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MARIA BITIRI

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THE SHOULDERED POINTS AND THE GRAVETTIAN OF THE EASTERN CARPATHIAN AREA: INSIGHTS FROM BISTRICIOARA-LUTĂRIE III (CEAHLĂU BASIN, NORTHEASTERN ROMANIA)

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***Keywords**: Eastern Carpathians, Late Gravettian, Cretaceous flint, shouldered points, lithic variability*

***Abstract:** The Bistricioara-Lutărie III (BL III) Upper Paleolithic site belongs to the dense network of multilayered sites located along the Bistrița Valley, Eastern Romanian Carpathians. Its Gravettian layer with shouldered points (ca. 27 ka cal BP) opens a succession of Gravettian and Epigravettian cultural layers covering the entire timespan of the Last Glacial Maximum. The layer preserves a consistent lithic assemblage almost entirely knapped in allogenous Cretaceous flint, together with poorly preserved faunal remains and in situ habitation/occupation features. Chronologically, this assemblage fits well within what was defined as a specific cultural package i.e., the shouldered points horizon, generally framed between 29 and 27 ka cal BP. This also seems to apply to several archaeological layers at other multi-layered sites in the region, located along the Bistrița (Poiana Cireșului, Buda, and Lespezi), Prut (Mitoc Malu Galben) and Dniester (Molodova V and Doroshivtsi III) river valleys. In this contribution, we aim at integrating the data provided by older and more recent investigations into a larger, common chronological and cultural framework, and discuss the validity of the shouldered points as Late Gravettian chrono-markers in the East Carpathian area.*

***Cuvinte-cheie**: Carpații Orientali, Gravettian târziu, silex cretacic, vârfuri à cran, variabilitate litică*

***Rezumat:** Aparținând paleoliticului superior, situl de la Bistricioara-Lutărie III (BL III) face parte din rețeaua de situri pluristratificate situate de-a lungul văii Bistriței moldovene. Nivelul gravettian cu vârfuri à cran (ca. 27 ka cal BP) deschide o succesiune de niveluri gravettiene și epigravettiene, care acoperă întreaga durată a ultimului maxim glaciar. Acest nivel a oferit resturi faunistice degradate, structuri de locuire și un ansamblu litic bogat, pentru care a fost utilizat, aproape în exclusivitate, silexul cretacic. Din punct de vedere cronologic, ansamblul gravettian de la BL III se încadrează în ceea ce a fost definit drept un pachet cultural specific, respectiv orizontul vârfurilor à cran, încadrat aproximativ între 29 și 27 ka cal BP. Aceeași situație pare a fi valabilă și în cazul altor câteva niveluri din situri din regiune, situate de-a lungul văii Bistriței (Poiana Cireșului, Buda, Lespezi), Prutului (Mitoc Malu Galben) și Nistrului (Molodova V, Doroshivtsi III). În această contribuție, ne-am propus să integrăm datele oferite de cercetările anterioare, precum și de cele recente, într-un cadru cronologic și cultural comun mai amplu, referindu-ne totodată la validitatea caracterizării, în zona est-carpatică, a vârfurilor à cran drept marcatori cronologici ai Gravettianului târziu.*

INTRODUCTION

Thanks to their ubiquitous presence, likely connected to their importance as hunting and processing equipment, the small lithic armatures play a key role in the design of Upper Paleolithic (UP) cultural taxonomies[1]. The stylistic relevance of these armatures seems also well supported empirically: their morphology and production technology are clearly patterned in time and space (e.g., Aurignacian Krems/Dufour armatures, Solutrean shouldered/leafpoints, La Gravette points, Hamburgian points etc.). These easily recognizable[2] shapes irresistibly evoke shared 'ways of doing' connected to social traditions of various breadths[3]. Irrespective of the likely many causes leading to these particular armature shapes (production and hafting technologies, functionality, ethnic styles, etc.),

[1] Moreau 2009; Klaric 2013; Lengyel 2016, 2018.

[2] Barely visible when hafted, most of the small UP lithic armatures likely played a minor role in terms of assertive, ethnic styles (Barton, Neeley 1996).

[3] Of course, the extent to which the current UP taxonomy actually corresponds to distinct social traditions remains a contentious issue (e.g., Reynolds, Riede 2019).

one may safely assume that the smaller their chronological and geographical range and the narrower their morphometric variation, the more important is their chrono-cultural value as index fossils.

For the later stages of the Gravettian technocomplex in Central and Eastern Europe, shouldered points have long played such a diagnostic role[4]. Based on the new results obtained at the UP site Bistricioara-Lutărie III (BL III) in northeastern Romania, we would like to provide here an updated perspective on the issue of shouldered points in East-Central European Late Gravettian contexts. While confirming through some key features the peculiarity of Late Gravettian assemblages in Central and Eastern Europe, a newly found lithic assemblage at BL III also raises some taxonomic issues worth of consideration.

THE SITE AT BISTRICIOARA-LUTĂRIE III

The BL III site is situated on a 15–18 m terrace, on the right bank of the Bistrița River, ca. 500 m southeast of the present confluence with its tributary, Bistricioara (Fig. 1). BL III is part of a dense network of multilayered Upper Paleolithic (UP) sites located in Bistrița's upstream Răpciuni (Ceahlău Basin) sector[5]. Systematic excavations, drill coring, as well as chronometric and paleoenvironmental sampling at BL III started in 2008 and continued intermittently to the present day[6]. Six archaeological horizons (AH) were uncovered in the ~2 m thick silty upper part of the thick sedimentary (ca. 9 m) sequence capping the terrace gravels. Apart from the topmost late Epigravettian layer lying in a thin fine silt unit (G1) close to the modern surface and lacking chronometric data, the remaining five layers are preserved in a coarse silt unit (G2) accumulated through mixed aeolian and colluvial input. Based on various methods, the lower chronological boundary of this unit, described at all sites located on the Bistrița terraces, was established at ca. 30/31 ka cal BP. According to the radiocarbon and thermoluminescence data available, the archaeological layers preserved in unit G2 at BL III range between ~27 ka cal BP and ~15 ka BP. Earlier traces of human presence are also preserved, especially as massive combustion features or scattered charcoals, in the lower part of the sequence. The available chronology of these traces (31–35 ka cal BP) points to ages that go beyond the acknowledged timeframe of the Gravettian technocomplex[7].

Several charcoal samples indicate radiocarbon ages of ~27 ka cal BP for the Gravettian layer (AH 2.5) (Table 1), which makes it chronologically and culturally unique not only within the BL III sequence, but also among other previously reported archaeological contexts in the area[8]. Although to some extent affected by slope processes and periglacial features, AH 2.5 preserves anthropogenic features, such as pits and combustion features, and includes relatively large boulders and heavily degraded flat sandstone slabs. More than 900 identifiable faunal remains were recorded, mostly reindeer, with a few bones of fox and hare. The preservation of small limb bones in anatomical connection certifies the good state of conservation of this layer, which is also the only one in the entire sequence at BL III preserving fauna. Sex and age repartition of the recognizable reindeer remains indicate either multiple hunting episodes or a large-scale late spring or mid-autumn hunt[9].

A lithic assemblage of 2217 pieces was so far recovered from AH 2.5, generally concentrated in the western part of the excavated surface (28 m^2), which is also the area where most of the refits of lithic fragments, showing distances between 0.2 to 2.7 m, were possible (Fig. 2). Although only the northern part of the site was systematically excavated yet, a considerable lateral extension of AH 2.5. was documented at the same depth by a survey trench 10 m to the south. This indicates that the current image of the assemblage is still preliminary and will be complemented as the excavated area expands.

THE LITHIC ASSEMBLAGE IN AH 2.5

The lithic collection from BL III/AH 2.5 (Table 2, Fig. 3) depicts a singular case of almost exclusive distant raw material provisioning. Cenomanian/Turonian flint from the Prut-Dniester interfluve constitutes 92.8% of the knapped lithic material. Generally acknowledged as 'Prut flint' in the Romanian archaeological literature, this high-quality raw

[4] Otte 1981; Svoboda 2007; Kozlowski 2007.
[5] Nicolăescu-Plopșor *et alii* 1966; Păunescu 1998.
[6] More detailed presentations of the site's geochronology and archaeology are to be found in Trandafir *et alii* 2015; Schmidt *et alii* 2020; Anghelinu *et alii* 2021b.
[7] Schmidt *et alii* 2020 ; Anghelinu *et alii* 2021 a, 2021b.
[8] Păunescu 1998; Anghelinu *et alii* 2012; Anghelinu *et alii* 2021a, 2021b.
[9] Anghelinu *et alii* 2021b.

material was, in varying amounts, described for virtually all UP collections of the Eastern Carpathians[10]. Recent petrographic and geochemical reassessments[11] suggest a hitherto underreported variability, involving potentially different sources and provisioning areas. Six macroscopically and microscopically distinct varieties of Cretaceous flint were in fact recently identified for the Gravettian and Epigravettian assemblages at BL III (M. Brandl, comm. pers.). Ongoing geochemical petrographic investigation and field sourcing will hopefully allow for a more accurate tracking of provisioning patterns. Whatever the actual provisioning area, with a minimum distance of 150 km to the north and/or northeast, the source for this raw material is clearly located far from the Eastern Carpathian range. A single radiolarite bladelet may point at a similarly, if not more distant Central European source. Locally and regionally available (up to 50 km) Eocene cherts, black shales or sandstone were only occasionally employed in the AH 2.5 assemblage. The representation of these raw materials is restricted to undetermined fragments, flakes, a few blades and formal tools, one core, and one core tablet.

The largest part of the AH 2.5 assemblage (45.7%) is composed of unidentified fragments and <5 mm chips/*esquilles*. Unmodified flakes, blades, bladelets and burin spalls amount to 33.1%, followed by cores, cortical and core rejuvenation products (11.7%), and formal tools (7.8%). The two complete cores and three core fragments recovered look heavily reduced (30–40 mm long, 27–37 mm wide, 18–22 mm thick). The prismatic pieces exhibit debitage surfaces covering the entire circumference, two opposing striking platforms, and show both flake or blade negatives. Small cortical areas on the debitage surfaces and battered/crushed portions of the striking platforms are present. The only sandstone core recovered is a pyramidal, one striking platform piece, with the debitage surface covered in flake negatives opposing a battered area. Primary flakes and blades (100% dorsal cortex) are rare and fragmented, with maximum lengths of 55 mm for a proximal blade. Secondary (more than 50% dorsal cortex) and cortical (less than 50% dorsal cortex) flakes, blades (width equal or higher than 12 mm) and bladelets (less than 12 mm wide) are more numerous. For complete specimens, maximum length values fluctuate considerably, probably due to varying initial sizes of the raw material pieces: 32 mm long bladelets, 74 mm long blades, and 62 mm long flakes. Several of the secondary and cortical pieces (blades, fragments, one flake and one bladelet) were further modified to formal tools – burins, endscrapers, truncated/retouched blades, one backed bladelet and one shouldered piece. Most of the core rejuvenation products are crested and half-crested blades and bladelets, with only a few core tablets on flakes. Several fragmented half-crested pieces exhibit small dorsal cortical areas, which places them in a rather early stage of the reduction sequence, as is the case with one of the core tablets. The latter are 30–60 mm long flakes, with distally or laterally visible parts of former debitage surfaces. Two of the half-crested blades were modified to a burin and a marginally retouched blade.

Blank production resulted in slightly more flakes than laminar products, and both categories are found mostly fragmented. Complete flakes are mainly divided between 8–14 mm long pieces, with punctiform striking platforms and feathered distal extremities, and larger, 25–55 mm long pieces, with flat or linear striking platforms and scarred or highly damaged bulbs, indicative of hard hammer percussion. Laminar production is balanced between blades and bladelets. Both types of blanks are represented mostly by fragmented pieces; only 10% of the blades and 22% of the bladelets are complete. For both blades and bladelets, triangular cross-sections and rectilinear profiles are dominant, as are punctiform and flat striking platforms and unidirectional dorsal negatives. Average length measurements of 28–40 mm (complete blades) and 20–30 mm (complete bladelets) are only occasionally topped by 80–113 mm (blades) or 52 mm (bladelets) values. Interestingly, maximum length values of 123 mm and 145 mm for blades belong to fragmented, proximal and distal pieces, indicating that flint cores or blocks transported at the site must have exceeded these in size.

The AH 2.5 collection comprises only 42 burin spalls, a figure smaller than expected within an assemblage in which burins amount to 27.4% of the toolkit (see below). They exhibit concave or twisted profiles, trapezoidal or triangular cross-sections, and linear or punctiform striking platforms. Occasionally, flat striking platforms were noticed, accompanied by slightly cracked percussion bulbs. Complete pieces are 18–28/40–43 mm long (with a single exception of 69 mm length), 4–8 mm wide, and 2–5 mm thick.

The formal tools category includes undetermined fragments of retouched pieces (n=15), one retouched flake (n=1), endscrapers (n=4), burins (n=43), marginally retouched blades and bladelets (n=30), truncated blades and bladelets (n=18), pointed blades and bladelets (n=3), backed bladelets (n=32), microgravettes (n= 14), and shouldered pieces (n=14).

[10] Nicolăescu-Plopșor *et alii* 1966; Păunescu 1998.
[11] Ciornei 2015; Moreau *et alii* 2018.

Endscrapers are represented by distal, 30–50 mm long fragments. One exhibits an incompletely shaped active front, while another has an obliquely truncated proximal edge. Burins belong to the dihedral, on truncation and on break types, sometimes to a combination of two types (proximal dihedral-on truncation distal). Their blanks are 40–60 mm long, 18–25 mm wide, 6–9 mm thick unidirectional blades, with mostly trapezoidal cross-sections. Likely, several 80–100 mm long and 12–19 mm thick fragmented pieces also functioned as bladelet cores. Burin spall negatives are 17–32 mm long and 3–7 mm wide, thus mostly within the range of actual burin spalls from the collection. For about one third of the burin category, spall negatives cover unidirectional, rarely bidirectional anterior similar detachments (*chutes reprises*), which once more points at an underrepresentation of these products within the collection.

Retouched blades and bladelets are mostly fragmented pieces of various sizes, with one or both long edges entirely or partially modified through direct, semi-steep retouch; occasionally, an inverse flat retouch was applied to the proximal end, probably for hafting purposes, as is the case for few, equally isolated examples of proximal convergence of two partially retouched edges. Undetermined and perpendicular fractures are the most frequent. Few distally retouched and unretouched blades and one unretouched bladelet exhibit straight, oblique or concave truncations, either complete or partially destroyed by longitudinal lateral fractures, some of which might represent failed attempts at shaping a burin.

Backed bladelets represent the most frequent type of retouched bladelets in the assemblage – abrupt, direct retouch is continuously or partially applied mostly to the right long edge and extended to the intersection with the highest dorsal ridge. They are fragmented, median and distal 19–30 mm long, 3–6 mm wide and 2–4 mm thick unidirectional pieces, with rectilinear, rarely concave profiles, and triangular, rarely trapezoidal cross-sections. The only proximal fragment recovered shows a crushed striking platform and cracked percussion bulb. Distal and median micrograveттes are 17–25 mm long, 3–8 mm wide and 2–4 mm thick and show bilateral, direct or inverse abrupt retouch.

Shouldered pieces (Fig. 4: 1–9) include seven medial and distal blades and seven complete and medial bladelets. One medial and one distal shouldered blade exhibit morphological traits consistent with the work of less experienced knappers[12]. Complete pieces are 83/39/29 mm long, 10/6 mm wide, and 8/2 mm thick, weighing 3.7/0.9/0.6 g. Direct, abrupt retouch shapes stems of various lengths (14/7 mm) and lateralization. Except for one case in which the punctiform striking platform was preserved, the proximal end lacks traces of the bulb and striking platform, both eliminated either by the convergence of the stem's end with the opposing retouched side, or through flat, inverse retouch applied to the proximal end. Similarly, the distal tip is shaped by converging retouched long edges, or through flat, inverse retouch. The largest of the complete pieces (Fig. 4: 1) resulted from conjoining a distal pointed fragment with what seemed a backed bladelet, but was, in fact, a fragmented stem; several morphologically similar fragmented pieces included in the backed bladelets category could also be parts of shouldered points.

In sum, despite the small area yet excavated, the AH 2.5 assemblage at BL III is a typical Late Gravettian assemblage, which features a massive input of exotic raw material, quantitatively well beyond the UP acknowledged average[13]. Despite the many archaeological layers providing a comparable numerical or relative chronology at the nearby sites on the Bistrița terraces[14], AH 2.5 appears however surprisingly isolated in the Eastern Carpathians.

REGIONAL ANALOGIES

At ~27 ka cal BP, BL III/AH 2.5 has no strict chronological counterparts among Gravettian cultural layers from the Ceahlău Basin, as only older (28/29 ka cal BP) or younger (25/26 ka cal BP) layers, all lacking shouldered points, have hitherto been reported[15]. However, further downstream the Bistrița Valley, three recently reassessed Paleolithic sites, Lespezi, Buda and Poiana Cireșului-Piatra Neamț (PNPC)[16], provided shouldered implements and reasonably close radiocarbon ages (Table 1).

At Lespezi, the earliest archaeological layer VI, recently dated to ~29 ka cal BP[17] is likely a result of mass redeposition of lithic and faunal material[18]. Reindeer, horse and bison hunted during autumn and/or spring, make up

[12] Niță *et alii* 2018.
[13] Féblot-Augustins 2009.
[14] Păunescu 1998, but see Anghelinu *et alii* 2012, 2018.
[15] Păunescu 1998; Steguweit *et alii* 2009; Anghelinu *et alii* 2012, 2018.
[16] Cârciumaru *et alii* 2006, 2018; Tuffreau *et alii* 2018.
[17] Tuffreau *et alii* 2018.
[18] Bitiri-Ciortescu *et alii* 1989; Bolomey 1989.

for over 90% of the faunal record. Within the small lithic assemblage (504 pieces, made of local sandstone, menilite, obsidian and smaller, but unknown amounts of Cretaceous flint), formal tools (7.53%) include burins, one endscraper, marginally retouched and truncated blades, backed blades and bladelets, Gravette points, and one fragmented shouldered piece (Fig. 4: 10; Fig. 5: 1–17).

The next relevant site, Buda, preserved three UP layers, including a two-staged Gravettian occupation (layer 1) dated, much like BL III/AH 2.5, to around 27 ka cal BP[19]. According to the first excavation report[20], layer 1 contained traces of four oval-shaped hearths up to 0.6 m^2, numerous faunal remains and a relatively small lithic assemblage (ca. 900 pieces[21]). The faunal collection is dominated by steppe bison (secondary butchery activities following at least one hunting episode during autumn), and reindeer (non-selective hunting episode in the beginning of the cold season[22]). A small lithic sample (464 pieces) combining both recently found pieces and artifacts of the old collection was recently reassessed[23]. Around 76% of this assemblage is represented by distant raw materials, mostly Cretaceous flint from the Prut-Dniester interfluve, although several pieces of 'striped obsidian' were also reported during earlier research. Laminar products are the most numerous among both retouched and unretouched pieces. They exhibit mostly flat and punctiform striking platforms, regular medial lateral and dorsal edges, and average sizes of 45/60 mm (length), 9/18 mm (width), and 4/5 mm (thickness). Cores and primary cortical products are either absent or very few. Formal tools (28.5% of the assemblage) include endscrapers, burins, borers, marginally retouched blades, bladelets and flakes, truncated blades, backed bladelets, one Gravette point, *microgravettes*, backed truncated bladelets and shouldered points (Fig. 4: 11, 12; Fig. 5: 18–35). Previous accounts of the lithic assemblage[24] also mention conical and prismatic blade/bladelet cores, 'burins on cores' (possibly multiple burins), and one case of an exceptionally long (148 mm) burin on an obliquely retouched blade.

As yet only a part (ca. 200 artifacts) of the small Gravettian assemblage of Piatra Neamț – Poiana Cireșului (PNPC/3), dated to around 28 ka cal BP, has been published[25]. Local raw materials (sandstone, menilite) supplied most of the largely laminar reduction sequence. Discarded, 21–31 mm long and 10–18 mm wide prismatic or slightly pyramidal cores exhibit one or two striking platforms and frontal or semicircular debitage surfaces. The toolkit (Fig. 5: 36–50), dominated by marginally retouched blades/bladelets, pointed blades and backed bladelets, comprises one shouldered piece and one fragmented tanged implement[26]. A few domestic tools (burin, endscrapers) and one peculiar point with ventral retouch complete the inventory. Although the amount of Cretaceous flint is much smaller (20%), this assemblage features a similarly high retouch index (12.3%) as BL III/AH 2.5.

Summing up, all Bistrița Valley Gravettian assemblages preserving shouldered implements are generally small, highly curated (i.e., with few, highly reduced cores and many retouched artifacts), displaying a large number of backed implements, burins and very few other domestic tools. Apart from their contemporaneity, Buda and BL III/AH 2.5 also share the large input of allogenous Cretaceous flint, as well as the production and use of very large size blade blanks. For the remaining smaller assemblages (Lespezi, PNPC/3), the presence/importance of these features cannot be presently evaluated. When viewed in relation to excavated areas, the BL III/AH 2.5 assemblage is, however, larger than all its regional counterparts. For instance, the assemblages at Buda and Lespezi were recovered from total excavated areas of ca. 500 m^2 and 900 m^2, respectively. Faunal data indicate that these assemblages were correlated to autumn, possibly spring hunting events, and to generally light habitat features. A less obvious but possibly relevant common feature of all these layers is the generally good state of preservation of organic remains, indicating a fast burial. This feature, which sometimes puts them in contrast to younger overlying layers (Epigravettian) at the same sites (e.g., Buda, BL III), point at comparable paleoclimatic settings with high sedimentation rates. More local sedimentation/erosion regimes also played their part, as both at Lespezi and PNPC, younger Epigravettian layers do preserve organic remains.

[19] Tuffreau *et alii* 2018.
[20] Căpitanu 1967.
[21] According to Bitiri-Ciortescu *et alii* 1989.
[22] Dumitrașcu, Vasile 2018, 2019.
[23] Tuffreau *et alii* 2018.
[24] Căpitanu 1967.
[25] Niță-Bălășescu 2008.
[26] The shouldered implement, although asymmetrical, may also be indicative for an incomplete preparation of an axial tang. At the same time, the tanged point displays an unusual feature, as the tang was prepared on the distal extremity of the blank (Niță-Bălășescu 2008).

MORE DISTANT ANALOGIES

As more than 90% of the lithic material at BL III/AH 2.5 was knapped in Cretaceous flint of northeastern origin, the search for more distant analogies towards the Prut/Dniester area is a most logical step. Despite the large number of documented or presumed Gravettian sites east of the Carpathians[27], only a small number of findspots provided comparable, chronologically close archaeological layers.

In the Prut valley, the slightly older 29/28 ka cal BP Gravettian layer IV at Mitoc Malu Galben[28] provided a collection of 11.660 lithic pieces of mainly Cretaceous flint, abundantly available locally. The assemblage also included several retouched pieces made of sandstone and a non-local white flint type (Fig. 4: 13–15, Fig. 6). The lithic collection has a dominant laminar component and numbers many slender blades and bladelets, obtained from cores with one or two opposite oblique striking platforms, rarely rejuvenated. Debitage surfaces were developed and maintained through crested products and lateral flakes/flanks detachment. Formal tools are dominated by burins, retouched blades and backed bladelets. The latter include microgravettes, shouldered pieces, and one Gravette point. The faunal material is dominated by collected reindeer antler and remains of horse and bison resulting from primary butchery, representing three to seven hunting episodes.

The rich layer 7 at Molodova V, on the Dniester Valley (>50.000 lithics[29]), provided prismatic/irregular cores, with one or two striking platforms, alongside pyramidal or circular/discoidal ones. Occasionally, cores underwent secondary use as tools. Laminar production resulted in 80–120 mm long blades, with few occurrences of 120–220 mm long ones. Bladelet production involved separate reduction sequences, using the lateral edge of flakes (Fig. 4: 16–23; Fig. 7). The formal tools category is mostly represented by burins (dihedral, on truncation, on break) and microlithic armatures. The latter are 20–90 mm long, 4–17 mm wide, directly/inversely abruptly retouched blades and bladelets, defined as Gravette points, microgravettes, Vachons points, truncated backed bladelets, rectangles, and shouldered pieces. Due to the presence of diagnostic impact fractures, microliths were defined as projectile elements, specifically arrow inserts. Similarly, 70–170 mm long Pavlov points on blades were interpreted to have equipped spears. The faunal material is mainly represented by horse and reindeer but includes also mammoth and small furry mammals; elements of an organic industry of bone, antler, and ivory are also present.

Further west on the Dniester river, layer 6 at Doroshivtsi III, dated to around 27/26 ka cal BP[30], also preserved a large assemblage of over 23.000 pieces of locally available varieties of Cretaceous flint (Fig. 4: 24–50; Fig. 8). Uni- and bidirectional cores on pebbles and flakes were used in producing mainly bladelets and micro-blades, through hard hammer percussion. The formal tools category is dominated by retouched and backed blades, bladelets and micro-blades, alongside endscrapers, burins, truncated, denticulated and notched pieces. It also includes four 40–60 mm long shouldered points, as well as four possible fragments shaped through steep/semi-steep retouch, without ventral thinning. The animal species recorded include horse, reindeer (butchering activities), and mammoth (collected ivory)[31]. Organic industry includes ivory and bone points and one decorated ivory rod. Overall, the particular features displayed by layer 6 argued for an Epigravettian assignation[32], despite the documented chronology that points to a Late Gravettian context[33].

DISCUSSION

Shouldered points have been long considered a hallmark of the Late Gravettian (Willendorfian/Kostenkian) from Central Europe to the Don area[34]. The wide dispersal of this type of implements was commonly associated to a population movement from Central Europe to more easterly areas, spurred by the increasingly harsh environmental

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[27] Păunescu 1998, 1999; Noiret 2009; Nuzhnyi 2015.
[28] Noiret 2009.
[29] Noiret 2009; Nuzhnyi 2009, 2015.
[30] Haesaerts *et alii* 2020; Kulakovska *et alii* 2015.
[31] Demay *et alii* 2015.
[32] Kulakovska *et alii* 2015. The main argument is the marginal position of the steep retouch, rarely affecting the overall shape of the blanks, and the rarity (but not absence) of ventral thinning/retouch of the armatures.
[33] While an earlier debut of the Epigravettian, more or less synchronous with the start of the major Late Glacial Maximum (LGM) environmental deterioration, as has been proposed elsewhere in Central Europe (Wilczyński *et alii* 2018, 2020), might be accepted, the classification of the overlying layers (5 to 2) at Doroshivtsi III as Gravettian post-dating the Epigravettian is clearly taxonomically confusing. It relies on a rather strict definition of the Gravettian lithic technology (soft hammer percussion) and typological spectrum (e.g., dominated by burins), and on the presence of two fragmented rectangles in level 3. The augmentation of lithic collections at Doroshivtsi III will hopefully clear this point in the future.
[34] Otte 1981; Svoboda 2007; Kozlowski 2007; Noiret 2009.

conditions of the LGM. Although less straightforward demographic models have been proposed[35] recently, shouldered points upheld their 'type-fossil' currency. While more recent reassessments of the Late Gravettian record in Central and East-Central Europe[36] is yet unable to challenge their status of diagnostic fossils, they nevertheless raise some important issues.

Any reliable cultural-taxonomic framework requires a minimum of spatial and chronological coherence – a daunting task for the sparse, distant and often poorly dated Paleolithic sites. The actual heterogeneity of the Late Gravettian lithic and organic assemblages (including the typology or decorative motives preserved on organic artifacts[37]) in Eastern and Central Europe is still partially downplayed under the broad Willendorfian-Kostenkian taxonomic umbrella. In Central Europe for instance, shouldered points are missing even in chronologically and geographically close contexts[38]. They are either rare or simply absent in many Late Gravettian contexts in the eastern part of Central Europe[39] as well. Excavation and older documentation biases (e.g., lack of sieving), or fragmentation hindering their recognition may have played some part but cannot entirely account for such absence. The UP record of the Bistrița valley provides a case at point, as many collections recovered from the 1950's on do contain microgravettes or small backed bladelets, so a size threshold particularly connected to shouldered pieces is unlikely. Given their documented function as hunting armatures[40], a systematic preservation bias (e.g., preferential off-site loss) in assemblages generally rich in backed armatures with comparable uses is equally implausible.

Moreover, even the reported occurrence of shouldered items might be over-estimated. In some assemblages, shouldered shapes may represent an epiphenomenon of the production of backed implements in these assemblages, which naturally include abandoned roughouts. As noted by Polanská and coworkers[41], a correct identification of shouldered points needs to be evaluated against the whole lithic assemblages involved. The main reason is the possible morphological convergence between partially backed points broken/abandoned during production and the shouldered point morphology. The confusion is all the more likely in the case of broken items missing either the distal or the proximal parts. Ideally, the finding of complete specimens in stratigraphically secure contexts, supplemented by functional proofs to their subsequent use (e.g., projectile fractures) may validate the identification of presumed, fragmented shouldered points. Unfortunately, this is not the case for many Central and East-Central European occurrences, as many reported shouldered points came from old excavations, surface collections and/or lack detailed functional assessments. In the particular case of Eastern Romania, this cautionary note may likely apply to many 'atypical' shouldered points reported in various Gravettian and Epigravettian contexts[42], which may represent such incomplete technological stages in the production of more regular backed implements (e.g., backed bladelets). A similar explanation may hold for the various *pointes à gibbosité* approaching the shouldered morphology.

Even when taking at face value the reported numbers, shouldered pieces (shouldered blades/bladelets and shouldered points, respectively), definitely represent a minority among the formal tools in all assemblages considered here: 0.8% at Molodova V/7, 1.5/1.8% at Buda/1 and Doroshivtsi III/6, to 3.2% at Mitoc MG/IV, with an unusual elevated representation of 8% at BL III/AH 2.5. Technologically, the shouldered pieces are mostly produced on narrow, rectilinear, unidirectional laminar blanks. Their typological and metrical variability (overall shape and size, retouch emplacement, stem length and lateralization etc.) is however considerable. This variation might have been connected to specific hafting/ballistic requirements, local idiosyncrasies and/or to a certain degree of shape approximation, as seems to be the case at BL III[43]. The discrete outline of the shouldered segment and the direct, abrupt retouch involved in shaping it, as well as their average reduced size mark however important differences in relation to the 'classic' Kostenki type of big, inversely retouched, long-stem shouldered points[44].

The poor standardization, coupled with size and shape differences and erratic presence of shouldered points in East-Central Europe, already threatening their chrono-typological value as Willendorfian-Kostenkian 'type-fossils', is

[35] Maier 2017; Maier, Zimmerman 2017.
[36] Wojtal *et alii* 2015; Polanská *et alii* 2021; Lengyel 2018;
[37] E.g. Krakow-Spadzista (Wojtal *et alii* 2015), Doroshivtsi III (Kulakovska *et alii* 2015).
[38] Polanská *et alii* 2021.
[39] Noiret 2009; Anghelinu *et alii* 2018.
[40] Kufel-Diakowska *et alii* 2016; Wilczyński *et alii* 2019.
[41] Polanská, Hromadova 2015; Polanská *et alii* 2021.
[42] Păunescu 1998.
[43] See for comparison the shape/size variability of the Bromme tanged points recorded at a single site (Reynolds, Riede 2019, p. 1355).
[44] Noiret 2013. The 'atypical' features of the East-Central European shouldered points in relation to their Eastern counterparts were in fact long noted (cf. Polanská *et alii* 2021 and references therein). Ironically, the iconic (e.g., Demars, Laurent 1989, p. 139) wide shape of some Kostenki shouldered 'points', also lacking diagnostic impact fractures, might indicate their function as knives.

aggravated by the considerably long(er) timespan of their occurrence. Apart from Doroshivtsi III, shouldered points are also reported at several other sites further east, in the Desna basin, with chronological assessments ranging between 26 and 23 ka cal BP[45]. A *pointe à gibbosité* was also recorded in the Gravettian I layer at Mitoc Malu Galben dated to around 31–32 ka cal BP, while a possibly fragmented shouldered item is reported in the overlying Gravettian III layer here (ca. 28 ka cal BP)[46]. This may indicate an earlier appearance of this type of implement, weakening once more its diagnostic value for the Late Gravettian.

However, throwing the whole taxonomic baby out with the marginally muddied chrono-typological bathwater is yet unwarranted. At least in the space between the Carpathians and the Dniester, shouldered points do seem to appear in a specific chronological interval (~29/26 ka cal BP). They also seem to disappear in the subsequent early Epigravettian stages[47]. Moreover, the particularities of these assemblages in their corresponding sequences and in the wider regional paleo-cultural landscape are in fact underestimated and go well beyond the presence of shouldered items.

At BL III, Buda and Lespezi, the assemblages with shouldered points are the first securely contextualized layers of the UP sequences and share little or no commonalities with the ensuing archaeological contexts, from which are (occasionally sharply) distinct in terms of size, raw material use, typological structure, average blank size and armature morphometry[48]. The small assemblage at PNPC/3 is also distinct from the overlying Epigravettian layers[49], as much as from the underlying earlier Gravettian[50]. At Doroshivtsi III, none of the previous or following layer(s) share any traits with layer 6, particularly in terms of organic industry or occupation intensity; Mitoc Malu Galben replicates the situation, with only tiny and inexpressive Gravettian (or perhaps early Epigravettian) assemblages overlying the rich Gravettian IV[51].

Especially in the case of sites located in the proximity of raw material sources on the Prut and Dniester valleys, the assemblages with shouldered points are by far the most numerous: layer 7 at Molodova V and layer IV at Mitoc Malu Galben, as well as layer 6 in Doroshivtsi III, are the richest within the sites' UP sequences, with tens of thousands of lithic pieces, while underlying and/or overlying assemblages are tens of times smaller. The assemblages at BL III, PNPC, Buda and Lespezi (i.e., at sites located significantly further away from the raw material sources and in a considerably different topographic and presumably paleoenvironmental settings), fall within the average size of UP Eastern Carpathian lithic assemblages[52]. They are nevertheless larger than most of the earlier, admittedly very few documented Gravettian assemblages[53].

All these features of Late Gravettian assemblages point at patterns of mobility and land-use that contrast with both earlier Gravettian and later Epigravettian occupations. Although related to palimpsest accumulations[54] and not necessarily to more intensive on-site activities, all sites in the sample seem to indicate a certain increase in the intensity of regional human presence when compared to previous Gravettian. Consequently, although the relationship between assemblages and population size is clearly not a straightforward one, a regional demographic increase might explain this contrast. The latter observation adds some shades to the hypothesis of a massive population contraction during Late Gravettian times in East-Central Europe. Existing paleo-demographic models[55] were built on the number of dated/taxonomically diagnostic assemblages and not on their actual/relative sizes. Consequently, divergent patterns at smaller, regional scales are imaginable, especially if population relocation was involved. Although geochemical/petrographic confirmations are pending, the appearance, likely from Central European sources, of

[45] Nuzhnyi 2015.
[46] Noiret 2009, p. 68, 71.
[47] Noiret 2009; Anghelinu *et alii* 2018.
[48] Anghelinu *et alii* 2021a, 2021b.
[49] We maintain here the original Early Epigravettian assignation (e.g., Cârciumaru *et alii* 2006), strongly reinforced by a new set of radiocarbon measurements (Cârciumaru *et alii* 2018), of the rich organic and lithic palimpsest at PNPC, presently dated between 24–21 ka cal BP. The recently claimed Gravettian re-assignation of this layer (Cârciumaru *et alii* 2018; Nițu et *alii* 2019) defies both the young chronology and the key features of the lithic and organic assemblages involved.
[50] Cârciumaru *et alii* 2006.
[51] Noiret 2009.
[52] The vast majority of these assemblages belong to various Epigravettian stages (Anghelinu *et alii* 2012, 2018).
[53] Although missing diagnostic features and statistical relevance, most of the earlier UP layers at the open-air sites excavated on the Bistrița terraces fall within a Gravettian time range between 28–31 ka cal BP (Anghelinu *et alii* 2012, 2018, 2021). The only exception, the earlier Gravettian assemblage at PNPC/4 (Niță-Bălășescu 2008) is still comparable in size/artifact density with BL III/AH 2.5 when excavated surfaces are accounted.
[54] For Doroshivtsi III, see Demay *et alii* 2015. At least two occupations episodes were noted at Mitoc Malu Galben, while the scatter of radiocarbon ages at Molodova is similarly indicative for multiple episodes accumulation (Noiret 2009). For the much smaller Eastern Carpathian assemblages, palimpsest accumulations were not yet demonstrated.
[55] E.g., Banks *et alii* 2008; Maier 2017; Maier, Zimmerman 2017.

obsidian and possibly radiolarites in the East Carpathian area around 29/27 ka cal BP (e.g., Buda, Lespezi, possibly BL III), much like in several undated sites in Eastern Romania[56] is perhaps relevant, as it may indicate a population influx from Central Europe.

Apart from the common chronological range, large size and use of one particular raw material, most of the archaeological assemblages considered here also share a preference for directing a good part of the lithic production towards obtaining long blanks, mostly blades, from prismatic, unidirectional or bidirectional cores. As BL III/AH 2.5, Buda/1 and Molodova V/7 show, this production of large blades (>100-120 mm long and >20 mm wide) is clearly unrelated to the distance from raw material sources and points at a particular strategy of raw material management[57] largely abandoned by subsequent, increasingly microlithic industries[58].

Irrespectively of the flakes-to-blades/bladelets ratios within the unmodified blanks category, the majority of the retouched implements in these Late Gravettian assemblages are based on laminar blanks. Also, within the formal tool's category, burins, backed implements and points, including shouldered ones, are the most frequent. A larger number of endscrapers was reported only at Molodova V/7 and Doroshivtsi III/6. This feature seems connected to the size of the related lithic assemblages[59] and/or to a function(s) apparently not shared by other sites in the sample. The hypothesis of longer occupations/base camps, which involved the abandonment of artifacts with longer life use like endscrapers, is tempting but less straightforward than it may seem. As is the case with many UP sites[60], site function issues are difficult to tackle based on lithics only, which often represent an aggregated outcome of multiple occupations[61]. With the exception of Buda/1 and Doroshivtsi III/6, both featuring unusually high percentages of retouched tools (28.5% and 12.8%, respectively), retouched frequency calculated on essential counts varies from 1.04% at Mitoc Malu Galben/IV to 4.3% at Molodova V/7, 7.5% at Lespezi/VI, and 7.8% at BL III/AH. 2.5. The expected inverse relation between assemblage size and retouch intensity[62], quite obvious for the highly curated Eastern Carpathian sites, is plainly defied by Doroshivtsi III/6, where the high degree of curation also challenges the presence of abundant local resources of Cretaceous flint. The rationales behind this variability are therefore difficult to disentangle at this stage of research. It is nonetheless clear that a proper understanding of the Late Gravettian east of the Carpathians needs much more than typological cherry-picking.

CONCLUSIONS

Summing up, despite a certain degree of inter-assemblage variability, likely connected to the duration of accumulation, site functions or perhaps diachronic changes, the Late Gravettian with shouldered points 'stage' or 'horizon' east of Carpathians appears like an articulated adaptive package that warrants a certain taxonomical individuality. This profile is not related, however, to the production of shouldered points *per se*, as these armatures are only a few, unequally present and poorly standardized. A long-range and high degree of mobility associated with 'provisioning places/people'[63], together with a strong reliance on high-quality Cretaceous flint (e.g., Buda, BL III), systematic production of large laminar blanks and slender bladelets, often obtained from burin-cores, a large number of backed implements etc., seem to characterize this strategy in lithic terms at least as much as the (occasional) production of shouldered implements. Among others, a more inclusive, polythetic perspective might help clarify the chrono-cultural context of some presently undated 'Epigravettian' occurrences in Eastern Romania (Dorohoi-Stracova, Țepu-Gârneață[64]), that feature a massive reliance on Cretaceous flint, similar technological and typological profiles, lack shouldered items, but include other Late Gravettian index types (e.g., rectangles).

It seems that in the area between the Eastern Carpathians and the Dniestr, much like in Central Europe, shouldered points were just a (marginal?) alternative techno-typological option in the design of the Late Gravettian armatures, largely dominated by backed bladelets, Gravette points and micrograveettes. However, even if some of the

[56] Anghelinu *et alii* 2018.
[57] Lengyel, Chu 2016.
[58] Păunescu 1998; Noiret 2009; Nuzhnyi 2015. The production of large laminar blanks, suited for repeated retouch and longer-term use as endscrapers, knives or 'Pavlov points' was occasionally reported (Noiret 2009; Nuzhnyi 2015) in previous regional Gravettian contexts (e.g. Mezhigirtsy, Molodova V/layers 10–8, Mitoc Malu Galben). The regional rooting of this particular raw material management/big blade technology remains nonetheless tentative, as Late Gravettian layers are generally millennia younger than earlier Gravettian layers at the same sites.
[59] Cf. Shott 2010.
[60] Bon *et alii* 2011.
[61] Shott 2010.
[62] Barton, Riel-Salvatore 2004; Riel-Salvatore, Barton 2014.
[63] Haas, Kuhn 2019, p. 501
[64] Based on their stratigraphic positions, both findspots were attributed to 'final Gravettian stages' (Păunescu 1998) i.e., Epigravettian (Anghelinu *et alii* 2018).

reported shouldered points are actually attributable to a particular production technology of backed implements, the absence of this peculiar shaping procedure in earlier Gravettian and later Epigravettian contexts suggest that these shouldered morphologies may still serve as a paleo-cultural proxy, provided that other contextual data support it.

The issue of a regional footing *vs.* a western source for this Late Gravettian phenomenon east of the Carpathians is presently unsolvable, given the general synchronicity of shouldered points industries in East-Central Europe, the small number of coherently dated sites, and the documented gaps of the record. The scarcity of early Gravettian sites identified in the area clearly impedes on a comparative approach. Further research into earlier Gravettian stages in eastern Romania and an accurate tracking of exotic raw materials circulation may clarify this issue. While to present knowledge the Late Gravettian does not seem to be connected to a demographic contraction in the area east of the Carpathian Mountains, ensuing early Epigravettian stages do seem to indicate a more consistent human presence across the peak of LGM[65]. This new paleo-cultural stage also brought consistent changes in terms of lithic technology, typology and raw material provisioning, further highlighting the peculiarity of the preceding Late Gravettian.

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Figure 1 – Late Gravettian (29–27 ka cal BP) sites east of the Carpathians: 1. Bistricioara-Lutărie III; 2. Poiana Cireșului – Piatra Neamț (PNPC); 3. Buda; 4. Lespezi; 5. Mitoc Malu Galben; 6. Doroshivtsi III; 7. Molodova V (map designed by G. Murătoreanu).

Figure 2 – BL III/AH 2.5., examples of horizontal refittings (trenches 3/2018–4/2019).

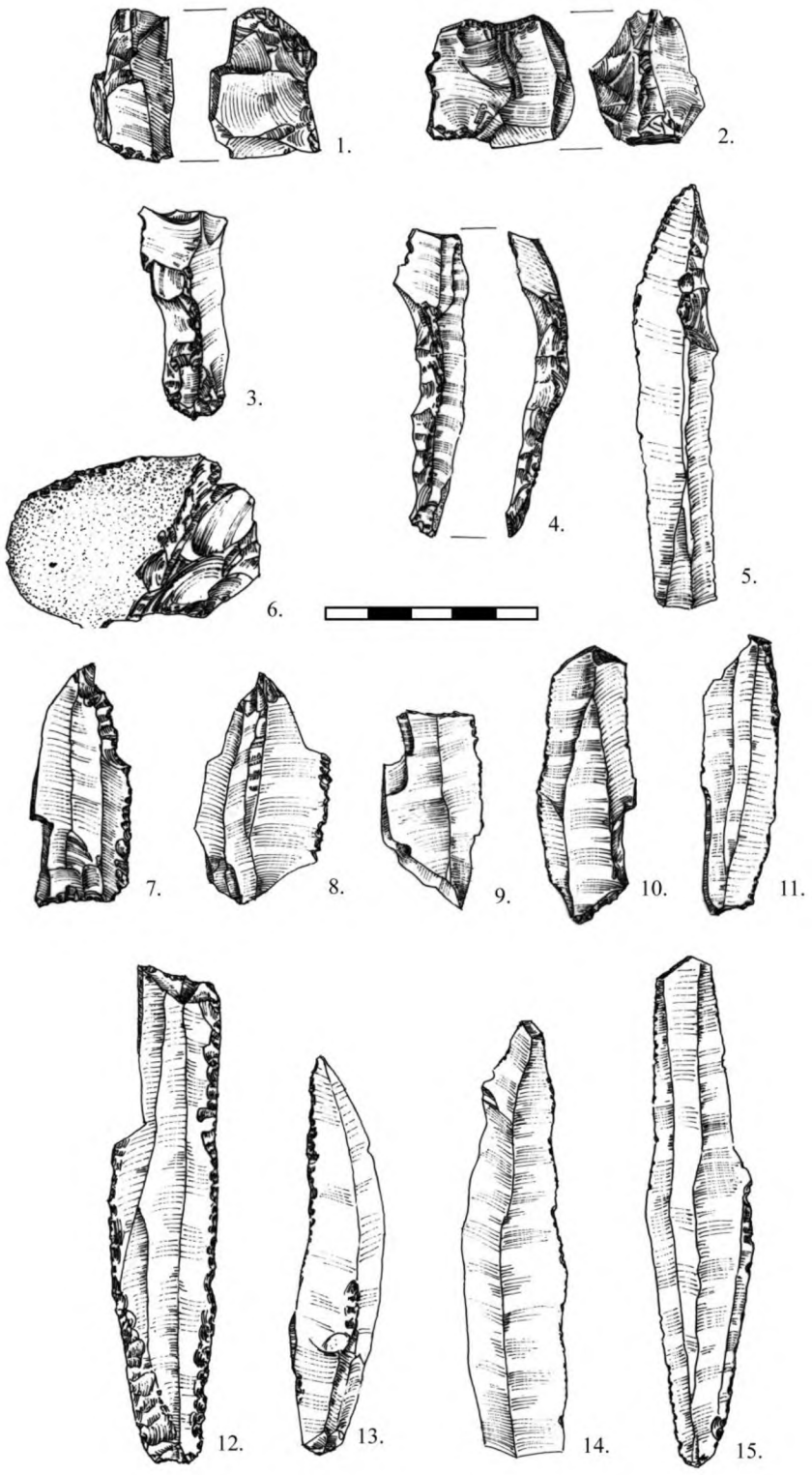

Figure 3 – BL III/AH 2.5, selected lithics: cores (1, 2), crested products (3–5), secondary cortical flake (6), burins (7-12), blades (13–15). Drawings by R. Ionescu.

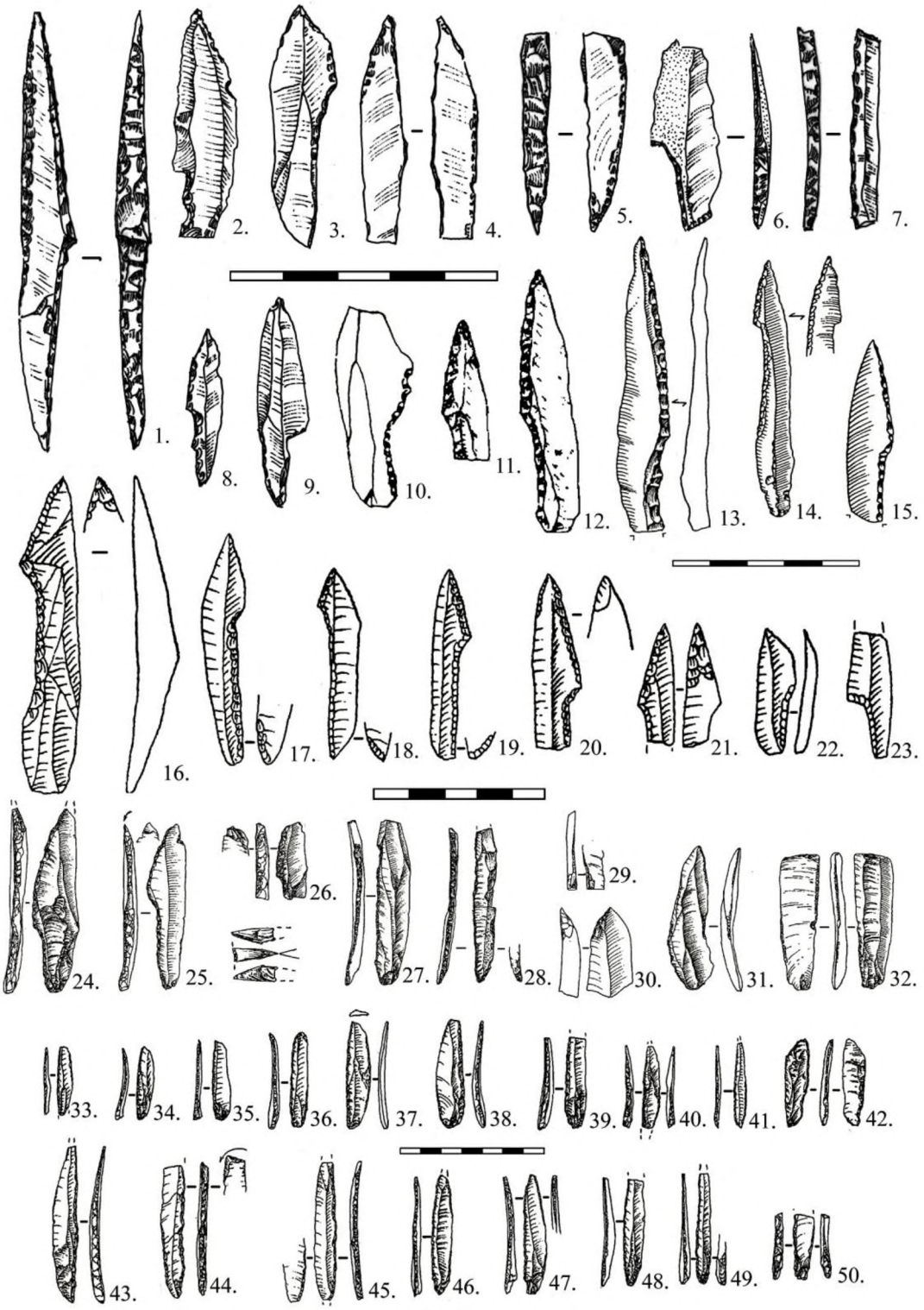

Figure 4 – Selected shouldered and backed items from BL III/AH 2.5 (1–9), Lespezi/layer VI (10), Buda/layer 1 (11–12), Mitoc Malu Galben/layer IV (13-15), Molodova V/layer 7 (16-23), and Doroshivtsi III/layer 6 (24–50) (1–9, drawings by R. Ionescu; 10–12, modified after Bitiri-Ciortescu *et alii* 1989, p. 34, 48; 13–15, modified after Noiret 2004, p. 450; 16–50, modified after Kulakovska *et alii* 2015, p. 357, 359).

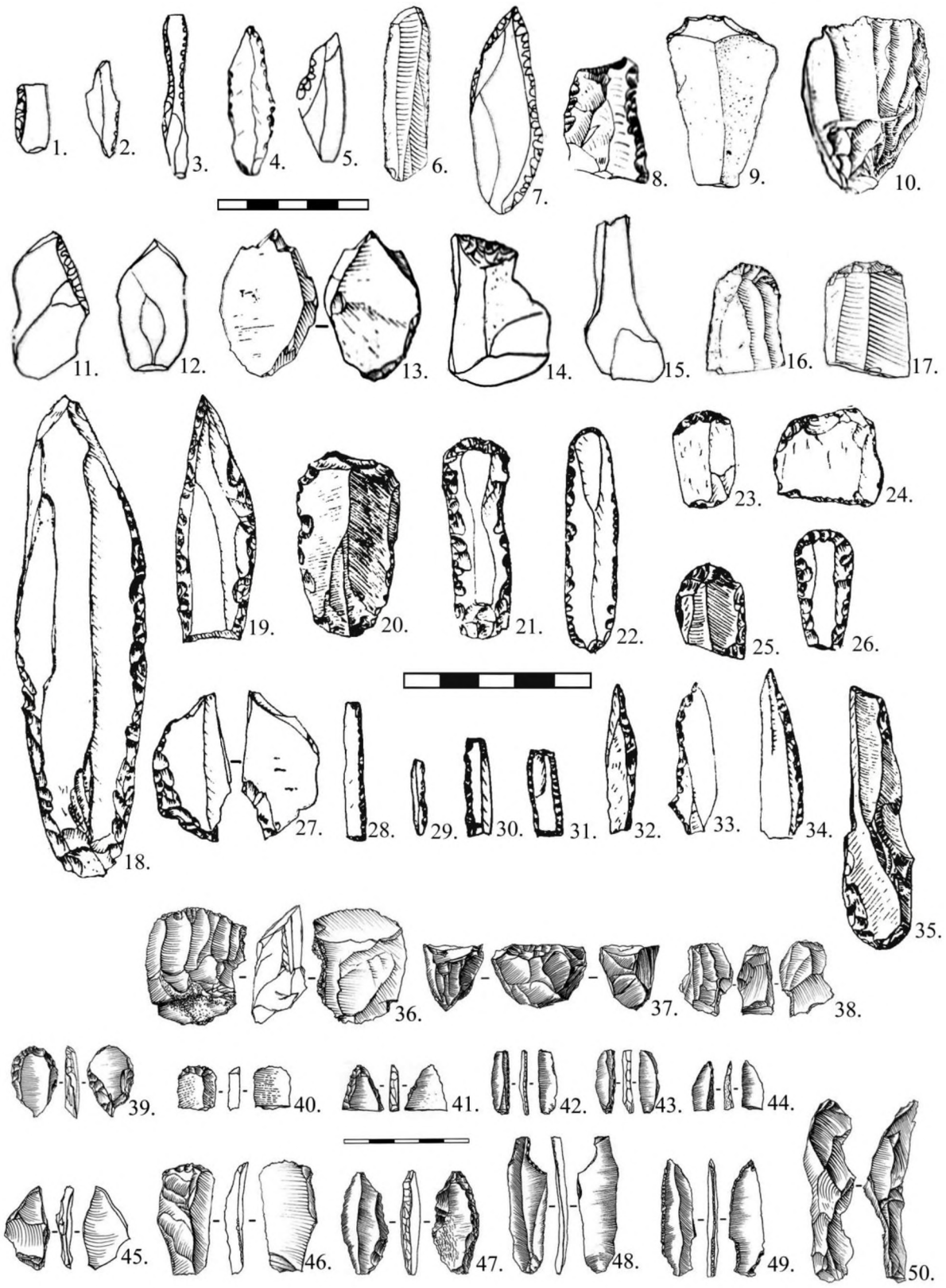

Figure 5 – Selected lithics from Lespezi/layer VI (1–17), Buda/layer 1 (18–35), and PNPC/layer 3 (36–50) (1–35, modified after Bitiri-Ciortescu *et alii* 1989, p. 34, 48; 36–50, modified after Anghelinu *et alii* 2018, p. 201).

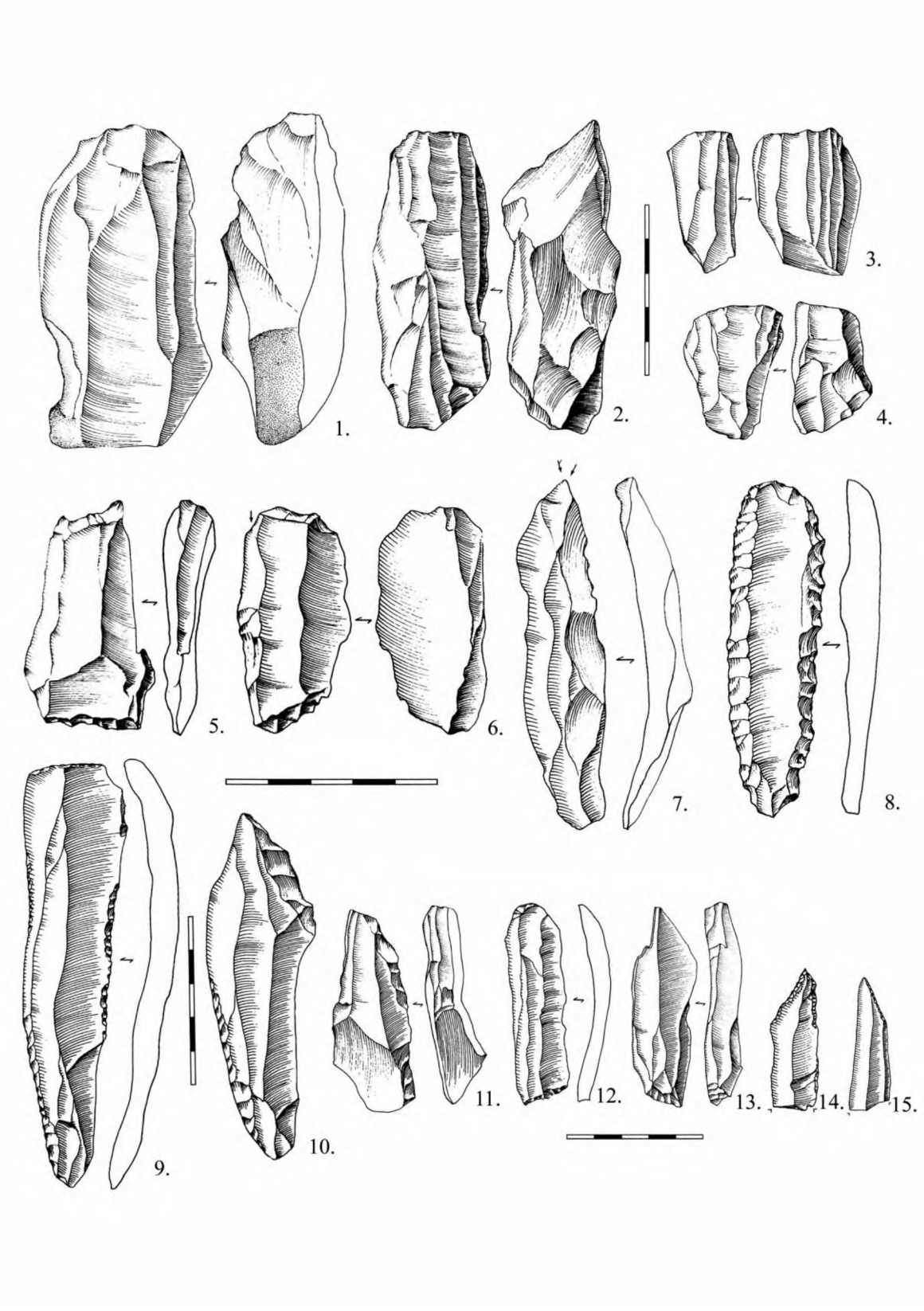

Figure 6 – Selected lithics from Mitoc Malu Galben/layer IV (modified after Noiret 2009, p. 72–73).

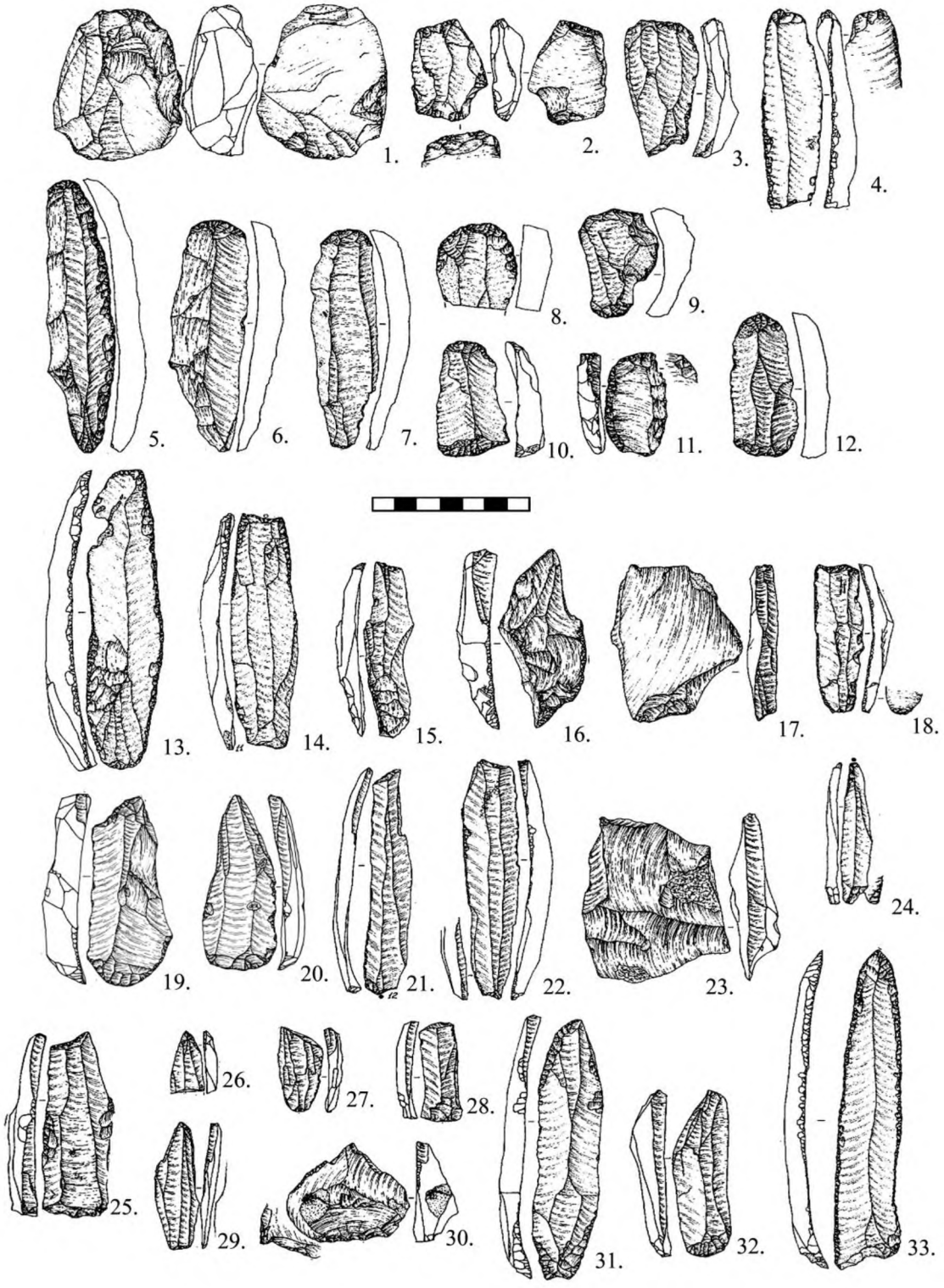

Figure 7 – Selected lithics from Molodova V/layer 7 (modified after Nuzhnyi 2015, p. 38–40, 43, 47–51).

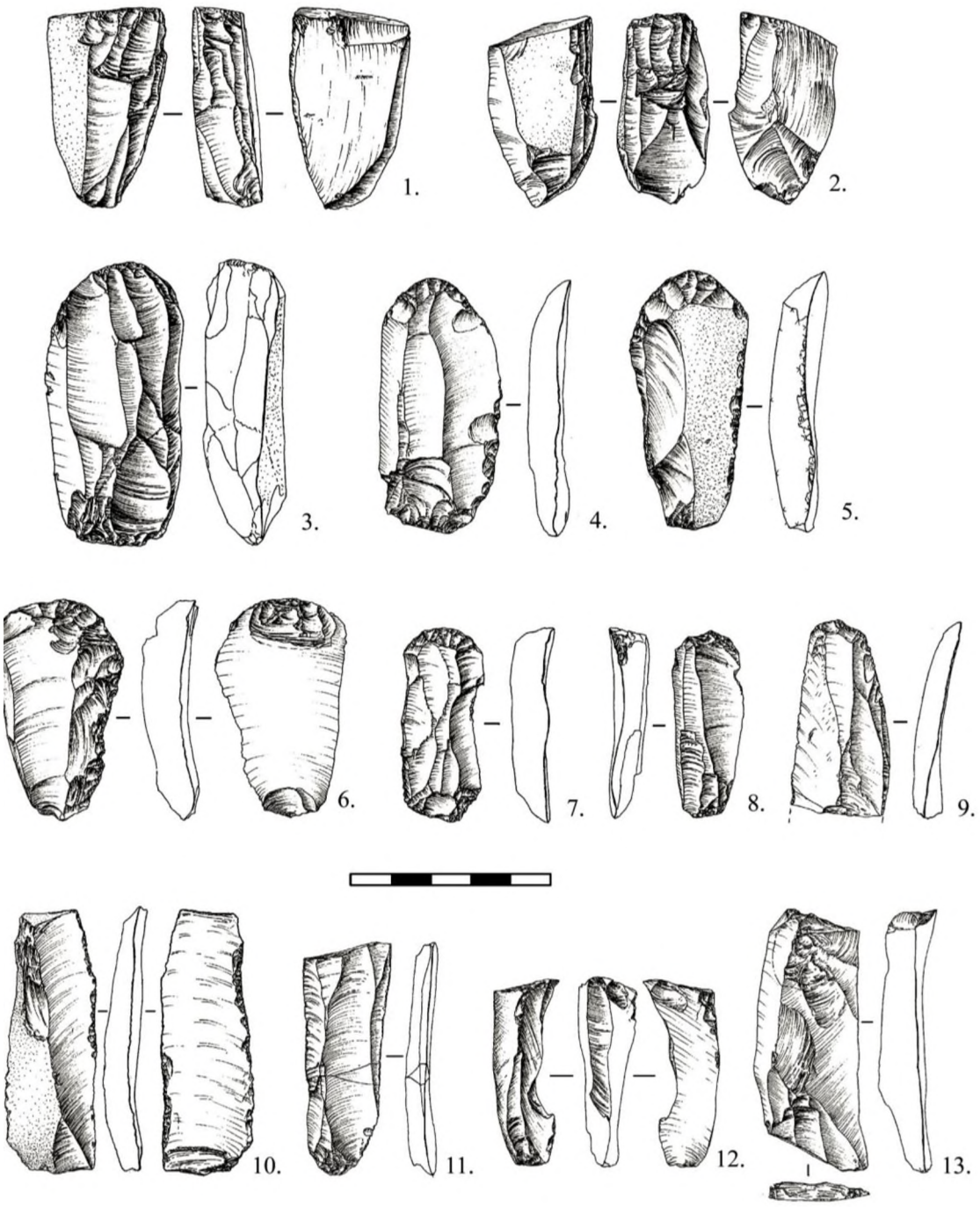

Figure 8 – Selected lithics from Doroshivtsi III/layer 6 (modified after Kulakovska *et alii* 2015, p. 355–357).

Table 1			
Lab number	Site/archaeological context	^{14}C/AMS ka uncal. BP	^{14}C/AMS ka cal BP (IntCal 13)
GrA-9455	Molodova V/layer 7	23000+/-170	27641–26991
GrA-22909	Molodova V/layer 7	23650+/-140	28000–27515
GrA-9457	Molodova V/layer 7	25170+/-210	29735–28727
GrA-9458	Molodova V/layer 7	25280+/-210	29932–28797
GrA ?	Doroshivtsi III/layer 6	22330+/-100	27010–26245
GrA-14671	Mitoc MG/layer IV	23290+/-100	27724–27344
GrA-1353	Mitoc MG/layer IV	23850+/-100	28141–27680
OxA-1779	Mitoc MG/layer IV	23650+/-400	28620–27218
GrN-14034	Mitoc MG/layer IV	23830+/-330	28603–27455
GrN-20438	Mitoc MG/layer IV	23390+/-280	28063–27135
OxA-1780	Mitoc MG/layer IV	24650+/-450	29736–27794
DeA-7462	BL III/AH 2.5	23342+/-133	27775–27348
RoAMS 1070.101	BL III/AH 2.5	23332+/-185	27824–27274
RoAMS 1417.101	BL III/AH 2.5	23699+/-137	28051–27551
RoAMS 1413.101	BL III/AH 2.5	23284+/-139	27754–27300
OxA-X-2762-25	PNPC/layer 3	23420+/-310	28200–27112
OxA-36787	PNPC/layer 3	23820+/-110	28128–27656
RoAMS 60,33	PNPC/layer 3	24410+/-127	28753–28115
OxA-36789	PNPC/layer 3	24820+/-120	29187–28553
OxA-36788	PNPC/layer 3	24540+/-120	28854–28283
RoAMS 61,33	PNPC/layer 3	24566+/-88	28827–28369
Beta-244072	PNPC/layer 3	25135+/-150	29556–28801
OxA-29525	Buda/layer 1	23300+/-160	27781–27286
OxA-29526	Buda/layer 1	23440+/-160	27855–27376
GrN-23072	Buda/layer 1	23810+/-190	28330–27580
OxA-31556	Lespezi/layer 6	24620+/-190	29103–28202

Table 1. Radiocarbon chronology of 27-29 ka cal BP archaeological layers east of the Carpathians[66].

Table 2									
Raw material	Lithic sample								
	Unknapped stone	Secondary debitage products				Unmodified blanks		Formal tools	**Total**
	Slabs/ pebbles	*Esquilles* (<5 mm)/ fragments	Cores	Rejuvenation products	Cortical products	Flakes	Laminar blanks/ Burin spalls		
Cenomanian/ Turonian flint	-	508/434	5	89	155	359	295/42	172	**2059**
Eocene cherts, black schist	-	-/3	-	1	-	10	-	-	**14**
Radiolarite, jasper, opal	-	2/-	-	1	-	2	4/-	2	**11**
Sandstone	22	-/16	1	-	-	7	-	-	**46**
Quartzite, marlstone, diorite	3	-/23	-	-	7	10	1/-	-	**44**
Undetermined	7	-/29	-	-	1	5	1/-	-	**43**
Total	**32**	**1015**	**6**	**91**	**163**	**393**	**343**	**174**	**2217**

Table 2. Bistricioara-Lutărie III/AH 2.5: the lithic assemblage.

[66] Haesaerts *et alii* 2003; Kulakovska *et alii* 2015; Tuffreau *et alii* 2018; Nițu *et alii* 2019; Anghelinu *et alii* 2021b. Calibration with IntCal13 calibration curve (Reimer *et alii* 2013), using OxCal 4.3 web tool; interface build 122, updated 12/3.2020; accessed 26/4/2020 (Bronk Ramsey 2019). Calibrated ages given with 95.4 confidence intervals.