classical Gáva jars or deep bowls with a lobed rim and incised or brushed surface (Type C.9; Kósa 2020, 23). A third piece can be reconstructed as part of a large storage vessel with channeled decoration and an upright knob. The last sherd is a handle fragment that once belonged to a mug with diagonally channeled decoration (*Fig. 19, 1*).

The second mould was found in a closed context, namely, a pit. The 69 ceramic objects recovered from the feature cover a wide range of types and shapes. Altogether, 18 belong to simple cooking pot types with flat or slightly flared rims, while three even have large knobs. Besides, twelve large storage vessels have been reconstructed from the material; two had definite outcurving rims; ten were decorated with different channeled decorations, and one had an incised bundle of lines and an upright knob

Fig. 12 1: Mould no. 1 (pins); 2: Mould no. 3 (sword) (photo: P. Kósa)
12. kép 1: az első öntőforma (tűk); 2: a harmadik öntőforma (kard) (fotó: Kósa P.)

Fig. 13 Mould no. 2 (socketed axe) (photo: P. Kósa)
13. kép A 2. öntőforma (tokosbalta) (fotó: Kósa P.)

(*Fig. 19, 7*). Besides, the pit contained 25 different bowls (*Fig. 18, Fig. 19, 3*). Of these, 18 were of a type with simple, slightly outcurving rims, four had wrapped turban rims, one was adorned with impressed decoration on its rim, and two had channeled rims and incised decoration inside. Three smaller fragments could only be identified as bowls or jugs based on the thickness of their walls. Two jugs could be classified into specific type groups, one to C.9 and the other to C.6 (Kósa 2020, 22–23). The former is a typical classical Gáva vessel type with a lobed rim and incised or brushed decoration below the neck, while the other comprises beautifully crafted, relatively small, black vessels with a biconical body emphasised with channeled decoration and an *appliqué* rib (*Fig. 19, 5*). The group of mugs consists of only two simple mugs with slightly outcurving rims and a D.14 ornamented cup (Kósa 2020, 27). Another band handle fragment may also have belonged to a mug. Furthermore, a ceramic 'token', the bottom part of a portable stove (*Fig. 19, 2*), a spouted spoon, a highly fragmented loom weight, and a simple, cylindrical miniature mug with a handle were found in this pit. Based on the reconstructable pieces, the pit contained pieces representative of the Gáva ceramic style and can therefore be dated to the Ha B1 period.

The sword mould was found in the fourth artificial spit level in Trench VI. Due to the large number of ceramic fragments (123 pieces), not all pieces will be analysed here, but only a few significant ones will be highlighted (the complete find material of the site will be evaluated in the PhD dissertation of one of the authors; Kósa 2024 *in progress*). In addition to the simple cooking pots with knobs (*Fig. 17, 1–3*), many fragments could be reconstructed as different kinds of large, black storage vessels with shining surfaces and channeled decoration. Besides the simple bowls with a conical body (*Fig. 17, 4*), the 'layer' contained several bowls with a wrapped turban rim and a footed bowl with a black inner surface. Several bowl fragments with burnished inner surfaces and channeled rims have also been recovered from this unit (*Fig. 17, 5, 7*); this vessel type is one of the most

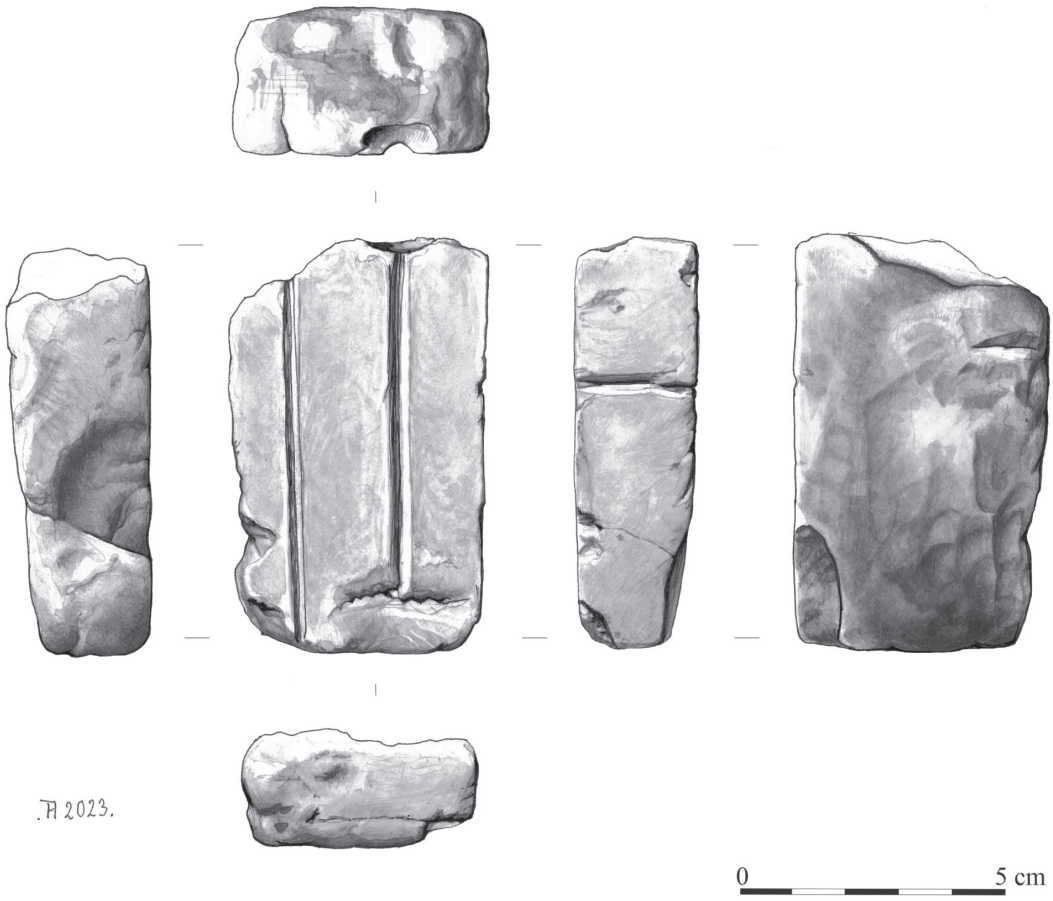

Fig. 14 Mould no. 1 (pins) (drawing: A. M. Tarbay)
14. kép Az első öntőforma rajza (tűk) (rajz: Tarbay A. M.)

characteristic of the classical Gáva pottery style. The most typical jar forms of the style also appeared in the record, such as those with an incised, brushed surface and lobed rim, or the most lavishly decorated C.1 type with a burnished surface and bundle of lines arranged into garlands (Kósa 2020, 21). On top of the beautifully crafted cups with raised handles and a burnished black interior, an almost intact large mug was also discovered (*Fig. 17, 6*).

The artificial spit levels and the pit contained many classical Gáva-style fragments dating to the Ha B1 period. In addition to the more decorative serving vessels, there are also a large number of cooking utensils for everyday use, not to mention the objects used for textile making. Conclusively, both artificial spit level no. 4 and pit 'J' preserved the traces of everyday life.

Petrographic observations: methods

The petrographic examination of the moulds was carried out by macroscopic and microscopic analyses. The textural analysis of the archaeological tools (e.g., grain size and sorting, distribution, roundness, and types of grains; amount and ratio of matrix and pores to grains; material of the cement and its proportion; and other posterior effects) was carried out during the initial macroscopic analysis. For higher resolution, microscopic analysis was also conducted on prepared thin sections, which were examined with a Leica DM 2700 P polarising microscope.

Petrographic observations: descriptions

Mould no. 1. (HNM Inv. no. 1971.1.32) Dacite tuff
The sample consisted of fine-grained, grey groundmass and well-sorted sedimentary rock of homogenous composition. A lot of white micas (muscovite) appeared on the altered surface; therefore, the sample was identified as aleurolite. Black and white grains could be observed on the cut surface; these could be minerals and/or rock fragments. The sample had a strong hygroscopic property.

At the microscale, the fabric was non-directed, consisting of a homogenous, fine-grained, light

Fig. 15 Mould no. 2 (socketed axe) (drawing: A. M. Tarbay)
15. kép Az második öntőforma rajza (tokosbalta) (rajz: Tarbay A. M.)

brown, probably acidic, glassy groundmass with a high level of microporosity, which was clearly visible by the blue mount (*Fig. 9, A*). The groundmass contained glass, X- and Y-shaped glass shards (juvenile components, 0.1–0.2 mm), and pores that were not altered or deformed. Round, burnt glass fragments were also present with a conchoidal appearance and fractures; their presence can result from natural processes.

In addition, irregular, angular, poorly or non-rounded grains or clasts, so-called phenocrysts, were detected; these can be minerals and rock fragments. Their sizes ranged from 0.2–0.5 mm, and their mass made up 10–15% of the sample (*Fig. 9, A*). Several types of clasts could be identified; the most frequent ones are described in the following.

The clasts included juvenile, glassy components: pumices. These were tube-or pipe-shaped and represented the dominant component of the sample (*Fig. 9, B*). The rock-forming minerals, namely quartz, feldspar, opaque minerals, muscovite, biotite, and pyroxene, showed no orientation. Quartz crystals were subhedral, resorbed, and had a distinct extinction. Feldspar phenocrysts were subhedral or euhedral (tabular) and did not show alteration (e.g., sericitisation or argillization). They showed polysynthetic twinning with frequent thin twin lamellas (*Fig. 9, C*) but, rarely, they could be zoned. Among the feldspar clasts, K-feldspar was not present in this sample. Muscovites were subhedral or euhedral, fresh grains. Biotite crystals were subhedral or euhedral, and they occurred in a new form (without alteration) with a dark brown-reddish brown pleochroism. They were present in the sample at a low frequency. Clinopyroxene (maybe augite) was a subhedral, colourless clast with inclined extinction (*Fig. 9, D*). This was a very rare component in the thin section. Accessory minerals did not occur frequently in this sample; they were very rare, and only rutile could be identified. Several types of rock fragments were present, such as andesite or, rarely, felsic volcanic, red claystone, and quartzite clasts. The most frequent one was andesite, an angular or poorly rounded, fine-grained fragment with disorderly plagioclase minerals. They produced a network; therefore, the texture could be described as pilotaxitic. The andesites also contained phenocrysts, mainly plagioclase, which had polysynthetic twins. In ad-

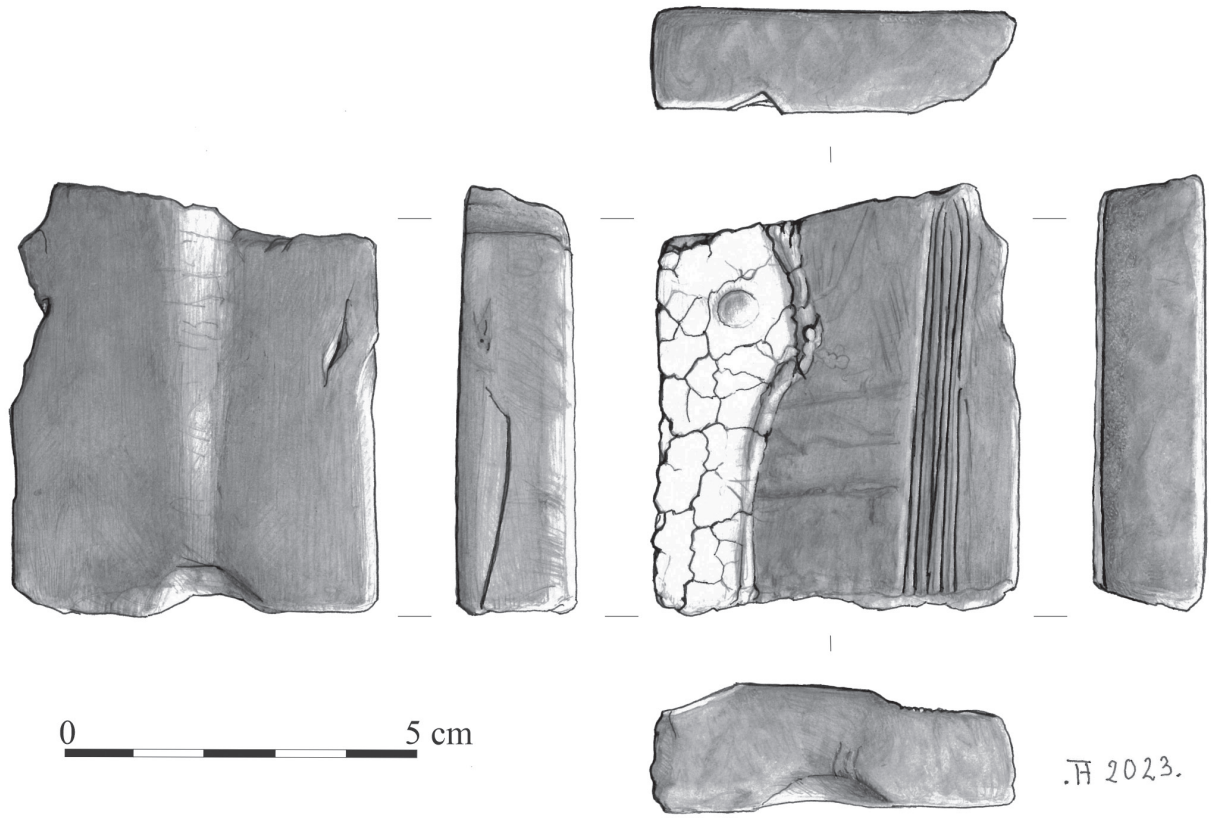

Fig. 16 Mould no. 3 (sword) (drawing: A. M. Tarbay)
16. kép A harmadik öntőforma rajza (kard) (rajz: Tarbay A. M.)

dition, the sample contained fine-grained, angular felsic rock fragments of volcanic origin. These were composed of quartz and feldspar (probably K-feldspar, but it cannot be identified with certainty due to grain size). The sample also included fine-grained red claystone variants with clay minerals, micas, and quartz. In addition, other quartzite grains with metamorphic origin were also documented, which consisted almost exclusively of quartz (>90–95%).

Mould no. 2. (HNM Inv. no. 1971.1.1093) Sandstone
The sample consisted of moderately or well-sorted, very fine to fine-grained, yellowish-brown sandstone with carbonate cement; the latter indicated by a reaction with HCl.

Among the sand grains, well-rounded limestone pebbles could be observed (*Fig. 10, C–D*). As the average grain size was 0.1–0.2 mm, this sample was categorised as fine-grained sandstone (*Fig. 10, A*). The sandstone had micropatite-patite, calcareous, and limonitic cement. The grains were angular, poorly rounded, or not at all. The texture was directed (shown by muscovite). Its main component was monocrystalline quartz, and it had a metamorphic or igneous magmatic origin (lacking volcanic quartz). The other components were plagioclase with frequent thin twin lamellas and without alteration, limestone grains (micritic with shells and other bioclasts, such as benthic foraminifera), and limonitic-glauconitic aggregates. Some strongly microporous grains could also be identified as limestone grains (*Fig. 10, B*). Biotite with brown pleochroism, opaque minerals, and brown, fine-grained claystone grains were also present, and, rarely, andesitic fragments occurred as well (*Fig. 10, C–D*). Accessory minerals were barely present in this sample.

Mould no. 3. (HNM Inv. no. 1974.1.234) Glass tuff
The sample can be characterised by a fine-grained, dark grey-black groundmass, including well-sorted sedimentary rock of a homogenous composition. As grains were not visible on the altered surface, this sample was described as aerolite or claystone. The sample had a strong hygroscopic property.

At the microscale, the fabric was non-directed and consisted of a homogenous, fine-grained, black, probably acidic, glassy groundmass with a 20–25% porosity. The groundmass contained glass, X- and

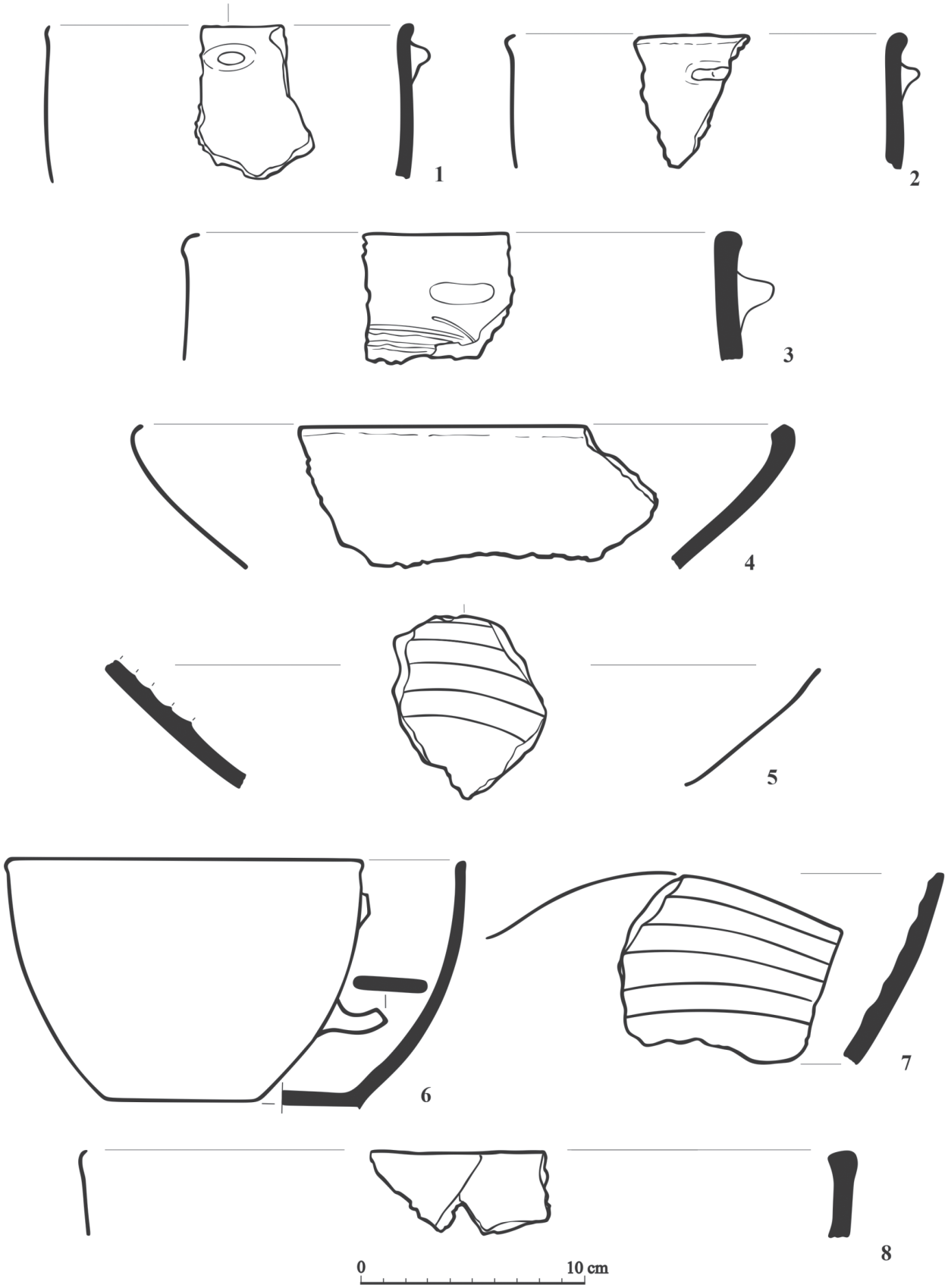

Fig. 17 Selected ceramic material from the fourth spade layer of Trench VI
(drawings: M. Koncz, modified by J. G. Tarbay)
17. kép Kerámiaválogatás a VI. szelvény negyedik ásónyomos rétegéből (rajzok: Koncz M.,Tarbay J. G. módosításával)

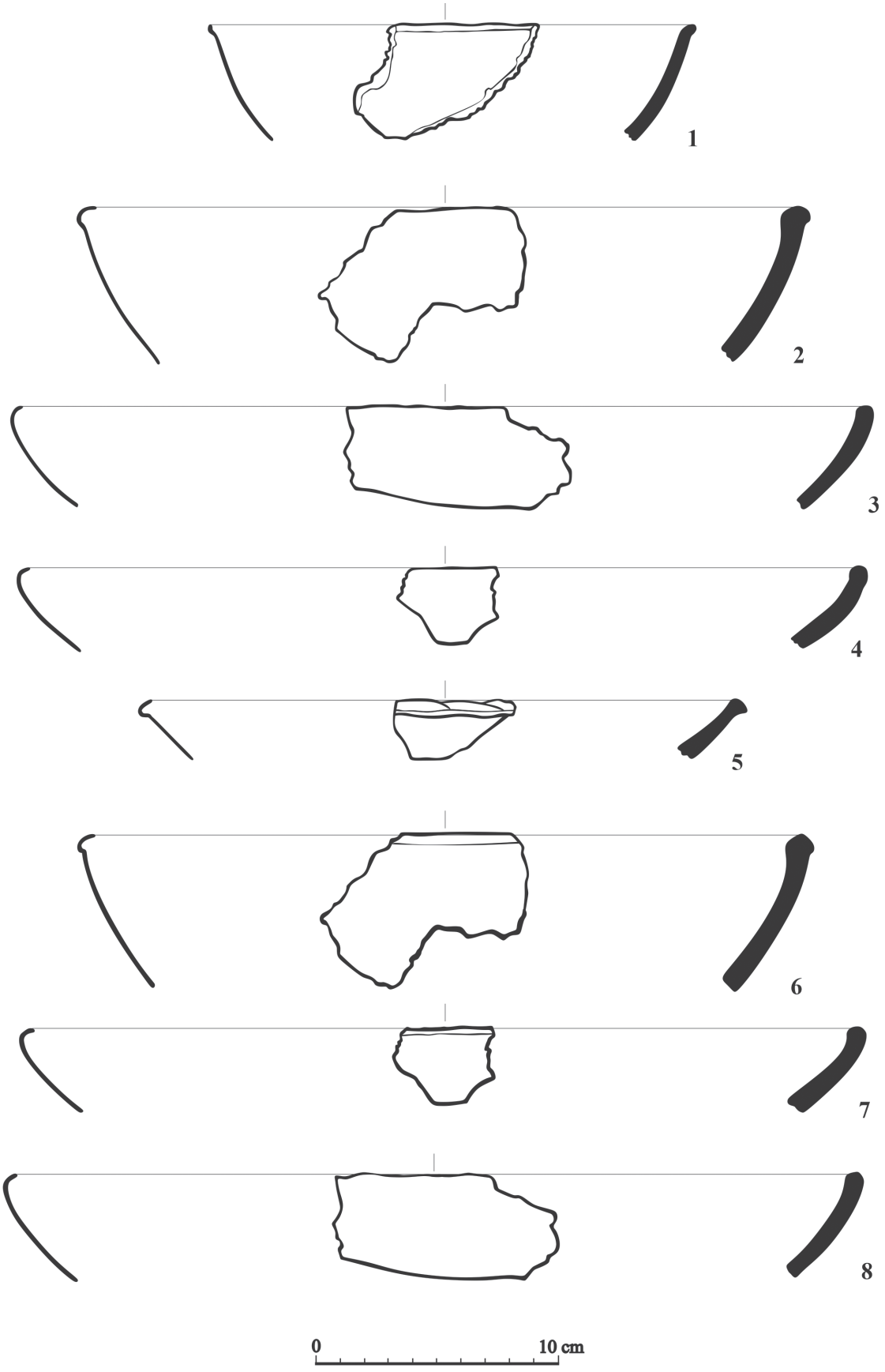

Fig. 18 Selected bowl fragments from pit 'J' (drawings: M. Koncz, modified by J. G. Tarbay)
18. kép Válogatás a 'J' gödör táltöredékeiből (rajzok: Koncz M., Tarbay J. G. módosításával)

Y-shaped glass shards (0.2–0.3 mm), and pores that were neither altered nor deformed (*Fig. 11, A*). Brown, burnt glass fragments were also present, indicating that the sample was heavily burnt (*Fig. 11, D*). However, the glass did not alter.

Furthermore, irregular, angular, poorly rounded, or not rounded phenocrysts with sizes ranging between 0.02 and 0.2 mm were observed; these made up about 20% of the sample. Several types of clasts were also present; the most frequent ones are described in the following.

The clasts included juvenile, glassy components (pumices). Tube-or pipe-shaped forms were present in low quantities in this sample. The rock-forming minerals, namely feldspar, opaque minerals, and muscovite, did not have orientation. Feldspar phenocrysts were subhedral or euhedral (tabular) and did not show alteration (e.g., sericitisation or argillization). They exhibited polysynthetic twinning with frequent thin twin lamellas (an SEM-EDX analysis can provide more information about their origin) (*Fig. 11, B–C*). Among the feldspar clasts, K-feldspar was not present in this sample. Muscovites were subhedral or euhedral, fresh grains, often in rock fragments with quartz. The accessory minerals identified in the sample were zircon and rutile, while mica schist or phyllite fragments composed of muscovite and quartz showing a directed lepidoblastic texture were also detected.

Provenience and conclusions, further research

Previously, two samples, moulds no. 1 and 2 from Poroszló-Aponhát were examined macroscopically by Bálint Péterdi (Péterdi 2004), together with another approximately 130 moulds from different archaeological sites; he distinguished between 12 types in this set. The two samples of Poroszló-Aponhát were described as sandstone (sample no. 2, representing the first group by Péterdi) and aleurolite (sample no. 1, assigned to Group 8). He described several variants and types of sandstone among the raw materials for the moulds.

Sample no. 2 was identified as sandstone, and we aim to determine its origin with further research. Geological sampling and additional petrographic and geochemical analyses, such as heavy mineral analysis (HMA) and mineral and/or bulk-rock chemistry, are proposed to be applied to achieve this goal. Thin section analysis allowed for describing the main characteristics and features of the sample; the small number of heavy minerals, the traits of the carbonate cement, and the composition of the grains suggest that the sample represents a young (maybe Early-Miocene) sandstone from the Mátra Mountains (Egyházasgergely- or Garáb Formation).

Based on the thin section analysis, sample no. 1 was proven to be of dacite tuff and not aleurolite (as described previously). Therefore, we plan to sample and investigate the tuff assemblages of the surrounding mountains (Börzsöny, Mátra, the foothills of the Bükk, and Tokaj because these were part of the Neogene Volcanic System) (Seghedi et al. 2004; Lexa et al. 2010; Harangi, Lukács 2019). Also, we wish to conduct an SEM-EDX analysis of the sample to determine the feldspar composition in its material.

Previously, Péterdi did not examine mould no. 3 of Poroszló-Aponhát. Based on the recent microscopic analysis, it can be described as glass tuff with some plagioclase, metamorphic rock fragments, and pumices (the latter in low quantities). Similar rocks can be found in the Mátra or Tokaj Mountain Ranges. In the future, we will have to sample some geological outcrops to compare them with the raw material of this mould.

Conclusions

Although the three presented finds seem to be few, they tell us a lot about the site and its importance.

The number of known moulds compared to the quantity of bronze objects is relatively low. Moreover, it is even rarer for them to be found in settlements or in a closed context. They are mostly stray finds in settlements, more commonly known from hoards, and rarely associated with pits.

It can be stated that Poroszló-Aponhát was a metalworking centre. Metalworking was not simply present in the life of the settlement but was probably carried out at a higher level, as the sword mould suggests. Casting a sword required the highest level of craftsmanship, as its size and shape made the task particularly challenging. Moreover, swords were not only weapons but also one of the most important prestige items. It is also interesting to note that the distribution pattern of socketed axes is similar to that of swords, and it cannot be excluded that this multi-functional tool (Mould no. 2) was a prestige object as well.

These objects were probably made in the larger, more prominent settlements, also known in the period as mega-settlements. The results of the petro-

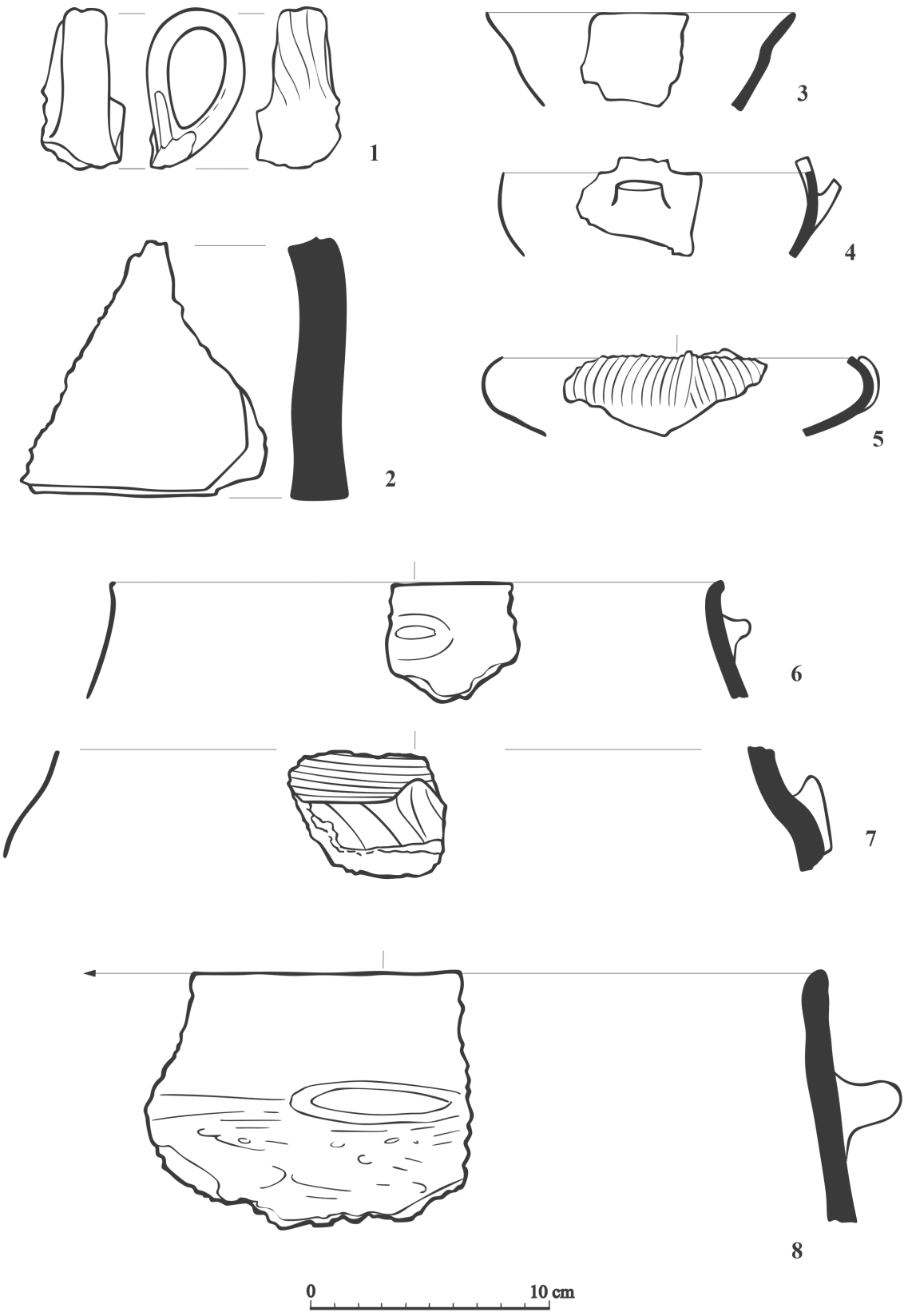

Fig. 19 1: Handle fragment from the vicinity of Mould no. 1; 2–8: selected fragments from pit 'J' (drawings: M. Koncz, modified by J. G. Tarbay)
19. kép 1: Fültöredék az első öntőforma közvetlen környezetéből; 2–8: válogatás a 'J' gödör töredékeiből (rajzok: Koncz M., Tarbay J. G. módosításával)

graphic analysis provide an important contribution to their characterisation. Based on current data, the three moulds were made from three different raw materials (no. 1: dacite tuff; no. 2: sandstone; no. 3: glass tuff). The results suggest that the raw materials could be obtained from the Mátra, Tokaj, Bükk, and Börzsöny Mountain that ranges north of the site. The Poroszló mega-settlement relied on the geographically closest raw material resources, and the stones were sourced, mined, and obtained through an exchange system. These moulds could be used locally and recycled in a professional way (no. 3).

Based on the research of Gábor V. Szabó, the metalworking settlements of the era can be divided into two groups. The first group includes settlements producing bronze tools used mainly for everyday life, such as axes, chisels, sickles, bracelets, and pins (V. Szabó 2002, 90). As making these objects did not require the most advanced technological skills, they could be manufactured by a craftsman with average skills. In contrast, the second group of settlements includes ones where not only the tools of daily life but also high-value prestige objects and elaborate artefacts for the members of the higher levels of society were produced (Jockenhövel 1990, 224, 226; V. Szabó 2002, 90).

It must be noted that casting a socketed axe or chisel is not simple. Many errors can occur in the process, therefore, highly skilled metalworkers are required to make them. The socketed axe from Poroszló has rather extended cultural connections, which might make it a high-value item. What is certain is that the moulds of prestige items are much less common and are mainly known from extensive sites with intensive pottery production (e.g., Poroszló-Aponhát, Polgár M3 site no. 1 and Teleac).

At the end of this paper, we provide a list of the known settlements (*Fig. 7*) where moulds, plano-convex ingots, casting jets, or any other objects and tools that can be associated with casting are collected. This is a preliminary list, which we will expand in the future. We were mainly looking for the classical Gáva moulds, casting cores, plano-convex ingots, and by-products with a particular focus on the Ha A2/Ha B1–Ha B2 periods. A lot of Ha B1 hoards contain material that can be connected with casting (plano-convex ingots, casting jets, etc.), but here we only included those, mainly from the Great Hungarian Plain, which are assumed or certain to have come from a settlement of the Gáva pottery style (see the Ha B1 hoards from the Great Hungarian Plain collected and evaluated in Tarbay 2022).

The socketed axe mould suggests a rather extensive system of networks (*Fig. 8*). Based on the analogies, these objects have connections far beyond the Gáva culture. There could be several reasons for this phenomenon: craftsmen travelled with their knowledge, other members of the community moved with their objects, only the objects relocated, other cultural groups started to copy these types of objects, etc. Since the raw material is local, this item was probably not produced by a travelling craftsman but rather by a settled community that sourced the stone materials and had their own specialist for making such objects. Most socketed axes of the Debrecen type can be found in the distribution area of the Gáva ceramic style, suggesting that this type has been a local variant copied by surrounding communities.

Appendix

1. **Aranyosapáti** (Ha B1) casting mould hoard, potential settlement: socketed axe casting moulds, casting core, moulds of unclassifiable objects (Mozsolics 2000, 33, Pl. 120–121).
2. **Baks-Temetőpart** (Ha A2/Ha B1–Ha B2) settlement: plano-convex ingots and casting jets from hoards (Hoard I & II), stray finds (bar, oval, and cuboid ingots, lumps, and as-cast antennae sword) (V. Szabó 2011; V. Szabó 2019, 105–117, Fig. 85–86, Fig. 90).
3. **Biharkeresztes-Láncos major** (Ha B1) settlement: Gór-type ingot from Feature 2 (V. Szabó 2002, Fig. 141, 7).
4. **Călinești-Oaș** (Gáva I – Ha A2) settlement: socketed axe casting mould (Marta 2020, 51, Pl. 17, 5).
5. **Căuaș-Sigethiu** (Ha A2/Ha B1) settlement: casting jets, two sandstone ring casting moulds (Kienlin et al. 2012; Marta et al. 2021, 370, Fig. 26).
6. **Cernatu** (Gáva II – Ha B1) settlement: two socketed axe casting moulds (Wanzek 1989, 156, 200, Pl. 49, 4–5).
7. **Köröm-Kápolna-domb** (style-based dating: Ha A1, radiocarbon: 944 cal BC (Feature 20), 975–832 cal BC (Feature 70) settlement: casting mould, tuyere, clay trough (B. Hellebrandt 2016, 74–75, 79, Fig. 59, 4, 7).
8. **Koromľa** (Ha A2/Ha B1) settlement: hoard with plano-convex ingots (Gašaj 1999, 59, Fig. 6).
9. **Lazuri** (Gáva II – Ha B1) settlement: mention of casting moulds (Marta 2020, 19, 99, fn. 66).
10. **Mediaș vicinity** (Gáva II – Ha B1) stray find: socketed axe casting mould (Wanzek 1989, 202, Pl. 47.2).
11. **Nádudvar-Halomzug 2** (Ha B1) potential settlement (potsherds): plano-convex ingot fragments and a casting jet (Sz. Máthé 1972, 403, Fig. 5, 24–30, Fig. 7).

12. **Nagyrábé 1** (Ha B1) potential settlement (potsherds): bronze hoard with plano-convex ingots from the settlement (Tarbay 2018, 596–599, Pl. 228, 22, Pl. 229–230, Pl. 231).
13. **Nyírtura 1** (Ha B1) potential settlement (potsherds): plano-convex ingot from a hoard (Mozsolics 2000, 63, Pl. 69, 17).
14. **Pleniţa** (Ha B1) settlement: casting mould hoard (Boroffka, Ridiche 2005, 134–139, Fig. 1–7).
15. **Pocsaj** (Ha A2/Ha B1) settlement: only researched by field walking and metal detector survey. Several types of bronze and ceramic artefacts were collected (V. Szabó 2017, 249), which suggests local metalworking.
16. **Pócspetri** (Ha A2/Ha B1) settlement: plano-convex ingot hoard (Kalli 2012, 175, Pl. 7, 2–3; Kalli 2017, 184, Fig. 7, 1–2).
17. **Polgár M3-1** (Ha A2/Ha B1) settlement: socketed axes mould, casting core, ring moulds, spearhead mould, sword mould, unclassifiable moulds from Features 7, 13, and 61 (V. Szabó 2002, 58, Fig. 201–203).
18. **Prügy-Tökföld** (Ha A2/Ha B1) settlement: stray find socketed axe mould and a chisel (Kemenczei 1984, 161–162; Wanzek 1989, 203).
19. **Reci** (Gáva II – Ha B1) settlement: socketed axe mould, mould fragment (Székely 1966, Pl. 8, 7–8; Wanzek 1989, 202).
20. **Siret** (Gáva-Holihrady) multi-period settlement: socketed chisel/axe casting mould (László 1994, Fig. 50, 2).
21. **Somotor** (Ha B1) settlement: socketed axe casting mould, socketed hammer (Pančíková 2008, 145, Fig. 4, 1, Fig. 10, 5).
22. **Szentes-Nagyhegy** (Ha B1) settlement: hoards (Hoard I & IV) with plano-convex ingots, bar ingots (Mozsolics 2000, 77–79, Pl. 92, 15, 17–24, Pl. 96, 25).
23. **Tăşad** (Ha B1) settlement: casting mould of a pseudo-winged socketed axe (Wanzek 1989, 202, Pl. 49, 2).
24. **Teleac** (Ha B1–Ha C) settlement: casting mould of a socketed axe with V-shaped ribs (Teleac Ia phase); casting mould of a bar ingot and a ribbed bracelet, and one to cast four vase-headed pins at once (Ha A–Ha B1); casting mould of a socketed axe, rings and pendants (Ha B2) (Ciugudean 2009, 66–69, Pl. 4, 2, 7, Pl. 10; Ciugudean 2012, 234, Fig. 10, 9).

Acknowledgements

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Notes

1 The following settlements were dated based on the works of Gábor V. Szabó and Liviu Marta. For the Hungarian sites, see Szabó 2002; Szabó 2017. For the Romanian sites, see Marta 2020.

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A POROSZLÓ-APONHÁTI KÉSŐ BRONZKORI ÖNTŐFORMÁK

Összefoglalás

A tanulmány a poroszló-aponháti késő bronzkori, klasszikus Gáva (Ha A2/B1) megatelepülés fémművességhez köthető tárgyait, három kőből készült öntőformaleletet mutat be (*12–16. kép*). Az 1969-es és 1971-es ásatások során Patay Pál által feltárt leletek a szakirodalomban régebb óta ismertek, ugyanakkor részleteiben sem tipokronológiai összefüggéseiket, sem pedig technológiai jellemzőiket (készítéstechnika, használat, nyersanyag) nem elemezték még mélyrehatóan. A multidiszciplináris módszereket, mint a készítéstechnológiai és használatinyom-elemzést, továbbá petrográfiai vizsgálatot felvonultató tanulmány ezeknek a kérdéseknek a megválaszolására vállalkozik.

Eredményeink alapján a három kétrészes, kétnegatívos öntőforma a következőképpen jellemezhető. Az első példány valószínűleg dísztűk öntésére szolgált (*12. kép 1 és 14. kép*), nyersanyaga tufa volt, melynek valószínű nyersanyagforrása a Börzsöny, Mátra, Bükk és Tokaj vidéke lehetett. Makroszkópos megfigyelések alapján ez a tárgy nem tűnt használt terméknek, amit a petrográfiai elemzés is igazolt. A formán látható tűformák keltezésre nem alkalmasak. Az I. szelvényen belül a tárgyhoz közel talált kerámiaformák a klasszikus Gáva időszakra datálnak. A második öntőforma a három lelet közül az egyetlen finom tipológiai elemzésre alkalmas tárgy (*13. kép, 15. kép*). A kétrészes, kétnegatívos, öntőmagos forma egy ún. Debrecen típusú tokosbaltát ábrázol, melynek bordadísz-kombinációi megtalálhatók Kelet-Magyarországon, Erdélyben és a Kárpátalján. Stíluskapcsolatai ugyanakkor egyáltalán nem korlátozódnak erre a térségre, megegyező díszű balták ugyanis előfordulnak a Havasalföld területén, a dunántúli urnamezős kultúra vidékén, továbbá Ausztria és Csehország (különösen Morvaország) területén is (*8. kép*). A baltatípus elsősorban a Ha B1-re datálható, de több Ha B2-es párhuzama alapján nem

zárhatjuk ki, hogy készítése és deponálása folytatódhatott a következő periódusban is. Az öntőforma egy gödörben volt (*2. kép*), ahonnan további 69 jellegzetes kerámiatöredék (*18. kép, 19. kép 2–8*; tálak, korsók, tárolóedények, bögrék) is előkerült, melyek az első szerző tipológiai beosztása alapján a klasszszikus Gáva kerámiastílust reprezentálják. A fentiek alapján valószínűnek tartjuk, hogy a poroszlói baltaöntőforma a díszítéskombináció korábbi Ha B1-es fázisát képviselheti. A viszonylag nagy méretű tárgy öntésére szolgált öntőformára a fül tetejéről vágták rá a beömlőtölcsért, aljára légzőt helyeztek, a negatív száján keresztül pedig a közepébe illesztették az öntőmagot. A petrográfiai vizsgálat alapján anyaga az egyik leggyakoribb nyersanyag a homokkő, mely feltételezhetően a Mátra területéről származik. Különösen fontos a harmadik, nyélnyújtványos kardöntőforma (*12. kép 2, 16. kép*), mely Európa-szerte viszonylag ritka lelettípusnak számít. A Mátra vagy Tokaj vidékéről származó üvegtufából készült lelet egy különleges, biografikus tárgy. A kard megöntését követően, valószínűleg a forma széttörése miatt, az öntőforma darabjait újracsiszolták és a markolatot ábrázoló fél hátsó, sima részét felhasználták egy új tárgy (karperec vagy fűrészlemez) megöntéséhez. A formát életútja utolsó állomásán, második törését követően vonták ki a forgalomból. Tipológiai jegyei alapján ez a tárgy nem alkalmas arra, hogy egyértelműen meghatározható kardtípushoz kössük.

A három öntőforma elemzése tovább árnyalja a poroszló-aponháti telepekhez hasonló lelőhelyek képét. Ezen a településen a Ha B1-es időszakban egy olyan fémművesműhely működhetett, mely a földrajzi értelemben viszonylag közel eső, északkelet-magyarországi kőnyersanyag-lelőhelyekre támaszkodott. Termékei között megtalálható a magas tudást és speciális készítéstechnológiát igénylő presztízsfegyver (kard), valamint a széles, a Gáva kerámiastílus tágabb értelemben vett elterjedési területén is túlmutató kapcsolatrendszerrel bíró eszköz (balta) is. Poroszló fémmegmunkálás szempontjából is a korszak egyik kiemelkedő központja lehetett, melynek bemutatása mellett igyekeztünk az összes hozzá hasonló korú, fémfeldolgozással biztosan jellemezhető települést összegyűjteni (*7. kép*). A későbbiekben ez a lista bizonyára bővülni fog, ahogy reményeink szerint a kőnyersanyagok beszerzéséről és felhasználásáról szóló tudásunk is egy következő tanulmány során.