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A SETTLEMENT OF THE MAKÓ CULTURE AT ÜLLŐ NEW EVIDENCE FOR EARLY BRONZE AGE METALWORKING

The site and the find circumstances

The archaeological investigations preceding the construction of the M0 motorway section southeast of Budapest were begun in 2001. An extensive late Sarmatian potters' settlement was identified at the Üllő 5 site, located at the junction of the motorway and Road 4, on the outskirts of Vecsés and Üllő. About 32 hectares of this settlement fell into the motorway's planned line (Fig. 1). Over 7800 Sarmatian features were uncovered between 2001 and 2003; these included storage and refuse pits, houses, ditches, fifty pottery kilns and sections of three Sarmatian cemeteries (RKM 2001, 232–233; RKM 2002, 286–287; RKM 2003, 306–307). In 2002, the remains of a settlement of the Early Bronze Age Makó culture were discovered between various Sarmatian features in the southern section of the site (Fig. 2). Additional Bronze Age pits came to light in the summer of 2003. Pit 5605, excavated in August 2002, contained moulds and a crucible, finds which shed new light on our knowledge of Early Bronze Age metalworking. This study offers a description and discussion of the Early Bronze Age settlement and its finds, and their implication for the metallurgy of this period.

The settlement of the Makó culture lay on the southern slope of a one-time high bluff, which has since been eroded and now barely rises above the present surface. A 30–150 cm thick humus layer was removed mechanically at the beginning of the excavation, in the course of which some settlement features and finds were destroyed, and thus the conclusions concerning the settlement and its finds are rather limited. On the testimony of the pottery finds, twenty-four pits can be associated with the Makó culture. Several other pits yielded indistinct prehistoric pottery sherds too. Since a few settlement features of the Late Bronze Age Urnfield culture were also uncovered at the site, the pits with indistinct sherds are not discussed here. Early Bronze Age pottery fragments were also recovered from the fill of the Sarmatian pits, ditches and graves.

Description of the settlement features and their finds

Pit 2037: Large cylindrical pit with slightly narrowing walls and a flat floor. Its fill was homogenous. Diam.: 204 cm, depth: 74 cm.
Finds: 1. Rim fragment from a pedestalled bowl decorated in its interior. Dark grey, brownish interior, tempered with sand and crushed pottery. An incised line runs under the rim, under which is a pattern of incised, hatched triangles. 5.7 cm x 4.2 cm, Th.: 0.1–1 cm (Fig. 27. 1). 2. Eight brownish-grey, worn body sherds tempered with sand and crushed pottery and a fragment from a carefully polished vessel with curved neck and strongly everted, thick rim. 3. Animal bones.[1]
Pit 2048: Triangular pit with rounded corners, rounded sides and flat floor. It had a homogenous fill of dark brown sand. Diam.: 130 cm, depth: 42 cm.
Finds: 1. Two rim fragments, five body sherds, and two body sherds with brushed decoration, all dark grey and tempered with sand and crushed pottery. 2. Animal bones.
Pit 2049: Irregular roundish pit with rounded sides and a flat floor. It had a homogenous fill of light brown-yellowish sand. Diam. 166 cm, depth: 34 cm
Finds: 1. Rim fragment from a dark grey, ovoid (?) pot with short, curved neck and everted, thickened rim, tempered with sand and crushed pottery. DM.: 21 cm, H.: 8 cm, Th.: 0.6 cm. Assembled from its fragments (Fig. 27. 2). 2. Fragment from a dark grey ovoid pot with short, curved neck and everted, thickened rim tempered with sand and crushed pottery. 9.5 cm x 5-2 cm, Th.: 0.6 cm. Assembled from its fragments. 3. Twelve grey body sherds, tempered with sand and crushed pottery. 4. Animal bones.
Pit 3608: Slightly oval pit with straight walls. It had a homogenous fill of sand mixed with humus. Its floor could not be cleaned owing to the groundwater. Diam.: 170 cm, excavated depth: 40 cm.
Finds: 1. Knob decorated, bevelled rim fragment from a greyish–brick red pot with indrawn neck, tempered with sand and crushed pottery. DM.: 22 cm, 10.2 cm x 7.2 cm, Th.: 0.7 cm (Fig. 27. 3). 2. Rim fragment from a light brick red pot with indrawn neck and everted, thickened rim, tempered with sand and crushed pottery. 5.8 cm x 5 cm, Th.: 0.6, Th. of rim: 1.1 cm (Fig. 27. 4). 3. Four light brown and grey body sherds, from vessels tempered with sand and crushed pottery. 4. Burnt daub. 5. Animal bones.
Pit 3624: Cylindrical pit with a flat floor. It had a homogenous fill of greyish-brown sand. Diam.: 150 cm, depth: 80 cm.

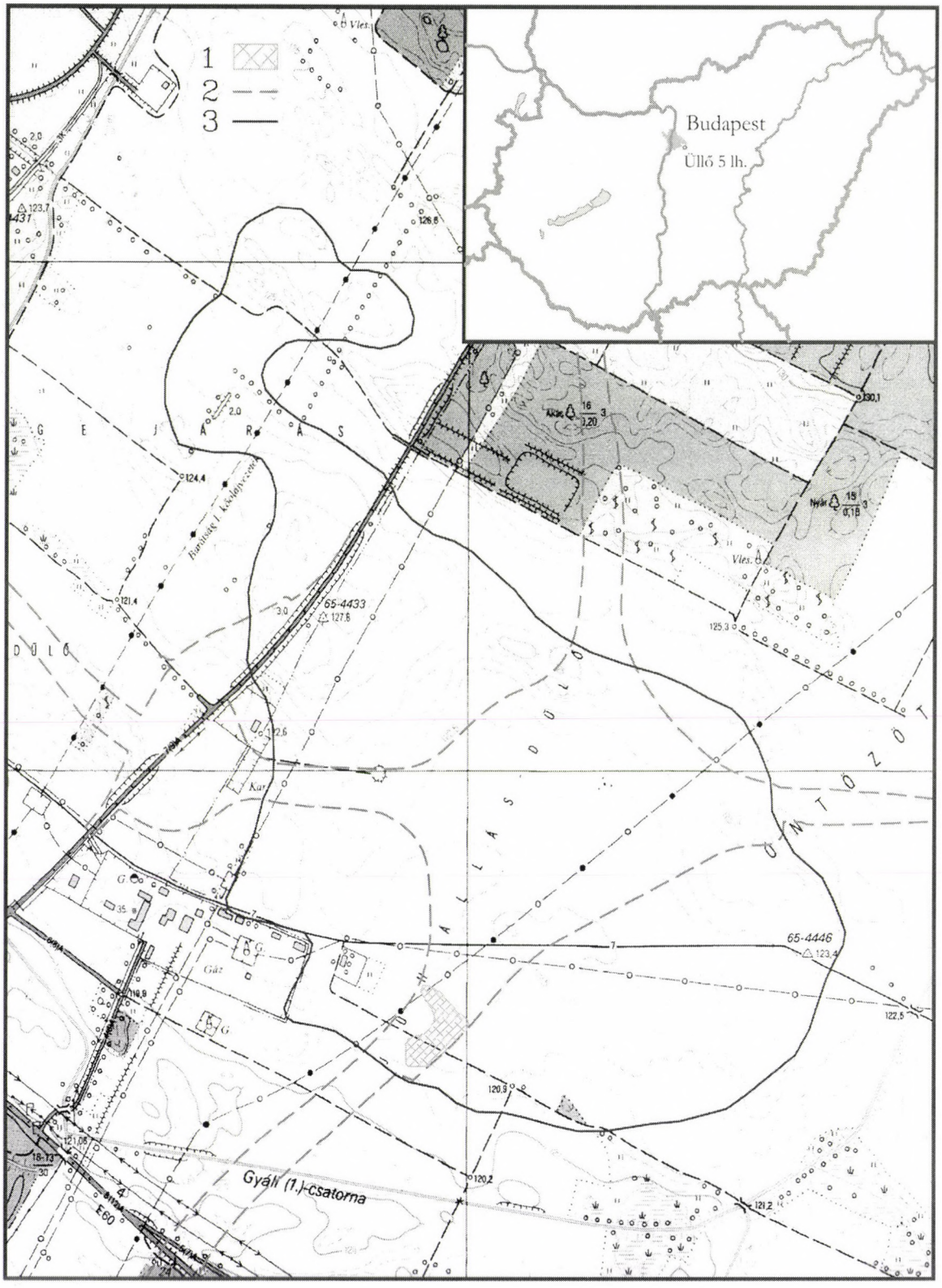

Fig. 1. Üllő. Location of the site. 1: Location of the Early Bronze Age features, 2: Boundary of the excavated area, 3: Boundary of the site

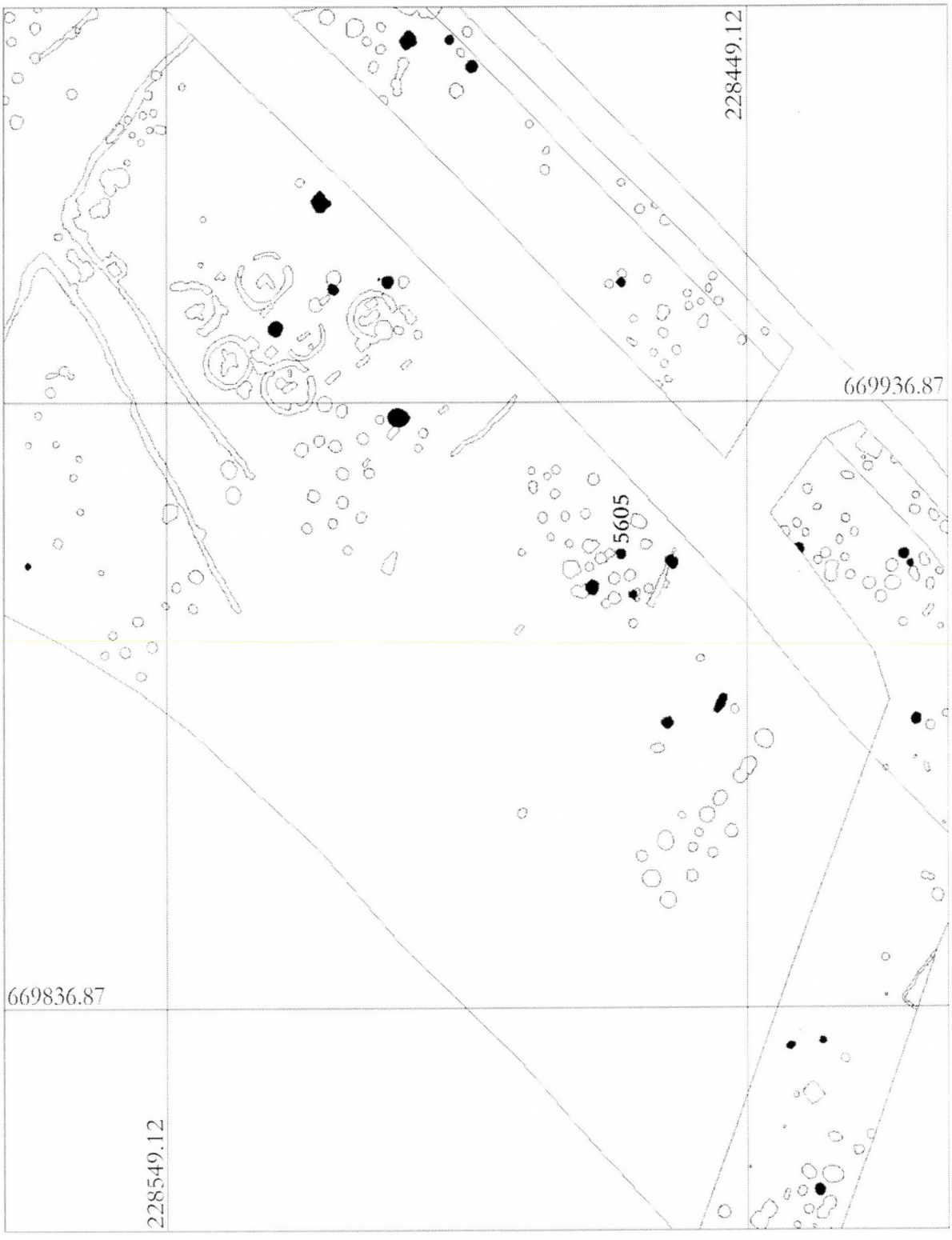

Fig. 2. Üllő. Map of the site. The Early Bronze Age features are marked with black

Finds: 1. Rim fragment from a light brown vessel with curved neck, tempered with sand and crushed pottery. DM.: 37 cm, 9.1 cm x 5.2 cm, Th.: 0.5 cm (Fig. 28. 1). 2. Grey and light brown body sherds tempered with sand and crushed pottery; a biconical body sherd; body sherd from a globular vessel. 3. Animal bones.

Pit 3627: Round pit with widening lower section. It had a fill of greyish-brown, clayey sand. Diam.: 182 cm, depth: 88 cm. A heap of animal bones lay at a depth of –40–60 cm in its southern part, and a group of vessels set beside each other by the south-eastern side. The jug described under no. 4 contained three animal bones and a few bones were found underneath it too (Fig. 24. 1).

Finds: 1. Carefully polished dark grey-greyish, biconical bowl tempered with crushed pottery. Rounded carination, thickened, rounded rim, short, curving neck and constricted, straight base. It is decorated with a crescentic rib on the shoulder. DM.: 11.8 cm, dB.:8.3 cm, H.: 12 cm (Fig. 28. 3). 2. Ochre and black coloured conical bowl tempered with grit. Straight, slightly narrowing rim, straight base. It has a slightly asymmetric form. DM.: 16.3 cm, dB.: 9.6 cm, H. 7.7 cm (Fig. 29. 1). 3. Carefully polished, dark grey, biconical bowl tempered with crushed pottery. Everted, rounded rim, curved neck, rounded carination and constricted, straight base. DM.: 17. 3 cm, dB.: 5.6 cm, H.: 12.3 cm (Fig. 29. 2). 4. Dark grey-brownish, mottled, one-handled jug tempered with crushed pottery. Everted, rounded rim, cylindrical, slightly curved neck, pronounced shoulder, flattened globular body, constricted, straight base. The handle spans the rim and shoulder. Assembled from its fragments. DM.: 12.1 cm, dB.: 8.1 cm, H.: 16 cm (Fig. 29. 3). 5. Dark grey-brownish, mottled, one-handled jug tempered with crushed pottery. Everted, rounded rim, cylindrical, slightly curved neck, pronounced shoulder, flattened globular body, constricted, straight base. The handle spans the rim and shoulder. Assembled from its fragments. DM.: 15.8 cm, dB.: 8 cm, H.: 18.6 cm (Fig. 28. 2). The bowl described under no. 2 lay in this jug. 6. Dark grey-greyish, conical bowl fragment tempered with crushed pottery. Prominent, rounded, rim, slightly incurving neck, straight base. DM.: 2.3 cm, dB.: 6.6 cm, H.: 7.8 cm. It lay underneath the jug described under no. 4 (Fig. 30. 1).

Finds from the fill: 7. Body sherd from a large vessel with dark grey and brown mottled exterior, dark grey interior, tempered with sand and crushed pottery. 23.5 cm x 19.2 cm, Th.: 0.8 cm. 8. Rim fragment from a carefully polished, grey vessel with curved neck, tempered with sand and crushed pottery. The shoulder is smoothed. DM.: 30 cm, 7.2 cm x 3.1 cm, Th.: 0.4 cm. 9. Body sherd from a grey pot with curved neck, tempered with sand and crushed pottery. 6.2 cm x 3.6 cm, Th.: 0.7 cm. 10. Rim fragment from a dark grey vessel with outward thickening rim and curved neck, tempered with sand and crushed pottery. 5.6 cm x 4.9 cm, Th.: 0.4 cm. 11. Rim fragment from a dark grey vessel with everted rim, tempered with sand and crushed pottery. The shoulder is smoothed. 4.2 cm x 2.8 cm, Th.: 0.9 cm. 12. Rim fragment from a carefully polished vessel with curved neck and thickened rim, tempered with sand and crushed pottery. 3.9 cm x 3 cm, Th.: 0.5 cm. 13. Rim fragment from a dark grey bowl with thickened, bevelled rim, tempered with sand and crushed pottery. 4.5 cm x 3.4 cm, Th.: 0.5 cm. Fifty-five 55 dark grey and light brown body sherds from vessels tempered with sand and crushed pottery; three basal fragments; one body sherd decorated with a perforated knob. 15. Burnt daub. 16. Animal bones.

Pit 3638: Large pit with widening lower section. It had a fill of dark brown sand filled with red burnt daub fragments. Diam.: 160–174 cm, depth: 120 cm.

Finds: 1. Rim fragment from a dark grey bowl with incurving neck and everted, thickened rim, tempered with sand and crushed pottery. 6 cm x 3.3 cm, Th.: 1.1 cm (Fig. 30. 2). 2. Body sherd from a vessel with combed decoration, tempered with sand and crushed pottery. 2.5 cm x 1.8 cm, Th.: 0.5 cm (Fig. 30. 3). 3. Body sherd from a vessel with combed decoration, tempered with sand and crushed pottery. 3.8 cm x 2 cm, Th.: 0.6 cm (Fig. 30. 4). 4. Ten body sherds from grey and light brown vessels, tempered with sand and crushed pottery; one body sherd with combed decoration. 5. Burnt daub. 6. Animal bones.

Pit 3679: Circular pit with rounded side. It had a homogenous fill of sand mixed with humus. Diam.: 192 cm, depth: 44 cm.

Finds: 1. Rim fragment from an ochre yellow-greyish, mottled pot, tempered with sand and grit. 6.8 cm x 5.8 cm, Th.: 0.6 cm. Assembled from its fragments (Fig. 30. 5). 2. Rim fragment from a yellow pot with slightly indrawn neck, tempered with sand and crushed pottery, tempered with grit. The rim has a knob-like widening. 4.9 cm x 3.5 cm, Th.: 0.6 cm (Fig, 30. 6). 3. Rim fragment from an ochre yellow greyish pot, tempered with sand and mica. There is a knob on the bevelled rim. 7.1 cm x 5.2 cm (Fig. 30. 7). 4. Rim fragment from an ochre yellow-greyish pot with bevelled rim, tempered with sand and mica. 4.3 cm x 5.1 cm (Fig. 30. 8). 5. Rim fragment from a yellowish-grey, mottled pot with low neck and everted, outward thickening rim, tempered with sand and crushed pottery. A knob is set on the rim. 7.2 cm x 10.7 cm, Th.: 0.5 cm (Fig, 31. 1). 6. Rim fragment from a yellow pot with everted, thickened rim, tempered with sand. 14.4 cm x 8.6 cm. Assembled from its fragments (Fig. 31. 2). 7. Animal bones. 8. One mussel *(Unio crassus)*.[2]

Pit 3681: Circular pit with rounded side. It had a fill of sand mixed with dark clay and humus in the upper section and a fill of clayey yellow send underneath. Diam.: 152 cm, depth: 36 cm. The finds have been lost; according to the excavation diary, the pit contained a few Makó sherds (e.g. a body sherd with brushed decoration) and a few animal bones.

Pit 3682: Oblong pit with rounded corners, straight walls and a flat floor, measuring 296 cm by 232 cm. The upper section had a fill of dark brown, rippled sand, which was burnt in some spots, underneath which lay a fill of lighter, yellowish-brown, speckled sand. The pit contained several lumps of stone.

Finds: 1. Rim and body fragment from a grey-dark greyish, mottled, globular bowl with a funnel-like, curved neck, rounded rim and constricted base, tempered with sand and crushed pottery. DM.: 18 cm, 13.3 cm x 10.6 cm, Th.: 0.6 cm (Fig. 31. 3). 2. Four grey and ochre coloured, mottled body sherds, tempered with sand and grit. 3. Burnt daub. 4. Animal bone. 5. One river mussel (*Unio crassus*).

Pit 4035: Following the mechanical removal of the humus layer, numerous animal bones were found lying in a heap on the scraped surface, but there was no visible trace of a possible feature in the brown sand. Another heap of animal bones was found lying 10 cm underneath. After these bones were lifted, the patch of the round pit with cylindrical sides and an uneven floor was outlined at a depth of –28/30 cm from the scraped level. It had a layered, burnt fill mixed with ash and charcoal. Diam.: 266 cm, depth: 116 cm.

Finds: 1. Rim fragment from a grey pot with curved neck and rounded rim, tempered with sand and crushed pottery. 7.3 cm x 4.4 cm, Th.: 0.6 cm (Fig. 32. 1). 2. Rim fragment from a grey mottled jug with a ribbon handle springing from the rim to the shoulder, tempered with sand and grit. 6.9 cm x 5.6 cm, Th.: 2 cm (Fig. 32. 2). 3. Rim fragment from a dark grey-greyish mottled pot with curved neck and rounded rim, tempered with sand and crushed pottery. 8.5 cm x 4.7 cm, Th.: 1.2 cm (Fig. 32. 3). 4. Rim fragment from a grey, biconical bowl with incurving neck, everted, thickened rim and rounded carination, tempered with sand and crushed pottery. 4.2 cm x 3.1 cm, Th.: 0.3 cm (Fig. 32. 4). 5. Rim fragment from a dark grey pot with everted, rounded rim, tempered with sand. 4.4 cm x 2.5 cm, Th.: 0.5 cm (Fig. 32. 5). 6. Basal fragment from a dark grey, biconical bowl with straight base, tempered with sand. H.: 2.8 cm, dB.: 4.1 cm (Fig. 32. 6). 7. Rim fragment from a dark grey pot or bowl with cylindrical neck and everted, thickened rim, tempered with sand. 9.4 cm x 4 cm, Th.: 0.6 cm (Fig. 32. 7). 8. Rim fragment from a grey pot with curved neck and rounded rim, tempered with sand. 4.3 cm x 4.2 cm, Th.: 0.6 cm (Fig. 32. 9). 9. Thirty-eight body sherds from dark grey-greyish vessels tempered with sand and crushed pottery; one rim fragment; one handle fragment; five basal fragments.

Pit 4067: A large vessel standing upright, but slightly tilted to one side, was found at a depth of –40 cm in the light brown, mixed sand under the humus after the mechanical removal of the topsoil. Its upper part was unfortunately damaged by the power shovel, which probably broke its mouth (Fig. 34). The patch of the pit around the vessel was rather uncertain; only after lifting the vessel and excavating to a depth of –70–80 cm was the dark patch clearly outlined. The slightly asymmetric, round pit had straight sides; the eastern side widened slightly towards the floor. Two layers could be distinguished in its fill: the upper part had a fill of dark brown humus and sand mixed with yellow and light brown patches of sand, which overlay obliquely the lighter, yellowish-brown layer underneath (Fig. 25). Diam.: 154 cm, depth: 118 cm.

Finds: 1. Urn with knobs in its interior. Oval urn with grey exterior and greyish-light brown interior, tempered with grit and crushed pottery. It probably had a biconical form and there were at least two horizontally set loop handles on the body. The base is straight. Two (originally four) pointed knobs were set on the carination and seven knobs on the base inside the urn. 61.3 cm x 50.5 cm, dB.: 22.5–19.8 cm, H.: 24.2 cm, H. of knobs: 2.6 cm, diam. of knobs: 2.6 cm, The *in situ* photos clearly show that the vessel had been deposited intact, together with the upper part and the handles, which broke off when the vessel was lifted owing to its bad state of preservation (Figs 33–34). 2. One small body sherd from the pit section under the vessel.

Pit 4079: Large cylindrical pit with a flat floor, It had a mixed, layered fill. There was a red burnt patch (remains of a fire) in the middle of the floor. Smaller stones and a pebble lay in the fill. Diam.: 276 cm, depth: 110 cm.

Finds: 1. Rim fragment from a carefully polished, dark grey-blackish pot with curved neck and rounded, thickened rim, tempered with sand and grit. 6.9 cm x 4.8 cm, dM.: 13 cm, Th.: 0.5 cm (Fig. 35. 1). 2. Rim fragment from a pot with brown exterior, dark grey interior, curved neck and thickened, bevelled rim, tempered with sand and grit. 4.5 cm x 2.7 cm, dM.: 35 cm, Th.: 1.7 cm (Fig. 35. 2). 3. Rim fragment from a dark grey pot with curved neck and everted, thickened rim, tempered with sand and grit. 4.5 cm x 2.2 cm, dM.: 13 cm, Th.: 0.6 cm (Fig, 35. 3). 4. Rim fragment from a grey pot with everted, slightly thinned rim, tempered with sand and grit. An impressed rib runs under the rim. 8.5 cm x 4.7 cm, dM.: 33 cm, Th.: 1 cm (Fig. 35. 4). 5. Rim fragment from a grey vessel with everted, rounded rim, tempered with sand and grit. 2.4 cm x 1.9 cm (Fig. 35. 5). 6. Rim fragment from a light grey-dark greyish bowl with thickened rim, tempered with sand and grit. 7.6 cm x 5.9 cm, dM.: 20 cm, Th.: 0.5 cm (Fig. 35. 6). 7. Rim fragment from a light brown vessel with everted, rounded rim, tempered with sand. 2.5 cm x 2.4 cm, Th.: 0.7 cm (Fig. 35. 7). 8. Rim fragment from a footed bowl with interior decoration. Light brown, red mottled exterior, dark grey and red interior, tempered with sand and grit. An incised line highlighted with incrustation runs under the thickened, bevelled rim; a pattern of incised, hatched triangles and squares highlighted with incrustation decorates the interior. 6.1 cm x 3.7 cm, Th. 0.7 cm (Fig. 35. 8). 9. One rim fragment from a dark grey-brownish pot tempered with sand and grit; eighty-one body sherds (one with a rib, two with brushed decoration, eleven with rusticated surface); six basal fragments (one with rusticated surface); one strap handle. 10. Burnt daub. 11. Animal bones.

Pit 4089: Dug into the humus, the patch of the feature could not be observed. Pottery sherds and a few animal bones lay beside a larger stone in the scraped level (at a depth of about –50 cm from the present surface).

Finds: 1. Rim fragment from a light brown-greyish, mottled, conical bowl, tempered with sand and grit. Rounded rim, incurving neck, decorated with a rib with vertical grooves. DM.: 27 cm, Th. 0.5 cm. Assembled from its fragments (Fig. 32. 10). 2. Rim and body sherd of a light brown, flattened globular bowl, tempered with sand. Everted, thickened rim, curved neck, pronounced shoulder. DM.: 21 cm, Th. 0.7 cm (Fig. 32. 8).

Pit 4676: Large, deep, beehive shaped pit with layered fill. Diam.: 240 cm, depth: 136–144 cm. The finds have unfortunately been lost. According to the excavation diary, it yielded two pottery sherds (one was a body sherd from a Makó vessel with brushed decoration), animal bones and burnt daub.

Pit 4683: Large, slightly ovoid feature. The northern and eastern sides had a ledge, the other sides were straight. It had a layered, sooty fill mixed with ash, and a streak of burnt daub debris could be distinguished in the fill. A small heap of animal bones lay in the northern part at a depth of

–19/20 cm from the level in which the feature's patch was first noted. Diam.: 330 cm, depth: 80 cm. According to the excavation diary, the pottery finds (which have since been lost) could be assigned to the Makó culture. The finds also included a tiny stone flake.

Pit 4875: Round, shallow pit with a homogenous sandy fill. Its eastern section was disturbed by a Late Bronze Age pit (no. 4874), and thus its original size could not be established. Depth: 28 cm.

Finds: 1. Body sherd from a dark grey vessel with combed decoration, tempered with sand. 3.6 cm x 2 cm, Th.: 0.5 cm (Fig. 36. 7). 2. Body sherd from a light brown vessel with combed decoration, tempered with sand. 2.5 cm x 1.6 cm, Th.: 0.5 cm (Fig. 36. 8). 3. Rim fragment from a dark grey pot with everted rim, tempered with sand and crushed pottery. 6.5 cm x 4 cm, Th.: 0.6 cm (Fig. 36. 6). 4. Animal bones.

Pit 5600: Round pit with slightly widening lower section and a flat floor. It had a layered fill. Diam. 240 cm, depth: 78 cm. Three deposits of animal bones could be distinguished: the first lay directly under the humus, on the scraped surface. There was a few centimetres' thick dark brown layer of sand mixed with humus between the animal bone deposits (Fig. 26. 1).

Finds: 1. Five body sherds from dark grey, light brown and grey vessels, tempered with sand and crushed pottery. One had a brushed decoration. 2. Burnt daub. 3. Animal bones

Pit 5605: Deep pit with widening lower section, slightly beehive shaped, with a flat floor. Diam.: 146–165 cm (top), 160–175 cm (floor), depth: 60 cm. The slightly irregular, round, greyish patch of the pit could be clearly seen after the removal of the humus in the scraped brown soil. The pit had a fill of dark brown humus mixed with sand, with smaller patches of yellow sand and sand lenses (Fig. 3, 1, Fig. 7. 1). We first uncovered the pit's southern half. Two polished stone tools lay by the south-eastern side, almost pressed to the wall, at a depth of –44 cm (Fig. 5. 2). The fragments of a vessel lay in the middle of the pit at a depth of –58 cm (with some sherd lying in the unexcavated northern half).

While drawing the section, which had dried out by then, we noticed a light intrusion from the eastern side which extended almost to the floor (–48 cm). The fill of this intrusion was lighter: a greyish-brown humus mixed with sand, with patches of yellow sand and sand grains. We did not notice this intrusion while excavating the pit's southern section and neither was it visible after scraping the northern section before the excavation. A total of nine intact two-part clay moulds and a crucible lay in a small heap between the scraped surface and –18 cm. The two halves of the mould lay on each other in the case of eight moulds (nos 1–8), and beside each other in the case of the ninth. This mould lay a little farther from the others and a few centimetres deeper. A tenth mould also came to light, which probably lay higher: its exact position is not known because it was removed during clearing. The crucible lay to the north of the moulds with its mouth upwards (Fig. 3. 2, Fig. 4, Fig. 7. 2).

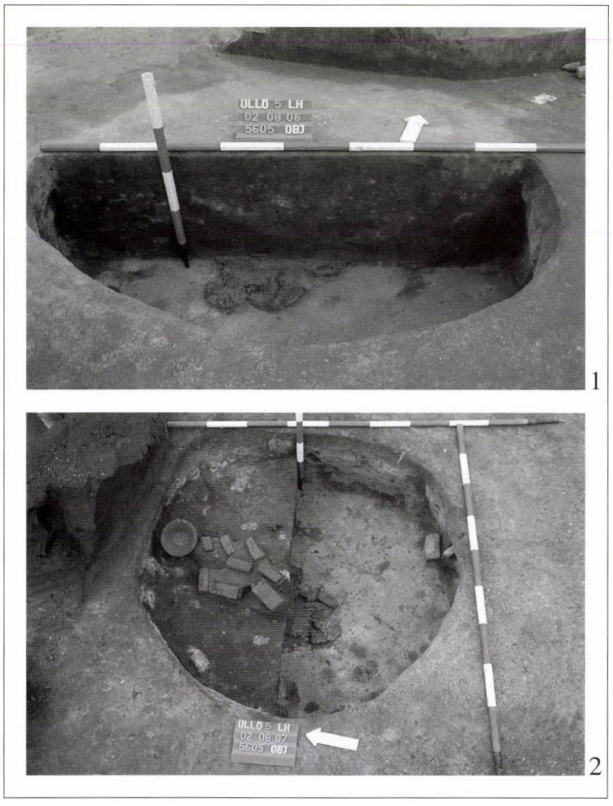

Fig 3. Üllő. 1: Section of Pit 5605; 2: Pit 5605 and its finds

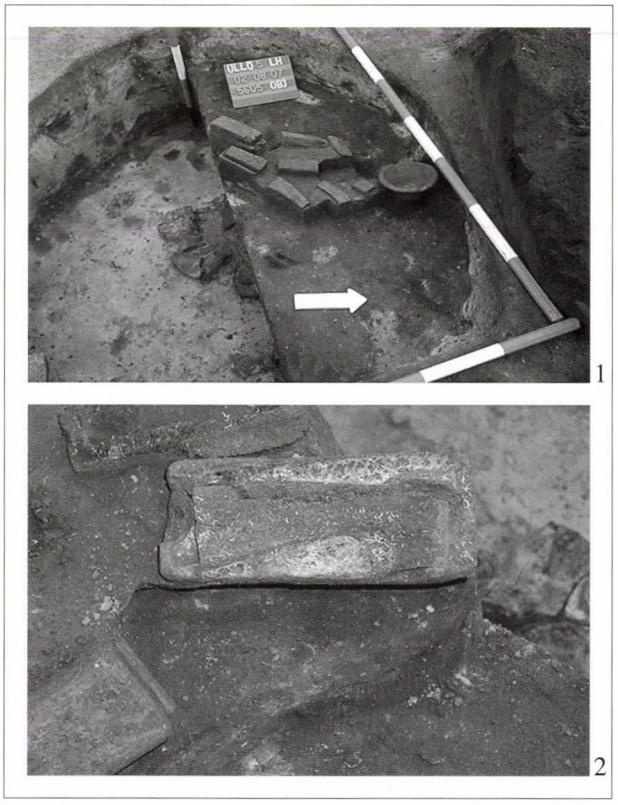

Fig. 4. Üllő. 1: The finds in Pit 5605; 2: One valve of mould 5 during cleaning

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Fig. 5. Üllő. 1: Stones lying under the moulds; 2: Stone artefacts from Pit 5605

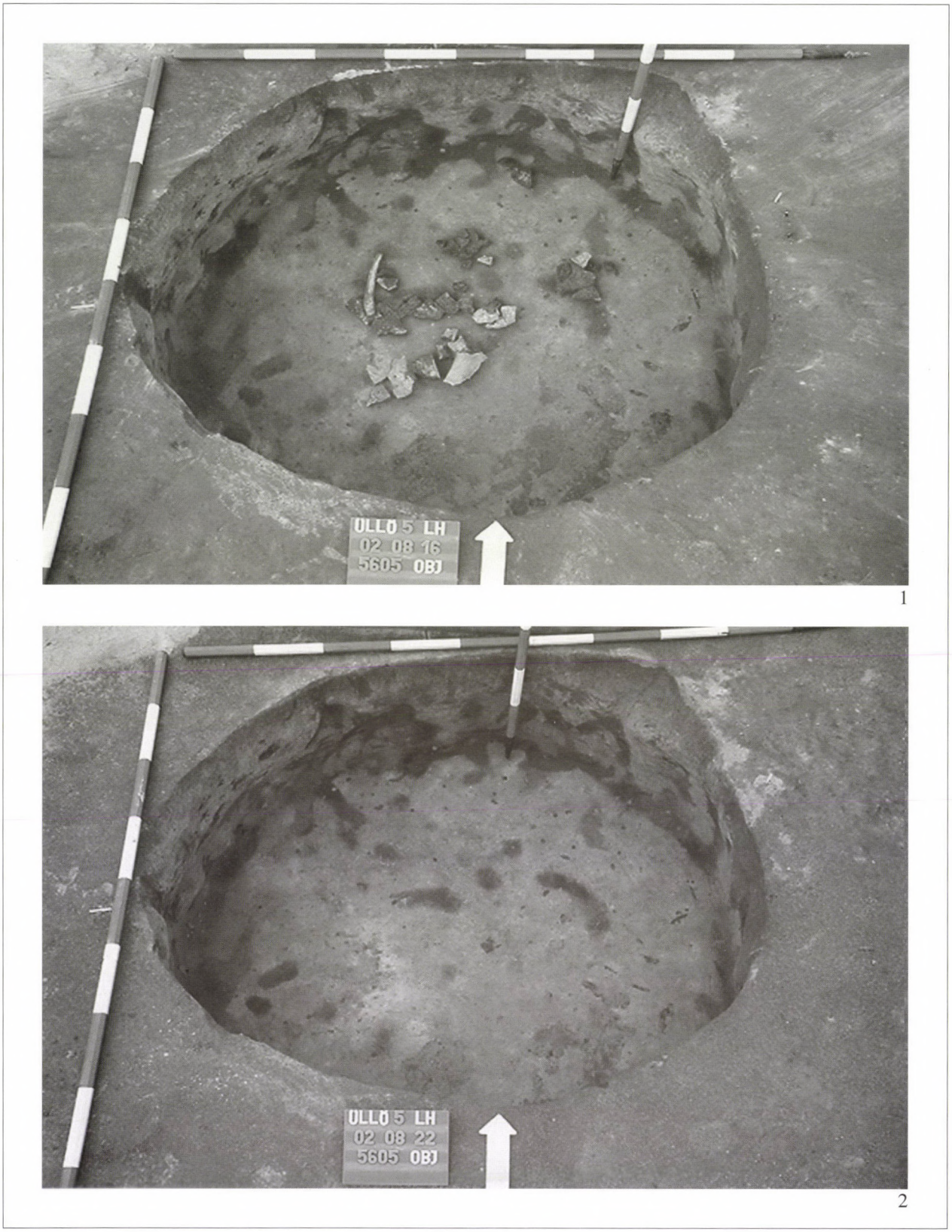


Fig. 6. Üllő. 1: Pottery sherds and an animal bone on the floor of Pit 5605; 2: Pit 5605 after cleaning

The moulds and the crucible lay within the patch of the intrusion observed in the section and we tried to clean what had remained of it separately. We found a rather uncertain, smaller pit, which contained three smaller stones and eight pottery sherds from a vessel tempered with sand and crushed pottery (Fig. 5. 1, Fig. 8. 2), most likely from one of the vessels on the pit's floor. Following the excavation of the pit's northern section, we found additional sherds from the vessel in the pit's southern part and the sherds of another vessel. A cattle rib and a sheep humerus lay among the pottery sherds (Fig. 6, Fig. 8. 2).

Finds: 1. Two-part closed mould for a socketed chisel. Yellowish-brown, with patches of black soot. The matrix is concave and narrows slightly towards the tip. The matrix in one valve has a short longitudinal rib at the end towards the cutting edge. A narrow groove runs along the edges of both valves. The remains of a lime coating and soot smudges can be made out in their interior. Intact. L. of valves: 7. 5 cm, W.: 3.4 cm, Th.: 2.3 cm, L. of matrix: 6.8 cm, W. (at the cutting edge): 1.5 cm, W. (at the butt): 2–2.2 cm, H.: 0.2–0.8 cm (Fig. 9. 1–3, Fig. 17. 1). 2. Closed mould for a flat axe. Yellowish-brown. Only one valve has a matrix of the tool. This valve is slightly curved and widens towards the end with the cutting edge. A pouring channel was cut into this valve at one end. The other valve has a flat inner surface, and has the contours of the cast artefact burnt into its surface. This valve is longer and lacks a pouring channel. The remains of a lime coating can be made out in the interior of both valves. Intact. L. of valves: 11.9 cm, 11.4 cm, W. (at the butt): 3.3 cm, 4 cm, W. (at the cutting edge): 4.5 cm, Th.: 1.2 cm, 1.3 cm, L. of matrix: 10.3 cm, W. (at the butt): 1.3 cm, W. (at the cutting edge): 3.6 cm, H. 0.2 cm (Fig. 9. 4–6, Fig. 17. 2). 3. Closed mould for a flat axe. Brown, with black patches on the exterior. Only one valve has a matrix of the tool. This valve is slightly curved and widens towards the end with the cutting edge. A pouring channel was cut into this valve at one end. The other valve is longer; it has a flat inner surface, and lacks a pouring channel. The matrix is curved, widening towards the straight cutting edge. Traces of a lime coating can be made out in the interior of both valves. Intact, with a small crack on each valve. L. of valves: 14.7 cm, 13.8 cm, W. (at the butt): 3.5 cm, 2.3 cm, W. (at the cutting edge): 5.5 cm, 5.4 cm, L. of matrix, 12.4 cm, W. (at the butt): 3 cm, W. (at the cutting edge): 4.5 cm (Fig. 10. 1–3, Fig. 18. 1). 4. Two-part closed mould for a flat axe. Yellowish-brown with black mottling. One part of the matrix is concave (meaning that one side of the cast artefact was convex), the sides are straight, widening towards the cutting edge. The cutting edge and the butt are straight. The shorter matrix is deeper. Both halves of the mould are cracked, the interior of the shallower valve is damaged (probably from a casting event). Remains of a lime coating and soot smudges can be noted in the interior of both valves and both have sooty patches on their exterior. L. of valves: 13 cm, 12.3 cm, W. (at the butt): 4.3 cm, W. (at the cutting edge): 5.2 cm, 5.2 cm, Th. (at the butt): 1.5 cm, 1.6 cm, Th. (at the cutting edge): 2.1 cm, 2 cm, L. of matrix: 11.6 cm, 12.7 cm, W. (at the butt): 2.8–3.1 cm, W. (at the cutting edge): 4.4 cm, H.: 0.2–0.8 cm (Fig. 10. 4–6, Fig. 18. 2). 5. Two-part closed mould for a shaft-hole axe. Brown exterior, light brown-black-yellow-greyish interior. The matrix widens towards the cutting edge. A lobed recess was made for the shaft core; fine striations can be made out on the shaft-hole. The interior of one valve is cracked, the left lower corner is damaged; the other valve is also damaged, with the lower part broken. Remains of a lime coating can be noted in the interior of both valves. L. of valves: 16.5 cm, 16 cm, W. (top): 7.2 cm, 7.4 cm, W. (bottom): 7 cm, Th.: 3.1 cm, 2.5 cm. L. of matrix: 14.7 cm, 15 cm, L. of cutting edge: 5.1–5.7 cm,[3] L. of blade (without the shaft-hole): 11.5 cm, L. of shaft-hole: 5.4 cm, W. 3.5 cm, H. of matrix: 0.3–1.5 cm, L. of recess 2.5 cm (Fig. 11. 1–3, Fig. 19). 6. Two-part closed mould for a socketed chisel. Brownish-red with black mottling. The matrix has straight sides and narrows slightly towards the cutting edge. The cutting edge is rounded. There are two grooves under the mouth for horizontal ribs. There is a short, longitudinal rib on one piece dividing the cutting edge. Both valves have a

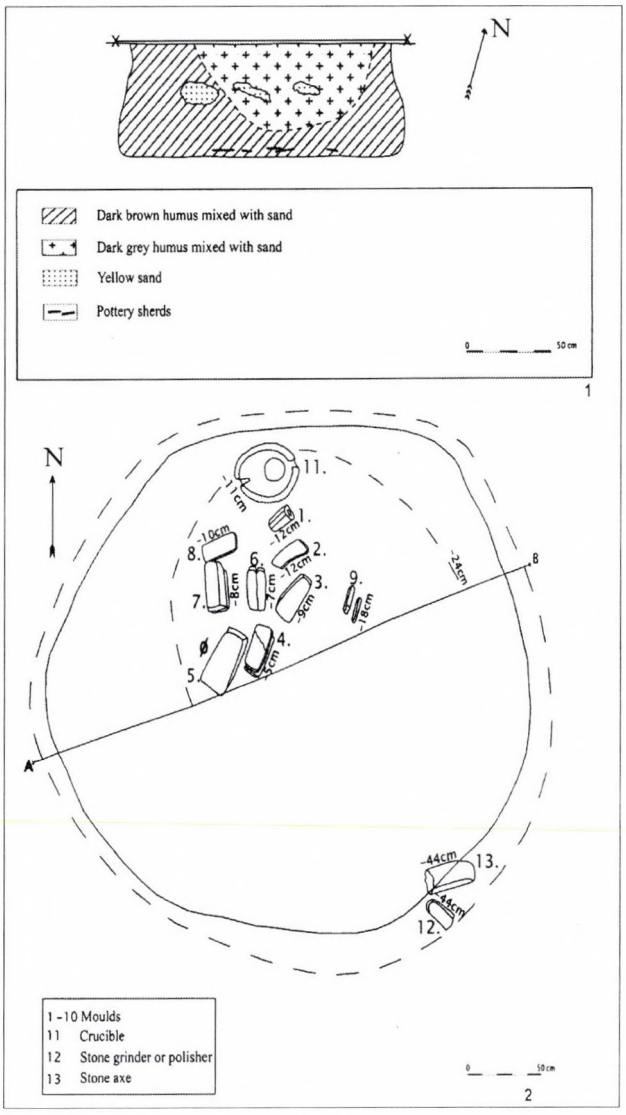


Fig. 7. Üllő. 1–2: Section of Pit 5605

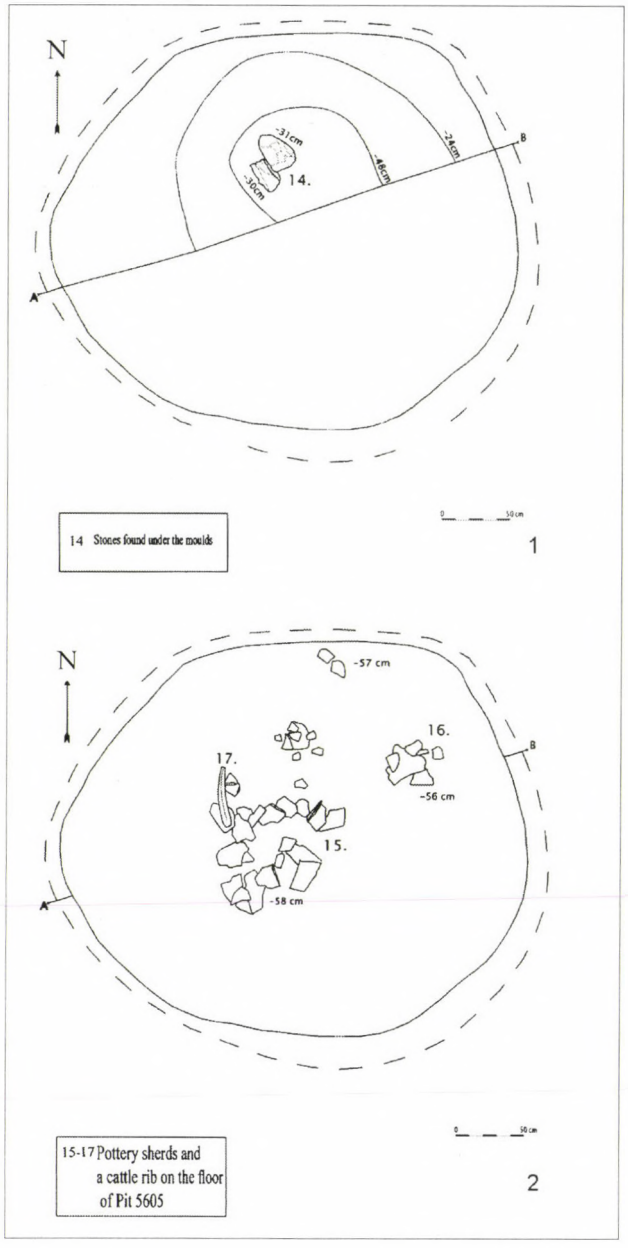


Fig. 8. Üllő. 1: Stones found under the moulds, 2: Pottery sherds and a cattle rib on the floor of Pit 5605

groove on the exterior and dimple impressions to aid correct location. Remains of a lime coating can be made out in the interior of both valves; their exterior is covered with sooty patches. Intact. L. of valves: 12.2 cm, W. (top): 3.7 cm, 3.9 cm, W. (bottom): 3.4 cm, 3.7 cm, Th.: 2.8 cm, 2.7 cm, L. of matrix: 11.6 cm, W. (at the socket): 2.7 cm, W. (at the cutting edge): 1.5 cm, H. 0.2–0.6 cm, W. of ribs: 0.4 cm, the matrix has a slightly oval section with a diam. of 2.1–2.5 cm (Fig. 11. 4–6, Fig. 20. 1). 7. Closed mould for a flat axe. Yellowish-brown. Only one valve has a matrix of the tool, which widens towards the straight cutting edge. There are small grooves by the two corners of the cutting edge. A small pouring channel was hollowed into this end and the valve section above it is concave. The other valve has a flat inner surface and has the contours of the cast artefact burnt into it. A longitudinal rib runs along the sides of both two valves. Their exterior is coarse and covered with soot patches. Both valves are cracked, probably owing to use-wear. L. of valves: 15 cm, 14.5 cm, W, (at the butt): 5.7 cm, 5 cm, W. (at the cutting edge): 6 cm, 5.8 cm, Th.: 2.1 cm, 1.9 cm, L. of matrix: 12.8 cm, W. (at the butt): 1.1 cm, W. (at the cutting edge): 4.8 cm, H. 0.15 cm (Fig. 12. 1–3, Fig. 20. 2). 8. Closed mould for a flat axe. Yellowish-brown, with sooth patches on the exterior. Only one valve has a rather shallow matrix of the tool, which widens towards the straight cutting edge. A small pouring channel was hollowed into this end and the valve section above it is concave. The other valve has a flat inner surface covered with striations. This piece is longer and lacks a pouring channel. The interior of the valve with the matrix is cracked. The small grooves on the exterior at one end of both valves probably served to aid correct location. Remains of a lime coating can be made out faintly on the left side, and better on the right side. Intact. L. of valves: 12.4 cm, 11.1 cm, W. (at the butt): 4.3 cm, 4.2 cm, W. (at the cutting edge) 4.8 cm, Th.: 1.8 cm, 2.5 cm, L. of matrix: 9.1 cm, W. (at the butt): 1 cm, W. (at the cutting edge): 2.8 cm, H.: 0.2 cm (Fig. 12. 4–6, Fig. 21. 1). 9. Two-part closed mould for an awl. Yellowish-brown, the exterior with dark grey mottling. The matrix is concave and has a tapering end. A pouring channel was hollowed into one valve, the section above it is funnel-like. The other, longer valve lacks the pouring channel. Traces of soot smudging can be made out in the interior of both valves. L. of valves: 9.9 cm, 9.5 cm, W. (top): 2.7 cm, 2.5 cm, W. (bottom): 1.9 cm, 1.1 cm, Th.: 1.4 cm, 1.5 cm, L. of matrix: 8.3–8 cm, W.: 0.3–0.8 cm, H, 0.3 cm (Fig. 13. 1–3, Fig. 21. 1). 10. Two-part closed mould for an awl. Dark grey, mottled. The matrix is concave, tapering slightly, its end is cut straight. Both valves have a pouring channel. Remains of a lime coating and soot smudging can be noted in the interior of both valves. Both valves are cracked (they were probably damaged at the same time). L. of valves: 9.7 cm, 9.8 cm, W, (top): 2 cm, 1.9 cm, W. (bottom): 1.3 cm, Th.: 1.2 cm, L. of matrix: 9.2 cm, 9.3 cm, W.: 0.6 cm, 0,7 cm (Fig. 13. 4–6, Fig. 21. 3). 11. Crucible. Light-brown and greyish; the base, the top of the rim, the interior and the section under the rim in the interior is burnt black. Conical body, with a wide, oval mouth and two pouring lips set opposite each other. The base is flat. Remains of a lime coating in the interior; traces of soot smudging on the rim and under the rim in its interior, Intact. DM.: 20.5 cm, 17.6 cm, dB.: 9.3 cm, H.: 8.8 cm, Th. of rim: 1.7 cm, Th. at the pouring lip: 3.5 cm, W. 2.2 cm (Fig. 14. 3, Fig. 15, Fig. 22).

The moulds and the crucible were all made from clay tempered with quartz sand and grit. They were well fired at a high temperature. Only the mould described under no. 4. was less well fired.

37. Polished stone implement. Quadrangular polisher or grinder, with traces of wear and brown spots on its surface, made from phonolite.[4] L.: 8.8 cm, W.: 5.2 cm, Th.: 4.6 cm, weight: ca. 40 dkg (Fig. 16. 2, Fig. 23. 1). 13. Polished stone implement. Fragment of a large, originally triangular shaft-

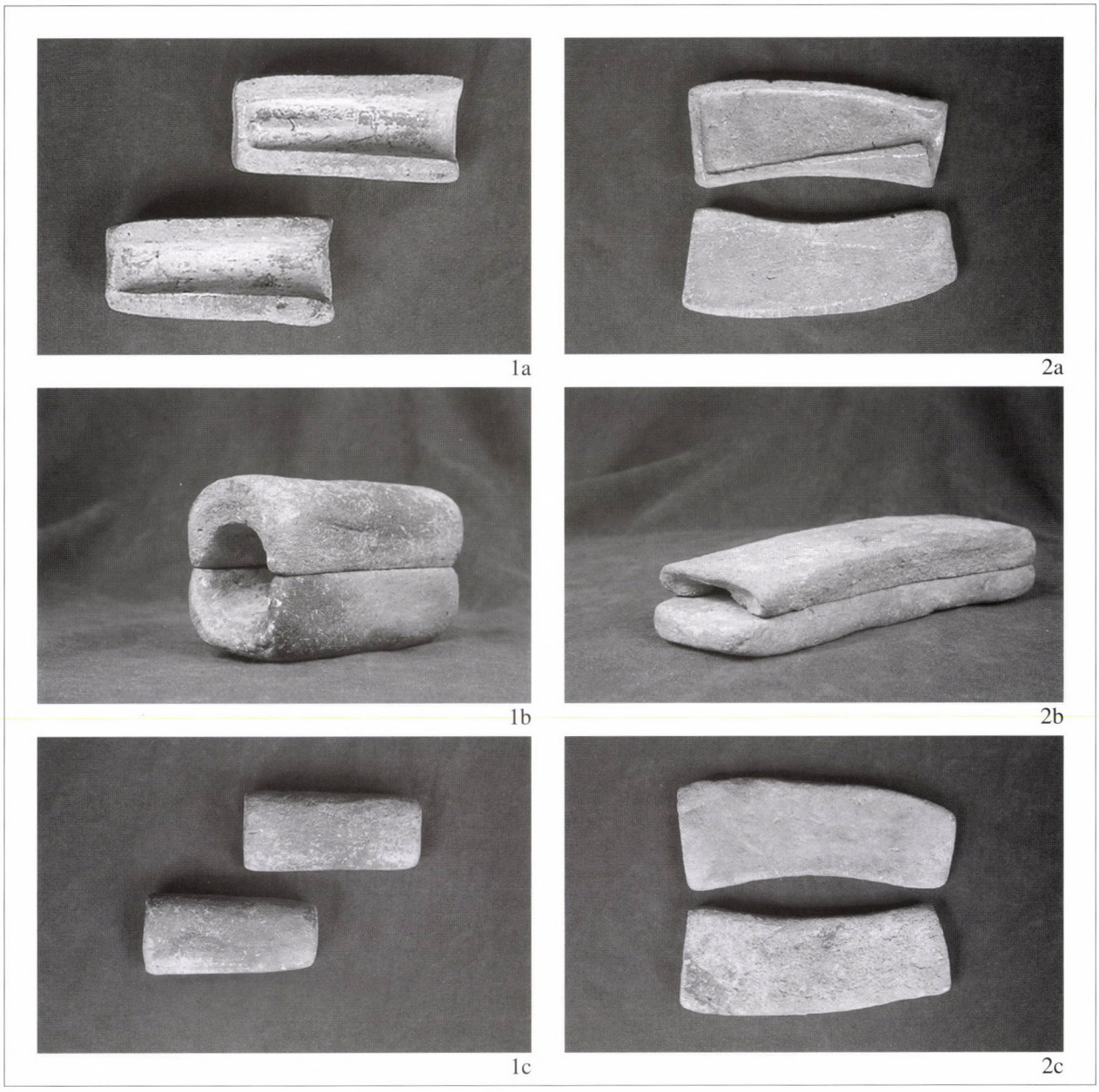


Fig. 9. Üllő. 1–3: Mould 1; 4–6: Mould 2

hole axe with vertical cutting edge and flat butt. It was broken at the shaft-hole. A part was chipped off. There is a second perforation through the top; traces of wear can be made out on the cutting edge, Made from diabase. Greatest L.: 16.8 cm, greatest W.: 7.8 cm, greatest Th.: 8.4 cm, diam. of perforation: 2.2 cm, weight: 2 kg (an estimated 3 kg with the broken-off part) (Fig. 16. 1, Fig, 23. 2). 14. Three irregular, unworked andesite stones[5] lay under the moulds. Several pottery sherds were found on the floor of the pit (Fig. 6. 1, Fig. 8. 2).

Two vessels could be assembled from these fragments: 15. Biconical vessel, tempered with sand. The neck and the shoulder are black, the rest of the vessel body is yellowish-brown. The asymmetrical belly is rounded, the lower part is constricted. It has a low cylindrical neck and an everted rim, which has an uneven finish. The vessel surface is uneven down to the belly and even more rusticated towards the base. Assembled from its fragments and restored. DM.: 19–19.5 cm, dB.: 10.5 cm, H.: 28 cm (Fig. 36. 10). 16. Ovoid pot, tempered with sand. Black, with yellow mottling. The low, cylindrical neck is separated from the body by a shallow groove. Two strap handles spring from the slightly everted rim to the shoulder. The neck and the shoulder are smoothed, the rest of the vessel body is coarser. Assembled from its fragments. The base is missing. DM.: 17 cm, H.: 24 cm (Fig. 37. 1).

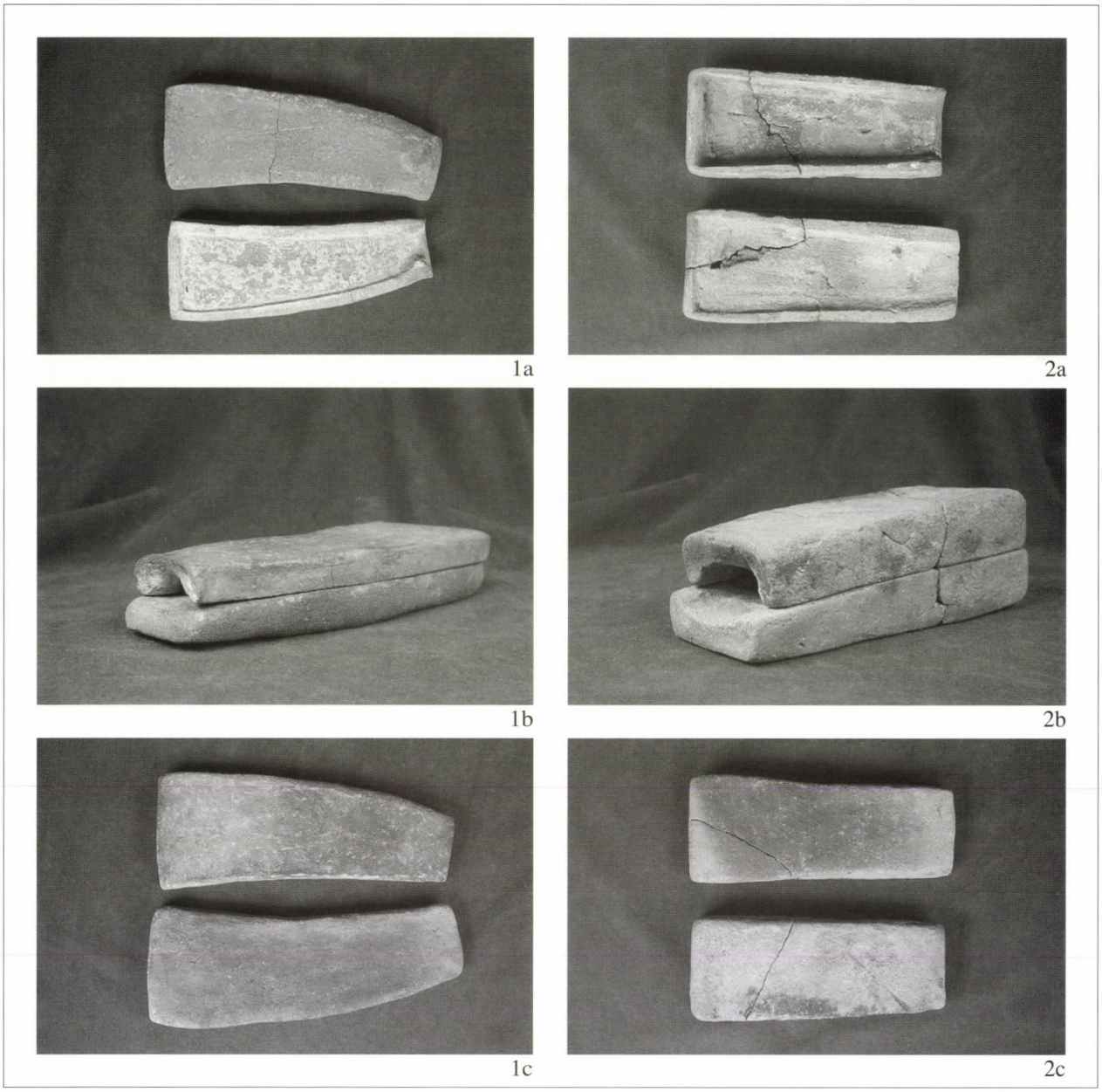


Fig. 10. Üllő. 1–3: Mould 3; 4–6: Mould 4

17. A cattle rib and a sheep humerus lay among the pottery sherds.

Pit 5614: Circular pit with rounded sides, with a mixed sandy fill. Diam.: 170 cm, depth: 38 cm. The pit was cut by ditch 5613 (probably dating from the Sarmatian period).

Finds: 1. Three body sherds from dark grey, grey and brown vessels tempered with sand; one basal fragment. 2. Burnt daub. 3. Animal bones.

Pit 5616: Long pit, with a shallow, ledge-like extension in its eastern and western part, a round central section, and a widening lower part. Its was made up of a fill of thin, dark brown humus layer and a light brown layer of sand underneath. Diam.: 3.4 m, depth: 80 cm.

Finds: 1. Basal fragment with light grey exterior and dark grey interior. H.: 2.3 cm, Th.: 0.6 cm. 2. Rim fragment from a brown mottled grey vessel with everted, thickened rim, decorated with a long, flat knob under the rim. 5.8 cm x 4.4 cm, Th.: 0.8 cm, Th. of rim: 2.9 cm. 3. Rim fragment from a greyish-brown vessel with slightly everted, outward thickening, rounded rim, tempered with sand. Decorated with a round knob under the rim. 3.8 cm x 3 cm, Th.: 0.5 cm. 4. Rim and neck fragment from a light brown vessel with thickened rim tempered with sand. 4.5 cm x 3.9 cm,

Fig. 11. Üllő. 1–3: Mould 5; 4–6: Mould 6

Th.: 0.6 cm. 5. Eleven worn body sherds with light brown exterior, grey interior, from coarse vessels tempered with sand. 6. Animal bones.

Pit. 5624: Roundish pit, narrowing towards the floor, with a homogenous humus fill. Diam.: 134 cm, depth: 50 cm.

Finds: 1. Dark grey body sherd from a brushed vessel, tempered with crushed pottery. 4.9 cm x 3.5 cm, Th.: 0.7 cm (Fig. 36. 9). 2. Dark grey, bevelled rim from a vessel tempered with sand. 1.7 cm x 1.4 cm, Th.: 0.5 cm. 3. Nine worn body sherds from brown and grey vessels, tempered with sand and crushed pottery. 4. Burnt daub. 5. Animal bones.

Pit 5629: More or less round pit with a deep middle section. It had a mixed fill. Diam.: 200 cm, depth: 80 cm.

Finds: 1. Rim fragment from a dark grey pot with curved neck and bevelled rim, tempered with sand and crushed pottery. 7.8 cm x 7.7 cm, Th.: 1.2 cm (Fig. 37. 4). 2. Rim fragment from a grey pot with curved neck and bevelled rim, tempered with sand and crushed pottery. 4.8 cm x 2 cm, Th.: 1.1 cm (Fig, 37. 5). 3. Seven body sherds from brown vessels tempered with sand; three rim fragments from grey vessels with slightly everted rim tempered with sand and crushed pottery. 4. Animal bones.

Fig. 12. Üllő. 1–3: Mould 7; 4–6: Mould 8

Pit 7479: Round pit with curved side. It had a burnt fill mixed with burnt daub fragments and soot specks. Diam.: 124 cm, depth: 36 cm (Fig. 26. 2).

Finds: 1. Rim and body fragment of an ochre, grey, dark brown, red mottled pot tempered with sand and grit. The rim is bent-back and decorated with three impressed knobs, the neck is slightly curved, the body is ovoid. DM.: 16 cm, H.: 13.5 cm (Fig. 38. 1). 2. Rim and body fragment from a dark grey-light brownish bowl with thickened, everted, rounded rim and curved neck, tempered with sand and grit. The shoulder is decorated with a crescentic rib. 5.1 cm x 4.7 cm, dM.: 11 cm (Fig. 38. 2). 3. Rim fragment from a grey-dark brownish pot with everted, bevelled rim, curved neck and pronounced shoulder, tempered with sand and grit. The stub of a handle and traces of polishing survive on the fragment. 6 cm x 4.1 cm, dM.: 12 cm, Th.: 0.4–0.7 cm (Fig. 38. 3). 4. Bowl fragment. Flat, straight rim, short, curved neck, cylindrical body, straight base. The rim is damaged. Diam.: 10.6 cm, H. 2 cm (Fig. 38. 7).[6] 5. Ochre yellow one-handled bowl with grey mottling. Thickened rim, slightly curved neck, pronounced shoulder, globular belly, constricted, straight base, The strap handle spans the rim and the shoulder. DM.: 15.6 cm, dB.: 9.4 cm, H. 10.9 cm (Fig. 39. 1). 6. Rim and body fragment from a grey mottled,

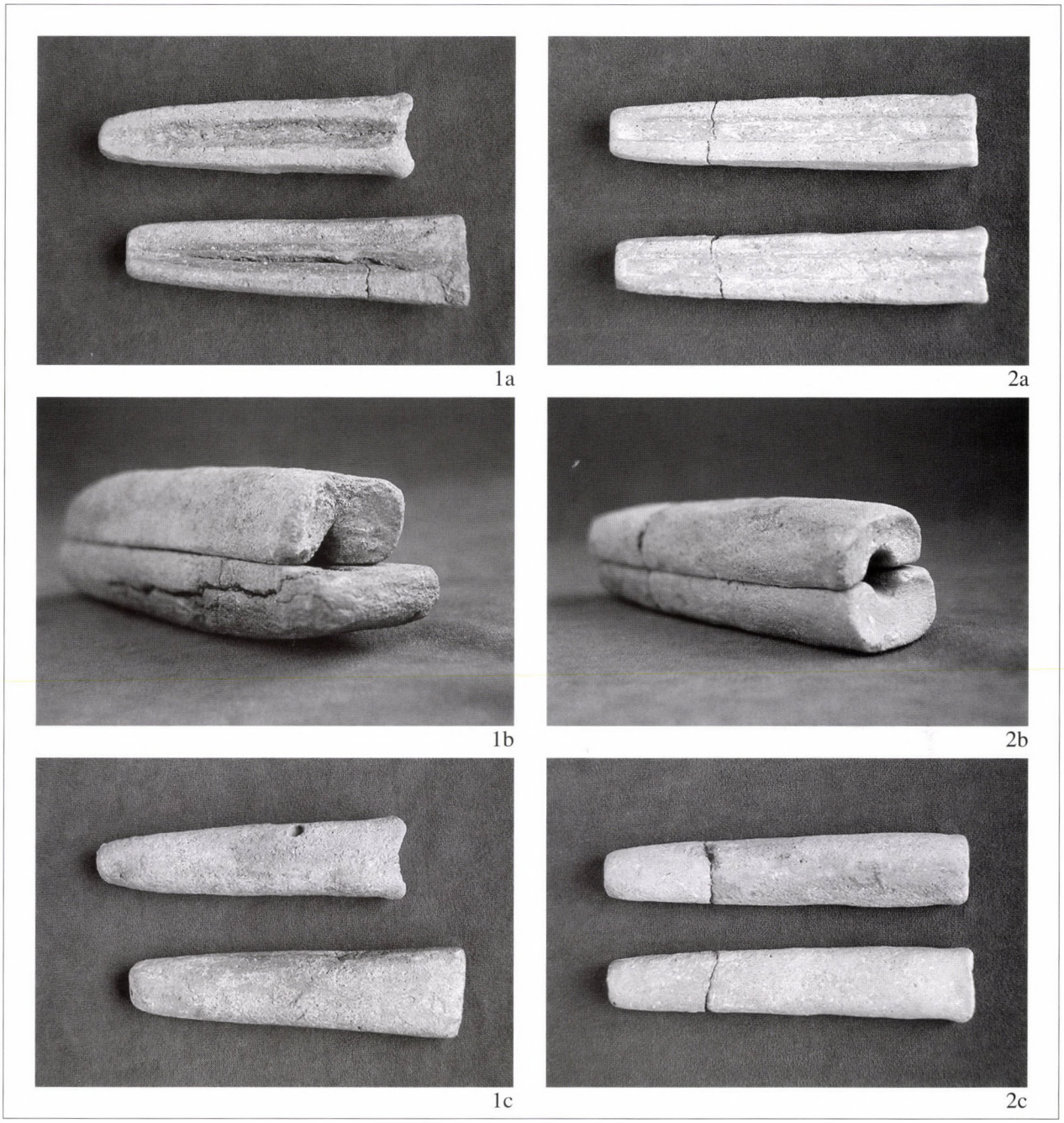


Fig. 13. Üllő. 1–3: Mould 9; 4–6: Mould 10

ochre coloured, large amphora with everted, thickened rim, slightly curved neck, flattened globular body and constricted base, tempered with sand and grit. Two perforated, pointed knobs are set on the shoulders. Assembled from its fragments. DM.: 18.4 cm, Th.: 0.9 cm (Fig. 39. 2). 7. Asymmetric dark grey-light brownish spindle whorl tempered with grit. Diam. 3.4 cm, Th.: 2–2.4 cm, diam. of perforation: 0.5 cm. 8. One rim fragment from a light brown vessel with everted rim, tempered with sand; twenty-one body sherds from grey and dark grey vessels tempered with sand and grit; fragments of a poorly fired, red, crumbly vessel. 9. Burnt animal bones.

Finds of the Makó culture were also recovered from the settlement feature of later periods:

Pit 3689, a Sarmatian smoking pit: 1. Rim fragment from a dark grey, mottled bowl with thickened, everted rim and incurving neck, tempered with sand and grit. DM.: 35 cm, 7 cm x 4.2 cm (Fig. 31. 4). 2. Body sherd from a dark grey-grey-brownish vessel tempered with sand, grit and crushed pottery.

Fig. 14. Üllő. 1: Aperture for allowing gases to escape during casting on mould 7; 2: Grooves for aiding correct location on mould 8; 3: Crucible from Pit 5605

Pit 4874 (Late Bronze Age): 1. Rim and shoulder fragment from a dark grey pot, tempered with sand. 6.9 cm x 4 cm, Th.: 0.4 cm (Fig. 36. 1). 2. Rim fragment from a light brown-greyish, mottled bowl with thickened, bevelled rim. 10.2 cm x 5.6 cm x 0.8 cm (Fig. 36. 2). 3. Rim fragment from a greyish-brown, mottled, small biconical bowl or cup with everted rim, tempered with sand. 5.3 cm x 3.9 cm x 0.5 cm, Th.: 0.9 cm (Fig. 36. 3). 4. Rim fragment from a light brown-greyish, mottled bowl with internally thickened, bevelled rim, tempered with sand. Traces of polishing in its interior. 6.9 cm x 2.8 cm x 0.5 cm, Th. of rim: 0.9 cm (Fig. 36. 4). 5. Rim fragment from a grey pot with curved neck and everted rim, tempered with sand and crushed pottery. 6 cm x 3.3 cm x 0.4 cm (Fig. 36. 5).

Pit 5623 (Sarmatian) 1. Rim fragment from a dark grey-brownish, mottled pot with slightly everted, thickened rim, tempered with sand and grit. An oval, pointed knob is set under the rim. 5.9 cm x 4.2 cm x 0.5 cm, Th. of rim: 0.9 cm, W. of knob: 3.1 cm (Fig. 37. 2). 2. Rim fragment from a bowl with grey exterior, dark grey interior and internally thickened rim, tempered with sand. 4.6 cm x 4 cm x 0.8 cm (Fig. 37. 3).

The settlement and its layout

Several settlements of the Makó culture are known from Budapest and its broader area which have been systematically surveyed (the former Buda, Szentendre, Vác and Szob districts; KALICZ-SCHREIBER 1994, Abb. 14; MRT 7; MRT 9; KALICZ-SCHREIBER 2001, 165, Abb. 1). In contrast, the area southeast of Budapest, the southern part of the Pest Plain, was for a long time a blank spot as regards the Early Bronze Age history of the region (KULCSÁR 2002,

Fig. 15. Üllő. Crucible from Pit 5605.

18). Several sites have recently been identified in this region: in addition to the Üllő site, a larger Makó settlement was found at Vecsés–Site 56 (DINNYÉS 2001, 77), lying some 4 km to the west, and three pits of the culture have been unearthed at Vecsés–Site 83 on the town's southern outskirts.[7] Even so, the number of known Makó sites is far below those known from the western side of the Danube and the hilly region in the Danube Bend, no doubt owing to the more favourable ecologic conditions in the hilly regions, better suited to human settlement (KALICZ-SCHREIBER 2001, 167). During the Early Bronze Age 2 period, a narrow zone along the Danube was occupied by the early Nagyrév culture and the Bell Beaker–Csepel group (KALICZ-SCHREIBER–KALICZ 1999, 86, Fig. 2; KALICZ-SCHREIBER 2001, 168, Abb. 2), while the areas farther from the river were uninhabited, being part of the economic hinterland of the Bell Beaker–Csepel group (KALICZ-SCHREIBER 2001, 168–169). No traces of the proto-Nagyrév horizon have yet been found on the Pest Plain (SZABÓ 1992).

With its twenty-four settlement features, the Üllő site can be categorised as a larger, intensively occupied Makó settlement. Since the investigation of the

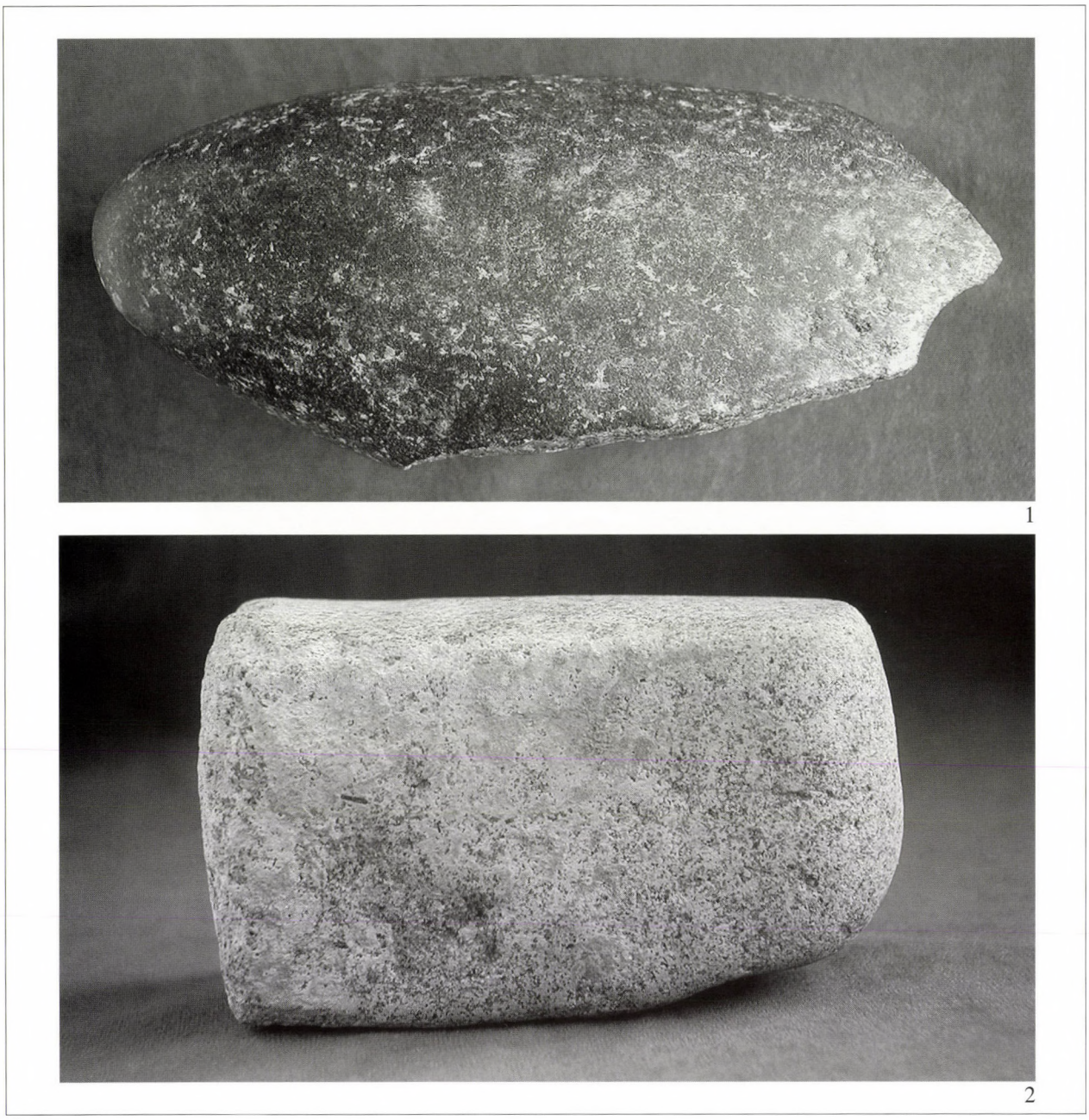


Fig. 16. Üllő. Stone artefacts from Pit 5605. 1: Stone axe; 2: Stone grinder or polisher

area was restricted to the planned line of the motorway, we can at the most only assume that this Early Bronze Age settlement also extended westwards and south-eastwards of the excavated area. The pits were scattered over a 10,500 m^2 large area and formed distinct clusters (Fig. 2).

Two main types of Makó settlements can be distinguished (TÓTH 2003, 66–67). The first is made up of a few pits scattered over a fairly large area, suggesting that these were briefly occupied, temporary sites, corresponding to the Makó population's mobile life-style based on stockbreeding (ECSEDY 1995, 18; CSÁNYI 1996, 56).[8] Temporary settlements of this kind can be found over the entire Makó distribution. At Kompolt–Kistér, for example, only one pit and two burials of the culture were found lying quite far from each other (GOGÂLTAN 1999, 171) in the almost three hectares large excavated area (VADAY 1999, 11). Five Makó pits lying some 15–22 m from each other were unearthed at Tiszakürt during the investigation of

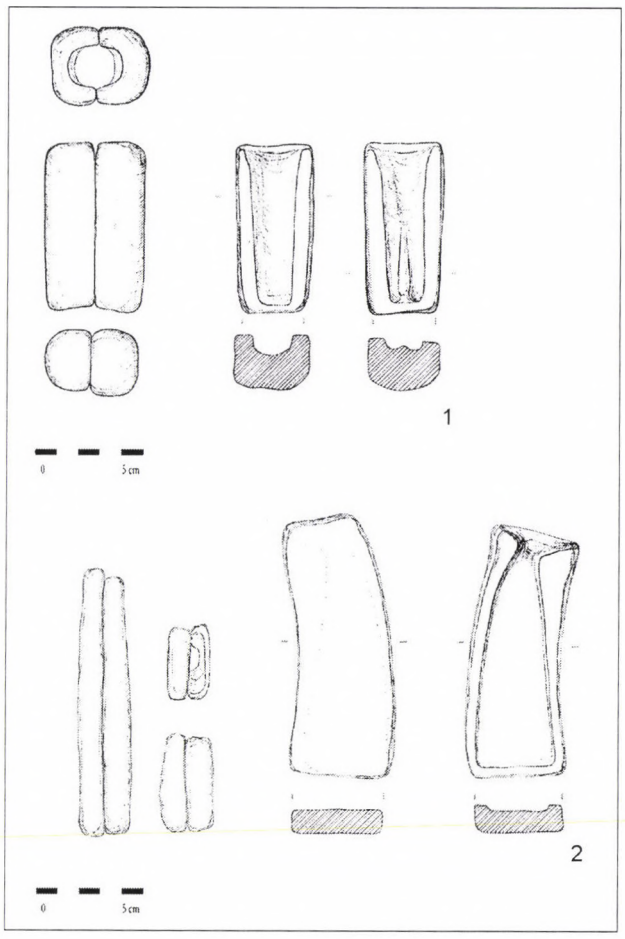


Fig. 17. Üllő. 1: Mould 1; 2: Mould 2

the several hectares large site (CSÁNYI 1996, 52, Fig. 3). At Čaka/Cseke in Slovakia, the settlement features of the Kosihy–Čaka group were scatted over a twenty hectares large area (VLADÁR 1966, 255–256).

The publication of earlier find assemblages and the large-scale excavations of the past few years have revealed that more intensive settlements occupied over a longer period of time and characterised by a higher number of settlement features were also established by the Makó population. Extensive settlements have been uncovered at Bajč (thirty-two pits; VLADÁR 1966, 254), Biatorbágy–Budapark (twenty-six settlement features; CSONGRÁDINÉ 2002), Budapest–Aranyhegyi Road (KALICZ-SCHREIBER 1994), Oszlár–Nyárfaszög (KOÓS 1998; KOÓS 1999), and Tiszalúc–Sarkad (twenty pits; SZATMÁRI 1999). Comparable settlements have been investigated more recently at Csongrád–Sertéstelep (nine settlement features; TÓTH 2001), Szeged–Kiskundorozsma-Subasa (twenty-seven settlement features; TÓTH 2002, 33), and Csengele–Fecskés (BALOGH–TÜRK 2004, 199). The currently known largest settlement of the Makó culture is now being investigated at Budapest–XI, Kőérberek-Lakópark, where over a hundred settlement features have been uncovered so far. The settlement dates to the late Makó period; the preliminary evaluation of the site and its finds indicates that stylistic traits of the Nagyrév culture and the Bell Beaker–Csepel group can be noted in the pottery.[9] The Üllő site can be assigned to the latter settlement type.

Some of the more intensively occupied settlements had a rather loose layout, with groups of pits scattered over a rather extensive area and large, empty areas in-between (TÓTH 2001, 131). A settlement layout of this type was observed at Tiszalúc–Sarkad (SZATHMÁRI 1999, 67, Abb. 2), Csongrád–Sertéstelep (TÓTH 2001, 131, Fig. 2. 2–3), Szeged–Kiskundorozsma-Nagyszék I (SZALONTAI–TÓTH 2003, 64), and Szeged–Kiskundorozsma–Subasa (SZALONTAI–TÓTH 2003, 84). K. Tóth has suggested that the "empty" areas between the pits may have had a building (a homestead) which, being a flimsy structure or only slightly sunk into the ground, left no trace in the archaeological record. and that the pit clusters can in fact be associated with these (TÓTH 2003, 67). The scattered pit groups of the Üllő site suggest a settlement layout of this type.

Most of the settlement features uncovered at Üllő were refuse pits. With the exception of three features, they had a regular or more or less circular or oval form, cylindrical or rounded sides widening towards the floor (one was beehive shaped). The fill of twelve pits was homogenous, nine had a layered and two a mixed fill. Three pits (nos 4035, 4683 and 7479) had a burnt, ashy fill mixed with charcoal. Traces of firing were noted on the floor of Pit 4079; a similar phenomenon could be noted in several pits at Biatorbágy–Budapark (CSONGRÁDINÉ 2002, 13). Pit 2048 had a roughly triangular form, while Pit 3682 was oblong with rounded corners. Even though no post-holes were noted beside or inside this feature, it is possible that this settlement feature had some economic function.

Most pits contained burnt daub fragments, although these were usually very small pieces and none bore imprints of wattling or showed traces of smoothing. The burnt, ashy, sooty fill of Pit 4683 contained a streak of burnt daub debris; Pits 3638 and 7479 had a fill mixed with burnt daub. These daub fragments indicate the one-time presence of one or more buildings with walls of daub or of ovens, similarly to the burnt daub fragments, pieces of burnt plastering and burnt daub debris layers found in pits on other Makó sites (TÓTH 2001, 125–126, with a list of similar features). Feature 3627 cannot be interpreted as a typical refuse pit: six vessels were set by its side in its lower half and

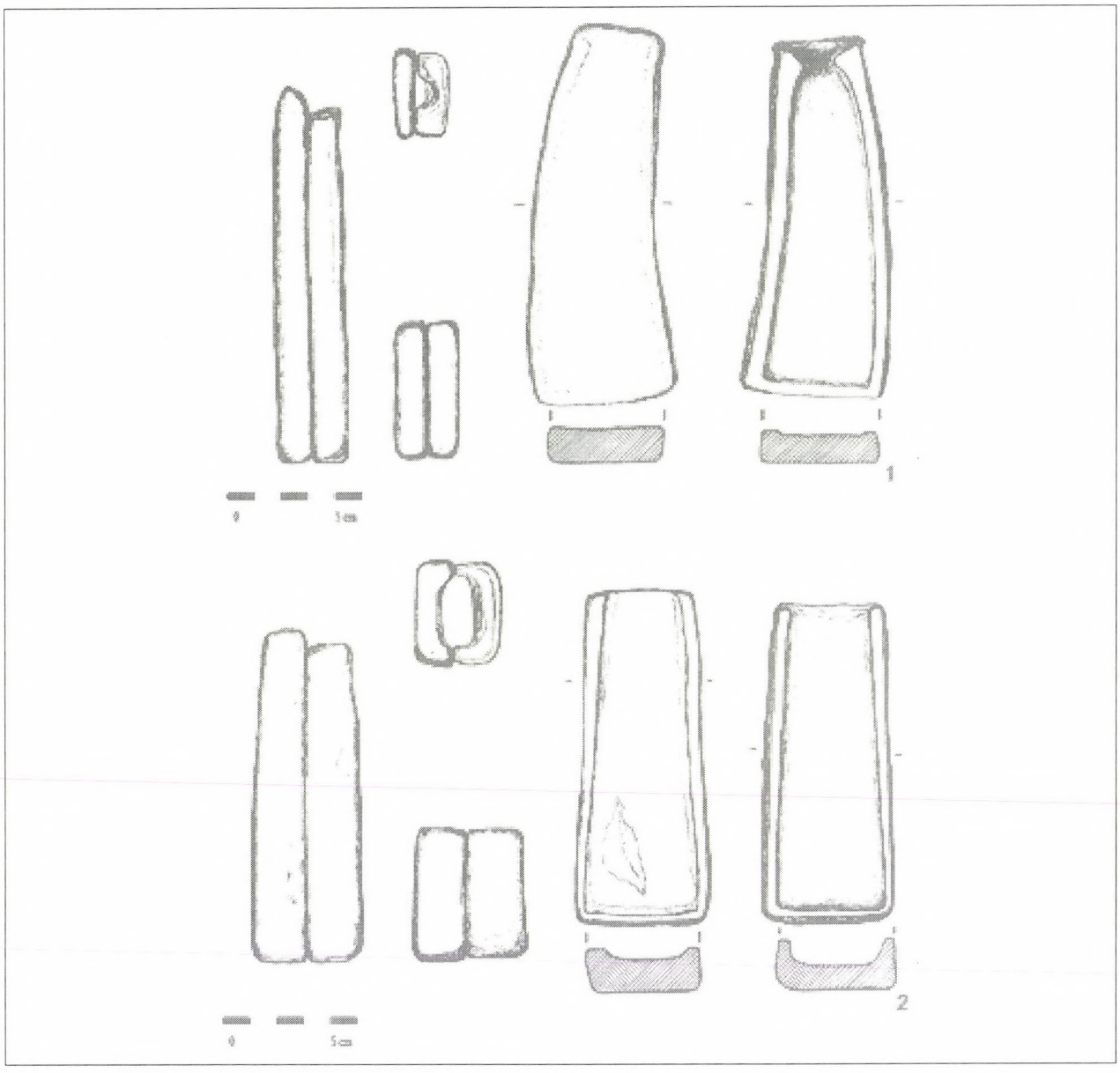


Fig. 18. Üllő. 1: Mould 3; 2: Mould 4

a heap of animal bones lay in its middle (although not in an anatomical order: Fig. 24. 1). Even though the vessels and the animal bones had obviously been deposited at the same time, they did not lie on the pit's floor. The vessels did not include cooking pots, the most frequent vessel type in the ceramic inventory from Üllő. The homogenous fill of this feature does not differ from the fill of the other pits: there were no traces of one or successive plasterings observed in Early Bronze Age bothroi, such as the ones uncovered at Szigetszentmiklós (ENDRŐDI 1992, 98) and Csepel–Hollandi Road (KALICZ-SCHREIBER 1981, 75–79), and thus its possible interpretation as a sacrificial pit is tentative. The vessels deposited in this pit were, with the exception of the bowl described under no. 1, all damaged (the greater part of the neck of the two jugs was missing, and about two-thirds of the bowl described under no. 6 was also missing). The other unusual pit was Pit 5605, whose fill did not contain any finds, except for the two broken vessels and animal bones on its floor (Fig. 6. 1, Fig. 8. 2).

The form of Pit 4089, dug into the humus, could not be established. The small heap of sherds lying beside the larger stone suggest the possibility that it may have been a burial, which was partly destroyed by agricultural activity, since observations made at other

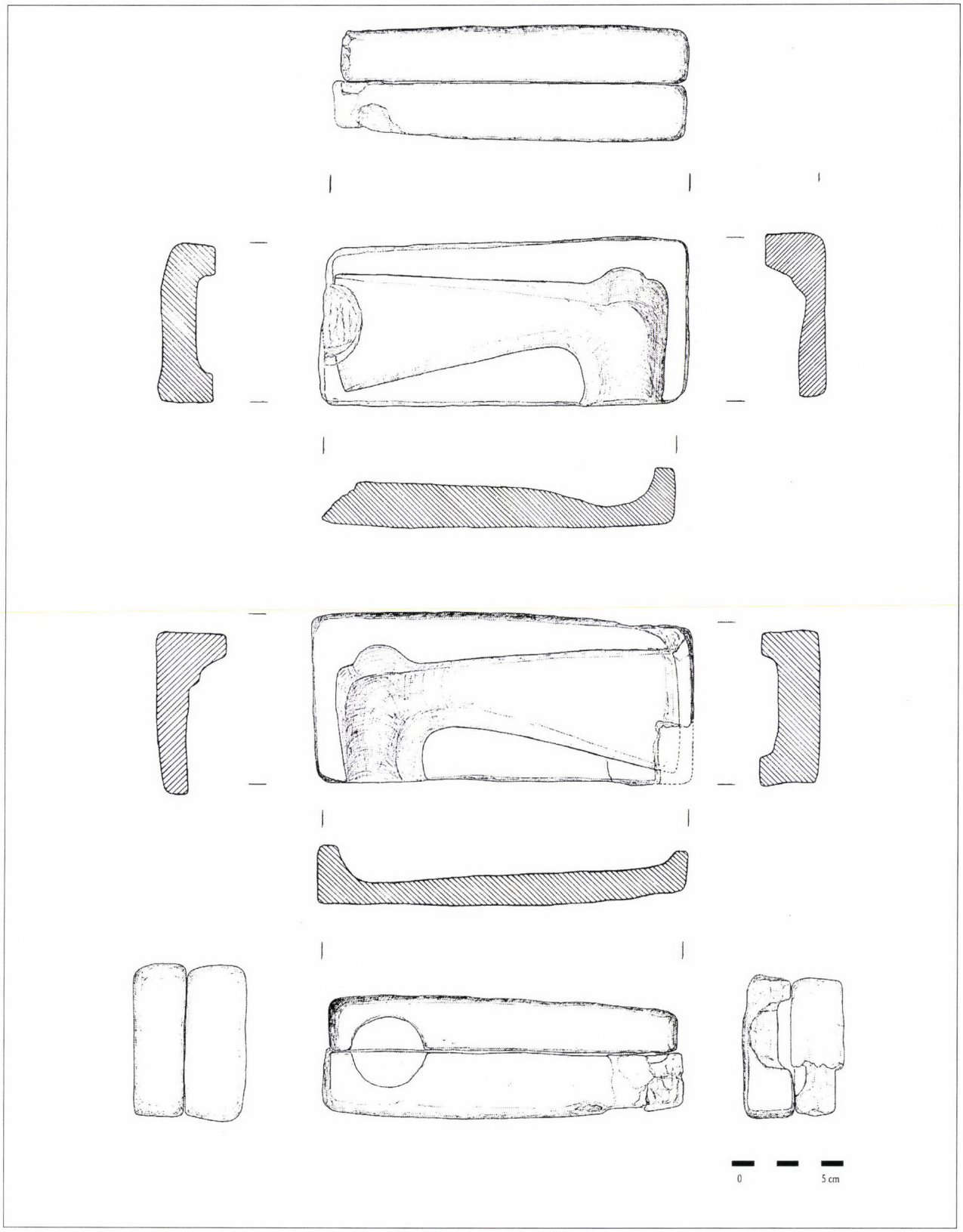


Fig. 19. Üllő. Mould 5

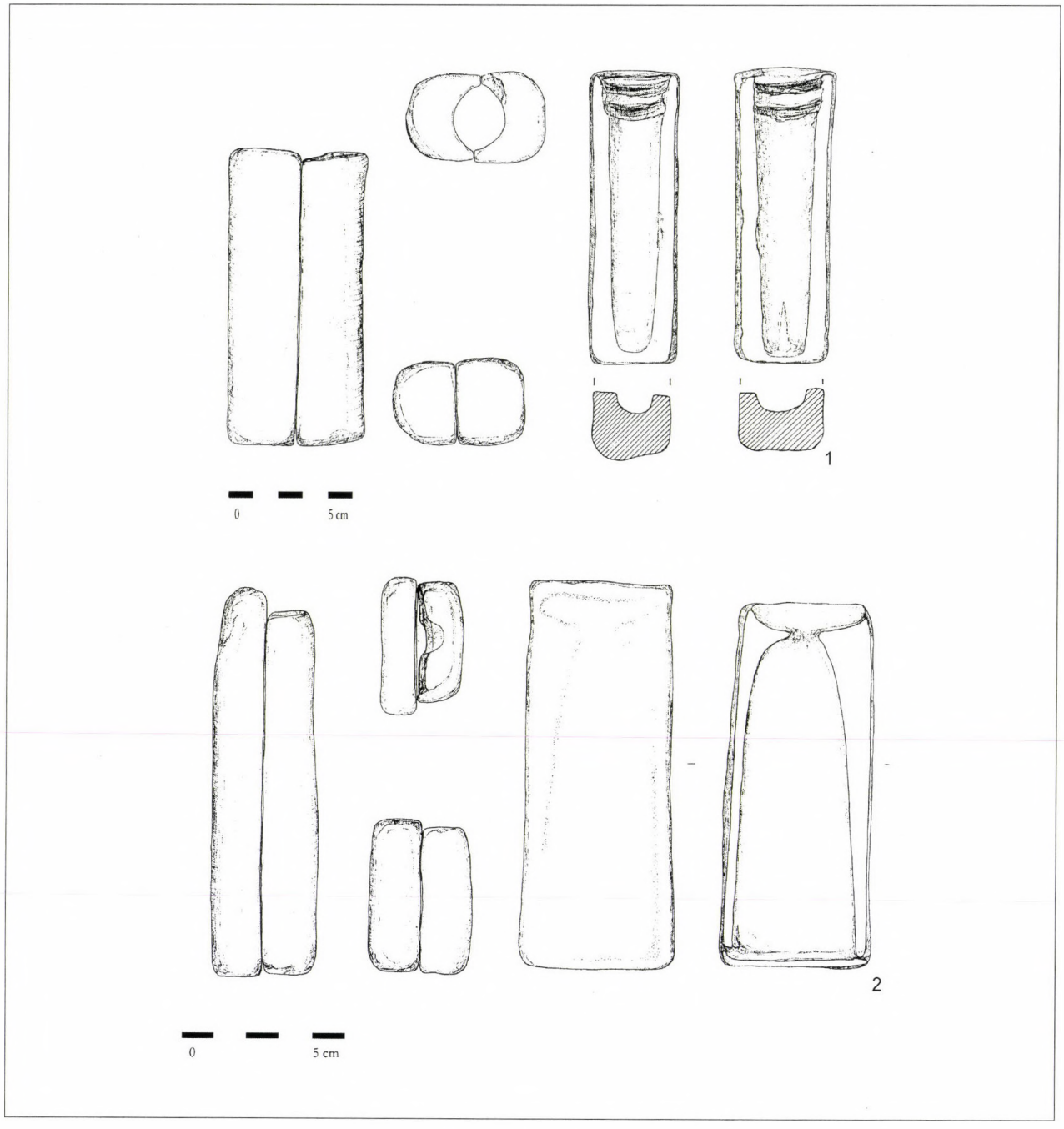


Fig. 20. Üllő. 1: Mould 6; 2: Mould 7

sites indicate that Makó graves were rather shallow (Kompolt–Kistér: GOGÂLTAN 1999, 171; Kál–Legelő III: KULCSÁR–SZABÓ 2000, 31).

Although animal bones were recovered from each pit, in most cases this meant a few, fragmentary pieces, with the exception of three pits. In Pit 3627, the animal bones lay in one heap (Fig. 24. 1), while in Pits 4035 and 5600 the animal bones were deposited in separate layers (Fig. 24. 2, Fig. 26. 1). Pit 5600 contained the remains of at least fourteen cattle: their feet and heads had been severed, and only their trunk was deposited in the pit. A similar phenomenon was observed in one of the late Nagyrév pits at Soroksár–Botanical Gardens (KALICZ-SCHREIBER 1981; KALICZ-SCHREIBER 1984; VÖRÖS 2002), and on other Middle and Late Bronze Age sites (e.g. Cson-

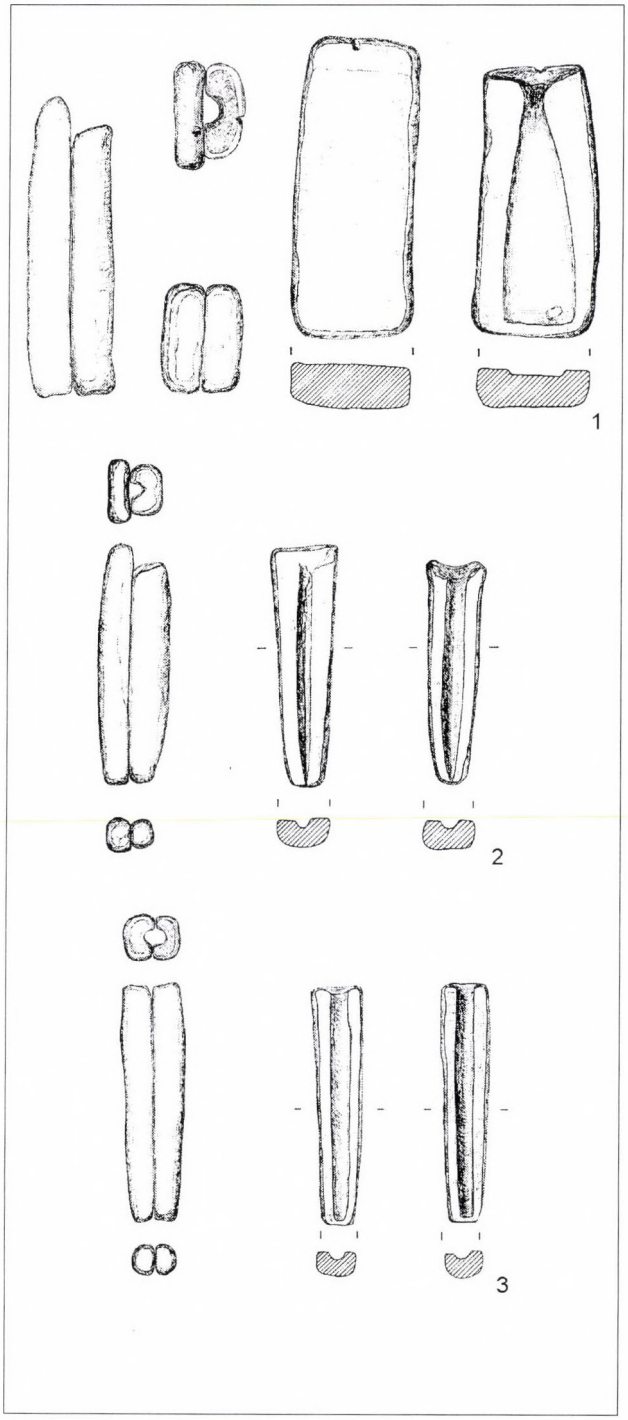


Fig. 21. Üllő. 1. Mould 8. 2. Mould 9. 3. Mould 10.

grád–Vidra-sziget: SZÉNÁNSZKY 1977; Ozora: VÖRÖS 1988). It is possible that the animals in Pits 4035 and 5600 were deposited as part of a ritual.

Pits 3679 and 3682 each contained a mussel: both were fluvial species preferring fast-flowing water and probably came from the Danube.

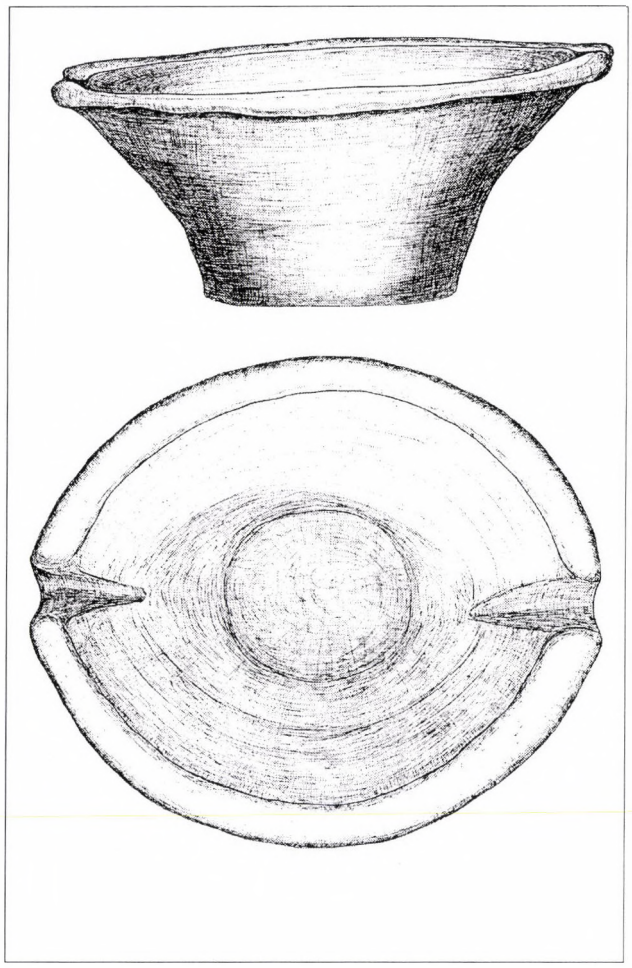


Fig. 22. Üllő. Crucible from Pit 5605

Evaluation of the pottery finds[10]

Cooking pots

The most frequent type in the ceramic inventory from Üllő, with the most varied neck and rim forms. In addition to pieces with outcurving neck common in the Early Bronze Age (Fig. 28. 1, Fig. 30. 5, Fig. 31. 2, Fig. 32. 1, 3, 5, 9, Fig. Fig. 36. 6, Fig. 37. 2), there were variants with a more strongly profiled neck, ranging from a low or higher cylindrical neck (Fig. 27. 2, Fig. 31. 1, Fig. 32. 7, Fig. 36. 1, 10, Fig. 37. 1) to a slightly funnel-like one (Fig. 35. 2–5, Fig. 36. 5, Fig. 38. 1). Other types include pots with slightly incurving, conical neck (Fig. 27. 3–4, Fig. 30. 6–8, Fig. 37. 4–5). Most cooking pots have an everted rim: on some types, the rim thins slightly (Fig. 28. 1, Fig. 35. 4, Fig. 36. 6). Outward thickening, rounded rims are more frequent (Fig. 27. 4, Fig. 32. 7, Fig. 35. 1–3, 5, Fig. 36. 10, Fig. 37. 1). This rim form is more typical in the eastern areas of the Makó–Kosihy–Čaka distri-

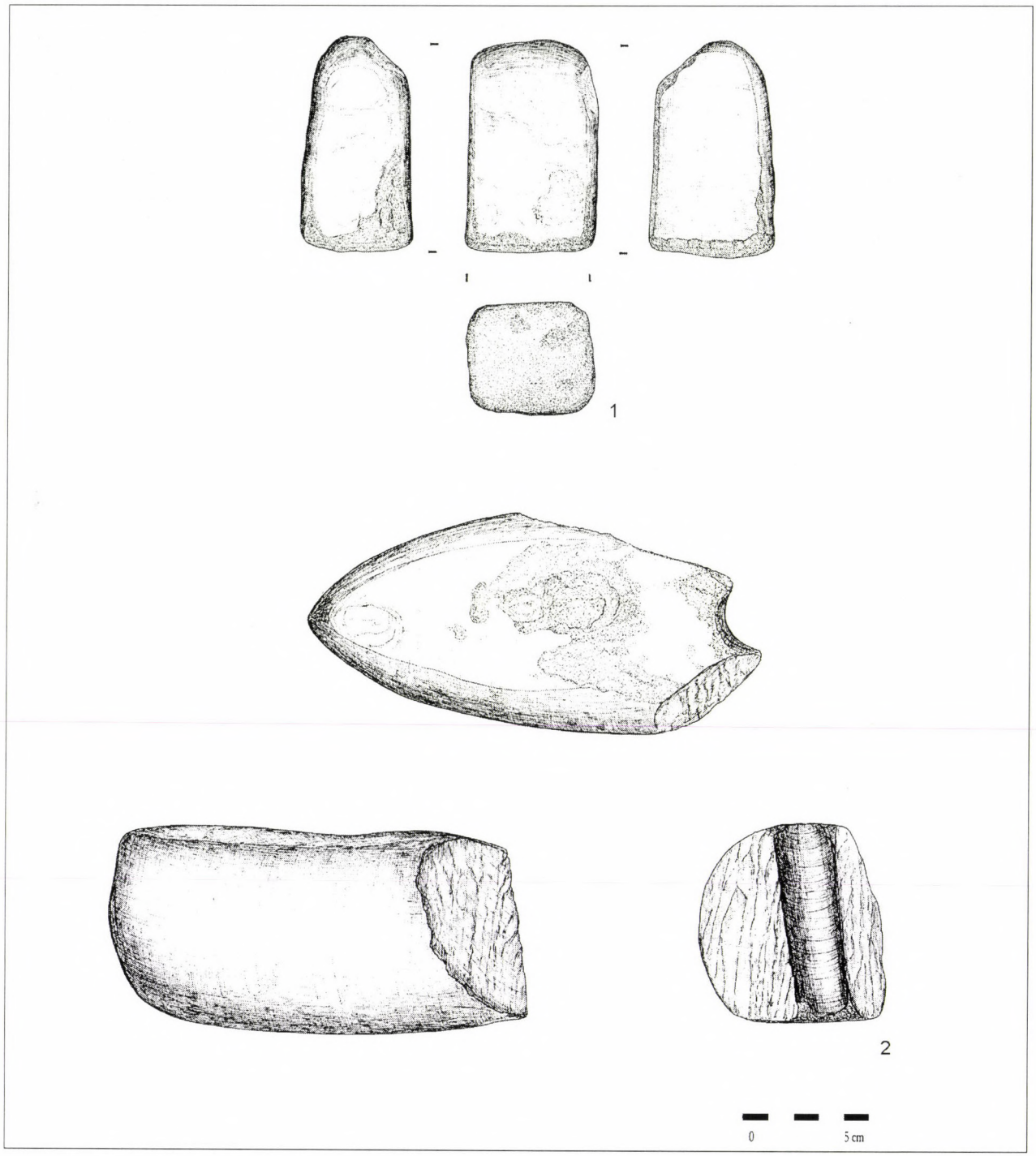


Fig. 23. Üllő. Stone artefacts from Pit 5605; 1: Stone grinder or polisher; 2: Stone axe

bution (TÓTH 2001, 128–129), for example in the pottery from Tiszakürt (CSÁNYI 1996, 54) and Tarnabod, where it is the dominant type (KALICZ 1998, Fig. 9. 1, Fig. 10. 15, Fig. 11. 6–9). It is less frequent at Budapest–Aranyhegyi Road (KALICZ-SCHREIBER 1994, Abb. 5, 1, 8; Abb. 6. 4; Abb. 12. 2, etc.), in the assemblage from a recently excavated pit at Kamenín/Kéménd in Slovakia (NEVIZÁNSKY 2001, Tab I. 13, Tab. IV. 2, Tab. V. 11). and it is quite rare at Táp–Borbapuszta (FIGLER 1994, Abb. 8. 9). The everted, collar-like rim form also occurs (Fig. 27. 2, Fig. 38. 1); analogies can be quoted from Buda-

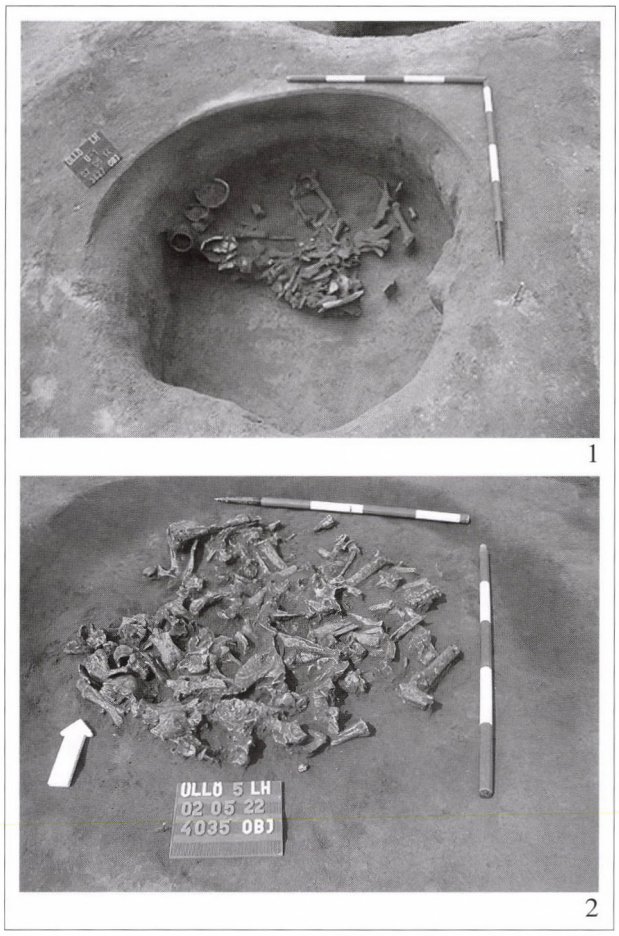


Fig. 24. Üllő. 1: Pit 3627; 2: Pit 4035

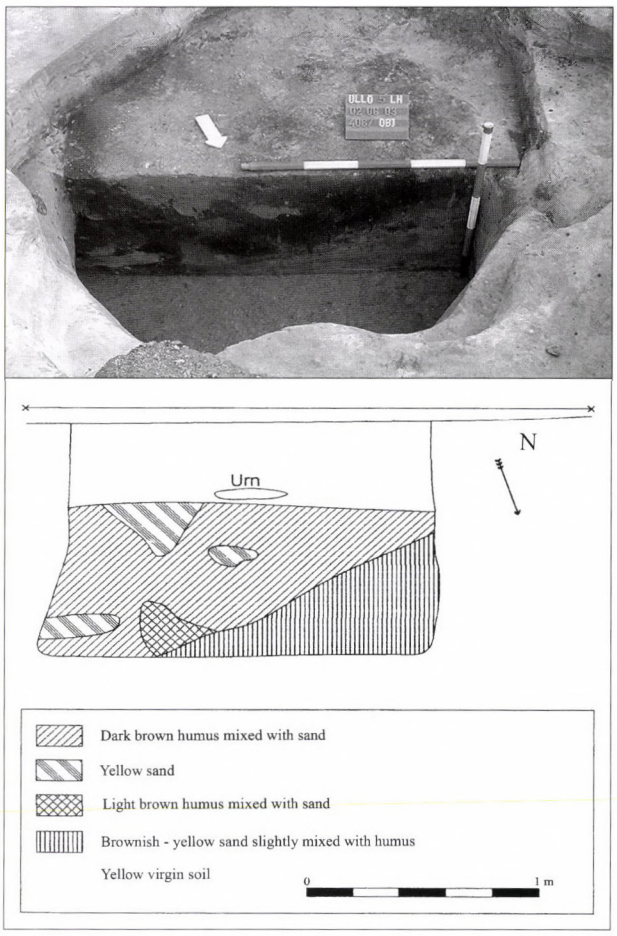
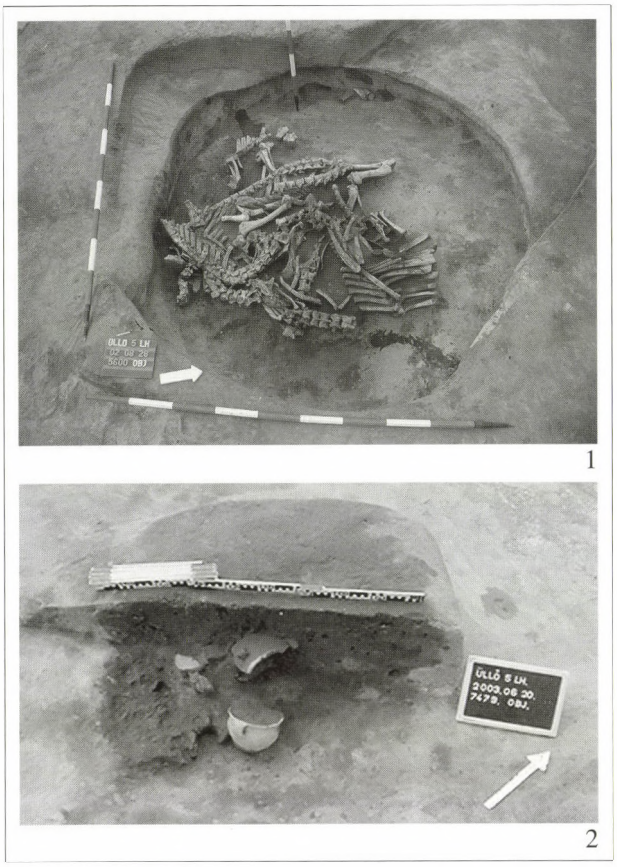


Fig. 25. Üllő. Pit 4067

pest–Aranyhegyi Road (KALICZ-SCHREIBER 1994, Abb. 5. 1, 8) and Tiszakürt–Homoki-szőlők (CSÁNYI 1996, Pl. VI. 5).

Another part of the cooking pots from Üllő have a triangular sectioned, thickened rim (Fig. 27. 3, Fig. 30. 6–8, Fig. 31. 1, Fig. 32. 3, Fig. 35. 7, Fig. 37. 4–5). K. Tóth has noted that this pot type is more common on Makó sites in north-western Transdanubia, Slovakia, Austria and Moravia: it is known from assemblages in the Budapest area and from sites in Pest and Heves counties, but is virtually absent from sites east of the Danube (Bács-Kiskun, Békés, Borsod-Abaúj-Zemplén, Csongrád and Szolnok counties) and in Romania (TÓTH 2001, 127, Fig. 21. 1, with further literature and analogous finds).[11] At Üllő, cooking pots with thickened, rounded and triangular sectioned rim occur in roughly the same proportion. One variant of cooking pots, the type with a thickened neck, has not been found at Üllő, these being typical for the areas east of the River Tisza, Békés and Csongrád counties, north-eastern Hungary and north-western Romania (TÓTH 2001, 129, Fig. 22. 1).

The almost intact pieces and the specimens assembled from their fragments recovered from Pits 5606 and 7479 best illustrate the forms of the cooking pots and the two basic types. One variant has a longish, ovoid body and comes either with or without handles (Fig. 36. 10, Fig. 38. 1), while the other is squatter and its upper part is more rounded (Fig. 37. 1). Several analogies can be quoted for both types, such as the ones from Tarnabod (KALICZ 1998, Fig. 9. 1) and Battonya–Georgievics-tanya (BONDÁR–MATÚZ–SZABÓ 1998, Fig. 14. 1), which are virtually identical with the ovoid, two-handled cooking pot from Üllő. One good parallel to the variant without handles from Pit 7479 comes from Čaka, which also has a knob protruding from the rim (VLADÁR 1962, Tab. III. 4). The squatter cooking pot from Üllő (Fig. 37. 1) is matched by a vessel from Szeged–Kiskundorozsma-Nagyszék I (TÓTH 2003, Fig. 3). Similar vessels of the Somogyvár–Vinkovci culture from Szava, but with decorated rim and neck, have been published by I. Ecsedy (ECSEDY 1978, Taf. I. 9; Taf. XI. 7). However, the more slender variants of the cooking pots of



1

2

Fig. 26. Üllő. 1: Pit 5600; 2: Pit 7479.

the Somogyvár–Vinkovci culture are less rounded and curved, such as the ones from Szava (ECSEDY 1978, Taf. I. 7; Taf. II. 7; Taf. III. 3; Taf. IV. 6) and Börzönce (BONDÁR 1995, Pl. 172. 324–325; Pl. 174. 358– 364).

The usual surface treatment typical for the Early Bronze Age can be noted on the two pots from Pit 5605: the neck and the rim are smoothed, while the lower part is rusticated. This treatment was popular in both the Makó and the Somogyvár–Vinkovci culture (KALICZ 1984, 97), and it seems likely that its practical purpose was to ensure the easier handling of the vessel (KALICZ 1998, 13). Pottery sherds with a coarsened, rusticated surface were also recovered from Pits 4079 and 5616 (Fig. 35. 4).

Pots were seldom decorated. Brushing the vessel body was probably a general practice. Unfortunately, most of the pottery sherds were too small to determine the type of vessel they came from. Some bear a finer, combed decoration (Fig. 30. 3–4, Fig. 36. 7–9).[12] Two pots are decorated with an impressed rib under the neck (Fig. 35. 4), one with impressed knobs set on the rim (Fig. 38. 1). Some pots have a knob projecting from the rim (Fig. 27. 3, Fig. 30. 7, Fig. 31. 1), a decoration known also from other Makó sites, e.g. Budapest–Aranyhegyi Road (KALICZ-SCHREIBER 1994, Abb. 5. 4, 15, Abb. 6. 3) and Táp–Borbapuszta (FIGLER 1994, Abb. 5. 7).

Amphoras

The best analogies to the large, oval vessel from Pit 4067 (Figs 33–34) can be quoted from the Somogyvár–Vinkovci culture. The amphora from Ilok (TASIĆ 1984, 21–22, Taf. I. 6) differs from the one found at Üllő in that it has vertically set handles, while the vessel from Üllő has horizontally set ones. A similar amphora was found at Győrszemere–Tóthtag (FIGLER 1994, Abb. 8. 4).[13] The most peculiar feature of the amphora from Üllő is the presence of knobs inside the vessel (Fig. 33. 1, Fig. 34. 3). The single comparable vessel of the Makó culture was found at Gyomaendrőd–Site 161 (BONDÁR 1999, 51, Fig. 9. 2). Vessels with interior knobs were more common in the later proto-Nagyrév and early Nagyrév periods (Gerjen– Váradpuszta, Level IV: SZABÓ 1992, Pl. LXXXV. 1; Hódmezővásárhely–Barci-rét, Pit 1971/I/18: KULCSÁR 1997, 34, Pl. XIV. 2), in the Hatvan culture (Hatvan–Strázsahegy: TOMPA 1935, 28–29) and in the Vatya culture (Vatya-puszta: KADA 1909, 130, Pl. III. 2). Their function is uncertain; it has been suggested that they were perhaps marinating vessels. G. Kulcsár dates their appearance to the period immediately preceding the emergence of Bronze Age tells (KULCSÁR 1997, 34).

The slightly biconical, rounded vessel with short, curved neck decorated with perforated knobs set on the shoulder can also be assigned to the amphoras (Fig. 39. 2). This is quite a rare type, which has so far only been recovered from the culture's burials (Hódmezővásárhely–Gorzsa-Czukor-tanya: GAZDAPUSZTAI 1959, 17–18, Pl. I; Szeged–Kiskundorozsma-Subasa: TÓTH 2002, Fig. 8. 1, Fig. 10. 4). A stray find from the Szarvas area (MRT 8, Site 8/XLII, Pl. 19. 2) can also be included among the vessels of this type. Another specimen is known from Oros–Belterület (KALICZ 1968, Taf. XVI. 9): N. Kalicz assigned this vessel to the Nyírség culture (KALICZ 1968, 68), while J. J. Szabó attributed it to the Makó culture (BONDÁR–MATÚZ–SZABÓ 1998, 17). Both derive the vessel form from the Cord Ornamented pottery (KALICZ 1968, 92–93; BONDÁR–MATÚZ–SZABÓ 1998, 17).

Bowls

Bowls make up the second most frequent vessel type in the ceramic inventory from Üllő. N. Kalicz regarded biconical bowls with a rounded carination and a low, incurving neck the most typical vessel form of the Makó culture (KALICZ 1984, 96). Two intact

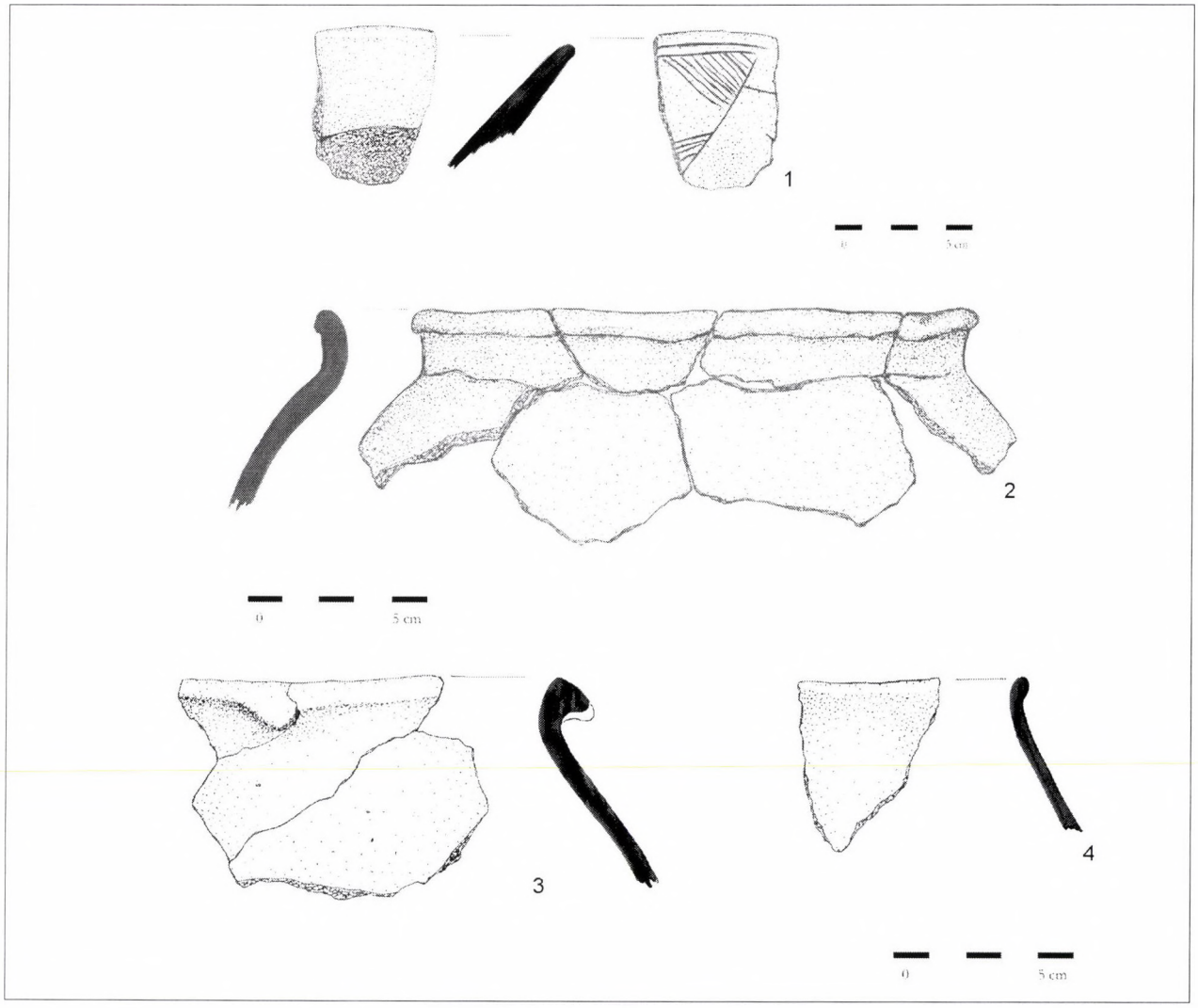


Fig. 27. Üllő 1: Pit 2037; 2: Pit 2049; 3–4: Pit 3608

pieces were recovered from Pit 3627, one with a narrower mouth, the other with a wider mouth and everted, rounded rim (Fig. 28. 3, Fig. 29. 2). Some of the fragmentary pieces could perhaps be better described as cups owing to their size (Fig. 32. 4, 6), similarly to a specimen from Tiszalúc–Sarkad (SZATMÁRI 1999, Taf. II. 4). Suffice it here to mention the bowls from Domony (KALICZ 1968, Taf. IV. 6, Taf. VI. 7, 11, Taf. IX. 14–15, 20, 30), Tarnabod (KALICZ 1998, Fig. 8. 7, 10), and Budapest–Aranyhegyi Road (KALICZ-SCHREIBER 1994, Abb. 3. 2, Abb. 11. 11). A variant with a handle, decorated with a crescentic rib, is known from Budapest–Aranyhegyi Road (KALICZ-SCHREIBER 1994, Abb. 3. 1), and a similar piece with a narrower mouth, ornamented with a vertical rib, has been recovered from Grave 1 of the Somogyvár–Vinkovci burial ground at Kajárpéc–Pokolfadomb (FIGLER 1994, Abb. 10. 8). K. Tóth has noted that the distribution of this bowl type roughly corresponds to that of pots with triangular sectioned, thickened rim, i.e. they are common on sites in northwest Transdanubia, Slovakia, Austria, Pest and Heves counties, and are virtually absent from eastern Hungary and Romania. Although bowls of this type have been brought to light at a few sites in Csongrád county, e.g. the eponymous site at Makó–Vöröskereszt and at Tiszalúc–Sarkad, their rim differs markedly (TÓTH 2001, 128, notes 36–37, Fig. 22. 2).

Conical bowls come in several varieties. The simplest variant has low, straight sides and a straight rim. One intact specimen of this variant was found in Pit 3627 (Fig. 29. 1). It is a fairly common Early Bronze Age type, popular in the Makó–Kosihy–Čaka culture (e.g. Domony: KALICZ 1968, Taf. V. 10; Csongrád–Sertéstelep: TÓTH 2001, Fig. 8. 8; Malé Kosihy/Ipolykiskeszi: VLADÁR 1964, Obr. 1. 2; Nové

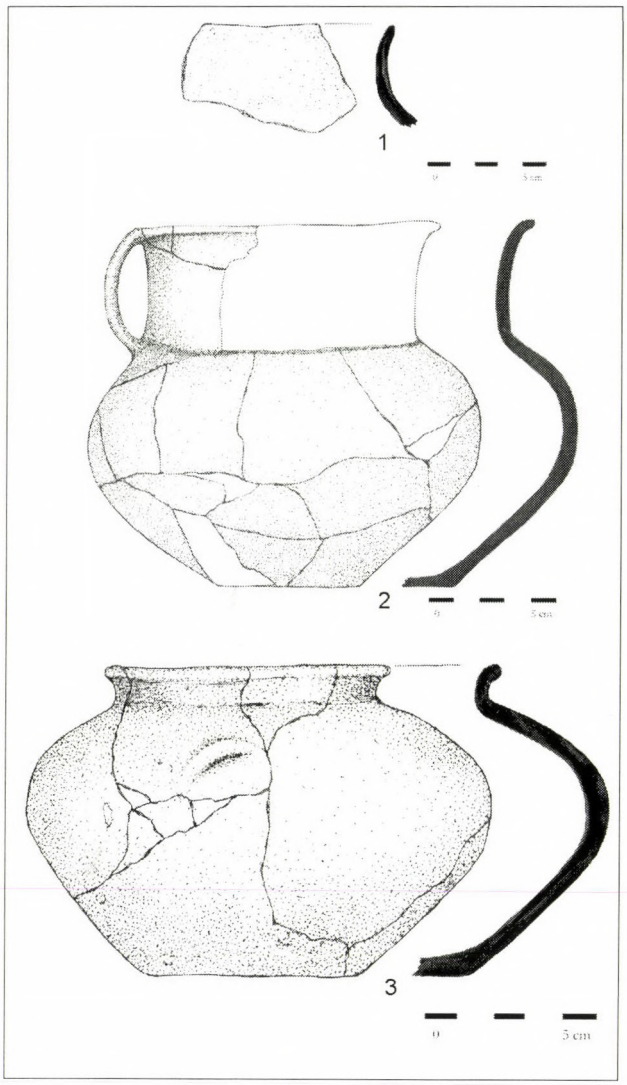


Fig. 28. Üllő. 1: Pit 3624; 2–3: Pit 3627

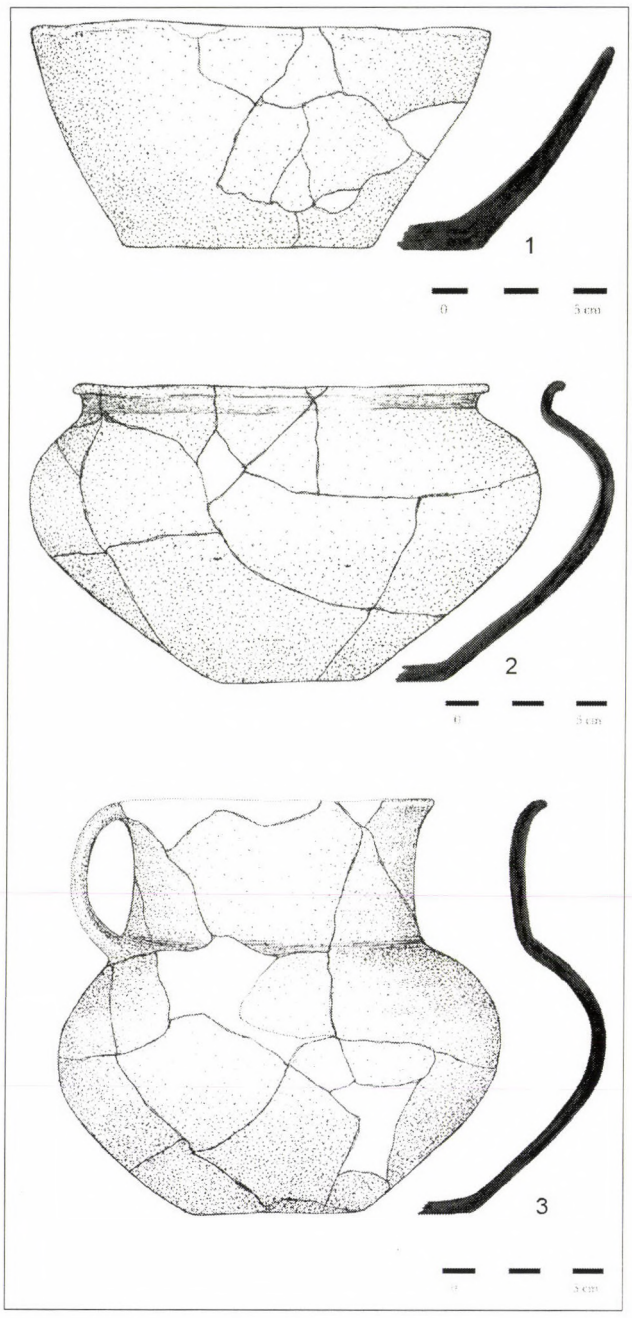


Fig. 29. Üllő. 1–3: Pit 3627

Zámky/Érsekújvár: VLADÁR 1966, Abb. 20. 1), the Somogyvár–Vinkovci culture (Nagyárpád: BÁNDI 1984, Taf. XXXa. 7) and the Bell Beaker–Csepel group (Békásmegyer: KALICZ-SCHREIBER–KALICZ 2002, Fig. 13. 8). Bowls with internally thickened rim were also quite general (Fig. 36. 2, 4); analogies to this form occur widely (Táp–Borbapuszta: FIGLER 1994, Abb. 4. 2–3, Abb. 6. 1–4; Kéménd/Kamenín: NEVIZÁNSKY 2001, Tab. IV. 7, Tab. V. 1–4; Tiszakürt: CSÁNYI 1996, Pl. XII. 7; Oszlár: KOÓS 1999, Fig. 4. 4, Fig. 9. 3; Tiszalúc–Sarkad: SZATMÁRI 1999, Taf. IX. 11, 13). One bowl in this group has a rim thickened on both sides (Fig. 35. 6).

Bowls with interior decoration can be regarded as one of the type fossils of the Early Bronze Age, being equally popular in the Vučedol, the Makó–Kosihy–Čaka and the Somogyvár–Vinkovci cultures (KALICZ 1968; KALICZ 1984, 96; KULCSÁR 1999; KULCSÁR 2002, 78–105). One of the two pieces from Üllő has a straight rim, the other has a bevelled rim (Fig. 27. 1, Fig. 35. 8). Both can be assigned to the variant decorated with hatched triangles and a chequerboard pattern of hatched squares (KULCSÁR 2002, 95). Countless similar pieces are known, amongst others from Tápiószele (DINNYÉS 1973, 39, Pl. II. 8.), Heves–Paptag (KALICZ 1968, 79, Taf. 3. 4), Kunfehértó–Kovács-tanya (TÓTH 1998, Fig. 1. 2),

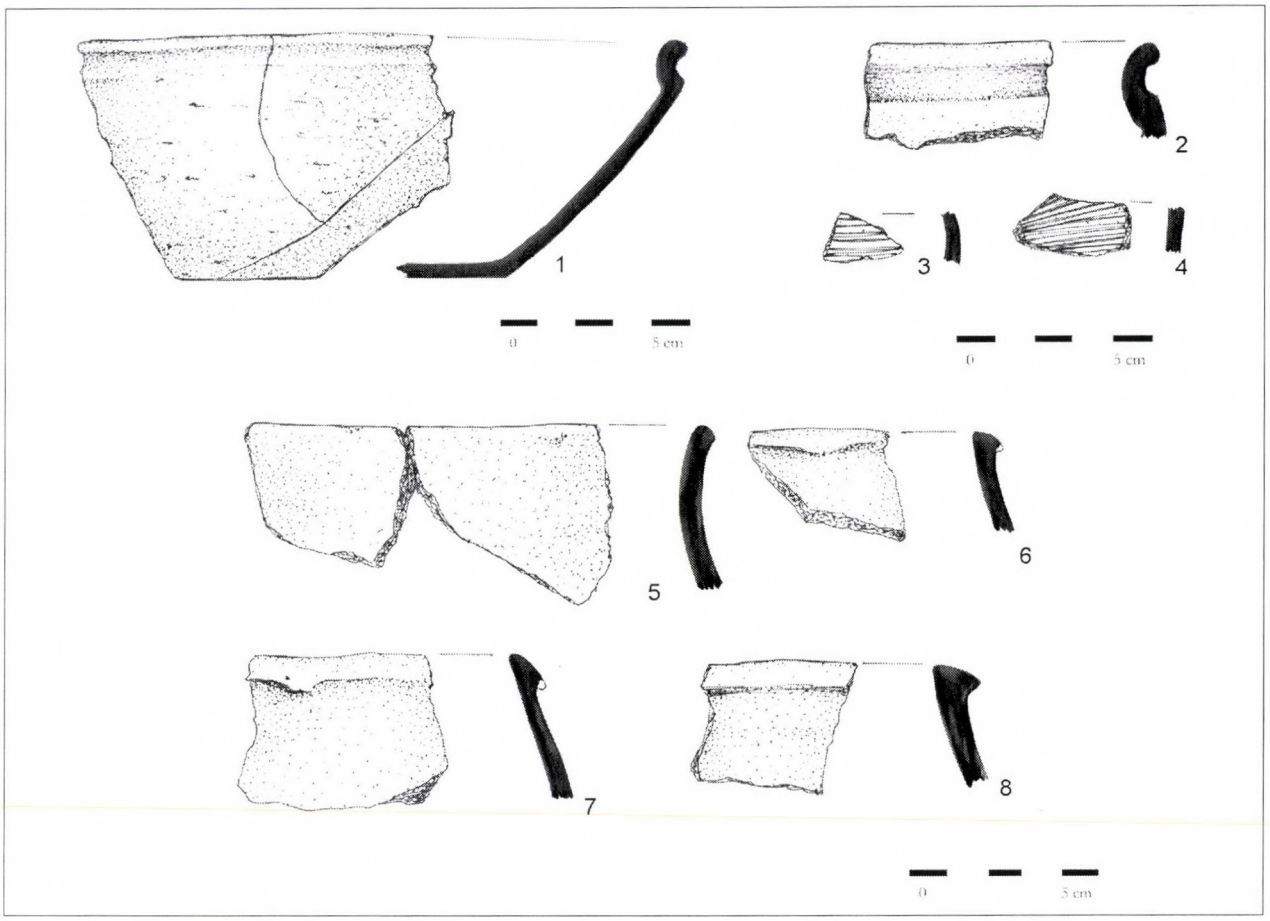


Fig. 30. Üllő. 1: Pit 3627; 2–4: Pit 363; 5–8: Pit 3679

and Kompolt–Kistér, where it was found together with a Somogyvár–Vinkovci/early Nagyrév type one-handled cups (GOGÂLTAN 1999, Pl. 17. 3). Comparable bowls with interior decoration from south-west Slovakia can be assigned to this type. The counterparts of these bowls are also known from Austria, Moravia and Romania (KULCSÁR 2002, 96, with a list of sites).

Several fragments of the variant with conical body, pronounced shoulder and incurving neck were found. The rim form of these bowls ranges from everted, slightly rounded (Fig. 32. 10) to more strongly rounded types (Fig. 30. 1–2, Fig. 31. 4). According to K. Tóth, this bowl type is common in the eastern part of the Makó–Kosihy–Čaka distribution – in the Great Hungarian Plain, in north-eastern Hungary and in Romania – and quite rare in the Budapest area. It is absent from the pottery assemblages from the currently known sites in north-west Transdanubia and Austria, and occurs but rarely in Slovakia and Moravia (TÓTH 2001, 127–128, with further literature and a list of sites; Fig. 22. 2). The popularity of the bowl type on sites east of the Danube was noted by N. Kalicz in his discussion of the finds from Tarnabod (KALICZ 1998, 11).

One rare bowl variant, represented by a single fragment only, has an outcurving, thickened neck and rounded shoulders (Fig. 34. 3). A comparable bowl is known from Csongrád–Sertéstelep (TÓTH 2001, Fig. 7. 8).

The low, wide necked, conical, one-handled bowl (Fig. 39. 1) is matched by a piece found at Tiszapüspöki, recovered from what the excavators believe to have been a sacrificial pit (CSÁNYI–CSEH–TÁRNOKI 2002, Fig. 4. 1). The type itself is rather rare in the Makó culture. Other specimens are known from Szatymaz–Jánosszállás (KULCSÁR 2000, Fig. 6. 5), from where good analogies to the Üllő pots can also be quoted. G. Kulcsár noted that the best parallels to this bowl type can be found in early Nagyrév assemblages, such as the ones from Sövényháza–Kőtörés and Dunaalmás (KULCSÁR 2000, 53). Variants of this bowl type include a piece with a slightly longer neck, rounded shoulders and a constricted base (Fig. 31. 3) and one with a more everted rim (Fig. 32. 8).

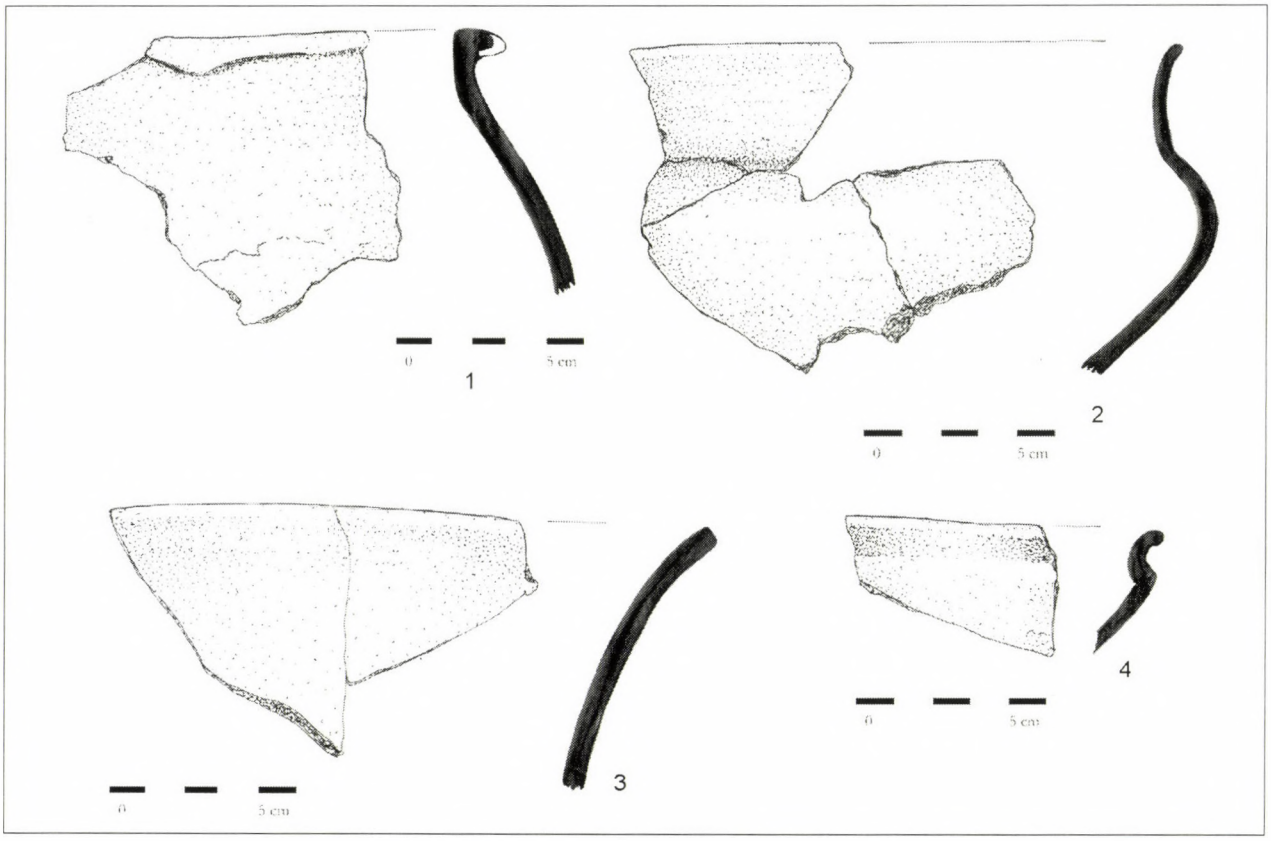


Fig. 31. Üllő. 1–2: Pit 3679; 3: Pit 3682; 4: Pit 3689

One single fragment comes from a small, globular bowl with everted rim, whose shoulder is decorated with a crescentic rib, a hallmark of the Makó culture (Fig. 38. 2).

Pit 7479 yielded a small conical bowl (Fig. 35. 4), whose rim is unfortunately broken, and it is thus uncertain whether it was perforated similarly to the other pieces. This type is quite common during this period; it has been recovered from settlement features of the Makó culture excavated at Budapest–Aranyhegyi Road (KALICZ-SCHREIBER 1994, Abb. 4. 2), Mezőgyán–Gépműhely (SZÉNÁNSZKY 1987–88, Fig. 11. 3), Mosonszentmiklós–Gyepföldek (ASZT 2001, 217, Pl. I), Szeghalom–Környe (SZÉNÁNSZKY 1987–88, Fig. 11. 2), Tiszapüspöki–Karancs-Háromág-dűlő (CSÁNYI–CSEH–TÁRNOKI 1999, Fig. 3. 2), Táp–Borbapuszta (with a less prominent rim and a spout: FIGLER 1994, Abb. 5. 12), from sites of the Somogyvár–Vinkovci culture (Kaposújlak–Road 61 bypass-Site 29: SOMOGYI 2004, Fig. 12. 1; Somogyvár–Kupahegy: KULCSÁR 2002, Pl. 74. 1) and from the Szigetszentmiklós settlement of the Bell Beaker–Csepel group (ENDRŐDI 1992, Fig. 62. 8). The Szeghalom pit has been dated to the late Makó period on the basis of the one-handled jug found in it (KULCSÁR 2002, 78); the other finds from Pit 7479 too suggest a similar date.

Unlike the bowls with interior decoration, simple household bowls were – similarly to pots – seldom decorated. The crescentic rib, a popular decorative element in the Makó culture, can be seen on two bowls from Üllő (Fig. 25. 3, Fig. 38. 2). One bowl is ornamented with a longish knob with vertical grooves (Fig. 29. 10), which is not too widespread on Makó pottery (Csongrád–Sertéstelep: TÓTH 2001, Fig. 9. 3, 6, Fig. 13. 6, 8; Tiszakürt: CSÁNYI 1996, Pl. IV. 1, 3).

Jugs

Jugs with flattened globular body, curved neck and everted rim (Fig. 28. 2, Fig. 29. 3) are not particularly frequent types in the Makó culture. They are best matched by a vessel from Hódmezővásárhely–Gorzsa-Czukor-tanya, found in a cremation burial together with an urn with asymmetric handle (GAZDAPUSZTAI 1959, 18, Pl. I. 3). Good analogies to this form can be quoted from the Gradina am Bosut site of the Vinkovci culture (TASIĆ 1984, Taf. III. 1–2) and the Szava site of the Somogyvár–Vinkovci culture (ECSEDY 1979, Taf. IX. 2). A neck fragment with a strap handle (Fig. 32. 1) probably comes from a tall

jug with conical neck. A variant with a slightly flattened body was found together with a vessel with asymmetric handle at Ivanka pri Nitre/Nyitraivánka (VLADÁR 1966, Abb. 28. 1). Tall handled jugs with curved neck, found together with several cups, are known from Szatymaz–Jánosszállás (KULCSÁR 2000, Fig. 2. 1, Fig. 6. 3). The Ada type finds from Radanovac (HORVÁTH 1984, 10, Tab. II. 1), Hajdukovo/Hajdújárás (HORVÁTH 1984, 13, Tab. III. 2, Tab. IV. 2), and Ásotthalom–Borgazdaság (HORVÁTH 1984, 15, Tab. V. 3) include cups resembling the Üllő jugs. J. Dani and G. Kulcsár published a catalogue of one-handled jugs in their study on the Jászdózsa burial (DANI–KULCSÁR 2000). The one-handled cups from the Makó–Kosihy–Čaka distribution reflecting influences of the Somogyvár–Vinkovci culture appear among the finds from the settlements and cremation burials of the late Makó period (DANI–KULCSÁR 2000, 46; KALICZ-SCHREIBER 1991, 10; KALICZ-SCHREIBER–KALICZ 1999, 85; KULCSÁR 2002, 56).

The ceramic inventory from Üllő corresponds to the usual assemblages from Makó settlements: it is dominated by pots and bowls, there are only a few jugs, and no cups. It includes one rather unusual vessel: the amphora with internal knobs. The settlement can be assigned to the Makó–Kosihy–Čaka culture in view of its pottery, which includes the culture's typical vessel types. One notable feature of the assemblage is that it contains wares typical for both the eastern and western region of the culture's distribution (biconical bowls with incurving neck and swollen rim; conical bowls with pronounced shoulder and everted rim; pots with triangular sectioned rim), similarly to the ceramic inventory from other sites in the Budapest area.

Other finds

A spindle whorl was recovered from Pit 7479. Similar finds can be quoted from several Makó sites, such as Kompolt (GOGÂLTAN 1999, Pl. 16. 18), Budapest–Aranyhegyi Road (KALICZ-SCHREIBER 1994, Abb. 10. 17), Mosonszentmiklós–Gyepföldek (ASZT 2001, 217), Bánov/Bánkeszi (VLADÁR 1966, Abb. 11. 7), and Male Kosihy/Ipolykiskeszi (TOČIK 1981, Tab. VIII. 1). Stone tools were only found in Pit 4683.

The moulds and the crucible: notes on casting techniques

The moulds and the crucible found at Üllő had both been used for casting metal articles. Even though traces or remains of metal from castings were not found on them, both the moulds and the crucible had been exposed to strong heat, for they were all burnt to great hardness. With the exception of one valve of mould 5, they were all intact and survived in an exceptionally good state of preservation. Cracks and other signs of damage, probably from the casting procedure, could be noted in the interior of moulds 4, 5, 7 and 8. Casting damages the interior of moulds and two-part moulds can therefore only be used once (DURMAN 1983, 78).

Each mould served for casting a single artefact only. None of the moulds had another matrix impressed into their side, a fairly common practice in the case of moulds for flat axes (e.g. Zók–Várhegy, Vučedol–Gradac, Ljubljansko Barje/Laibacher Moor–Ig), enabling the molten metal remaining from the casting of the flat axe to be immediately used (BRANIGAN 1974, 80–81; ECSEDY 1982, 84). This would suggest that the bronzesmith using the Üllő moulds was able to precisely estimate the amount of metal which could be melted in the crucible and the number of articles which could be cast from it. The pouring channel was hollowed into the shorter side of each mould (with the exception of no. 5); it was without exception carefully shaped into a funnel: on six pairs, an aperture was only made on one valve (nos 2, 3, 4, 7, 8, 9), and on both in one case (no. 10). Three moulds have a simple round pouring channel (nos 1, 5, 6).

Mould 1 served for casting a small socketed chisel with divided cutting edge (Fig. 9. 1–3, Fig. 17. 1). No comparable mould is known from the Early Bronze Age. I. Bóna mentions chisel moulds from Layers 1911/C5 and 1948/o of the Tószeg–Laposhalom settlement (BÓNA 1992, 50).

Moulds 2–3 and 7–8 were for flat axes (Fig. 9. 4–6, Fig. 10. 1–3, Fig. 12, Fig. 17. 2, Fig. 18. 1, Fig. 20. 2, Fig. 21. 1). The rather shallow matrix was hollowed into one valve of the moulds, the other valve – used as a cover – has a flat inner surface. The form of the artefact cast in the mould was burnt into the upper valve. A similar phenomenon could be observed on one of the moulds for an anchor shaped ornament brought to light from a pit of the Nagyrév culture at Diósd–Szidóniahegy (PATAY–PATAY 1965, 164, Fig. 6). It has been suggested that the flat axe cast in the moulds from Levels XIII–XIV of the Pécska tell (dating to the Middle Bronze Age) could have been fashioned into a flanged axe (VULPE 1975, 62–63, Taf. 35. 311–318). This possibility cannot be excluded in the case of the Üllő moulds either, because the mould itself is unsuitable for determining whether it had been used for casting a flat axe or a flanged axe (HUNDT 1982, 207). A similar flat axe from the Mala Gruda

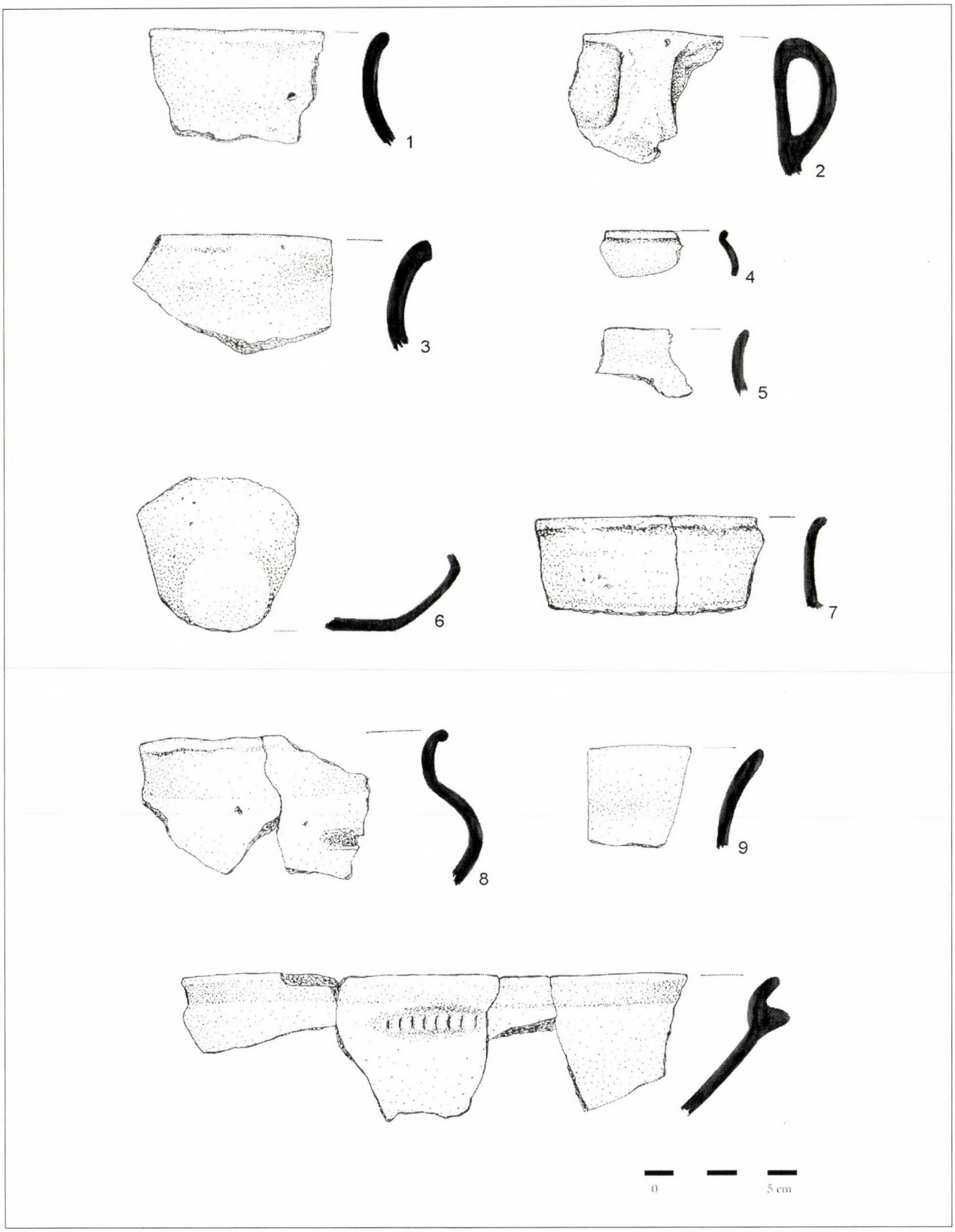


Fig. 32. Üllő. 1–7, 9; Pit 4035; 8, 10: Pit 4089

grave was probably cast in an open mould (PRIMAS 1996, 94). Small grooves were cut into two corners of mould 7, whose purpose was to allow the gases to escape during casting (Fig. 14. 1). Grooves serving as visual aids to ensure a correct location can be seen on mould 8 (Fig, 14. 2). These visual aids were crucial to the casting procedure since the precise location of the two halves of the mould ensured the quality of the cast artefact. The use of grooves and impressed dimples as visual aids for precise location was a general practice in the case of early moulds made from clay. Later, when moulds began to be carved from stone, these were replaced by dowels (BOČKAREV–LESKOV, 43–44). The form of the moulds similarly reflected the need for precise location. Some of the moulds (nos 1, 5, 6, 9, 10) have identical valves which can be easily fitted together. The two valves of the others (nos, 2, 3, 4, 7, 8) differ in size: their upper part is longer than the lower one accommodating the matrix.

Mould 4 was for a trapeze shaped flat axe (Fig. 10. 4–6, Fig. 18. 2). The matrices in the two valves of the mould have a differing depth, meaning that the cutting edge of the cast implement was asymmetrical. Its best parallel comes from Vučedol (SCHMIDT 1945, 103, Taf. 49. 2). Moulds for similar artefacts are known from the Vučedol settlements at Zecovi (COVIĆ 1976, T. I. 2) and Zók (ECSEDY 1982, 75, Pl. XI. 1, 3, 4, Pl. XII. 3), and they have also been reported from the Glina III–Schneckenberg culture (VULPE 1975, 62, Taf. 35. 321A). Moulds for a flat chisel have been brought to light at Saloš–Donja Vrba (LOZUK 1995, 57, Fig. 8). This implement was still used in the formative phase of the tell cultures, as shown by the moulds from Diósd–Szidóniahegy (PATAY–PATAY 1965, 164, Fig. 5), Tószeg (Layers 1911/C5 and 1948/0; MOZSOLICS 1952, 45, 47, Taf. XIV. 6, Taf. XVIII. 5). Sîntion (Ottomány culture; VULPE 1975, 62, Taf. 35. 319–320), and Pécska–Nagysánc (Level XIV; VULPE 1975, 62, Taf. 311–318). The moulds from the latter site include two-part, closed moulds made from sandstone (VULPE 1975, Taf. 35. 312). A stray piece came to light at Butimanu, from an Early Bronze Age context (ROMAN 1976, 28, Abb. 2. 12).

Mould 5 was used for casting a shaft-hole axe (Fig. 11. 1–3, Fig. 19). The greater part of the currently known Early Bronze Age moulds served for making this implement.[14] A recess was created for supporting the shaft core above the shaft-hole, similarly to one of the moulds from Zók–Várhegy (ECSEDY 1982, 75, Pl. X. 2, Pl. XIII. 1, Pl. XIV). The mould itself is less massive, it is hardly larger than the matrix, resembling the pieces from Vinkovci–Trznica (DIMITRIEVIĆ 1979, T. XLIII. 5; DURMAN 1983, 78, T. 1–3; DURMAN 1988, 133, 138, 139, 183–184, cat. nos 203, 210–213). Its walls are rather thin, meaning that the mould cooled quite rapidly, reducing the danger of cracks in the cast artefact (DURMAN 1983, 79). At the same time, the mould does not conform to the shape of the matrix as in the case of the moulds from Salzburg–Rainberg (PITTIONI 1954, 354, Abb. 251; MAYER 1977, 20, Taf. 5. 40), Ljubljana (KOROŠEC–KOROŠEC 1969, 40–41, 137–138, T. 104. 1–2), and Debelo Brdo (ČOVIĆ 1976, 107–110, T. II. 1; Dimitrievič 1979, T. XLIII. 7). The form of the axes cast in these moulds differed: for example, the section between the cutting edge and the shaft-hole of the axe cast in mould 5 from Üllő was straight, similarly to the pieces cast in the moulds from Debelo Brdo, Ljubljana, Salzburg and Domony (KALICZ 1968, 48, Taf. X, 1; KALICZ 1968a, 84–85).

The molten metal was poured into the mould by the lower section of the axe's shaft-hole, between the butt and the shaft-hole (Fig. 11. 2). There was no separate opening, as on the moulds from Vinkovci–TriŹnica (DIMITRIEVIĆ 1979, T. XLIII. 5; DURMAN 1983, T. 1. 1, T. 2. 1, T. 3. 1–2) and Zók–Várhegy (ECSEDY 1982, Pl. XII. 1, Pl. XIII. 3), which had a pouring channel at the cutting edge. A similar procedure has been assumed in the case of the moulds from Mala Gruda and Ljubljansko Barje/Laibacher Moor–Ig (PRIMAS 1996, 109).

The moulds for casting shaft-hole axes of the Vučedol culture date from the culture's middle and late phase (B–C) (DURMAN 1983, 80, 86; ECSEDY 1982; GALE 2002, 59–60). The moulds of the Makó culture from Domony (KALICZ 1968, 48, Taf. X. 1; KALICZ 1968a, 84–85), Salgótarján–Pécskő (KOREK 1968, 55–56, Taf. XII. 1–2), and Veľký Meder/Nagymegyer (HROMADA–VARSIK 1994, Obr. 1), as well as the fragmentary one found during a field survey in the Endrőd area, which can most likely be assigned to the Makó culture (MRT 8, 147–148, Pl. 19. 5), represent this type.

Mould 6 was used for casting a socketed chisel (Fig. 11. 4–6, Fig. 20. 1). No exact analogies from the Early Bronze Age are known either for the mould, or for the article cast in it. The form of the matrix recalls the socketed axes with a crescentic mouth, although the Üllő piece is slightly shorter, thicker and its mouth is not curved. A mould for a socketed chisel with crescentic mouth was brought to light at Pécska–Nagysánc (DÖMÖTÖR 1902, 273). One valve of another comparable mould from Domahida can be found in the collection of the Hungarian National Museum (HAMPEL 1896, 31). A mould for casting a socketed chisel has also been recovered from the early, Vatya layer of the Százhalombatta–Földvár settlement (POROSZ-

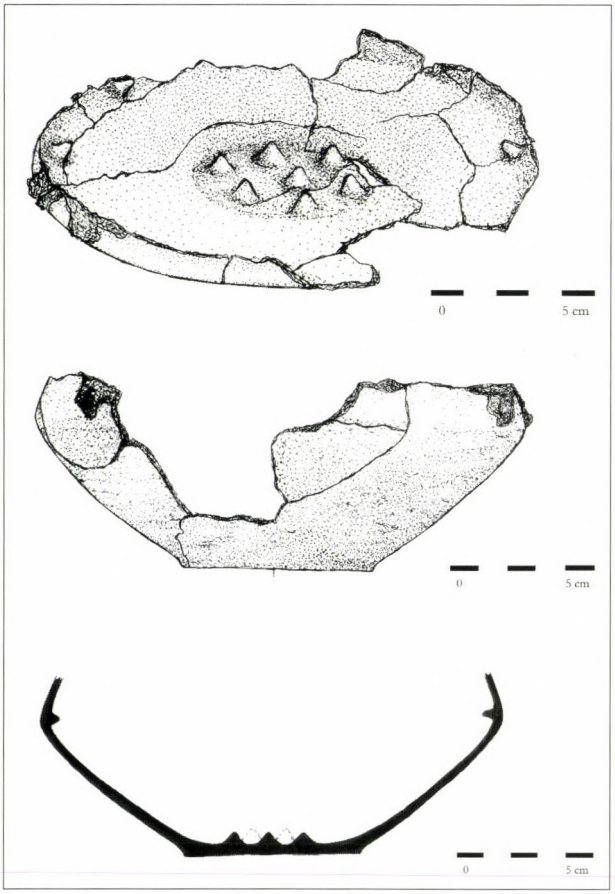


Fig. 33. Üllő. Pit 4067

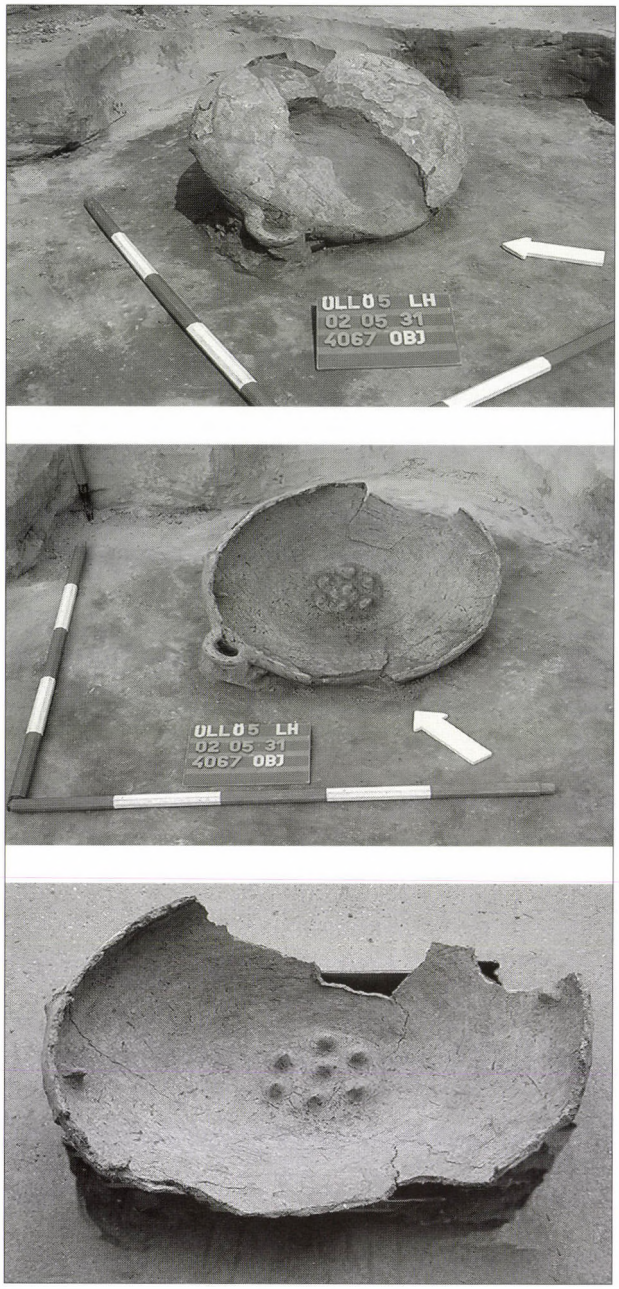


Fig. 34. Üllő. Pit 4067

LAI 2000, Fig. 17b; HORVÁTH–KOZÁK–PETŐ 2001, Pl. VII. 8).

It has been generally assumed that awls were made by cold hammering (DURMAN 1983, 85). The moulds from Sarvaš (DIMITRIEVIĆ 1979, T. XLIII. 3; DURMAN 1983, T. 4. 4–5) and Üllő (Fig. 13, Fig. 21.2–3) indicate that they had also been cast. The mould from the Somogyvár–Vinkovci settlement at Börzönce was used for casting pins or perhaps awls (BONDÁR 1995, 214–216, Pl. 181. 432).

The crucible is a large, carefully made piece (Fig. 14. 3, Fig. 15, Fig. 22). It has a slightly oval form, its walls are not too thick and it is well fired. There are two pouring lips along the rim. The raw material was heated in the crucible. The molten metal had to be poured into the mould as quickly as possible to prevent it from cooling below the necessary temperature. After removing the crucible from the hearth, the slag was removed by tilting the crucible to one side and the molten metal was then poured into the mould through the other pouring lip. Similar crucibles are known from Saloš–Donja Vrba (LOZUK 1995, Fig. 7). A comparable funnel shaped, but smaller and rather uneven, less carefully made specimen has been found on the Vučedol settlement at Zók–Várhegy (ECSEDY 1982, 79, Fig. 44), together with hemispherical pieces (ECSEDY 1982, 72, 79, Figs 38–40, Figs 42–43, Pl. X. 3). A more or less similar, funnel shaped (or better said, conical) crucible was unearthed at Vinkovci (DURMAN 1988, 133, cat. no. 203). Each of these finds, however, had a single pouring lip only.

The remains of a lime coating and soot smudging could be noted in the interior of each mould (with the

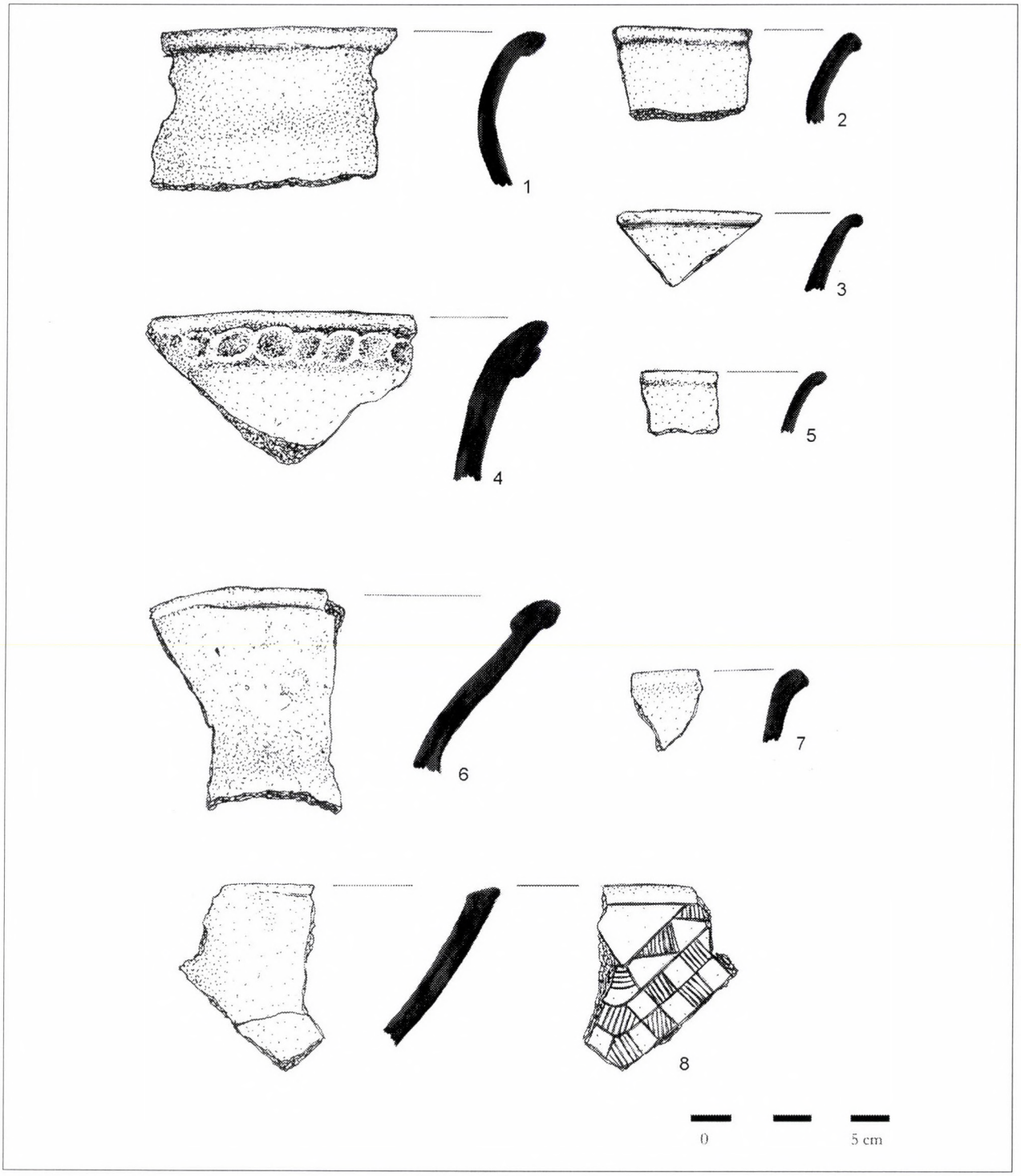


Fig. 35. Üllő. 1–8: Pit 4079

exception of no. 7) and the crucible. This coating was necessary for insulation and to ensure the smoothness of the cast artefact; in the case of the crucible, it aided slag formation (ECSEDY 1982, 83; TYLECOTE 1976, 33; BRANIGAN 1974, 70–71). At the same time, there was no trace of the incisions resembling a lattice pattern noted on the moulds from Zók, Sarvaš, Vinkovci, and Nagyárpád–Dióstető, which aided the even distribution and adherence of the lime coating (ECSEDY 1982, 79, 82).

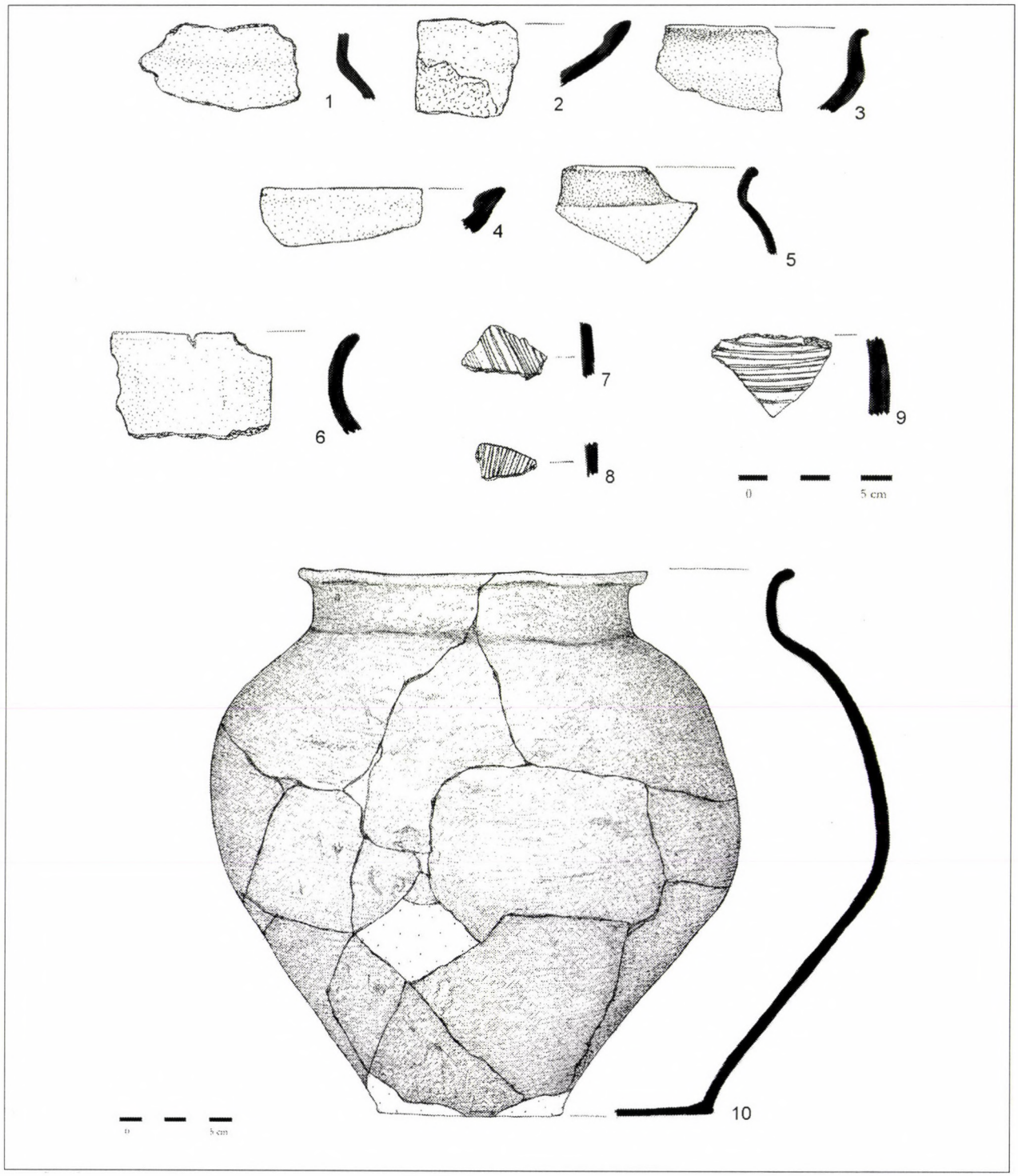


Fig. 36. Üllő. 1–5: Pit 4874; 6–8: Pit 4875; 9: Pit 5624; 10: Pit 5605

On the basis of their technological features, the moulds from Üllő can be assigned to Type 4, i.e. the closed, two-part moulds, in E. N. Chernykh's typological framework. This type was widely used in the Balkans and in the Carpathian Basin. Their appearance can be linked to the use of alloys in the Middle Bronze Age (CHERNYKH 1978, 139, Рис 72. 4). A. Durman has noted that two-part moulds were used from the classical Vučedol B1 phase to the late C phase (DURMAN 1983, 78). Dating from the turn of

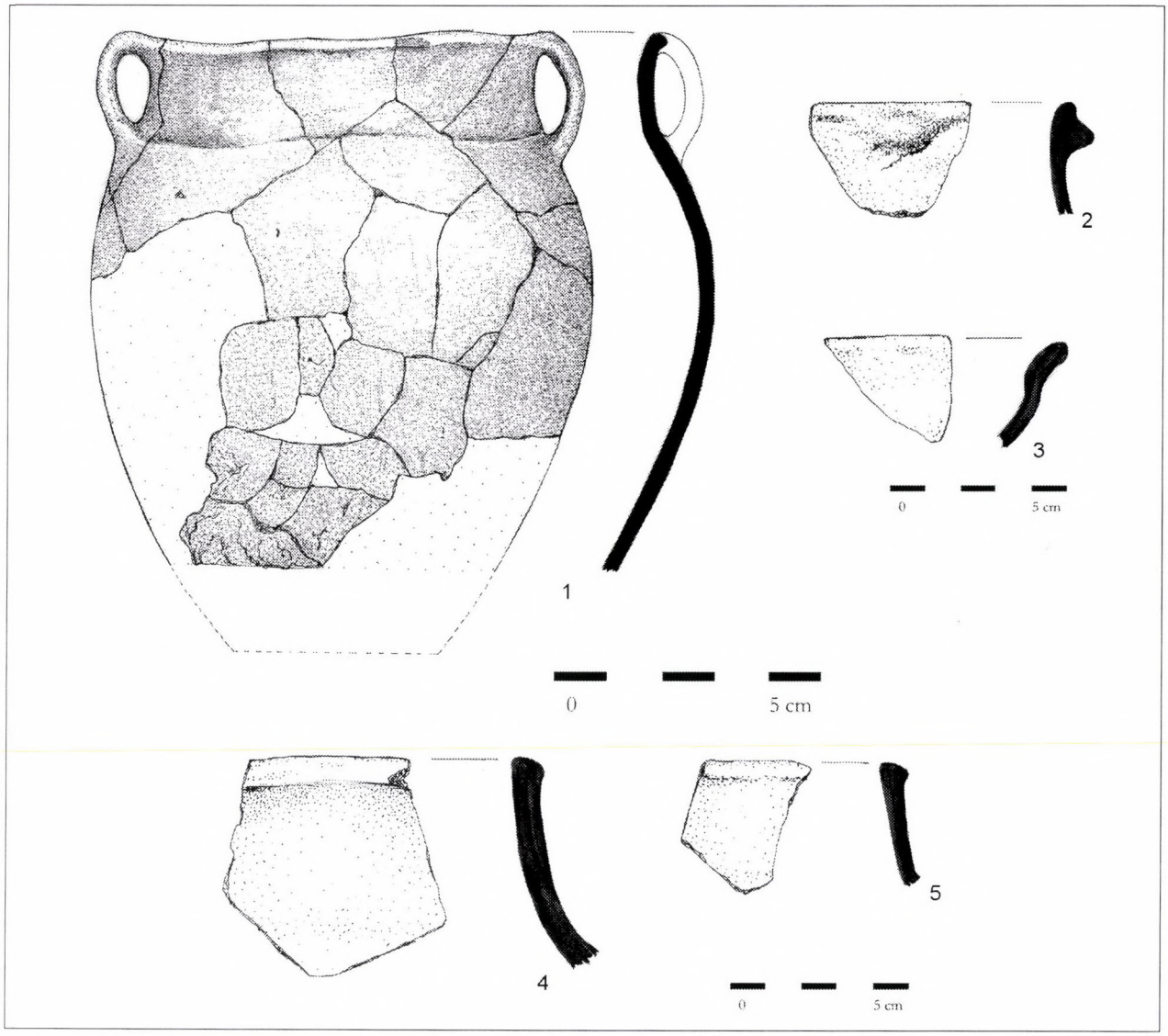


Fig. 37. Üllő. 1: Pit 5605; 2–3: Pit 5623; 4–5: Pit 5629

the Early and the Middle Bronze Age, the finds from Üllő represent the currently known earliest examples of closed, two-part moulds.

The moulds and the crucible were both carefully made, with accurately made matrices. The similarity between the moulds and the identical form of the pouring channel suggest that the moulds had been made by a metalsmith, who had an excellent command of his craft. This knowledge was no doubt reflected in the quality of the artefacts cast by him.

The artefacts cast in the moulds

The matrices on the ten two-part moulds served for casting different implements: socketed chisels, flat axes, a shaft-hole axe of the Kömlőd type and awls. A part of these implements conforms to the tool types known from various Early Bronze Age assemblages (ECSEDY 1982, 84, with further literature). However, the presence of two moulds for socketed chisels in this early period came as a surprise.

Mould 1 served for casting a small socketed chisel. A long, convex rib running parallel to the long axis of the mould from the cutting edge was created in the matrix on one half of the mould, which appeared as a shallow groove from the cutting edge on the cast implement, i.e. the chisel had a divided cutting edge. It seems likely that this division played a role in the use of the chisel for woodworking, enabling the wood chips to fall more easily. No socketed chisels were previously known among Early Bronze Age metal finds. Until now, the earliest pieces came from Layer

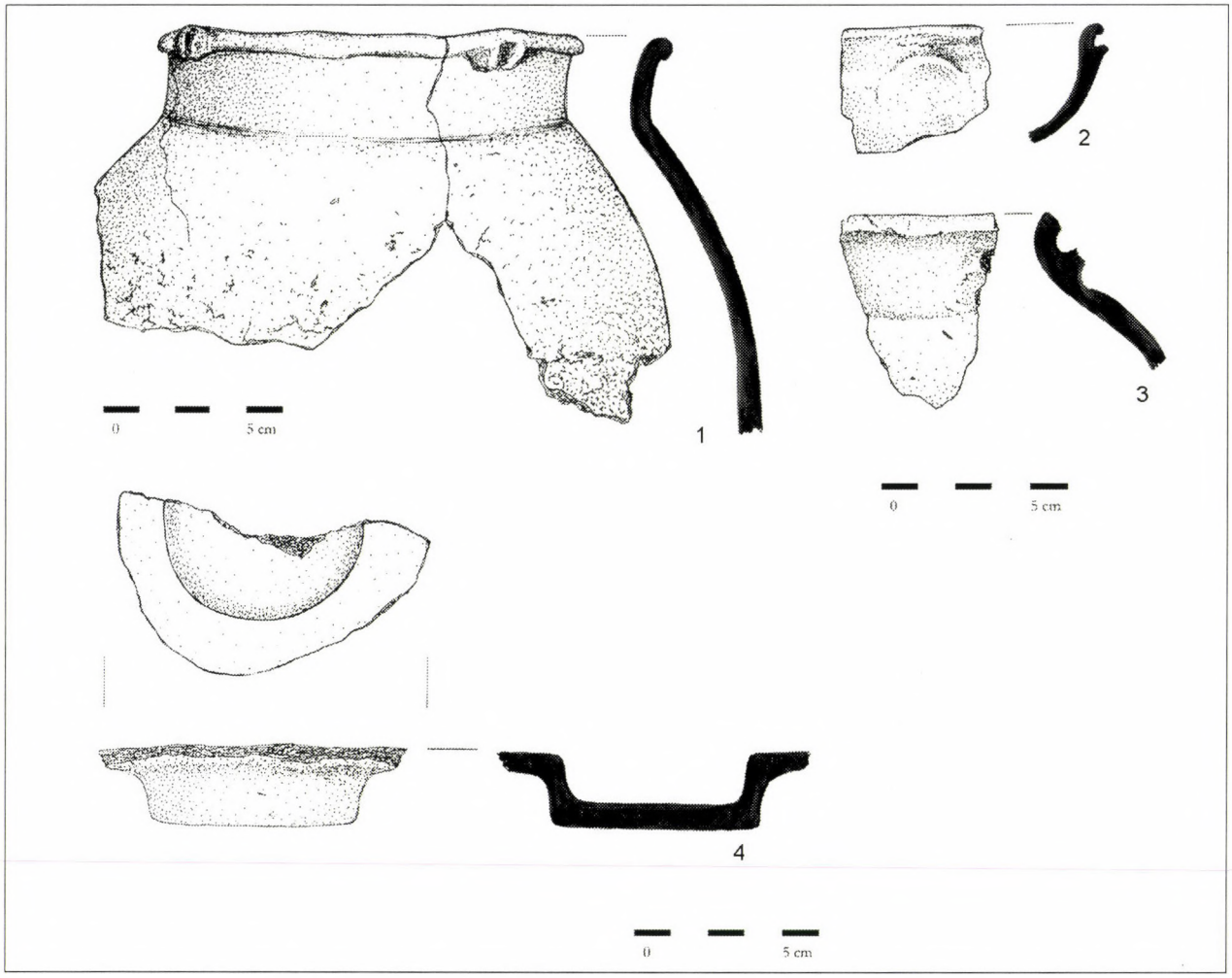


Fig. 38. Üllő. 1–4: Pit 7479

1974/XVI (classical Nagyrév culture, period A) of the Tószeg–Laposhalom tell (BÓNA 1978–79, 99; BÓNA 1992, 50),[15] from a bronze hoard found in Somogy county (MOZSOLICS 1967, 63, Taf. 38. 1), and from Kamendin/Kéménd (MOZSOLICS 1967, 143); later pieces include the ones from Tószeg B (Hatvan culture) and Tószeg C (Füzesabony culture) (BANNER– BÓNA–MÁRTON 1959, Abb. 23. 5a–b; BÓNA 1978–79, 99; BÓNA 1992, 50), as well as the specimens deposited in Koszider type hoards, such as Hoard I from Dunaújváros–Kosziderpadlás (MOZSOLICS 1967, 63, Taf. 46. 3) and the bronze hoard from Kölesd–Nagyhangos (MOZSOLICS 1967, 151, Taf. 31. 121). Another specimen has been recently found at Százhalombatta–Földvár (POROSZLAI–VICZE 2003, 292–293) and a small burin was brought to light on the Hatvan settlement at Galgahévíz–Szentandráspart (KŐVÁRI 2003).

Flat axes were widely used tools in the 4th–3rd millennium BC (PRIMAS 1996, 94–95; VULPE 1975, 62; ŽERAVICA 1993, 50–63). Most of the known pieces are stray finds, although some have been found on settlements, in burials and in hoards.

Five different types of flat axes could be cast in the Üllő moulds. The pieces which could be cast in moulds 2 and 3 would have been very thin (no more than 2–3 mm) and curved. No analogies to these curved implements are known from the Early Bronze Age, or from the preceding or subsequent periods.

Mould 7 served for casting a similarly thin, but straight flat axe with a straight cutting edge. M, Kuna assigned the similar trapeze shaped, thin flat axes to the Baranda type in his typological scheme (KUNA 1981, 21, 60, Taf. XXIV. 7–8, XXVI. 10). The best parallel to the Üllő axe comes from Stara Palanka (KUNA 1981, 60, Taf. XXIV. 7), Ariuşd/Erősd (upper layer, Schneckenberg B period; SZÉKELY 1997, 66, Pl. XCI. 9), and Tápé, where it was found together with two shaft-hole axes (TROGMAYER 1957, 21; KOVÁCS 1996, 118. Abb. 2). This axe type was

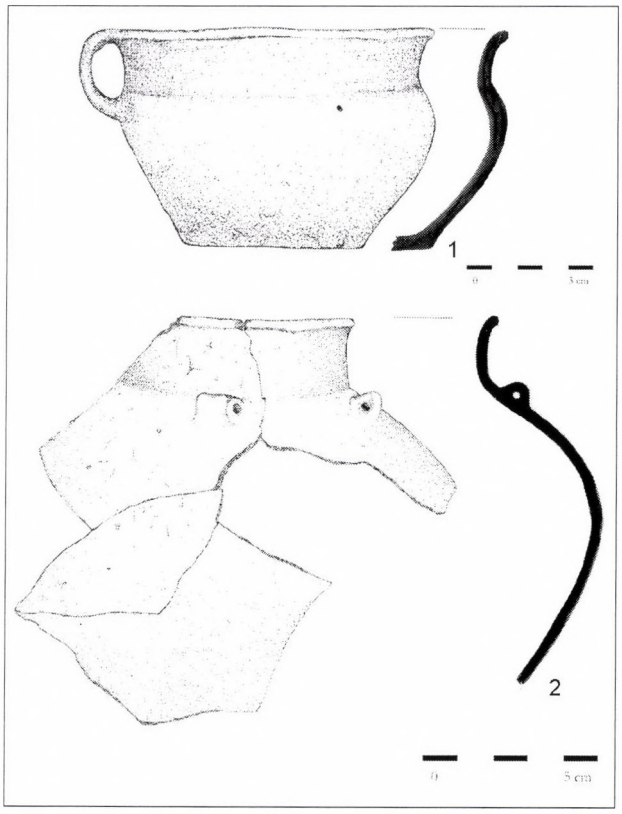


Fig. 39. Üllő. 1–2: Pit 7479

widespread in the Balkans and in the Aegean (BRANIGAN 1974, 24, 166, Pl. 13. 597, 601): comparable pieces are known from Vučedol (SCHMIDT 1945, 103, 206, Taf. 49. 2), the Mala Gruda burial (PRIMAS 1996, 93–97, Abb. 7. 1, 2), the Petralona hoard and an unprovenanced hoard in the National Museum of Athens (ΓΡΑΜΜΕΝΟΣ-ΤΖΑΧΙΛΗ 1994, 76–89, Εἰχ. 1–3, 7–10). The Vinča type flat axe can perhaps also be assigned to this group (ŹERAVICA 1993, 57–58, 167–168). The Brno–Lišeň hoard, which also contained a flat axe, provides an important anchor for the chronology of these axes since the hoard could be dated to the Jevišovice B period of the settlement (BENEŠOVÁ 1956, 238, Obr. 1. 4, Obr. 2. 4). It must nonetheless be borne in mind that only the pieces from Tápé and Stara Palanka are as thin as the ones which had been cast in the Üllő mould.

Mould 4 served for casting a trapeze shaped, straight, roughly 1 cm thick flat axe with an asymmetric cutting edge. This axe type is known from the Dunakömlőd hoard (ROSKA 1957, Fig. 1. 2, 7, 9; MOZSOLICS 1967, Taf. 1. 1–2), Vučedol (SCHMIDT 1945, 103, 206, Taf. 49. 2), and the Brno–Lišeň hoard (BENEŠOVÁ 1956, 238, Obr. 1. 4, Obr. 2. 4).

The best parallel to the flat axe cast in mould 8 is a stray find from Stankovci in central Dalmatia. Z. Źeravica interpreted this small axe as a ritual object or a symbol of rank, and dated it to the Late Copper Age (ŹERAVICA 1993, 56–57, Taf. 15. 163). A small flat chisel is known from Leliceni/Csíkszentlélek (ROMAN–DODD-OPRIŹESCU–JÁNOS 1992, 159, 230, Taf. 79. 4). The hoard found at Ostrovul Corbului included a few small flat axes, but their form differs markedly and they were probably used as raw material (VULPE 1975, 60, 63, Taf. 33. 274–288). G. Bándi mentioned a flat, trapeze shaped bronze axe from Szemely–Poljanak-Törökdomb, a site of the Somogyvár–Vinkovci culture (BÁNDI 1979, 71).

The shaft-hole axe which could be cast in mould 5 can be assigned to the Kömlőd type (MOZSOLICS 1967, 15–17, Abb. 1B). This axe type has variously been described as Dumbrăviora, Kozarac and Stublo type (VULPE 1970, 31–32; ŹERAVICA 1993, 28; NOVOTNÁ 1970, 29–30). The axe itself probably represents the same basic type, distributed over an extensive area, which had several regional variants (DURMAN 1983, 64–65; KOVÁCS 1996, 115; GOGÂLTAN 2000, 233–234; HORVÁTH 2001, 53). Many specimens of this type dating to the very end of the Copper Age and Early Bronze Age have been found in the extensive area from the northern Pontic to northern Greece and the Alpine region (BÁTORA 2002; DÉNES–V. SZABÓ 1998, ECSEDY 1982, 84–85, GOGÂLTAN 2000, 231–235; HORVÁTH 2001, 54; KALICZ 1968, 46–49; KOVÁCS 1996, 115–119, Abb. 1; KUNA 1981, 36; MAYER 1977, 20–23; MOZSOLICS 1967, 15–17; NIKOLOVA 1999, 294–295; NOVOTNÁ 1970, 29–30; PRIMAS 1996, 152–155; VULPE 1970, 6–13, 39–41, Taf. 44. B; ŹERAVICA 1993, 22–32). Kömlőd type axes were still in use during the Early Bronze Age 3 period, as shown by the specimen from Mokrin (Grave 208; GIRIĆ 1971) and the one from the Hatvan settlement at Emőd–Nagyhalom (KOÓS 1993, 5, 9, Pl. 1. 2). I. Bóna assigned the stray pieces from Békásmegyer, Budapest–Óbuda, Érd, Csepel–Little Danube to the Nagyrév period (BÓNA 1992, 50, KŐSZEGI 1957, Pl. VI. 1–2). Several suggestions have been made as to the function of these axes: the use-wear traces and the signs of damage on their cutting edge indicated that they had served as both tools and weapons. The specimens without any traces of use-wear can probably be interpreted as symbolic artefacts or trade items (MOZSOLICS 1967, 15–17; ŹERAVICA 1993, 27–28). The axe from Mala Gruda, made from silver containing a significant amount of gold, was no doubt a symbol of high prestige (PRIMAS 1996; ŹERAVICA 1993, 28).

The socketed chisel with ribbed mouth made in mould 6 was until now unknown in Early Bronze Age

metalwork. It is related to the socketed chisels with a crescentic mouth, although it is slightly shorter and less slender in form, with the ribs appearing on and under the mouth forming a straight and not a curved line. In his publication of the Balatonakali grave, I. Torma provided an excellent overview of the socketed chisels with crescentic mouth (TORMA 1978, 18–19). He traced the ancestry of this artefact to the late Aunjetitz culture, suggesting that it was transmitted to the Carpathian Basin by the Gáta–Wieselburg culture. He dated the metal finds and the grave itself to the Kisapostag 3 period, to the final phase of the Early Bronze Age–the initial phase of the Middle Bronze Age. I. Torma noted that the early appearance of the chisel was surprising and that the specimen from Balatonakali can be regarded as one of the earliest ones (TORMA 1978, 18, 24). This date was rejected by G. Vékony, according to whom this artefact type (which he labelled ribbed socketed chisel) was much later, meaning that the Balatonakali grave and its finds could hardly predate the Reinecke BA/BB transition (VÉKONY 2000, 178). J.-H. Hundt regarded socketed chisels with crescentic mouth and the similar spearheads from the Carpathian Basin as evidence for the south-eastern contacts of the Aunjetitz culture. He linked the first widespread use of tin bronzes to the Aunjetitz culture (HUNDT 1982, 217, Abb. 5). M. Novotná too linked the chisel from Balatonakali to the Aunjetitz culture, and quoted the chisels from the Vedrovice burial in southern Moravia and the Billendorf hoard in Lower Austria as related finds (NOVOTNÁ 1997, 353). The chisel with ribbed mouth cast in the Üllő mould can be regarded as a model or an early variant of the pieces with crescentic mouth appearing at the close of the Early Bronze Age and the onset of the Middle Bronze Age, which would explain its appearance in assemblages whose date seems surprisingly early. The presence of the socketed chisel mould at Üllő is a reflection of the contacts between the Carpathian Basin and more westerly regions at the close of the Early Bronze Age and it is also a valuable piece of evidence for the cultural and chronological determination of the period marked by the appearance of artefacts made from tin bronze, ushering in Middle Bronze Age metalwork.

Copper awls are known from several Early Bronze Age assemblages, e.g. from Vučedol (SCHMIDT 1945, Taf. 48. 24–26), the Brno–Lišeň hoard (BENEŠOVÁ 1956, 238, Obr. 1. 4, Obr. 2. 4), Leliceni/Csíkszentlélek (ROMAN–DODD-OPRIȚESCU–JÁNOS 1992, 159, 230, Taf. 79. 3), Ariușd/Erősd (SZÉKELY 1997, 66, Pl. XCI. 10), and Pfatten in southern Tyrol (OBERRAUCH 2000, 481) amongst others. An awl was also found at Tiszaug–Kéménytető, but without a closer context (CSÁNYI–STANCZIK 1982, Fig. 9. 4).

Stone tools

During the Early Bronze Age, the surface of cast artefacts was worked by hammering; the casting flaws were removed by working the cooled artefact after casting (DURMAN 1983, 78; HUNDT 1982, 207; PRIMAS 1996, 94, 107). Two stone artefacts were found in the lower part of the pit which had contained the moulds: the fragment of a triangular shaft-hole axe with a vertical cutting edge and a flat butt (Fig. 16. 1, Fig. 23. 2) and a quadrangular stone polisher or grinder (Fig. 16. 2, Fig. 23. 1).[16] Traces of wear can be made out on the cutting edge of the large stone axe. The axe was broken at the shaft-hole: a new cutting edge was created and an attempt was made to bore a new shaft-hole through it (Fig. 23. 2). The axe was carved from diabase, a rock whose closest source to the Üllő site lies in the Bükk Mountains. The other artefact, the rather worn polisher or grinder, was made from phonolite. This rock only occurs in the Mecsek Mountains in the Carpathian Basin. Both diabase and phonolite are hard, resistant rocks. The stones found under the moulds were andesite, which probably originated from the andesite deposits in the Cserhát or Mátra Mountains.[17] The moulds may have been deposited after the infilling of the late Makó pit (see below), and it is therefore uncertain whether the finds from the pit can be associated with the moulds and the crucible.

Be as it may, various stone artefacts have been interpreted as tools used by early metalsmiths. Broken stone axes resembling the one from Üllő have been found in association with moulds at Ezero (GEORGIEV–MERPERT–KATINČAROV–DIMITROV 1979, 537–538, Taf. 5–8), Leliceni/Csíkszentlélek (ROMAN–IÁNOS–HORVÁTH 1973, Pl. 7. 6; ROMAN–DODD-OPRIȚESCU–JÁNOS 1992, 154–155. Taf. VI. 14–16, Taf. 67. 1–3, 6–8, 10–11, 13–15, Taf. 68. 1–11, 13–14, 17, Taf. 79. 1), Vučedol (SCHMIDT 1945, Taf. 49. 3–8), and various other sites. At the Diósd–Szidóniahegy site of the Nagyrév culture, an axe, a hammer stone and a broken stone polisher with wear traces were found together with moulds (PATAY–PATAY 1965, 165). According to a report from 1885, two polished stone axes, bronze lumps and pottery sherds (probably of the Vatya culture) were found "on a burnt platform among ashes" at Szigetmonostor, at the northern end of the Göd Great Island (MRT 7, 302).

A broken perforated stone axe and a stone polisher/grinder were brought to light at the Tarnabod

site of the Makó culture (KALICZ 1998, 13, Fig. 12. 8); an axe fragment was recovered from one of the pits uncovered at Tiszapüspöki–Karancs-Háromág-dűlő (CSÁNYI–CSEH–TÁRNOKI 2002, 49), while a broken stone axe and two polished stone chisels were found in a secondary position together with Makó sherds at Dvory nad Žitavou (VLADÁR 1966, 256, 296–297, Abb. 16. 3–5).

By the end of the Early Bronze Age, the beginning of the Middle Bronze Age, metalworking had reached a level when ore mining, smelting and casting had become separate branches. The smelting of the metal ores and their preparation for casting was usually performed at the same location, where the ores were mined. Bronzesmiths generally worked with ingots (usually in the form of torcs), which were distributed through long-distance trade (TYLECOTE 1976, 16, Fig. 4). Casting artefacts in closed moulds called for great technical skills, which would have made their subsequent working unnecessary. It must therefore again be emphasized that the association between the two stone artefacts and the metalsmith's equipment, the moulds and the crucible, is tentative at the most.

Results of the fabric analyses

The analyses yielded the following results (cp. Table 1 for details):[18]

1. Ground bone was mixed into the clay from which the moulds were fashioned.

2. The white coating in the interior of the moulds was calcium carbonate ($CaCO_3$), i.e. lime. This is additional evidence for a technological procedure used in the Early Bronze Age.

3. The samples taken from the interior of the moulds contained significant amounts of lead (Pb), arsenic (As) and bismuth (Bi).

It must be borne in mind that since the analyses were not made on samples taken from bronze artefacts, the analytical results are unsuitable for drawing far-reaching conclusions concerning the composition of the metal used for casting. It is entirely accidental how much of the metal remains in the mould after casting (none remains in an ideal case, this being the purpose of the lime coating!) and to what extent the metal is contaminated with trace elements in the soil in which it lies buried.

The metallographic analyses of various metal artefacts have revealed that they were made of copper in the Early Bronze Age 1–2, and that other elements (lead, nickel, zinc, iron, bismuth) were impurities occurring in native copper. Experimentation with alloying copper and arsenic had already begun (SCHALK 1998, 126). It has been suggested that copper alloyed with arsenic should be regarded as bronze (HUNDT 1982).

The metal surviving in the Üllő moulds correspond to the Early Bronze Age usage of metal ores (SCHALK 1998, 126). Experimentation with the use of arsenic had probably begun by this period, and high concentrations of lead and bismuth have been demonstrated for Early Bronze Age metal finds from the Carpathian Basin.[19] It is difficult to determine whether the occurrence of a particular element is the result of alloying or simply accidental (CHERNYKH 1992, 17). Values over 1.5–2 per cent are usually regarded as alloys. The samples taken from the surface of the Üllő moulds, however, do not allow any far-reaching

Table 1. Results of the fabric analyses of the Üllő moulds

	As	B	Ba	Bi	Co	Cr	Cu	Ga	Mn	Ni	Pb	Sr	Ti	V	Zn
interior of mould 5	250	40	400	60	–	25	25	10	400	10	250	250	2500	–	<100
exterior of mould 5	160	40	400	–	–	16	16	<10	400	10	100	100	1600	–	<100
interior of mould 8	250	40	400	250	–	10	16	–	400	<10	600	160	1600	–	<100
exterior of mould 8	160	40	400	60	–	10	16	–	400	<10	250	250	1600	–	<100
sample from mould 5	–	60	600	–	10	160	100	16	400	60	40	160	2500	25	100
statement limit	160	10	100	60	16	10	10	10	100	10	16	100	100		100
Average of deposits															
Vinogradoy 1962	6,6	100	800	0,01	20	100	57	30	670	95	20	450			80
Turekian-Wedepohl	6	88	700		20	47	66	13	1000	69	25	600			66
1961															

conclusions as regards arsenic copper ores, the possibly conscious choice of ores or the problems of alloying.

Chronology

Three main points must be considered in the determination of the chronological position of the finds from Üllő: the type of metal artefacts cast in the moulds, the radiocarbon dates for the samples taken from two settlement features, and the pottery finds.

In spite of the many analogous finds and the similarities in manufacturing techniques, the artefacts cast in the Üllő moulds cannot be assigned to the earliest metal horizon characterised by Vučedol and Makó metalwork, and the Fajsz, Bányabükk and Corbasca type shaft-hole axes of the Early Bronze Age 1 (DANI 2000; ECSEDY 1982; MOZSOLICS 1967, 120–121; VULPE 1970, 28–29). Unlike the assemblages from Zók–Várhegy (ECSEDY 1982, Taf. XIV. 1, 2, 3 6) and Vinkovci–Trźnica (DURMAN 1983, T. 1. 1, 2, T. 2. 1), the moulds from Üllő do not include one for Bányabükk type axes. The artefact types are undoubtedly later than the ones in the hoards from Brno–Lišeň (Staré Zámky; BENEŠOVÁ 1956), Griča (ŹERAVICA 1993, 24–25, Taf. 6. 57–59, Taf. 60–67), Kozaraci (ŹERAVICA 1993, 23–24, Taf. 6. 48–56), Ostrovul Corbului I (VULPE 1970, 30, Taf. 4. 44–47, Taf. 65. E) and Vranovci (ŹERAVICA 1993, 25, Taf. 7. 70–72).

This typology is confirmed by the radiocarbon date for the Brno–Starý Lískovec site dating to the Jevišovice B period (2890–2770 BC),[20] which provides a reliable anchor for dating the Brno–Lišeň (Staré Zámky) hoard (BÁTORA 2003, 13). The dates for the Mala Gruda burial mound and the related Velika Gruda burial (2800–2700 BC) indicate a date at the beginning of the Early Bronze Age (PRIMAS 1996, 154). The date for Pit 34 of the Zók site is 2875–2501 BC (PRIMAS 1996, 168; NOVOTNÁ 1998, 351). Each date is earlier than the ones for the Üllő pits (see below).

The shaft-hole axe and the flat axe which could be cast in mould 4 appear in the Kömlőd hoard (MOZSOLICS 1967, 121, Taf. 1. 1–8), although it must be noted that both types were used over a fairly long period of time. The socketed chisels cast in moulds 1 and 6 were not known from Early Bronze Age contexts until now – their closest analogies come from the second half and the close of the Early Bronze Age and the beginning of the Middle Bronze Age. The metal types of the Hajdúsámson horizon do not appear among the artefacts cast in the Üllő moulds (MOZSOLICS 1967, 121–123). The horizon marked by the Veselinovo, Pădureni, Monteoru, and Pătulele type axes is also later than the artefacts cast in the Üllő moulds (VULPE 1970, 13). A. Vulpe dated the Veselinovo II type to the earliest period, to the turn of the Early and Middle Bronze Age in Romania (VULPE 1971, 37).

In view of the above, the artefacts cast in the Üllő moulds can be assigned to the Kömlőd metal horizon. They represent the final phase of this horizon, the period when the earliest variants of the metalwork typical for the Reinecke A period make their appearance (MOZSOLICS 1967, 121).

The radiocarbon dates for the animal bones from two features are the following[21]:

Sample code	Sampled settlement feature	$\delta^{13}C$ (PDB) [‰]	Conventional radiocarbon age (BP)	Calendar age* 1δ (calBC)
deb-10842	Pit 5605	–19.7	3900±50	2470–2340
deb-11907	Pit 3627	–20.32	3790±55	2300–2130

* Calibrated using the RADIOCARBON CALIBRATION PROGRAM REV. 4.4.2 software

The two dates suggest that the Üllő settlement can be assigned to the late Makó period (probably the final horizon on the southern Pest Plain). Very few radiocarbon dates are available for the Makó culture. The dates for Szeghalom–Környe (2566–2542, 2502–2448, 2434–2346 BC; RACZKY–HERTELENDI–HORVÁTH 1992, 42–44) are slightly earlier than the ones for Üllő. Only BP dates have been published for the late Makó pit uncovered at Battonya–Georgievics-tanya (3870±40 BP; BONDÁR–MATÚZ–SZABÓ 1998, 19, note 7). A date for a feature representing the Makó/Somogyvár–Vinkovci transition has been published from Győrszemere–Tóth-tag (2473 BC; FIGLER 1996, 8). The date for Pit 5605 falls into the same rather broad chronological horizon as the Vinkovci–Hotel site representing the latest Vučedol period (2460–2146, 2455–2140 BC; DURMAN–OBELIĆ 1989, 1004; FORENBACHER 1993, 242), the Budapest–Csepel–Hollandi Road site of the Bell Beaker–Csepel group (2420–2404, 2432–2392, 2382–2352 BC; KALICZ-SCHREIBER–KALICZ 2000), the early Nagyrév period of the Bölcske–Vörösgyír settlement (2448–2436, 2344–2264, 2262–2202, 2456–2418, 2406–2286 BC), the Nagyrév layers of the Tószeg–Laposhalom tell (2460–2432, 2392–2382, 2352–2192 BC) and the Hatvan period of the tell settlement at Jászdózsa–Kápolnahalom (2450–2430, 2400–2370, 2360–2130 BC; RACZKY–HERTELENDI–HORVÁTH 1992, 42–44). The date for Pit 3627 is slightly later and can be correlated with the one for

Grave 208 from Mokrin (2200–2020 BC; Gogâltan 2000, 233). The finds from this pit reflect the cultural impact of the Somogyvár–Vinkovci and the Nagyrév cultures. This period corresponds to the close of the Early Bronze Age 2/beginning of the Early Bronze Age 3 period and the beginning of the Reinecke A phase in the Carpathian Basin. The two dates suggest that the Üllő site was occupied over a rather long period. Taking the mean value of the two dates (2405–2215 BC), this means a two hundred years long occupation. However, the lack of remains indicating a permanent occupation would rather suggest brief, recurring occupation, with groups returning to the Üllő site several times during the Early Bronze Age 1–2 period.

The formal and stylistic traits of the pottery finds offer good anchors for determining the chronological position of the settlement within the Makó sequence. The appearance of one-handled jugs such as the ones from Pit 3627 (Fig. 28. 2, Fig. 29. 3) can be definitely linked to the impact of the Somogyvár–Vinkovci culture. They are best matched by a jug from a burial uncovered at Hódmezővásárhely–Gorzsa-Czukor-tanya, where it was found together with an amphora, which parallels the amphora from Pit 7479 at Üllő (Fig. 39. 2). The burial also yielded a vessel with asymmetric handle. The grave was dated to the late phase of the Makó culture on the basis of its finds (TÓTH 2002, 44). The best analogies of the wide mouthed, one handled bowl from Pit 7479 (Fig. 39. 1) can be quoted from find assemblages foreshadowing the early Nagyrév culture. The urn with internal knobs from Pit 4067 (Figs 33–34) falls into the same period, marking the emergence of Bronze Age tell cultures. The variants of bowls with interior decoration characterised by less elaborate patterns (coarsely incised shallow linear patterns, rows of punctates highlighted with lime encrustation) without a cross-shaped low pedestal are again typical for the late Makó period (KULCSÁR 1999, 121–123). Decoration in this style can be noted on two bowl fragments from Üllő (Fig. 27. 1, Fig. 35. 8). The Oszlár–Nyárfaszög settlement excavated by J. Koós, where a cup of the Nyírség culture was found in a Makó settlement feature, can be similarly assigned to the late period (KOÓS 1998, 10, Abb. 13). On the basis of the quoted analogies and its cultural contacts, the Üllő site can be assigned to the late Makó horizon and the end of the Early Bronze Age 2 period (BÓNA 1992, 16; KALICZ-SCHREIBER–KALICZ 1999, Fig. 2; KALICZ-SCHREIBER–KALICZ 2002, 46, 56, Fig. 1; KULCSÁR 1998, 38, 40; KULCSÁR–DANI 2000; V. SZABÓ 1999, 54; TÓTH 2002, 44–45), represented by the settlements at Budapest–Aranyhegyi Road (KALICZ-SCHREIBER 1994), Čaka/Cseke (VLADÁR 1966, 255–256, Abb. 13–15), Kajárpérc–Pokolfadomb (FIGLER 1996), Oszlár–Nyárfaszög (KOÓS 1998; KOÓS 1999), Szeghalom–Környe (SZÉNÁNSZKY 1987–88, 146, 152, Fig. 8 1–2, 4, 6, Fig 9. 2, Fig. 11. 2), etc., and the burials uncovered at Békéscsaba–Alvégi-legelők (MRT 10, 211–212, Fig. 41), Hódmezővásárhely–Gorzsa-Czukor-tanya (GAZDAPUSZTAI 1959), Jászdózsa–Kápolnahalom (DANI–KULCSÁR 2000), Kompolt–Kistér (GOGÂLTAN 1999), Tata–Tófarok (VADÁSZ–VÉKONY 1979, 59–60, Pl. II; KALICZ-SCHREIBER 1991, 11, Fig. 4). It would appear that similarly to north-eastern Hungary (KOÓS 1998; KOÓS 1999) and Slovakia (BÓNA 1992, 16; KALICZ-SCHREIBER 1994, 42), the survival of the Makó culture must also be reckoned with in the Pest Plain.

Interpretation of Pit 5605 and its finds

The following points must be taken into consideration in the interpretation of the pits and its find:

– The mould and the crucible were deposited in the northern part of the pit at a rather shallow depth. Unworked stones and pottery sherds lay under them. These finds came to light from a layer which differed visibly from the fill of the pit. The pottery sherds came from the vessel lying on the floor of the pit. The two stone implements lay opposite the moulds, by the pit's southern side. The different fill was not visible before the cleaning of the pit was begun and neither could it be noted while cleaning the pit's southern half. This is why it cannot be established whether the stone artefacts had been deposited together with the moulds or earlier, together with the vessels.

– The pale, but visibly differing fill may have been a later intrusion or the remains of some organic substance or both. The craftsman had perhaps wrapped his equipment in a leather (?) bag before concealing it. The position of the moulds and the crucible suggest that this bag had been laid on its side.

– Most of the other currently known Early Bronze Age moulds and crucibles are broken: they had been thrown away after casting as unnecessary refuse. In contrast, the moulds and the crucible from Üllő are undamaged and they were apparently carefully packed together before their concealment. it is quite possible that the craftsman had intended to return and retrieve his equipment.

– The finds of metalworking activity were recovered from a single pit only. We did not find any tuyères or their fragments (HUNDT 1988; TYLECOTE 1976, 17) and neither were there any indications of the one-time presence of smelting furnaces.

However, it must be borne in mind that we did not excavate the entire settlement and that some features may have been destroyed during the mechanical removal of the topsoil. It is therefore impossible either to prove or to reject the possibility of metallurgical activity at the Üllő site.

– Even without the relics of metallurgy, Pit 5605 was no simple refuse pit. Its fill did not contain any pottery sherds or animal bones. The two vessels on the pit's floor had been broken before their deposition.

One of the crucial issues in the interpretation of the finds is the relation between the pit and the metalworking equipment. Were the moulds, the crucible and the other finds from the pit part of the same assemblage? Put in another manner, were the metalworking implements deposited at the time when the pit was dug or at a later date?

As noted in the above, the pottery sherds under the moulds and a few tiny fragments in the fill came from the vessels lying on the floor of the pit. This would imply that, being part of the same assemblage, the moulds and the finds on the pit's floor were contemporary, and thus the radiocarbon date for the pit can be regarded as providing the age of the moulds and crucibles. The broken vessels on the pit's floor suggest the possibility that the assemblage represents a relic of some ritual activity, perhaps a sacrifice associated with metalworking. Was the assemblage a sacrifice offered after a particularly successful casting event? An interpretation along these lines can be challenged on several counts. Firstly, the moulds and the crucible were not broken, even though this was the usual practice in the case of cult finds. Secondly, there is no explanation for the accumulation of the 15 cm thick homogenous layer between the finds on the pit's floor and the metalworking implements. No other similar assemblage is known from any other early metallurgical centre. N. Kalicz and J. Koós interpreted one of the features uncovered at the Late Bronze Age settlement of Oszlár–Nyárfaszög as a ritual pit. In addition to several vessels, pottery sherds, the fragment of a baking platform, stones and stone implements, the pit also contained broken moulds (KALICZ–KOÓS 1996, 68–69, Fig. 60). The Brădiceşti site in the Iaşi district of Romania, assigned to the Early Iron Age Basarabi culture (8th–7th centuries BC), yielded ten stone moulds (both broken and intact pieces), stones and a strainer vessel. The possible interpretation of the find assemblage is not discussed in the publication (ICONOMU 1995).

Since the metalworking assemblage came to light in a layer differing from the fill of the pit and since the socketed chisels made in moulds 1 and 6 could post-date the late Makó period in view of their type and the analogous finds, it is possible that the moulds and the crucible cannot be associated with the pit's other finds. Seeing that the radiocarbon dates indicate a rather long occupation, it is quite likely that some of the settlement's other features post-dated Pit 5605 and it is therefore possible that the metalworking equipment had been deposited by an itinerant craftsman at a later date in the settlement's life or perhaps after its final abandonment.

Be as it may, the question remains open. The available evidence – which will hardly be augmented in the future – does not allow any final conclusions as to whether the metallurgical assemblage had been deposited at the same time as the other finds or at some later date.

It seems to us that the moulds and the crucible can be interpreted as a metalsmith's equipment. The moulds do not include a piece for casting weapons (daggers) and the assemblage cannot thus be assigned to the dagger-axe assemblages typical for the Carpathian Basin and the Balkans during the Early Bronze Age, such as the ones from Balkány (KALICZ 1968, 46, Taf. I. 3, 15), Baranda (KUNA 1981, 67), Mokrin, Grave 208 (GIRIĆ 1971), and Mala Gruda (PRIMAS 1996). At the same time, the assemblage contains moulds for flat axes and a shaft-hole axe, as well as for awls and socketed axes, and it cannot therefore be assigned to the shaft-hole-axe–flat axe type bronze hoards of the Carpathian Basin, the Balkans and the Aegean (Dunakömlőd, Fajsz, Bányabükk, Ostrovul Corbului, Griča, Lohinje, Vranovci, Petralona, Thebes, etc.). In view of their distinctive composition (shaft-hole axe–flat axe), J. Maran interpreted the Early Bronze Age hoards as sacrificial assemblages or as a collection of articles expressing fixed values (trade items, currency) (MARAN 2001, 282–283). This interpretation can be rejected in the case of the Üllő assemblage owing to the presence of awls and socketed axes. In contrast to J. Maran's suggestion, the articles in the Petralona hoard can be better interpreted as woodworking implements (ΓΡΑΜΜΕΝΟΣ–ΤΖΑΧΙΑΝ 1994, 103, 106). The Vinča type flat axes are usually also regarded as woodworking tools (ŽERAVICA 1993, 58). It seems to us that the awls and the socketed axes, as well as the flat axe with asymmetric cutting edge were woodworking tools suitable for specialised activities and for carving more intricate forms and designs. Flat axes and shaft-hole axes could similarly be used as tools. It seems likely that the artefacts cast in the Üllő moulds were used by craftsmen for woodworking.

Early Bronze Age metallurgy in the Carpathian Basin

Following the visible decline of metallurgy in the Late Copper Age (the Baden period), metal finds and metalworking implements again make an appearance in the Early Bronze Age (CHERNYKH 1992).

In his study on the origins of Early Bronze Age metallurgy in the Carpathian Basin, G. Bándi suggested that the new artefact types appearing in the late Coţofeni–Glina III–Vučedol complex could be derived from the south Balkanic Ezero–Mihalič and the east Balkanic Ezerovo metallurgical province. He did not assume a widespread knowledge of metalworking techniques or of metalworking among the various Early Bronze Age groups of the Carpathian Basin, which he explained by the lifestyle of the Makó–Kosihý–Čaka and the Somogyvár–Vinkovci culture (which differed from that of the sedentary southern cultures), by the cultural and ethnic changes and, most importantly, by the decline of the manufacturing and supply centres, primarily of the Vučedol culture (BÁNDI 1979–1980, 120).

Metalworking was practiced on almost all of the major Vučedol settlements. The excavations at Zók–Várhegy offered a good insight into this metallurgy (ECSEDY 1982). I. Ecsedy emphasized the role of Vučedol metallurgy in connection with the finds from Zók: he derived the Fajsz and Dunakömlőd type axes and the metalwork of the Makó–Kosihý–Čaka complex directly from the Vučedol–Zók complex, and outlined a metallurgical province characterised by a uniform technology and range of metal artefacts extending from the Aegean to southern Poland, with the technological advances made in the Pontic metallurgical province transmitted from the southeast to the northwest by the Vučedol culture. In his opinion, the appearance of the first products of Bronze Age metallurgy could be dated to the Mihalič (Ezero II) and the Vučedol period in the northern Balkans and to the Makó–Kosihý–Čaka, Somogyvár–Vinkovci, Glina III–Schneckenberg B and Jigodin cultures in the Carpathian Basin. The "Circumpontic metallurgical province" reached its greatest extension during this period and its subsequent development in the Middle Bronze Age was based on the stability of the Early Bronze Age (ECSEDY 1982, 84–85; ECSEDY 1995, 36–37).

G. V. Szabó noted that the impact of the cultural expansion of the Somogyvár–Vinkovci culture, which essentially meant the continuation of the Vučedol metalworking traditions, played a crucial role in the flourishing metallurgy in the Makó culture's second phase in the Great Hungarian Plain. He linked the Tápé hoard to this period (V. SZABÓ 1999, 54). In a study written jointly with I. Dénes describing the hoard found in the Vargyas Valley, they argued that Early Bronze Age metalworking technology emerged in a metallurgical province encompassing the Carpathian Basin, the northern Balkans and the eastern Alpine region. This was affected by a cultural diffusion from the south, resulting in the growing output of local metalworking. They derived the moulds for casting axes resembling the one from the Vargyas Valley from the east (DÉNES–V. SZABÓ 1998, 93).

M. Bondár interpreted the mould found at the Börzönce settlement of the Somogyvár–Vinkovci culture as a reflection of the survival of Vučedol metalworking traditions (BONDÁR 1995, 215–216).

T. Kovács considered the southern and south-eastern regions of the Carpathian Basin to have been one of the major centres of the production of early shaft-hole axes (KOVÁCS 1996, 118–119).

R. Kalicz-Scheiber and N. Kalicz attributed the appearance of a new type of metalwork to the cultural diffusion from the late Vučedol distribution in the northern Balkans. The network of contacts resulting from the spread of this new metalwork played a crucial role in changing the cultural status quo in the Balkans and the Carpathian Basin, and in the rise of the Early Bronze Age cultures of the Carpatho-Balkanic region. They argued that the emergence of this new metallurgy was independent of Thessaly, Thrace and Macedonia, and they also assumed that shaft-hole axes were developed locally in the Carpathian Basin. In their view, the Makó and, more im portantly, the Somogyvár–Vinkovci cultures played a major role in the diffusion of new metalworking techniques. They suggested a possible link between the distribution of shaft-hole copper axes and the high necked, one-handled jugs, the type fossils of the Somogyvár–Vinkovci culture (KALICZ-SCHREIBER 1997, 186; KALICZ-SCHREIBER–KALICZ 1999, 84–85; KALICZ-SCHREIBER–KALICZ 2002, 48–49).

According to J. Bátora, Vučedol metallurgy was transmitted to Slovakia and thence to Moravia and Bohemia by the Somogyvár–Vinkovci and the Makó–Kosihý–Čaka cultures. He emphasized the role of these three cultures in the advances made in the production of shaft-hole axes (BÁTORA 2003, 13–24).

The metalwork of the earliest phase of the Bronze Age (Vučedol culture) is well known, as is its technology (DURMAN 1983; DURMAN 1988; ECSEDY 1982; TYLECOTE 1976, 14–28). Following the decline of the Vučedol settlements, the output of metallurgy also dropped, but this did not lead to the fading of metalworking techniques (ECSEDY 1995, 33). The metalwork and the metalworking equipment of the Vučedol C–Makó–Kosihy–Čaka–Somogyvár–

Vinkovci–Jigodin–Glina III–Schneckenberg B period – M. Kuna's Horizon Vb (KUNA 1981, 41) – are a reflection of the survival and continued use of metalworking techniques. Very little was known until recently about the metallurgy of the Early Bronze Age 2–3 period, corresponding to the late (surviving) Makó–Kosihy–Čaka, Nagyrév, Bell Beaker–Csepel group, Somogyvár–Vinkovci, Nyírség, Óbéba–Pitvaros, and early Hatvan cultures. The few known metal artefacts were mostly stray finds and there were virtually no metalworking implements. The finds from Üllő represent the flourishing metallurgy beginning in the Vučedol period at the close of the post-Vučedol period. They reflect the adoption and development of the Vučedol technology of the late Early Bronze Age 2 and the Early Bronze Age 3 period (corresponding to Reinecke A). A part of the implements (the Kömlőd axe, the flat axe and the awls) were metal types widespread during the Early Bronze Age, while others (the thin and curved flat axes) were less common during this period. The socketed chisels cast in moulds 1 and 6 reflect impacts from the west. The carefully made crucible and the equally finely fashioned two-part moulds reflect an excellent knowledge of the period's bronze casting techniques.

In his overview of Early Bronze Age metallurgy in 1992, I. Bóna noted that "we are just beginning to gain an idea of the large-scale bronze metallurgy at the beginning of the Bronze Age." (BÓNA 1992, 49). The excavations conducted over the past thirteen years and their finds have confirmed his contention. The finds from Üllő represent one of the currently known peaks of Early Bronze Age metallurgy. It is an assemblage dating from the transition from one period to another, when Early Bronze Age technology began to be used for the creation of artefacts foreshadowing the Middle Bronze Age.[22]

Catalogue

Moulds from the Early Bronze Age 1–3 period of the Carpathian Basin and adjacent regions

Vučedol culture

1. Alihodže: settlement: broken moulds for a shaft-hole axe and a flat axe (ČOVIĆ 1976, 111, T. II, 4–6).
2. Debelo brdo: broken mould for a Kömlőd–Kozarac type axe; three broken moulds for a mid-ribbed dagger and a pin or an awl, with two matrices on one mould; two broken tuyères; from a settlement level (ČOVIĆ 1976, 107–110, T. II, 1–3, T. III; DIMITRIEVIĆ 1979, T. XLIII, 7–9; DURMAN 1983, T. 5, 3–6).
3. Dunaszekcső–Várhegy: broken mould; stray find (BÓNA 1992, 49; ECSEDY 1990, 228, Fig. 9; ECSEDY 1995, 33).
4. Ig, Ljubljansko Barje/Laibacher Moor: moulds for Kömlőd–Kozarac and Corbasca type axes, chisels (?), and flat axes (?); tuyères (DIMITRIEVIĆ 1979, T. XLIII, 6; DURMAN 1983, T. 6, 1–7; MACHNIK 1974, Taf. IV. 42; KOROŠEC– KOROŠEC 1969, 40–41, 137–138, T. 102–104).
5. Poliochni–Azurro: mould for a shaft-hole axe (BERNABÓ BREA 1964).
6. Sarvaš: open moulds with matrices for two daggers and an awl (DIMITRIEVIĆ 1979, T. XLIII. 1–3; DURMAN 1983, T. 4. 2–5).
7. Velika Gradina: mould for an indeterminable artefact (DURMAN 1983, 78).
8. Vinkovci–Ervenica: mould for what was probably a Kömlőd–Kozarac type axe; recovered from a pit, from the culture's phase B2 (GALE 2002, 57, T. 5. 5).
9. Vinkovci–Tržnica (Hotel): settlement; one valve of a mould for a Kömlőd–Kozarac type axe, recovered from under a house floor; two-part mould for a Kömlőd–Kozarac type axe; open mould for an awl; two-part mould for an awl; moulds for indeterminable artefacts; two shaft cores; a crucible; recovered from a pit (DIMITRIEVIĆ 1979, T. XLIII. 5; DURMAN 1983, 78, T. 1–3; DURMAN 1988, 133, 138, 139, 183–184, cat. no. 203, 210–213).
10. Vučedol: settlement: open moulds for a flat axe and a knife, L.: 18 cm, W.: 9 cm, Th.: 4.3 cm (SCHMIDT 1945, 103, Taf. 49. 1; DIMITRIEVIĆ 1979, T. XLIII. 4; DURMAN 1983, T. 4. 1).
11. Zecovi: settlement: broken moulds for a flat axe and a gouge or chisel; three tuyères; copper lump (ČOVIĆ 1976, 106–107, T. I. 1–6; DURMAN 1983, T. 5. 1–2).
12. Zók–Várhegy: twelve moulds, including ones for Kömlőd–Kozarac and Bányabükk types axes, chisels and flat axes; six fragmentary crucibles; two shaft cores; from a settlement feature, from the culture's late phase C (ECSEDY 1982).

Makó–Kosihy–Čaka culture

13. Domony–János Roob's garden: broken mould for a Kömlőd–Kozarac type axe; from a settlement feature (KALICZ 1968, 48, Taf. X. 1; KALICZ 1968a, 84–85, 87).
14. Kánya: tuyère (KULCSÁR 2002, 125, 255, Pl. 138. 7).
15. Salgótarján–Pécskő: two open moulds with two casting surfaces and one open mould with a single casting surface carved from red sandstone; one fragmentary mould with two casting surfaces with the matrix of a trapeze shaped flat axe on both surfaces; an open mould with two casting surfaces, one for casting a flat axe, the other for an awl; stray finds (KOREK 1968, 55–56, Taf. XII. 1–2).
16. Tesárske Mlyňany: tuyère (BÁTORA 1989, 12).
17. Veľký Meder/Nagymegyer: one valve of a broken mould for a shaft-hole axe; from a settlement feature (HROMADA–VARSIK 1994).

Somogyvár–Vinkovci culture

18. Börzönce–Temetői-dűlő: mould for a pin; from a settlement feature (BONDÁR 1995, 214–216, Pl. 181. 432).
19. Döbrököz–Tűzköves (Tüszküs): broken mould for a Kömlőd–Kozarac type axe, and an abundance of pottery sherds; found during a field survey (RKM 1999 [2002] 197, J. G. Ódor; KULCSÁR 2002, 230, 289–290, 115. t. 13).
20. Kaposújlak (Kaposvár bypass, Site 29): three broken moulds for Kozarac type axes; from a settlement feature (SOMOGYI 2004, 167, Figs 14–16).
21. Pécs–Nagyárpád-Dióstető: broken mould for an axe; from a settlement feature (BÁNDI 1981, 22, Taf. 1. 6; ECSEDY 1983, 79, Fig. 45).
22. Ravazd–Villibald-domb: mould for a shaft-hole axe; from a settlement feature, from the culture's later phase (RégFüz Ser. I. 38 (1985) 24, A. Figler; KALICZ-SCHREIBER 1991, 10).

Glina III–Schneckenberg culture

23. Govora Sat–Runcuri (ROMAN 1985; SCHUSTER 1997, 146).
24. Butimanu: flat axe (ROMAN 1976, 28, Abb. 2. 12; SCHUSTER 1997, 277, Fig. 51. 3; VULPE 1975, 62, Taf. 35. 321).
25. Valea Iaşului: crucible fragment (SCHUSTER 1997, 141).
26. Glina: mould for a flat axe with splayed cutting edge (VULPE 1975, 62, Taf. 35. 321A).

Jigodin culture

27. Fântânele (ROTEA 1993, 84, Pl. XIII. 8–9; SCHUSTER 1997, 143).
28. Leliceni/Csíkszentlélek: open mould with two casting surfaces for a Dumbrăviora type shaft-hole axe; broken moulds for a dagger and a chisel; shaft cores; slag; from a settlement feature (ROMAN–JÁNOS–HORVATH 1973, 562, Fig. 3; ROMAN–DODD-OPRIȚESCU–JÁNOS 1992, 157–159, 229–231, Taf. V, Taf. 78–80).

Zabola culture

29. Zabola: two crucibles and the pouring lip of a crucible (SZÉKELY 1997, 31, Pl. XIX. 6, Pl. XXVII. 3, 5).

Bell Beaker–Csepel group

30. Szigetszentmiklós–Üdülősor: broken mould for an axe; from a settlement feature (ENDRŐDI 1992, 96, Fig. 77. 7).

Mondsee culture

31. Salzburg–Rainberg: mould for a Kömlőd–Kozarac type axe; from a settlement feature (PITTIONI 1954, 354, Abb. 251; MAYER 1977, 20, Taf. 5. 40).

Ezero culture

32. Ezero: three axe moulds from Level XIII (horizon A1); axe moulds from Levels VIII–VI (transitional phase and horizon B1) (GEORGIEV–MERPERT–KATINČAROV–DIMITROV 1979, 539, Abb. 106–110, Taf. 23, 26–27).

Finds with uncertain cultural attribution

33. Aszód: stone mould for ribbed bar ingots, two intact pairs; stray finds? (MOZSOLICS 1984, Taf. 12).
34. Endrőd–Paraj-hegy-dűlő: broken mould for an axe; found during a field survey, probably of the Makó culture (MRT 8, 147–148, Pl. 19. 5).
35. Hidegség–Templomdomb: mould for a Kömlőd–Kozarac type axe (GÖMÖRI 1992, 14).
36. Nevidzany: broken mould for a Stublo type axe (BÁTORA 1982).
37. Üllő 5.

Notes

[1] The animal bones were analysed and evaluated by Andrea Kőrösi (cp. the Appendix). We would here like to thank her for her work.

[2] The mussels were kindly determined by Pál Sümegi (SZTE). We would here like to thank her for her work.

[3] The section by the cutting edge is damaged on both halves of the mould and thus the length measurements are approximate.

[4] The lithics were determined by geologist Dr. Béla Nagy (VE).

[5] Probably procured from the Cserhát or Mátra Mountains.

[6] In the preliminary report (RKM 2003, 307), we interpreted this bowl as a crucible. The closer examination revealed that it is a shallow bowl.

[7] T. Rácz's excavation in summer, 2004, part of the archaeological investigations preceding the construction of the M0 motorway. Another Early Bronze Age settlement was excavated by K. Ottományi on the outskirts of Vecsés (OTTOMÁNYI 2002).

[8] It must be borne in mind that the low number of features can also be explained by the fact that the remains of above-ground wooden structures rarely survive if the topsoil is removed mechanically.

[9] László András Horváth's paper read at the meeting of the Archaeological and Art Historical Society in April, 2002, and his kind personal communication.

[10] The determination of pottery forms was based on fragments which could be identified with certainty.

[11] Two new sites, Szentendre–HÉV end stop (MRT 7, Site 28/22, Pl. 8. 9) and Perőcsény–Jancsi-hegy (MRT 9, Site 23/19, Pl. 13. 11) can be added to the sites in Pest County listed by K. Tóth (Bag, Domony and Budapest–Aranyhegyi Road). The pottery finds from both sites includes pots with thickened, triangular sectioned rim.

[12] Brushed pottery sherds were also recovered from Pits 2048, 3638, 3681, 4079, 4676, and 5600.

[13] The amphora found at Győrszemere was broken and it is therefore uncertain whether or not it had a handle.

[14] Cp. the Catalogue for a detailed list.

[15] The artefact is displayed in the permanent exhibition of the Damjanich János Museum (Szolnok). We are greatly indebted to Marietta Csányi for kindly allowed us to personally examine this find. Even though the cutting edge of the Tószeg chisel is not divided and its end is curved and slightly larger, its form and proportions compare well with the one cast in the Üllő mould.

[16] We would here like to thank Judit Antoni and Tünde Horváth for the observations concerning the stone implements.

[17] The mineralogical and geochemical examination of the two stone implements was carried out by geologist Dr. Béla Nagy (VE).

[18] The optical emission spectroscopy and the electro-micro-scanning analyses were performed by Dr. Béla Nagy, Mrs. Béla Nagy and Mrs Gál Kamilla Sólymosi (Eötvös Loránd University, Department of Geology and Geochemistry). Samples were taken from the earth adhering to the exterior and interior of moulds 4, 5, 6 and 8 and the white coating in their interior; samples were taken from the patches visible to the naked eye in the interior moulds 3, 4 and 5; a tiny piece of mould 5 was also submitted to analysis.

[19] Cp. János Dani's doctoral dissertation (in progress): *A Felső-Tisza-vidék kora bronzkora a tell-kultúrák előtti időszakban* [The Early Bronze Age of the Upper Tisza region preceding the tell cultures]. We would here like to thank him for kindly allowing us to read the manuscript.

[20] The dates quoted here and in the following are all calibrated radiocarbon dates.

[21] The measurements were performed in the Nuclear Research Institute of the Hungarian Academy of Sciences. We would here like to thank Dr. Zsuzsanna Szántó and Dr. Éva Svingor for their help.

[22] The drawings were made by Judit Antoni, Erzsébet Pintér and Géza Szöllősy, the photos by Linda Szászvári, Géza Szöllősy and the authors; the maps and the digitisation of the drawings and figures, their editing by Benedek Érdy, László Zsolt Kiss and Szabolcs Progli. We are grateful to all of them. We are indebted to János Dani, Tünde Horváth, Gabriella Kulcsár, Valéria Kulcsár, Zsolt Székely, Sándor Sztáncsuj and Edit Tari for their help and to Tibor Rácz for guiding us through the maze of Romanian archaeological literature. Special thanks are due to István Ecsedy for his insightful comments on the draft version of this study.

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