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POST-FIRING INTERVENTIONS ON LA TÈNE POTTERY FROM THE EASTERN CARPATHIAN BASIN: MENDING PRACTICES

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Abstract: This paper investigates post-firing interventions on La Tène pottery from the eastern Carpathian Basin, examining repair practices as indicators of adaptive technological and economic behavior. Drawing on material from both pottery workshops and consumption contexts, the study documents a variety of repair techniques, including metal fastenings, organic adhesives, and structural replacements. A regional focus on graphite-tempered *situla*-type vessels in the Upper Tisza Basin suggests limited resource access and a functional valuation of ceramics. Even where evidence is indirect, the widespread occurrence of perforated vessels suggests a systematic attitude toward conservation and reuse. These findings highlight the need for interdisciplinary analysis and offer insight into Iron Age attitudes toward material durability, resource management, and object value.

Keywords: *repairs, post-firing interventions, La Tène pottery, La Tène workshops, La Tène settlements*.

Although the practice of pottery reconditioning remains a relatively underexplored aspect of Late Iron Age archaeology, it holds significant relevance for understanding the technological, economic, and cultural practices of prehistoric communities. Post-firing interventions on ceramic vessels—often visible as perforations, added metal fittings, or traces of adhesive substances—reflect a pragmatic approach to the maintenance and reuse of everyday objects.

In the eastern part of the Carpathian Basin, archaeological research has documented evidence of pottery repairs in both production and consumption contexts. Academic literature reports the reconditioning of ceramic vessels using metal artifacts in the Pișcolt necropolis,[1] as well as in the settlements of Berveni,[2] Carei-Ferma Spitz,[3] and Via Căminului-Nord (Satu Mare County).[4] Mentions of repairs, though lacking detailed descriptions, also appear in analyses of pottery from the Aghireș-Sub Pășune settlement[5] (with pottery kilns) and the Șeușa-La Cărarea Morii settlement.[6]

At the same time, circular perforations on wheel-thrown and hand-made ceramic vessels are observable in several major La Tène settlements that

[1] NÉMETI 1975, Pl. III/11; NÉMETI 1992: grave 107–82, Fig. 17/10; RUSTOIU 2014, 176.
[2] RUSTOIU 1993, 137, Fig. 1/1.
[3] NÉMETI 2013, 330.
[4] PLANTOS/BÂRCĂ/POPA 2024, 246.
[5] BĂCUEȚ-CRIȘAN *et alii* 2009, 47.
[6] FERENCZ 2007, Pl. LXXXVIII.

have been extensively published. In some cases, such as the settlement at Moreşti,[7] they are explicitly identified as post-firing perforations; in others, such as Cămin-Malul Crasnei,[8] Ciumeşti-Bostănărie,[9] Giarmata-Baraj,[10] and Cicir-La Gropi[11] settlements, they are only briefly mentioned or illustrated, without detailed analysis. As a result, this phenomenon has received little scholarly attention to date.

Researcher Aurel Rustoiu initiated an important discussion on restoration interventions in the context of La Tène pottery with graphite-tempered fabric. In addition to analysing specific types of interventions and the artefacts used in the reconditioning of ceramic vessels in the 'Celtic' cultural sphere, he also addresses comparable practices and objects in the 'Dacian' environment, where other forms of repair are attested.[12] A similarly significant contribution comes from Sándor Berecki, who explores the interpretation of circular perforations and highlights the limitations that call for a reassessment of their functional significance.[13] Daniela Ciugudean takes a broader approach, examining various ancient ceramic repair methods, such as the use of resins, organic ties, and lead fittings, and reflecting on their technological and economic significance from the Iron Age to the Roman period.[14]

This study aims to initiate a focused discussion on the practice of ceramic vessel repair within the eastern La Tène cultural sphere. The approach draws on new data from the analysis of ceramic assemblages from pottery workshops in the eastern Carpathian Basin, as well as archaeological data from consumption contexts that have already entered the scientific literature. The objectives are to classify the types of interventions, using typologies focusing on ceramic vessel repairs in prehistory and antiquity, and to assess the potential of these repairs to reflect economic and social practices.

REPAIRS AND DIAGNOSTIC TRACES ON VESSELS FROM POTTERY WORKSHOPS

The analysis of ceramic material from workshops attributed to the Middle La Tène period at the sites of Carei-Ferma Spitz, Carei-Bypass Road, and Orosia-Site V has revealed evidence of post-firing interventions that can be associated with repair traces.

An illustrative example is a graphite-tempered *situla*-type vessel from the Carei-Ferma Spitz workshop (Pl. I), originally published by I. Németi[15] and recently brought to our attention in a discussion about repairs to a vessel found at the Via Căminului-Nord site.[16] The pottery production structures at Carei-Ferma Spitz consist of three updraft, two-chambered kilns that reflect two distinct phases of workshop activity. Two of these kilns (Cx 10/1 and Cx 10/2) overlap the third (Cx 10/3).[17] The vessel in question was recovered from feature Cx 10/2, although its exact position within the structure was not documented.

The vessel from Carei-Ferma Spitz shows numerous traces of post-firing interventions, including repairs with iron nails (Pl. I.1a/1, I.1b/5, I.1c/7), circular perforations (Pl. I.1a/2–3, I.1b/6, I.1d–1e), and possible evidence of unfinished interventions (Pl. I.1a/4). In three cases, the iron artefacts used in the repairs have been preserved. In the area of the vessel's maximum diameter, a ceramic fragment preserves an iron nail that was inserted through a perforation and caught in a staple; the artefact is approximately 5.6 cm long and has a pointed tip and a flattened, ovoid head measuring 0.8 × 0.6 cm (Pl. I.1a/1). Two additional ovoid-headed nails, positioned along fracture edges, are smaller (approx. 3 cm long, with head dimensions of 0.5 × 0.4 cm and 0.6 × 0.4 cm respectively) and have tips bent inward toward the vessel's interior (Pl. I.1b/5; I.1c/7). The circular perforations, each with a diameter of approximately 0.5 cm, were made from the exterior inward. An exception is represented by two circular impressions located on the interior of the vessel's neck (Pl. I.1a/4).

Traces of post-firing interventions were also identified on ceramic fragments from the assemblage recovered at the Carei-Bypass Road site. From feature Cx 100/2012, a ceramic firing kiln, three pottery fragments were recovered, including one with graphite-tempered fabric, which displays circular perforations with diameters ranging from 0.3 to 0.5 cm (Pl. II/?).

Another vessel fragment bearing traces of repair was recovered from feature Cx 97 at Orosia-Site V, which has been interpreted as a pottery workshop.[18] The fragment belongs to a graphite-tempered vessel with striated decoration. On the lower register, a circular perforation with a diameter of 0.4 cm is visible, along with a second mark on the vessel's interior surface (Pl. III). Based on the interventions observed on the vessel from Carei-Ferma Spitz, we hypothesise that the marks on the Orosia fragment may indicate a repair once secured with a staple.

Repair marks on vessels from pottery workshops are not limited to the three aforementioned sites. At the Aghireș-Sub Pășune workshop, for instance, two wheel-thrown pottery fragments with graphite-tempered paste show circular perforations that the excavators interpreted as repairs.[19]

These post-firing interventions are found on vessels belonging to the La Tène formal repertoire: *situla*-type forms with graphite-tempered fabric (Pls. I, II.1, III), shallow open shapes with S-profiles (Pl. II.2), and tall, closed forms with turned-up rims (Pl. II.3). The perforations and repairs are generally located in the upper half of the vessels, and less frequently in the lower half, as observed in the Orosia example.

The high degree of pottery fragmentation in features associated with ceramic production makes it difficult to determine the number of repairs per vessel. However, the

[7] BERECKI 2008, 40, Pls. 13/9; 14/2; 30/1; 51/6, 12.
[8] NÉMETI 2011, Pls. 7/8,11; 12/2; 14/2; 16/4, 6.
[9] ZIRRA 1980, Pls. XI/7; XIII/3; XVII/9; XVIII/3; XX/14; XXXIX/5,13; XL/12.
[10] URÁK 2020, Pls. XXVIII/1; XL/5; XLI/1, 3; XLV/7; XLVII/6, 8–9; LIV/9; LX/10; LXXVI/4; LXXVII/4.
[11] URÁK 2020, Pls. LXXVIII/3; XC/7; XCV/1; CI/6; CIV/6.
[12] RUSTOIU 1993, 137.
[13] BERECKI 2008, 40, expresses concerns regarding single, centrally positioned perforations on the bases of vessels. An example of such a vessel can be found in grave 6/1962 of the Ciumeşti necropolis (ZIRRA 1967, 24, Fig.10/VI; Fig. 41/M6/VI, Pl. XVIII/M6/VI).
[14] CIUGUDEAN 1994.
[15] NÉMETI 2013, 330, Pl. VIII/1–3.
[16] PLANTOS/BÂRCĂ/POPA 2024, 246, Pl. 86/2–4.
[17] NÉMETI 2013, 329.
[18] URÁK 2018, Pl. IV/10.
[19] BĂCUEȚ-CRIȘAN *et alii* 2009, 47, Pl. 162/1, 3.

number of post-firing interventions on the vessel preserved in the greatest proportion (Pl. I) is significant, with at least nine repairs or traces of repair documented.

The analysis of pottery from Middle La Tène workshops reveals a recurring practice of vessel repair. The presence of such interventions across multiple pottery production centers suggests that repair was relatively common practice during this period. These repairs, which involved making circular perforations and fastening with iron nails, suggest an interest in extending the service life of the vessels, particularly those with graphite-tempered paste, such as *situla*-type vessels. Based on the available data, we cannot argue whether the repairs were carried out at the request of domestic consumers to extend the vessels service life or if the craftsmen tried to recover slightly damaged vessels during the production process, either for their own use or for the use of third parties.

REPAIRS AND DIAGNOSTIC TRACES ON VESSELS FROM CONSUMPTION CONTEXTS

Archaeological evidence of ceramic vessel repair also comes from consumer contexts, particularly settlements. Although much of the available information is indirect or incomplete, existing literature provides examples that help contextualize the restoration practices discussed in relation to pottery workshops.

Mending interventions involving iron artifacts, similar to those identified on the vessel from Carei-Ferma Spitz, have also been documented in other La Tène settlements in north-western Romania. Archaeologist Aurel Rustoiu recorded a comparable reconditioning on a graphite-tempered *situla*-type vessel from the Berveni settlement, which bears the marks of an iron clamp.[20]

Another type of artifact used in the repair of La Tène ceramic vessels is the iron rivet. One such example appears on a graphite-tempered ceramic fragment from dwelling Cx 31 at the Carei-Bypass Road site (Pl. IV.1). A similar intervention is reported on another graphite-tempered fragment, recently published, recovered from feature Cx 2/2022 at the Via Căminului-Nord site (Satu Mare County).[21]

The ways in which the life of vessels can be extended through repair are not limited to the use of iron artifacts. A particularly illustrative example is a small wheel-thrown ceramic vessel (height: 8 cm; rim diameter: 7 cm; base diameter: 6 cm) from grave 107 in the Pișcolt necropolis, whose handle was replaced with a bronze band (Fig. 1/1).[22] In the same necropolis, three additional wheel-thrown vessels were repaired by drilling and bonding with bitumen (Fig. 1/ 2–4).[23]

Compared to the concrete examples of ceramic vessel repair discussed above, the indirect evidence for ancient reconditioning is much more striking. In several well-researched and widely published La Tène settlements within present-day Romania, numerous archaeological features contain pots

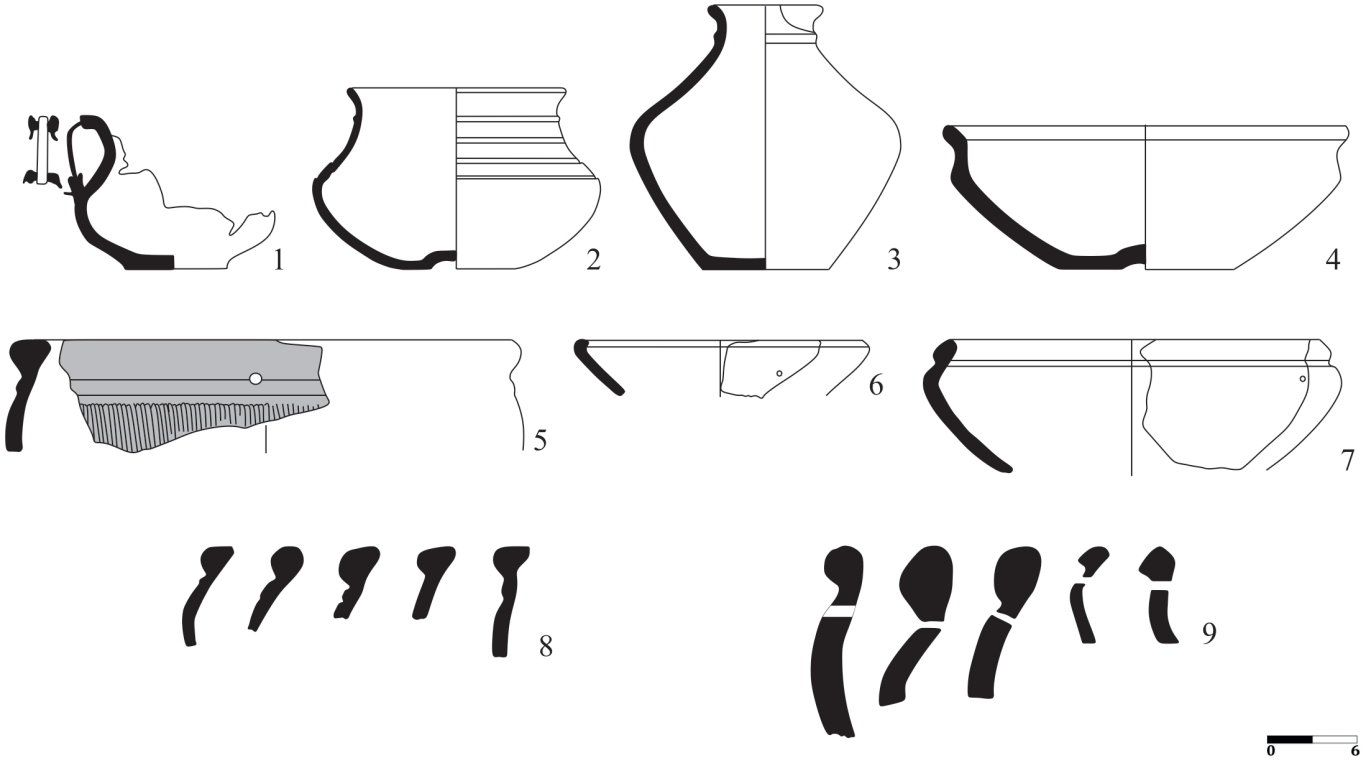

Fig. 1. Types of repaired vessels from consumption contexts (Upper Tisza Basin). 1 – Repair with a bronze band (Pișcolt/grave 107). 2–4 – Vessels repaired with bitumen (Pișcolt/graves 124, 53, and 63). 5–7 – Vessels with circular perforations (Ciumești-Bostănărie settlement). 8–9 – Graphite-tempered vessel profiles with circular perforations (8: Ciumești-Bostănărie settlement; 9: Cămin-Malul Crasnei settlement) (digitized after: 1, 3–4: NÉMETI 1992, Fig. 17/10; 6/4; 9/5. 2: NÉMETI 1989, Fig. 8/6. 5–8: ZIRRA 1980, Pl. XI/7; XIII/3; XVII/9; XVIII/3; XX/14; XXXIX/5,13; XL/12. 9: NÉMETI 2011, Pl. 14/2; 16/6; 7/8,11; 12/2).

[20] RUSTOIU 1993, 137, Fig. 1/1.

[21] PLANTOS/BÂRCĂ/POPA 2024, 246, Pl. 86/1.

[22] NÉMETI 1975, Pl. III/11. NÉMETI 1992, grave 107: 82, Fig. 17/10. CIUGUDEAN 1994, 531. RUSTOIU 2014, 176.

[23] NÉMETI 1989, grave 124: 86, Fig. 8/6. NÉMETI 1992, grave 53: 67, Fig. 6/4 and grave 63: 70, Fig. 9/5. Bitumen lumps are mentioned in graves 166 (NÉMETI 1988, 58) and 143 (NÉMETI 1992, 94).

with circular perforations that may represent traces of repair, suggesting a widespread practice. While macroscopic observations of vessels from pottery workshops indicate that circular perforations were made post-firing, concrete information on this aspect is lacking for other sites. The absence of archaeological data hinders the interpretation of these perforations; information can often only be extracted from illustrative material.

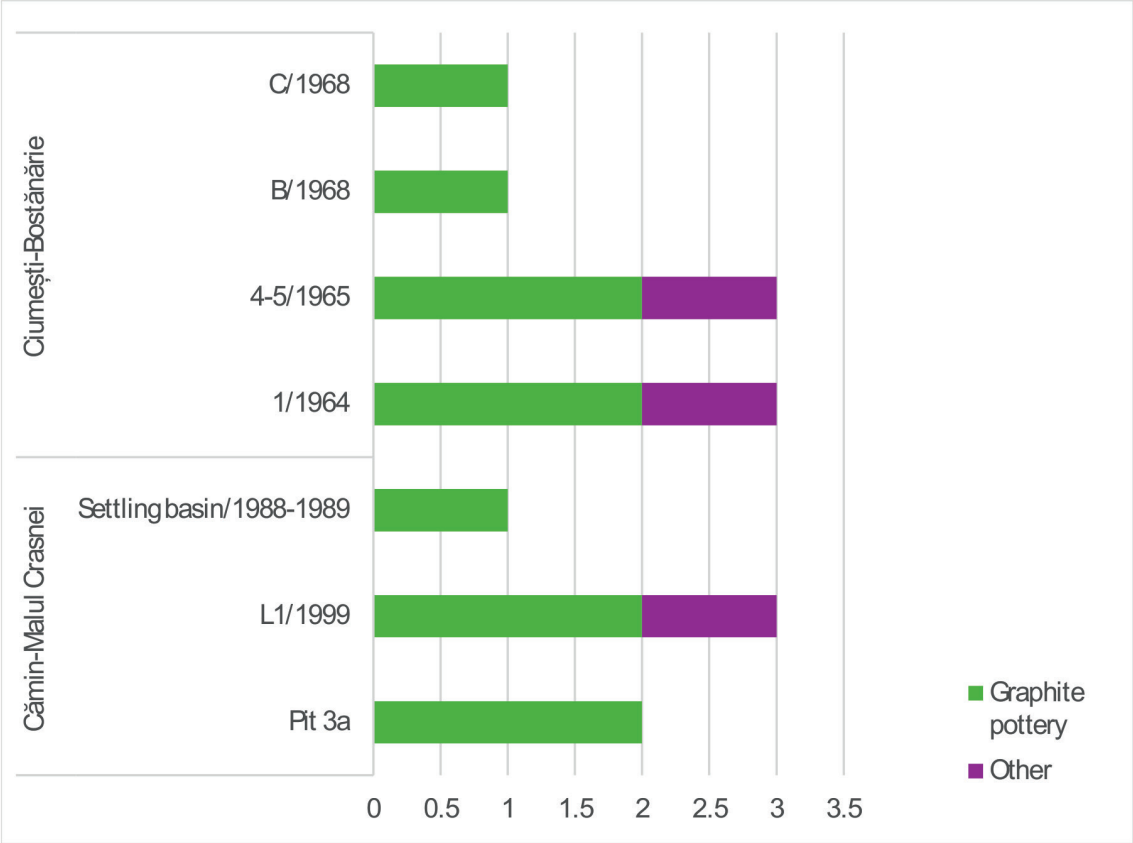

Fig. 2. Distribution by feature of vessels with possible repairs (perforations) from the settlements of Ciumești-Bostănărie and Cămin-Malul Crasnei (data adapted from ZIRRA 1980 and NÉMETI 2011).

Nevertheless, we find it useful to review the main sites where perforated pottery has been identified. We argue that, in cases where vessels have not been assigned to a typology that clearly attributes a primary function to the perforations—such as strainers, decanters, or vessels used for burning aromatic substances—or where no alternative interpretation has been proposed, these traces may indeed represent post-firing interventions and could be associated with repair practices to some extent.

In the Upper Tisza basin, in north-western Romania, possible traces of vessel reconditioning have been identified on pottery from the sites of Ciumești-Bostănărie (Fig. 1/5–8) and Cămin-Malul Crasnei (Fig. 1/9). An analysis of the ceramic illustrations from the Ciumești-Bostănărie settlement shows that, of the seven features interpreted as dwellings, four contain vessels with circular perforations. From dwellings B and C/1968, fragments of *situla*-type vessels with graphite-tempered fabric and possible repair traces were recovered. Two *situla* fragments and a bowl with an S-profile were found in L1/1964, while two additional graphite-tempered *situlae* and a truncated-conical bowl were recovered from feature L4–5/1965.[24]

Out of the total of eight vessels showing circular perforations, six are *situla*-type forms with graphite-tempered fabric and striated decoration (Figs. 1/5, 8); in these cases, the perforations are positioned below the rim. In one instance, the ceramic fragment features two adjacent perforations, while in the remaining examples, only a single perforation is preserved. In the features containing vessels with perforations, the proportion of vessel forms with graphite-tempered fabric ranges from approximately 10–15% of the total ceramic assemblage—except in feature C/1968, where it reaches nearly 25%[25].

In the earlier excavations at Cămin-Malul Crasnei, where a pottery kiln was also discovered,[26] János Németi reports circular perforations on six ceramic vessels. These ceramic fragments were recovered during various excavation campaigns; however, three of the vessels—a *situla*-type vessel with graphite-tempered fabric, a bowl with an S-profile and graphite-tempered fabric, and a deep, wheel-thrown bowl—were found in dwelling L1/1999.[27] Two additional *situla*-type vessels with graphite-tempered fabric and circular perforations were recovered from Pit 3a, while a sixth vessel comes from an uncertain context.[28] The perforations are positioned just below the rim; in one case, two perforations were preserved on two conjoined fragments.

At both sites located in the Upper Tisza Basin, circular perforations most frequently occur on *situla*-type vessels or other forms made with graphite-tempered fabric (Fig. 2). More rarely, perforations appear on La Tène forms that are wheel-thrown but lack graphite temper, such as one vessel from Cămin-Malul Crasnei[29] and two vessels from Ciumești-Bostănărie.[30]

[24] ZIRRA 1980, dwelling B/1962: Pl. XI/7; dwelling C/1962: Pl. XIII/3; dwelling L1/1964: Pls. XVII/9; XVIII/3; XX/14; dwelling L4–5/1965: XXXIX/5,13; XL/12.

[25] ZIRRA 1980, Pl. VIII.

[26] NÉMETI 2011, 123.

[27] NÉMETI 2011, L1/1999: 127, Pls. 14/2, 16/4, 6.

[28] NÉMETI 2011, 123, 125, Pls. 7/8,11 (Pit 3a); 12/2.

[29] NÉMETI 2011, Pl. 16/4.

[30] ZIRRA 1980, Pl. XX/14 – S-profiled bowl; Pl. XL/12 – truncated-conical

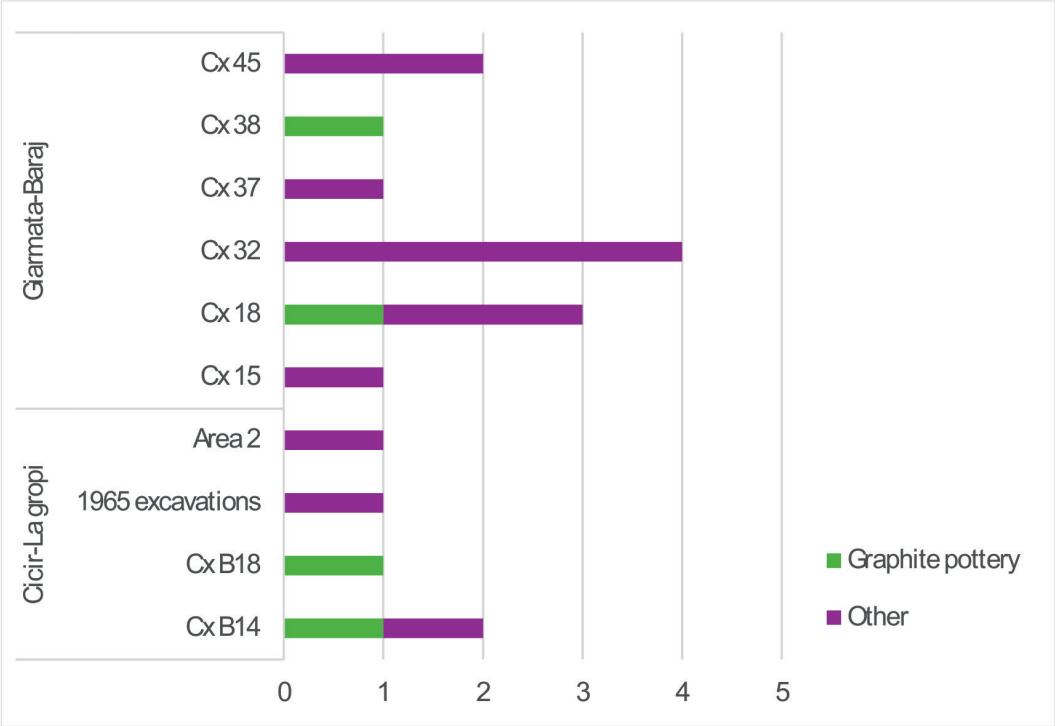

Fig. 3. Distribution by feature of vessels with possible repairs (perforations) from the settlements Giarmata-Baraj and Cicir-La gropi (data adapted from URÁK 2020).

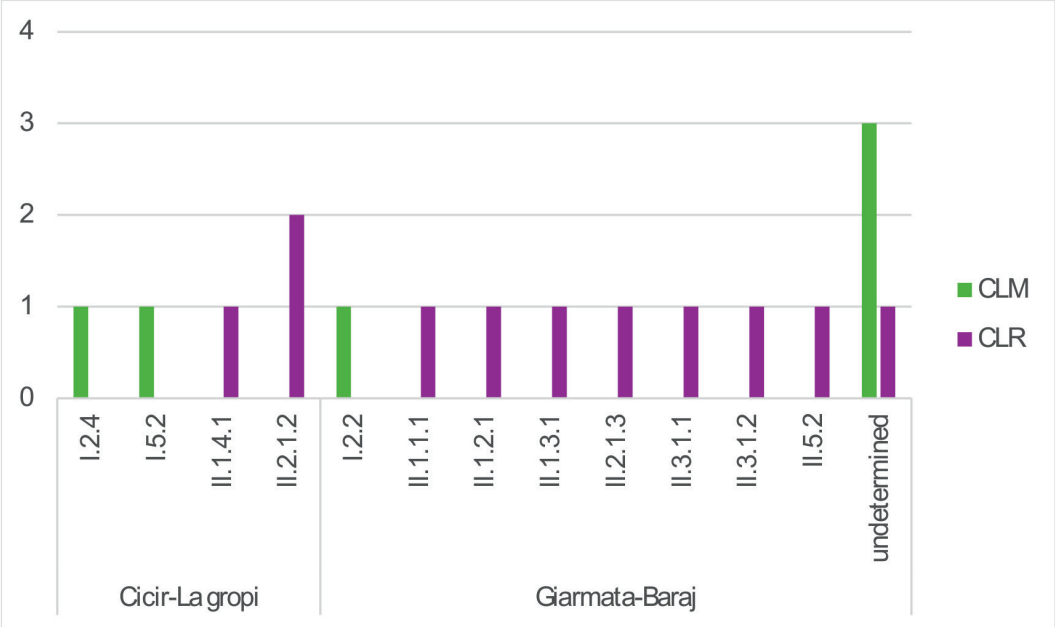

Fig. 4. Distribution of vessels with possible repairs (perforations) in the settlements Giarmata-Baraj and Cicir-La gropi, related to modeling technique and vessel types (data adapted from URÁK 2020).

In the settlements of the Western Plain of Romania, the situation appears to be somewhat different. At Giarmata-Baraj site, an analysis of the illustrations shows that, out of a total of 12 vessels with circular perforations indicating possible repairs, only two have graphite-tempered fabric (Fig. 3).[31] In general, the number of perforated vessels per feature is one or two;[32] exceptionally, feature Cx 18 yielded three wheel-thrown fragments,[33] while feature Cx 32 produced four hand-made vessel fragments with circular perforations.[34] At Cicir-La Gropi site, five vessels recovered from two features and from the occupation layer exhibit traces of possible repairs (Fig. 3). The vessel forms bearing circular perforations include graphite-tempered *situlae*,[35] wheel-thrown carinated forms,[36] and hand-made forms.[37] In most cases, a single perforation was preserved, typically located on the body of the vessel.

Compared to the situation in the north-western settlements, the two sites in the western region display possible repairs on a wider variety of ceramic forms (Fig. 4), including vessels shaped without the use of kinetic energy—such as semi-globular forms, truncated-conical shapes, and pots with curved walls.[38]

Traces of ceramic vessel repairs have also been reported in settlements along the middle and upper course of the Mureș River. I.V. Ferencz notes three ceramic fragments with repair marks at the site of Șeușa-La Cărarea Morii,[39] while several fragments with post-firing

bowl.

[31] URÁK 2020, Cx 18: Pl. XL/5, cat. no. 951–952; Cx 38: Pl. LX/10, cat. no. 3787–3788.

[32] URÁK 2020, Cx 15: Pl. XXVIII/1, cat. no. 1834; Cx 37: LIV/9, cat. no. 2834–2835; Cx 38: Pl. LX/10, cat. no. 3787–3788; Cx 45: Pl. LXXVI/4, cat. no. 4578–4579; Pl. LXXVII/4, cat. no. 4604.

[33] URÁK 2020, Cx 18: Pl. XL/5, cat. no. 951–952; Pl. XLI/1, 3, cat. no. 1335–1336.

[34] URÁK 2020, Cx 32: Pl. XLV/7, cat. no. 3387; XLVII/6, 8–9, cat. no. 3015, 3087, 3381.

[35] URÁK 2020, 101–102, Cx B14: Pl. XC/7, cat. no. 471; Cx B18: Pl. XCV/1, cat. no. 6–11.

[36] URÁK 2020, 100–101, Pl. CI/6, nr. cat. 552 (1965 excavations).

[37] URÁK 2020, 86, 91, Pl. LXXVIII/3, cat. no. 1359 (shallow, open, truncated-conical shape, Cx B14), Pl. CIV/6, cat. no. 640 (curved-walled pot, area II).

[38] Giarmata-Baraj: URÁK 2020, Pl. XLV/7; XLVII/6, 8–9. Cicir-La gropi: URÁK 2020, Pl. LXXVIII/3; CIV/6.

[39] FERENCZ 2007, Pl. LXXXVIII.

circular perforations have been identified by S. Berecki in the material assemblage from Moreşti.[40] The fragments from Moreşti originate from dwellings Af2 and Af6, from pit LM, and from the occupation layer. The ceramic forms showing possible repairs include graphite-tempered *situlae*,[41] hemispherical bowls, and deep bowls with straight rims.[42]

Ceramic vessel repairs are thus equally attested in consumption contexts, particularly within settlements. Both direct evidence—such as nails/clamps, rivets, or metal bands embedded in vessels—and indirect evidence, represented by circular perforations, indicate the existence of a widespread practice aimed at extending the functional lifespan of pottery. The distribution of these repairs across several regions (the Upper Tisza Basin, the Western Plain, and the intra-Carpathian region), and on a variety of vessel types, suggests a strategy adapted to local needs, sometimes occurring independently of production environments.

DISCUSSION

With the exception of rare cases where clear evidence of ceramic vessel reconditioning has been preserved, the majority of archaeological evidence for repair is limited to the presence of perforations. Although post-firing perforations associated with repairs are predominantly circular at the sites analyzed, it should be noted that in other regions, square or rectangular perforations have also been documented.[43] In some instances, certain macroscopic features serve as indicators supporting their interpretation as traces of repair. These include cases where perforations are positioned on both sides of a fracture line (Pl. I.1a/2–3); regular perforation edges produced by mechanical action (Pls. I–IV); surface damage surrounding the perforations, suggesting post-firing intervention (Pls. I.1a, II.1.b–c, II.3.b–c, III, IV.2.b–c); reddish or bluish-green coloration around the perforation edges, indicating possible contact with metal during the repair process (Pls. I, IV.1.b–c); and impressions near the perforations that may result from surface contact with artifacts used during reconditioning (Pls. I.1a/4, III). In cases involving repairs with organic materials, the macroscopic identification of binding agents, along with physico-chemical analyses, is necessary to correlate the perforations with restoration-type interventions.

The few examples of vessels bearing repair traces from the pottery workshops at Carei-Ferma Spitz, Carei-Bypass Road, Aghireș-Sub Pășune, and Orosia-Site V suggest that, in some cases, such interventions may have been carried out within the workshops. An additional argument supporting this hypothesis is the presence, in the Biharea pottery workshop, of tools clearly associated with ceramic production,[44] along with bone and metal artifacts that may have been used in repair activities. These include a bone awl (MTC inv. 10515) and an iron nail or awl tip, both recovered from the service pit of the kilns.[45] Such practices are not specific to the region under study but are also attested, for example, in Horizon 3 (LT B2/C1–LT C2/D1) of the Sopron–Krautacker settlement, where the activities of potters appear to have included ceramic reconditioning, particularly of graphite-tempered vessels.[46]

During the Middle La Tène period, the reconditioning of ceramic vessels is archaeologically documented in both pottery production contexts and consumption settings. Although most of the information is indirect—repair being inferred from the presence of post-firing perforations—vessels such as those from Carei-Ferma Spitz, Carei-Bypass Road, Via Căminului-Nord, Berveni, and the Pișcolt necropolis provide concrete examples of various repair techniques.

Studies focused on documenting ceramic vessel repairs in prehistory and antiquity have proposed several classification systems.[47] Based on the typologies consulted and the technological operations underlying the restoration interventions observed in the analyzed material, three main categories can be distinguished: I. joints made using mechanical fastenings, II. bonds made with adhesives, and III. replacement of a portion of the vessel.

The highest frequency is observed in repairs belonging to the first category, within which several types of interventions can be distinguished: I.1. perforations and presumed organic fastenings, I.2. perforations and metal fixings, I.3. perforations and composite fixings (metal and other types of binding materials). Type I.1 repairs involve the creation of perforations on both sides of a fracture, with binding carried out using organic materials of either plant or animal origin.[48] Type I.2 repairs are similar to the first, but the connections are made using metal artifacts.[49] Type I.3 interventions[50] consist of making small perforations (with a maximum diameter of 0.5 cm) near the fracture edges, inserting iron artifacts—such as nails or rivets—into the holes, with clamp or semi-clamp fixation (Pls. I.1a/1, I.1b/5, I.1c/7, IV.1.a–c), and stabilizing the joints using additional binding materials.

The fragmentary preservation of metal-repair elements discussed in this analysis makes it difficult to clearly classify them as either Type I.2 or I.3. For the fragments from Carei-Ferma Spitz (Pl. I) and Carei-Bypass Road (Pl. IV.1), we lean toward identifying them as part of a composite repair system (Type I.3). This interpretation is supported by the anchoring of the preserved metal elements—apparently complete—in a single perforation, and by the small size of the rivet head on the fragment from Cx 31/2012 at Carei-Bypass Road. However, we cannot exclude the possibility that these metal artifacts were used to seal larger pores or flaws that compromised the structural integrity of the vessels.

[40] BERECKI 2008, 40–41.
[41] HOREDT 1979, Abb. 19/21. BERECKI 2008, Pl. 30/1 (Pit LM 7–8), 51/6, 51/12 (Cx. Af 6).
[42] BERECKI 2008, Pl. 13/9, 14/2 (Cx. Af2).
[43] IRLINGER 1995, 77.
[44] DUMITRAȘCU 1994, 128, Pl. LIII/1, 8—stamps decorated with crescent motifs and, respectively, with concentric circles; Pl. LIV/1 – faceted graphite fragment.
[45] DUMITRAȘCU 1994, 128.
[46] ZEILER 2011, 390.
[47] Selective: ECHEVARRÍA 2006, 77; DOOIJES/NIEUWENHUYSE 2007, Fig. 1, 3, 5–6; NADALINI 2007, Fig. 2; DÁVILA BUITRÓN 2013, Fig. 1.
[48] ECHEVARRÍA 2006, 77, type A. DOOIJES/NIEUWENHUYSE 2007, 18, Fig. 1. DÁVILA BUITRÓN 2013, 458, Fig.1/type I.D.1.a.
[49] PEÑA 2007, 232–249, provides a clear description of the technique, supported by examples of Roman-period artifacts. DOOIJES/NIEUWENHUYSE 2007, 18, Fig. 3. DÁVILA BUITRÓN 2013, 457–458, Fig. 1/type I.D.2–5.
[50] ECHEVARRÍA 2006, 77, 80–81, Type E. NADALINI 2007, 30, Fig. 2b. DÁVILA BUITRÓN 2013, 459–460, Fig. 1/type IE, Fig. 6.

In the Late Iron Age, the practice of ceramic reconditioning using metal artifacts was neither temporally nor geographically limited, and the types of repairs are certainly more diverse than those documented in the present study. Restoration interventions involving iron and bronze artifacts are attested in Early La Tène settlements in Moravia, such as Modrá, Neředín,[51] and Křenovice.[52] For later phases, statistical data are available on the repair of graphite-tempered vessels from the *oppida* of Staré Hradisko and Hostýn.[53] Iron and bronze clamps are also reported in connection with La Tène pottery repairs from both the cemetery and settlement at Dürrnberg-bei-Hallein.[54] More recently, repairs—including some carried out with iron artifacts—have been reported in the southern part of the Great Hungarian Plain, at the settlement of Szeged-Kiskundorozsma – Tóth János dombja I.[55]

Regarding the use of adhesives in the repair of ceramic vessels, previous classification systems distinguish four types: mineral-based, animal-based, plant-based, and metallic materials.[56] The examples from the Pișcolt necropolis document the use of an organic binding agent, bitumen, although this identification should be treated with caution, as to our knowledge, the macroscopic observations have not been confirmed through physico-chemical analyses. Although tar-based adhesives appear to have been used less frequently during this period, their presence is attested in various regions. In western Transdanubia, a *kantharos* discovered at the Zalakomár settlement has a handle that was reattached to the vessel body using such a binder.[57] In southern Moravia, at Klentnice, a graphite-tempered *situla* is reported to have been repaired with birch tar.[58]

The third category of ceramic vessel reconditioning involves the replacement of a portion of the vessel, a process also referred to as reintegration. Detailed classifications of prehistoric and ancient repairs identify several types of such interventions: filling with mastics, insertion of ceramic fragments, use of supported mastics, as well as filling or patching with materials of metallic or organic nature.[59] The example discussed here, in which a damaged handle was replaced with a bronze sheet band,[60] falls into the latter category. It is worth noting that, within the study area, this type of repair is, so far, a unique case, and references to vessel restoration interventions in funerary contexts are extremely rare.[61]

Within the broader La Tène cultural area, other forms of intervention on ceramics are attested, which can be assigned to distinct types and categories of repair. In addition to the three types of mechanical fastening discussed above, we also note the use of metal collars in vessel repair.[62] This type of intervention has been documented on a *situla*-type vessel with graphite-tempered fabric discovered at the site of Kościejów (southern Poland, Middle La Tène), where traces of an iron band applied around the vessel's neck were identified.[63] At the level of intervention categories, we also note reconditioning through mechanical removal, involving the reshaping of the rim by grinding after damage to the original edge. Relevant examples of this type of repair include two *Linsenflasche*-type vessels discovered at the settlements of Koryčany and Kostelec na Hané (Moravia).[64]

Returning to the sites in the eastern Carpathian Basin and considering the varied contexts from which the vessels originate, we believe a brief analysis of the motivations behind the decision to repair ceramic containers is necessary. In the case of the handled vessel recovered from grave 107 at Pișcolt necropolis, the specially commissioned repair extended the vessel's use-life until the owner's death. The customized nature of the repair, the material employed, and the depositional context all point to and underscore the personal value attached to the object.[65] A similar interpretation was proposed by Mariana Egri in relation to the *kantharos*-type vessel from Zalakomár.[66]

A comparative analysis of the funerary inventories associated with the four graves from Pișcolt necropolis containing repaired vessels (graves 107, 124, 53, 63) suggests that ceramic reconditioning was not limited to a particular level of prestige or social status (Table 1). The presence of repaired vessels in both modestly equipped graves and richly furnished contexts—such as grave 124, which includes weaponry, and grave 107, which contains personal adornments—indicates that the decision to preserve and reuse pottery may reflect a pragmatic attitude toward wear and damage, rather than economic necessity. Since the selection of grave goods does not necessarily reflect the deceased's will or objective social status, the inclusion of reconditioned vessels may be interpreted as an expression of continued functional and/or emotional value recognized by those responsible for the funerary deposition. In this sense, repairs do not diminish the status of objects; on the contrary, they may reinforce a culturally appreciated notion of durability—potentially invested with symbolic meanings related to continuity, frugality, or remembrance.

For the La Tène workshops and settlements in the Upper Tisza Basin (north-western Romania), the available data indicate a higher frequency of repairs on graphite-tempered vessels, particularly on *situla*-type forms (Fig. 2, Pl. I, II, IV). This observation, previously noted by J. Németi,[67] may suggest either a greater structural vulnerability of

[51] GOLÁŇOVÁ 2018, 169, Modrá: Cx 1/1997 – Pl. 2/28 (Fe); Pl. 2/19 (bronze); Cx 17/2003 – Pl. 8/25 (Fe); Neředín: Cx 331 – Pl. 15/18, 44 (Fe) și Cx 173 – Pl. 13/38 (bronze).
[52] MEDUNA 1980, 110.
[53] HLAVA 2008, 214–215, Tab. 3.
[54] PENNINGER 1972, 52, 55, 93, Taf. 12/14, 15/11,13, 64/10. MOOSLEITNER/PAULI/PENNINGER 1974, 108, Abb. 5/B6, Taf. 168/A4. IRLINGER 1995, 77.
[55] SÖRÖS 2024, 90, Fig. 30/4.
[56] DÁVILA BUITRÓN 2013, 461–464, Fig. 1/Type II.
[57] HORVÁTH 2008, 113, Fig. 2.
[58] MEDUNA 1980, 110, footnote 120; HLAVA 2008, 214.
[59] DOOIJES/NIEUWENHUYSE 2007, 19–20, refers only to the integration of ceramic fragments. DÁVILA BUITRÓN 2013, Fig.1/type IV.A–D.
[60] NÉMETI 1975, Pl. III/11; NÉMETI 1992: grave 107–182, Fig. 17/10; RUSTOIU 2014, 176.
[61] ZIRRA 1967, grave 2/1962: 19; Fig. 7/III; Fig. 39, M2/III; Pl. XVI, M2/III—the circular incision on the vessel may represent a possible trace of repair. NÉMETI 1989, grave 124: 86, Fig. 8/6. NÉMETI 1992, grave 53: 67, Fig. 6/4 and grave 63: 70, Fig. 9/5.
[62] DÁVILA BUITRÓN 2013, Fig. 1/ Type I.A.b.
[63] DULĘBA 2021, 261, Fig. 5/4.
[64] Koryčany: MEDUNA 1980, 110, Taf. 59: 1; HLAVA 2008, 214; GOLÁŇOVÁ 2018, Fig. 59/7. Kostelec na Hané: HLAVA 2008, 214; GOLÁŇOVÁ 2018, 216 (cat. no. 35), Fig. 59/4.
[65] RUSTOIU 2014, 176.
[66] EGRI 2014, 81.
[67] NÉMETI 2009, 270.

Table 1. Inventory of graves from the Pișcolt necropolis containing repaired vessels (NÉMETI 1989, grave 124: 86. NÉMETI 1992, grave 53: 67, grave 63: 70, grave 107: 82)

Chronology (ZIRRA 1997, Table I)	Feature	Ceramic Vessels	Bronze fibula	Iron fibula	Bronze chain	Bronze bracelets	Lignite bracelets	Ankle rings	Iron shears	Sword with scabbard	Iron knife	Spearhead
LT B2/C1	Grave 107	3	2		1	2	2	2				
LT B2/C1	Grave 124	4								1	1	1
LT C1	Grave 53	6							1			
LT C1	Grave 63	3		1								

graphite-tempered ceramics or a reduced availability of replacement vessels, which may have encouraged their preservation and repair.

The multiple repairs observed on the vessel from the Carei-Ferma Spitz workshop (Pl. I), along with its porous microstructure (with pores measuring 0.2 cm on both the interior and exterior surfaces), which may have been the source of the fractures subsequently repaired, support the hypothesis of potential technological issues arising during the vessel's production process. In the absence of detailed analyses of graphite-tempered ceramics recovered from production contexts, however, this hypothesis cannot be extrapolated at a regional level.

From the second perspective—the reduced availability of graphite-tempered vessels—it can be hypothesized that a shortage of graphite as a raw material may have contributed to the perception of these vessels as having higher value and may have warranted the effort invested in their repair. The extremely small quantity of raw graphite recovered from La Tène contexts in the region,[68] compared to other areas such as western Transdanubia,[69] along with the low number of graphite-tempered ceramic fragments relative to the overall ceramic assemblages from workshops (Fig. 5), supports this interpretation. Further support for the hypothesis of imported graphite or graphite-tempered vessels comes from studies of the sustained cultural and economic interactions between Transylvania and Central Europe.[70] A similar hypothesis was advanced by M. Hlava in reference to sites in Moravia, where repairs on graphite-tempered vessels appear more frequently at locations believed to have imported such ceramics or the graphite used to produce them.[71]

However, it is important to acknowledge the limitations of the currently available data. The information from workshops is based on primary analysis of ceramic material, but the sites have either been investigated through small-scale rescue excavations, as in the case of the Carei-Ferma Spitz and Andrid workshops, or are still undergoing excavation, as at the Carei-Bypass Road site. For the north-western settlements, the data comes from secondary sources, which limits the interpretation of technological details. Additionally, several other sites with the potential to provide relevant data are still in the process of publication (e.g., Pișcolt-Lutărie, Oradea-Salca Pepinieră).

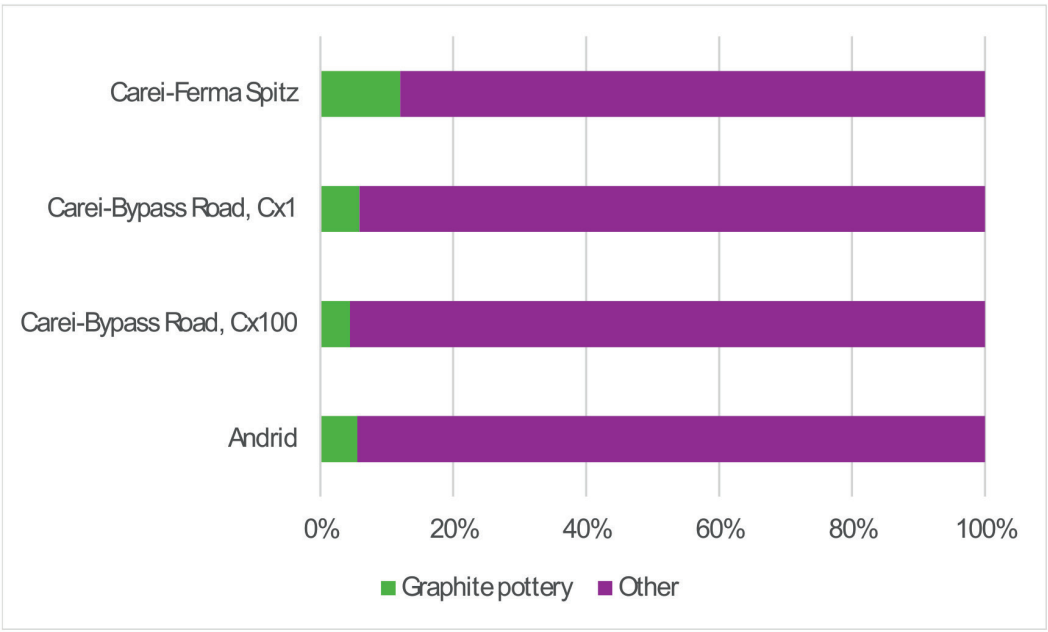

Fig. 5. Proportion of graphite-tempered ceramic in pottery workshops from the north-western region of Romania (Upper Tisza Basin).

In addition to the limitations mentioned above, it is important to clarify the situation regarding the repairs noted on vessels from the Pișcolt necropolis. In the necropolises of the north-western region, the proportion of graphite-tempered vessels is particularly low,[72] indicating that this type of consumption context was not common in the area. Therefore, while these funerary examples contribute to the documentary scope of the phenom-

[68] DUMITRAȘCU 1994, 128, Pl. LIV/1 – faceted piece of graphite. NÉMETI 2009, 268, reports small fragments of graphite at the Pișcolt-Lutărie settlement.

[69] TANKÓ 2020, 226. Approximately 40 kg of raw graphite are reported at the Ménfőcsanak–Szeles-dűlő settlement in north-western Hungary.

[70] RUSTOIU/POPA 2000, 254–256.

[71] HLAVA 2008, 214–215.

[72] NÉMETI 2009, 268. Two graphite-tempered vessels are mentioned in Graves 9 and 45 from the Pișcolt necropolis. RUSTOIU 1993, 140, Appendix 2.

enon, they do not provide a sufficiently solid basis to confirm or refute the previously discussed hypotheses regarding the motivations for and frequency of reconditioning in production and everyday consumption settings.

While multiple factors can be identified as possible motivations for vessel reconditioning during the Middle La Tène period in north-western Romania, the situation in settlements from the Western Plain may be different. An important consideration is that data from this region are more limited: no pottery workshops have been documented to date, and evidence of repairs on vessels is indicated solely by the presence of circular perforations. The variety of vessel forms showing repair traces (Fig. 4), along with the fact that these occur on both wheel-thrown and hand-made ceramics, suggests that the decision to recondition pottery may have been influenced by the socio-economic conditions of the inhabitants—repair being a more accessible alternative than replacement,[73] and/or by seasonal access to ceramic products. A similar interpretation, involving seasonal production or trade, has been proposed for the settlement at Szeged-Kiskundorozsma (La Tène C, southern part of the Great Hungarian Plain), where approximately one-tenth of the ceramic assemblage shows signs of repair, as observed on various vessel types, both wheel-thrown and hand-made.[74]

Even where the evidence is indirect, the frequency of perforations suggests a systematic behavior oriented towards the preservation of ceramic objects. Moreover, this pragmatic attitude toward ceramic wear in the period is also supported by archaeological evidence attesting to the reuse of ceramic fragments in various ways. In most of the domestic features at Ciumești-Bostănărie, perforated discs made from vessel fragments—either with or without graphite-tempered fabric—have been reported.[75] Similar discs or tokens made from vessel sherds, sometimes interpreted as spindle whorls, are also mentioned at the settlements of Cămin-Malul Crasnei,[76] Pișcolt-Lutărie,[77] Cicir,[78] and Morești.[79] In other cases, the literature notes the reuse of graphite-tempered ceramic fragments as burnishers.[80]

CONCLUSIONS

The documented cases of ceramic repairs in La Tène contexts from the eastern Carpathian Basin demonstrate a frequent and adaptive practice aimed at extending the use-life of ceramic vessels. These interventions– identified both in pottery workshops and in consumption contexts– reflect a diverse range of technological solutions, from circular perforations and metal fastenings to organic adhesives and structural replacements. They also reveal a pragmatic approach to wear, highlighting the functional value attributed to ceramic objects.

Archaeological evidence from production contexts—including vessels with repairs or repair traces, as well as possible tools used to make perforations or bind joints—suggests that some reconditioning may have been carried out within pottery workshops. Additionally, in the case of more complex interventions, such as the replacement of a ceramic handle with a bronze one, the hypothesis emerges that certain repairs were specially commissioned, possibly involving collaboration with artisans specialized in metalworking.

This study suggests that such interventions are not isolated occurrences, but rather part of an adaptive system of technological and economic practices, potentially linked to the perceived value of ceramic objects, the availability of raw materials or finished products, and the territorial and temporal variability in access to ceramics or the means to acquire them. The comparative analysis between sites located in the Upper Tisza Basin and those in the Western Plain of Romania highlights not only the frequency and distribution of these interventions by archaeological feature, but also potential economic motivations and local technological practices that may have influenced decisions to carry out repairs.

Although the available data are limited, they provide a meaningful starting point for deeper exploration of ceramic technology and the socio-economic implications derived from the study of ancient repair practices. Further progress in this area will depend on interdisciplinary research, including physico-chemical analyses of repair materials and a systematic re-evaluation of repaired ceramics from known sites. Integrating data from preventive excavations into broader regional statistical frameworks could also contribute to a more nuanced understanding of the phenomenon.

Ultimately, the reconditioning of ceramics during the La Tène period reflects more than a functional technique, it embodies a cultural attitude toward objects, resources, and durability. It is a practice that warrants renewed attention and reinterpretation within the framework of contemporary archaeological paradigms.

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[74] SÖRÖS 2024, 90.
[75] ZIRRA 1980, B/1968: 45, Pl. X/8–9; L1/1964: 49, Pl. XIV/13; L2/1964: 54, Pl. XXIV/12; L3/1964: 58, Pl. XXXI/9; L4–5/1965: 62, Pl. XXXVI/8.
[76] NÉMETI 2011, 123, Pl. 15/6.
[77] NÉMETI 2009, Fig. 11/4.
[78] URÁK 2020, 130, Pl. CXXIX/2–3 (discs with a central perforation), Pl. CXXIX/1 (discs without perforation).
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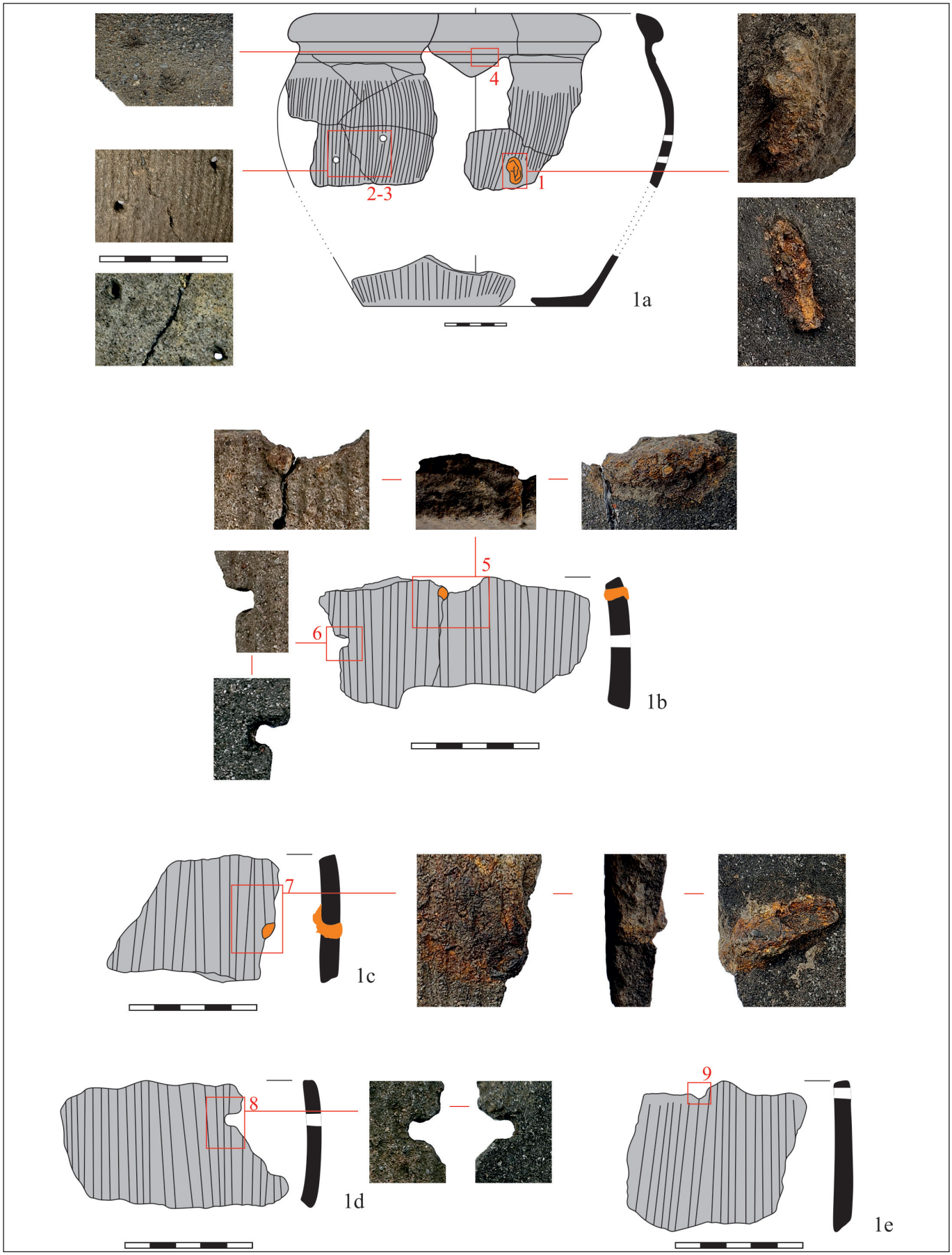
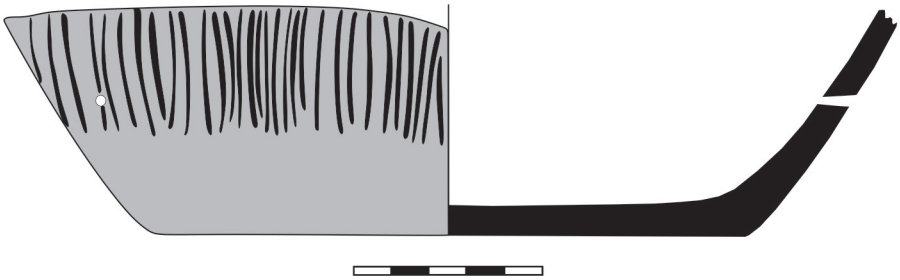
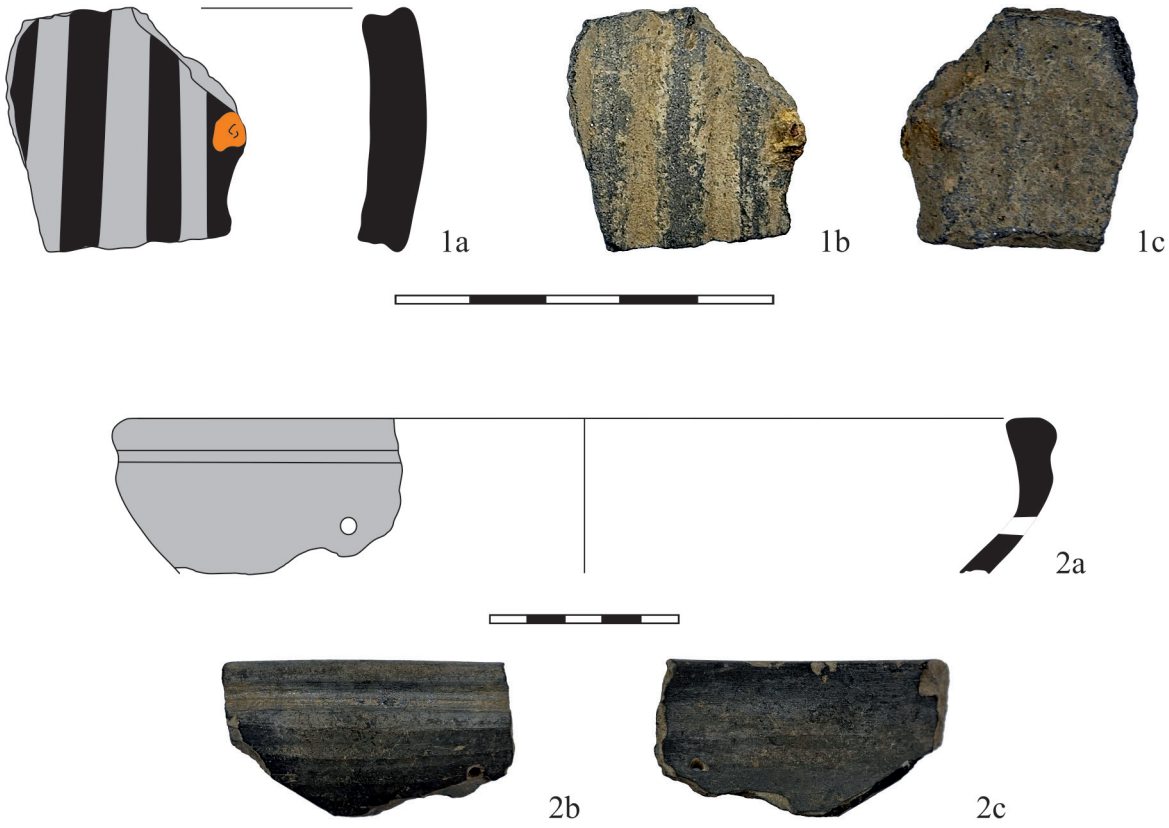


Pl. I. Carei-Ferma Spitz, Cx 10/2012. 1.a - e - Fragments of a repaired vessel (details at 1:1 scale, details 1a/2–3 at 1:2 scale).

Pl. II. Carei-Bypass Road, Cx 100/2012 – pottery kiln. Ceramic fragments with traces of post-firing interventions – circular perforations. 1.a–c – Wheel-finished fragment with graphite paste; 2–3 – wheel-thrown fragments.



Pl. III. Orosia-Site V, Cx 97/2016 – pottery workshop. Traces of post-firing interventions on a graphite-tempered vessel (detail at 1:1 scale).



Pl. IV. Carei-Bypass Road, dwelling Cx 31/2012. Traces of post-firing interventions on ceramic fragments tempered with graphite. 1.a–c – Ceramic fragment with iron rivet; 2. a–c – ceramic fragment with circular perforation.