Mobility of hunter-gatherer populations in the Bistrița Valley (Romania) in the Palaeolithic

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Abstract: *The Bistrița Valley is definitely the most densely populated region in Romania in the Upper Palaeolithic. In addition to the abundance of settlements, each of these settlements' inventory, variety and cultural impact are also important. Most of the symbolic and mobiliary art objects in the entire Romanian Palaeolithic have been found at* Poiana Cireșului *Piatra Neamț and the only Venus sandstone figurine in Romania has been discovered in an Epigravettian level in the Piatra Neamț 1 settlement. The density and cultural quality of the sites also point to a special dynamic of the hunter-gatherer groups along this valley.* ^{14}C *dating and partly the study of the fossil fauna have allowed for some early considerations on the mobility of successive communities over the last 40,000 years with remarkable constancy during this time.*

Rezumat: *Valea Bistriței este cu certitudine regiunea cea mai intens locuită din România în Paleoliticul superior. Pe lângă abundența așezărilor, este important inventarul din fiecare, varietatea sa și impactul cultural. La* Poiana Cireșului *Piatra Neamț s-au descoperit cele mai multe obiecte simbolice și de artă mobilieră din întreg Paleoliticul din România, iar în așezarea de la Piatra Neamț 1, într-un nivel Epigravetian s-a descoperit singura statuetă din gresie de tip Venus din România. Densitatea și calitatea culturală a siturilor presupune și o dinamică deosebită a grupurilor de vânători-culegători de-a lungul acestei văi. Datările* ^{14}C *și, în parte, studiul faunei fosile au permis câteva prime considerații asupra mobilității comunităților care s-au succedat în ultimii 40.000 de ani cu o remarcabilă constanță în tot acest timp.*

Keywords: *mobility, Gravettian, hunter-gatherer, the Bistrița Valley, population dynamics*
Cuvinte-cheie: *mobilitate, Gravetian, vânători-culegători, Valea Bistriței, dinamica populației*

◈ 1. Introduction

The Bistrița Valley is located in northeastern Romania, crossing the entire Eastern Carpathian chain. Its route from its springs (1,850 m altitude) to its mouth (140 m altitude) is 283 km long, with a difference in level of about 1,700 m. This points to a special dynamic of erosion and sediment depositions, particularly within terraces, and a highly varied route in terms of the geological composition and geomorphology of the regions crossed. A distinct feature of the Bistrița Valley is the alternation of widening sectors of the valley separated by gorges as a result of the geological structure and of the influence of confluences with other

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rivers which flow into the Bistrița. These tributaries, mainly those on the right side, favored the emergence of small basins through the pressure exerted by the generated cones of dejection. In this way, many opportunities were created for choosing suitable places for encampments and developing hunting strategies specific to the Palaeolithic. Thus, all the settlements discovered so far are located exclusively to the right of the Bistrița, in such small basins, usually at the confluence with another valley, in the middle course specific to the mountain area and in the lower course, spreading in the plateau region, i.e., over a length of about 100 km. Along this route, several areas of concentration of settlements stood out, from upstream down to its mouth, namely, the basins of Răpciuni (Ceahlău), Izvorul Alb *Secu*, Bicaz, Piatra Neamț in the mountain area and the Buda *Lespezi* settlements in the plateau region (fig. 1).

The cultural variety and the features of the lithic inventory are remarkable, from the Early Upper Palaeolithic until the Late Epigravettian, and the ^{14}C dates cover an extremely wide chronological range, between 37,550 ± 360 BP (42,475-41,417 cal BP) (Beta 507,488) and 9,680 ± 30 BP (11,201-11,071 cal BP) (Beta 646477), with countless intermediate dates, covering most of the mentioned timespan, obtained in various settlements in the Bistrița Valley (Cârciumaru *et alii* 2023). Archaeological excavations in the Bistrița Valley, more precisely in the Piatra Neamț *Poiana Cireșului* settlement (fig. 2/1-2; 3), have delivered over 75% of the art objects and ornaments found in the Romanian Palaeolithic. Their variety is impressive, covering most of the range specific to the Gravettian and essentially contributing to defining the art and symbolism of the Gravettian culture in this part of Europe (fig. 4, 6) (Cârciumaru 2022a; 2022b; 2022c; 2023; Cârciumaru, Nițu 2018; Cârciumaru, Țuțuianu-Cârciumaru 2009; 2011; 2012; Cârciumaru *et alii* 2011; 2012; 2016; 2018; 2019a; 2019b; 2021; Nițu *et alii* 2019). Also in this area, in the site of Piatra Neamț 1 (fig. 2/3-4), the only Venus stone figurine in Romania and Southeast Europe has been recently found (fig. 7) (Nițu *et alii* 2023).

The *Homalopoma sanguineum* shells (fig. 5/B) were retrieved from the Gravettian III at *Poiana Cireșului*, having been brought from Mediterranean beaches 900 km away. This implies either the existence of highly functional and well-organised exchange networks or a massive migration of Palaeolithic communities. In both cases, the mobility of the respective communities over very long distances is evident. Given that the Gravettian III reaches 27,321 BP (31,551-30,921 cal BP) (Erl 11,859), one might realise the importance of this find in terms of the origin of the Gravettian in this part of Europe (Nițu *et alii* 2019).

The Gravettian I siltite pendant from *Poiana Cireșului* (ca. 20,000 BP) (fig. 6/a) is a synthesis, meeting all the attributes of Gravettian pendants. Most pendants from this period are made of flat pebbles, generally regular in shape, perforated for suspension, without further interventions for aesthetic purposes. The next category is that of pendants with the circumference marked by incisions, followed by those which, in addition, have an engraved side. Finally, the most complete have all the aforementioned characteristics, with a second side engraved as well. The *Poiana Cireșulu*i pendant combines all these features and is among the few of its kind found in the Eurasian Gravettian.

Fig. 1. Areas of concentration of Palaeolithic settlements in the Bistrița Valley: 1 – Romania's geographic position in Europe; 2 – location of settlements in the Bistrița Valley in Romania; 3 – concentration of Palaeolithic settlements in the Bistrița Valley (cartographic sources Google Earth and visualwallmaps.com).
Zonele de concentrare a așezărilor paleolitice de pe valea Bistriței: 1 – poziția geografică a României în Europa; 2 – poziția așezărilor de pe valea Bistriței în România; 3 – concentrarea așezărilor paleolitice pe valea Bistriței (surse cartografice Google Earth and visualwallmaps.com).

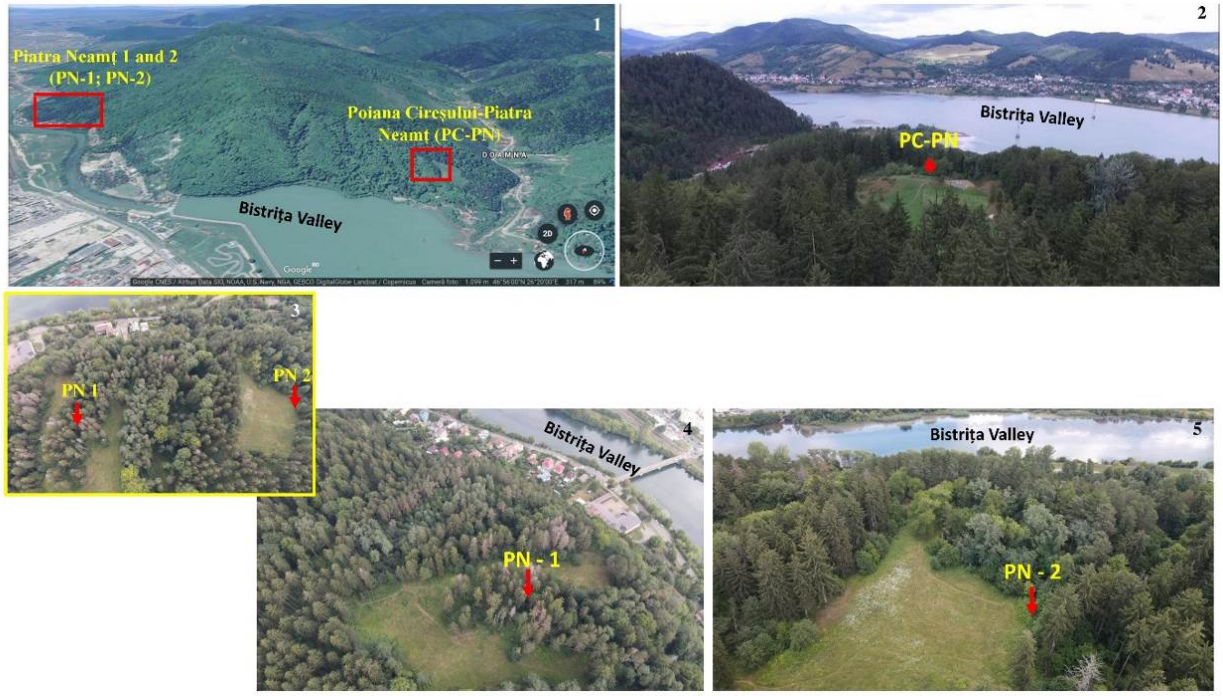

Fig. 2. Geographical position of Palaeolithic sites at Piatra Neamț.
Poziția geografică a siturilor paleolitice de la Piatra Neamț.

Fig. 3. Stratigraphic profile and images during the archaeological excavations in Gravettian I-III levels: a – stratigraphic profile; b, c – concentrations of lithic and osteological material and of combustion structures in the Gravettian I; d – Gravettian II hearth; e – combustion structures and pits with geometrically shaped limestone from the Gravettian III.
Profilul stratigrafic și imagini din timpul săpăturilor arheologice din nivelurile Gravetiene I-III: a – profil stratigrafic; b, c – concentrări ale materialului litic, osteologic și structurilor de combustie din Gravetianul I; d – vatră din Gravetianul II; e – structuri de combustie și fose cu pietre de calcar de forme geometrice din Gravetianul III.

If we are to refer to the mobility of communities in the Gravettian I, we should bring up the aragonite moulds of the four bivalve fossils of the species *Congeria subcarinata*, which, by their shape, suggest the vulva (fig. 8). They carry a strong symbolic connotation and were brought to the *Poiana Cireșului* settlement from more than 100 km away, from deposits of Middle-Late Pontian age outcropping in the Curvature Carpathians or in the eastern part of the Transylvanian Basin (Cârciumaru *et alii* 2011).

The mobility of Palaeolithic communities was certainly conditioned by the existence of means of communication. In this respect, the Gravettian I from *Poiana Cireșului* has produced the only wind instrument from the Palaeolithic in Romania, made of a reindeer phalanx. The hole designed to facilitate the production of various sounds was made by rotating a lithic tool that left marks as a result of this action (fig. 6/f) (Cârciumaru, Țuțuianu-Cârciumaru 2011; Cârciumaru, Nițu 2018).

Along with the lithic tools made of a variety of rocks, which implied the knowledge of sources, often located at considerable distances, there is also the diversity of tools and weapons made of hard animal materials, found mainly at *Poiana Cireșului* in the Gravettian I, contemporary with the Last Glacial Maximum (LGM), which point to complex actions of approaching hunting and the pursuit of certain species in their seasonal migrations, especially reindeer. The only ivory spear points in the Romanian Palaeolithic, and among the few mentioned in the Gravettian in general, were also found here. In a matter of speaking, the Bistrița Valley is to Romania what the Vézère Valley is to the Dordogne region in France.

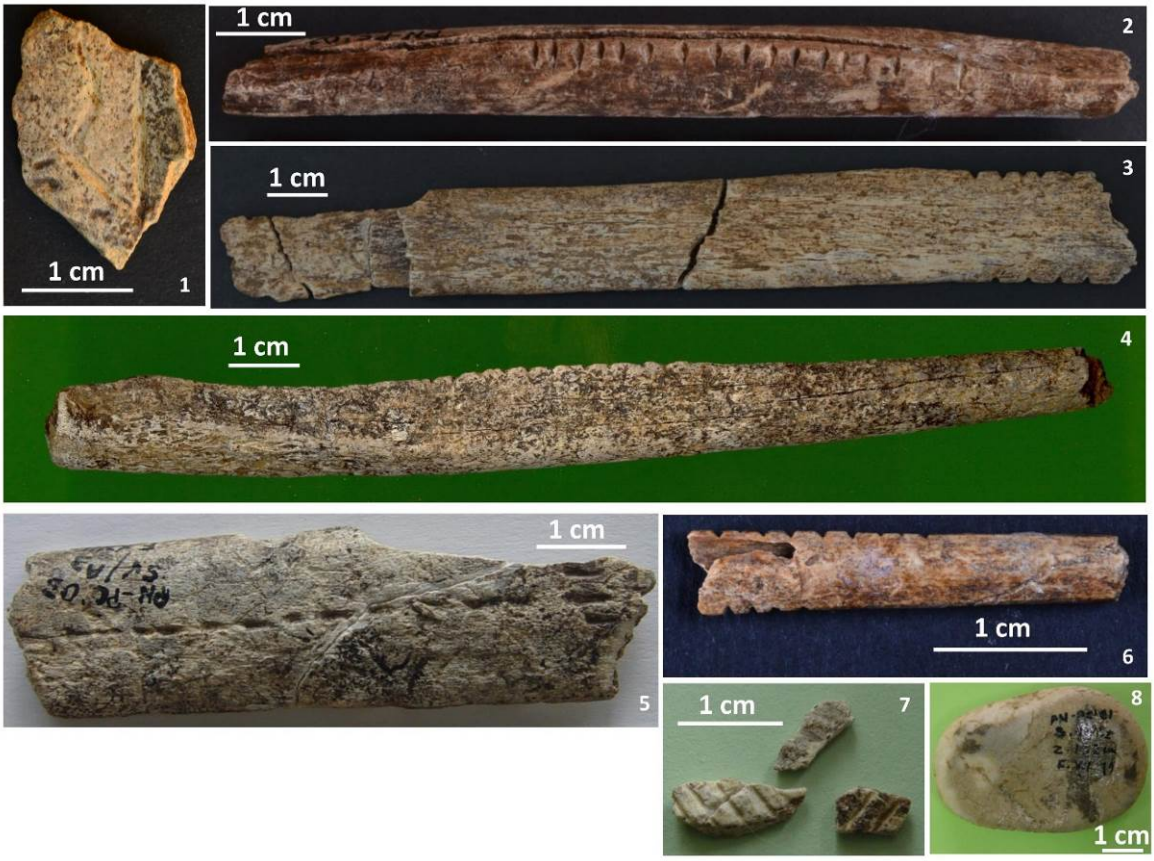

Fig. 4. Engraved bones and quartzite pebble in the Gravettian I from *Poiana Cireșului*: 1 – bone engraved on the upper face; 2 – engraved diaphysis; 3 – laterally engraved rib; 4 – engraved lateral horse metapodium; 5 – medially engraved bone; 6 – laterally engraved bone; 7 – small fragments of variously engraved bones; 8 – pebble engraved with incisions (after Cârciumaru *et alii* 2018).
Oase și galet de cuarțit gravate din Gravetianul I de la *Poiana Cireșului*: 1 – os gravat pe fața superioară; 2 – diafiză gravată; 3 – coastă gravată lateral; 4 – metapod lateral de cal gravat; 5 – os gravat median; 6 – os gravat lateral; 7 – mici fragmente de os gravate diferit; 8 – galet gravat cu incizii (după Cârciumaru *et alii* 2018).

◈ 2. Animal migration *vs* mobility of hunter-gatherer groups in the Palaeolithic in the Bistrița Valley

According to the ^{14}C dates for various settlements in the Bistrița Valley, currently available to us, several hypotheses may be formulated regarding the dynamics of Palaeolithic populations. Starting from a reality resulting from existing archaeological research, the presence of the Palaeolithic man in different stages was recorded in the Bistrița Valley. As mentioned, several sectors of intensive habitation of the valley in the Palaeolithic can be outlined from downstream to upstream: Buda *Lespezi*, Piatra Neamț, Bicaz, Izvorul Alb *Secu* (fig. 9) and Răpciuni Basin (Ceahlău). We have ^{14}C dates for three of the settlements investigated in each sector, whereas Bicaz - Izvorul Alb *Secu* are the only sectors that lack such data. The distances between the mentioned sectors measure 40 km between Buda *Lespezi* and Piatra Neamț, 60 km between Piatra Neamț and the Răpciuni Basin (Piatra Neamț - Bicaz about 30 km; Bicaz - Izvoru Alb about 15 km; Izvorul Alb and the Răpciuni Basin around 15 km) (fig. 10).

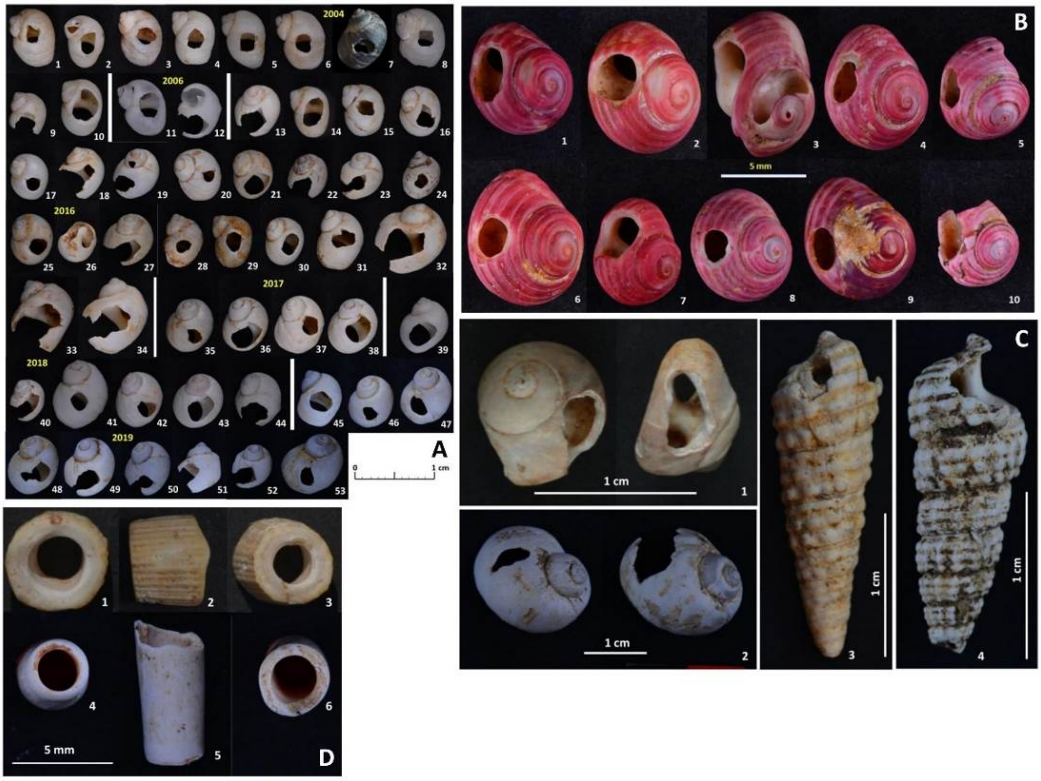

Fig. 5. Ornaments made of gastropod shells found at *Poiana Cireșului* in the Gravettian III (A-B), II (C-2), I (C-1, 3-4 and D) and at Piatra Neamț 1 (C-2). A – *Lithoglyphus naticoides*; B – *Homalopoma sanguineum*; C – 1. *Tritia* sp., 2. *Lithoglyphus naticoides*, 3. *Potamides bicostatus*; 4. *Potamides disjunctus quadricinctus*; D – *Dentalium* sp.
Podoabe din cochilii de gasteropode de la *Poiana Cireșului* din Gravetianul III (A-B), II (C-2), I (C-1, 3-4 și D) și de la Piatra Neamț 1 (C-2). A – *Lithoglyphus naticoides*; B – *Homalopoma sanguineum*; C – 1. *Tritia* sp., 2. *Lithoglyphus naticoides*, 3. *Potamides bicostatus*; 4. *Potamides disjunctus quadricinctus*; D – *Dentalium* sp.

Fig. 6. Pendants (a-c), stone bead (d), ornaments of animal teeth (e: 1 – wolf, 2-3 – red deer, 4-5 – fox) and sound-producing instrument (f) in the Gravettian I of *Poiana Cireșului*.
Pandantive (a-c), mărgea (d) din piatră, podoabe din dinți de animale (e: 1 – lup, 2-3 – cerb, 4-5 – vulpe) și instrument de obținut sunete (f) din Gravetianul I de la *Poiana Cireșului*.

Fig. 7. Venus sandstone figurine in the Epigravettian of Piatra Neamț 1 (after Nițu *et alii* 2023).
Statuetă din gresie de tip Venus din Epigravetianul de la Piatra Neamț 1 (după Nițu *et alii* 2023).

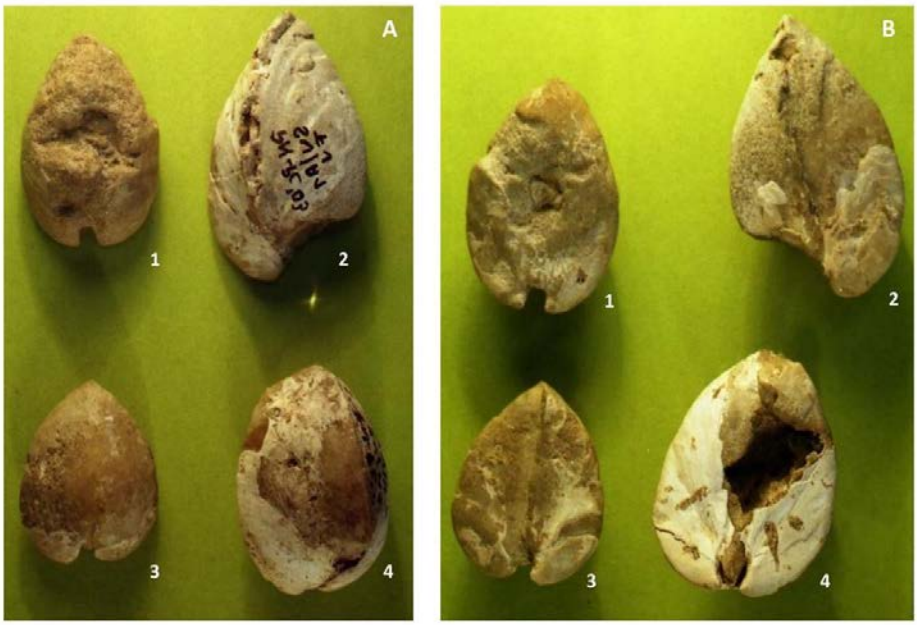

Fig. 8. Aragonite moulds belonging to the species *Congeria subcarinata* in the Gravettian I from *Poiana Cireșului* which, by their shape, suggest the vulva: A – obverse; B – reverse (after Cârciumaru *et alii* 2011).
Mulaje de aragonit aparținând speciei *Congeria subcarinata* din Gravetianul I de la *Poiana Cireșului* care, prin forma lor, sugerează vulva: A – avers; B – revers (după Cârciumaru *et alii* 2011).

The calibrated ^{14}C dates for all settlements in the Bistrița Valley have been related to the isotopic climate curve GICC05 (Blockley *et alii* 2012), resulting in an overall, relatively uniform picture of climate changes consistent with the global ones, specified on a global level (fig. 11).

Naturally, the use of calibrated ^{14}C dates, which means an interval between the minimum and maximum age, may create certain difficulties in interpretation, as the extent of intervals leads to overlapping ages and creates the impression of continuity, in contradiction with the stratigraphic reality. It should be noted that a calibrated ^{14}C interval does not necessarily imply human presence throughout that entire chronological segment, but only its

possible existence at some point between the specified minimum and maximum age. Reporting human communities by two dates with calibrated ages that overlap partly or entirely does not necessarily mean that those communities were contemporaneous and possibly intersected. Instead, the existence of each of them at a certain time within this interval remains a certainty. The established one – or two – thousand-year sequences (fig. 10) are conventional, without chronological barriers in between.

Fig. 9. Izvorul Alb settlements (photo by Cristian Preutu).
Așezările de la Izvorul Alb (foto de Cristian Preutu).

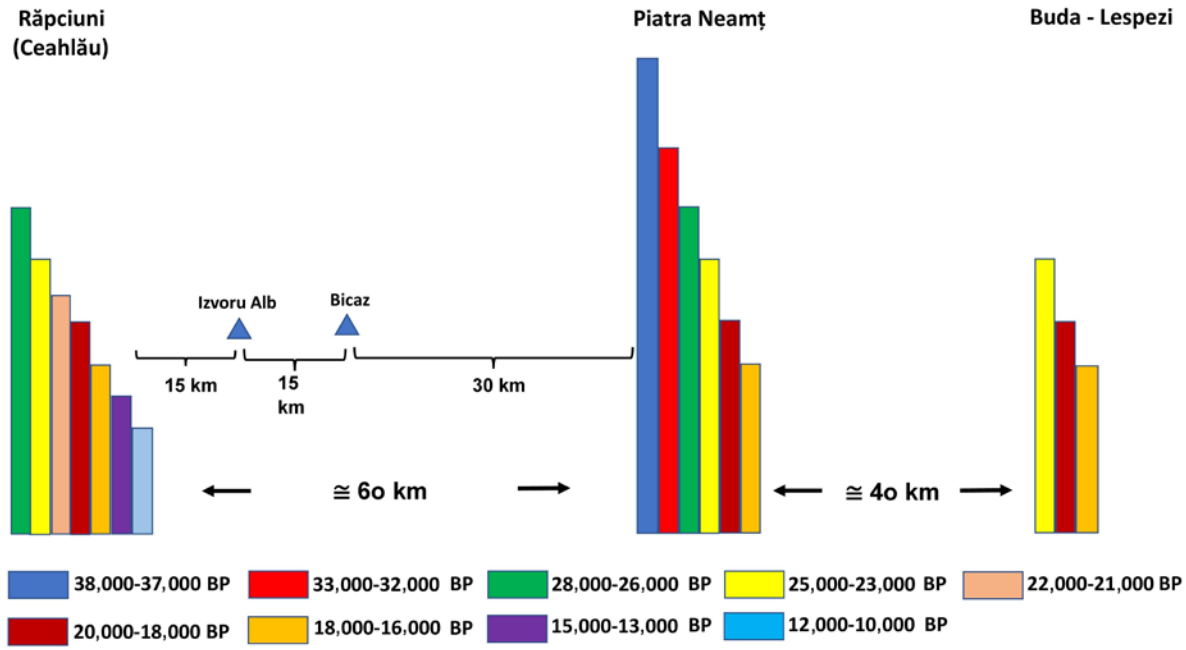

Fig. 10. Periods in which man was present in each of the sectors of concentration of Palaeolithic settlements in the Bistrița Valley.
Perioadele în care omul a fost prezent în fiecare din sectoarele de concentrare a așezărilor paleolitice de pe valea Bistriței.

Depth (cm)	Layer	Material	AMS Lab. Nr.	Age BP (uncal.)	Age (cal BP) (95.4% probability)
185	Gravettian I	Charcoal	RoAMS 63,33	16,850 ± 63	20,529-20,100
185	Gravettian I	Bone	RoAMS 67,33	18,607 ± 87	22,696-22,300
148	Gravettian I	Tooth	RoAMS 68,33	18,819 ± 96	22,941-22,450
183	Gravettian I	Charcoal	OxA-36,785	19,320 ± 80	23,538-22,992
185	Gravettian I	Tooth	OxA-X-2,762-24	19,440 ±130	23,779-23,020
190	Gravettian I	Charcoal	Erl 12,162	19,459 ± 96	23,730-23,085
182	Gravettian I	Charcoal	OxA-36,786	19,555 ± 80	23,856-23,265
185	Gravettian I	Charcoal	RoAMS 65,33	19,571 ± 67	23,850-23,320
184	Gravettian I	Charcoal	RoAMS 64,33	19,615 ± 105	23,961-23,321
148	Gravettian I	Tooth	RoAMS 69,33	19,640 ± 87	23,948-23,390
190	Gravettian I	Charcoal	RoAMS 62,33	19,710 ± 64	23,981-23,506
180	Gravettian I	Tooth	OxA-X-2.762-23	19,790 ± 180	24,277-23,385
185	Gravettian I	Charcoal	RoAMS 66,33	19,836 ± 83	24,125-23,610
151	Gravettian I	Tooth	RoAMS 71,33	19,881 ± 91	24,195-23,645
192-193	Gravettian I	Charcoal	Beta 224,156	20,020 ± 110	24,380-23,790
210	Gravettian I	Charcoal	Beta 244,071	20,050 ± 110	24,408-23,828
207	Gravettian I	Charcoal	Erl 9,964	2,.053 ± 88	24,370-23,869
210	Gravettian I	Charcoal	Erl 9,965	20,076 ± 185	24,601-23,648
210	Gravettian I	Charcoal	Erl 12,163	20,154 ± 97	24,484-23,959
SXIV, D1,303	Gravettian II	Bone	OxA-X-2,762-25	23,420 ± 310	28,200-27,112
S VIII, B1, 295	Gravettian II	Charcoal	OxA-36,787	23,820 ±110	28,128-27,656
S VII, B1, 330	Gravettian II	Charcoal	Beta 507,497	23,940 ± 100	28,260-27,730
S VIII, B1, 318	Gravettian II	Charcoal	Beta 507,490	24,330 ± 80	28,652-28,108
SVII, B3, 330	Gravettian II	Charcoal	Beta 507,496	24,370 ± 90	28,690-28,140
SVIII, B1, 318	Gravettian II	Charcoal	RoAMS 60,33	24,410 ± 127	28,753-28,511
Trench 3, 335	Gravettian II	Charcoal	Beta 507,495	24,480 ± 90	28,768-28,278
SVIII, A1, 330	Gravettian II	Charcoal	OxA-36,788	24,540 ± 120	28,854-28,283
S VIII, B1, 320	Gravettian II	Charcoal	RoAMS 61,33	24,566 ± 88	28,827-28,369
SVIII, B1, 318	Gravettian II	Charcoal	OxA-36,789	24,820 ±120	29,187-28,553
303	Gravettian II	Charcoal	Beta 244,072	25,135 ± 150	29,556-28,801
339	Gravettian III	Charcoal	OxA-36,790	25,390 ±140	29,895-29,030
350	Gravettian III	Charcoal	OxA-36,768	25,460 ± 200	30,232-29,033
S XII, C3, 381	Gravettian III	Charcoal	Beta 507,492	25,530 ± 110	30,101-29,295
SV, B5, 380	Gravettian III	Charcoal	Beta 507,494	25,560 ± 110	30,150-29,337
365	Gravettian III	Charcoal	OxA-36,792	25,650 ± 150	30,340-29,380
364	Gravettian III	Charcoal	Beta 244,073	25,760 ± 160	30,491-29,476
382	Gravettian III	Charcoal	Beta 224,157	25,860 ± 170	30,620-29,570
S XII, C2, 362	Gravettian III	Charcoal	Beta 507,491	26,000 ±100	30,679-29,840
371	Gravettian III	Charcoal	Beta 206,707	26,070 ± 340	30,943-29,519
408	Gravettian III	Charcoal	Erl 9,963	26,185 ± 379	31,038-29,553
365	Gravettian III	Charcoal	OxA-36,791	26,250 ± 140	30,920-30,197
415	Gravettian III	Charcoal	Erl 9,962	26,347 ± 387	31,140-29,676
360	Gravettian III	Bone	OxA-36,914	26,480 ± 230	31,100-30,271
360	Gravettian III	Bone	OxA-36,915	26,610 ± 230	31,158-30,440
SV, A3, 375-415	Gravettian III	Charcoal	Erl 11,860	26,677 ± 244	31,204-30,487
S V, A6, 382	Gravettian III	Charcoal	Beta 507,493	26,700 ± 120	31,102-30,695
SV, A3, 375-415	Gravettian III	Charcoal	Erl 11,859	27,321 ± 234	31,551-30,921
SVII,A1-B2,510-520	Early Upper Palaeolit.	Charcoal	Beta 507,489	32,400 ± 180	36,750-35,850
SVII, A2, 530	Early Upper Palaeolit.	Charcoal	Beta 507,487	32,630 ± 190	37,250-36,077
S VII, B1, 555	Early Upper Palaeolit.	Charcoal	Beta 507,488	37,550 ± 360	42,475-41,417
690	-	Soil	Erl 11858	-	55,923±12,926

Tab. 1. ^{14}C dates from the Piatra Neamț *Poiana Cireșului* site.
Datele ^{14}C din situl Piatra Neamț *Poiana Cireșului*.

The earliest occurrence of *Homo sapiens* in the Bistrița Valley is attested at Piatra Neamț *Poiana Cireșului* between 38,000 and 37,000 BP The date 37,550 ± 360 BP (42,475-41,417 cal BP) (Beta 507,488) confirms the presence here of an Early Upper Palaeolithic (tab. 1). According to the time interval resulted from the calibrated age, it would appear that the first Palaeolithic hunter-gatherers arrived at *Poiana Cireșului* during the glacial stage 11 (GS-11) (fig. 11) (Blockley *et alii* 2012).

Based on the recently published genetic study on Palaeolithic hunter-gatherers, these early communities that came to la *Poiana Cireșului* might belong to pre-40 ka individuals who did not leave substantial traces in the genetic composition of current Eurasian populations. It is even assumed that they largely disappeared or were assimilated by subsequent expansions (Posth *et alii* 2023).

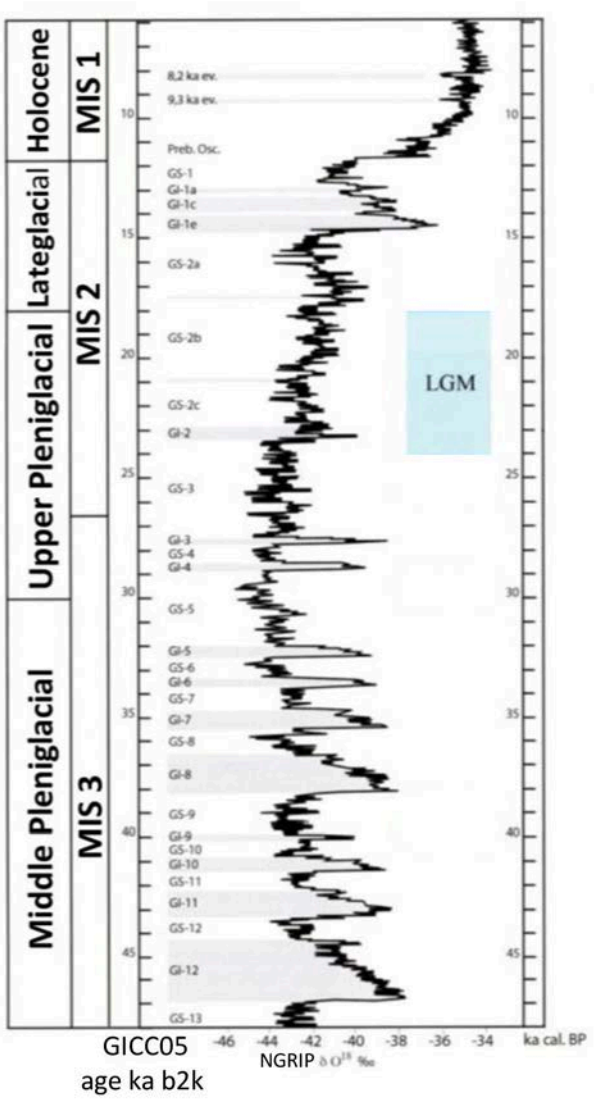

Fig. 11. GICC05 time scale 8,000-48,000 cal BP MIS – marine isotope stages; GI – glacial interstades; GS – glacial stages; LGM – Last Glacial Maximum (after Blockley *et alii* 2012).
Scara de timp GICC05 Age 8.000-48.000 cal BP MIS – stadii izotopice marine; GI – interstadii glaciare; GS – stadii glaciare; LGM – last glacial maximum (după Blockley *et alii* 2012).

The next stage of early existence of the Palaeolithic man in the Bistrița Valley occurred at Piatra Neamț *Poiana Cireșului* as well between 33,000 and 32,000 BP, also associated with an Early Upper Palaeolithic supported by the two ^{14}C dates: Beta 507,489: 32,400 ± 180 BP (36,750–35,850 cal BP) and Beta 507,487: 32,630 ± 190 BP (37,250-36,077 cal BP) (tab. 1) (Cârciumaru *et alii* 2023). During this time, the Bistrița Valley environment was typical of a transition stage from interstadial (GI) 8 to glacial stage (GS) 8 (fig. 11).

This second wave of occupation in the Bistrița Valley, following the mentioned genetic study, could belong to the oldest genomes of the ancestors of today's Europeans (the Kostenki-14 and Bacho-Kiro type). This genome later contributed to the formation of the Věstonice genetic cluster. The populations identifying with this genetic signature are likely responsible for shaping and defining the Gravettian culture in Central and Southern Europe. Those particular communities may have disappeared after the Last Glacial Maximum (LGM) in many areas of Europe. Faced with the climate challenges of the Last Glacial Maximum, the Gravettian communities are believed to have found refuge in the Italian Peninsula, the Balkans, and the South-East European Plain (Posth *et alii* 2023). According to these hypotheses, the identification and succession of some Gravettian and Epigravettian communities in the Bistrița Valley is, without a doubt, extremely important.

Fig. 12. The Carpathian steep before the Palaeolithic communities. 1-2. images of the mountain rim as seen from the east, before Piatra Neamț; 3. mountain rim of the Eastern Carpathians (after https://visualwallmaps.com/collections/countries?).
Abruptul carpatic în fața comunităților paleolitice. 1-2. imaginile ramei montane văzută dinspre est, înainte de Piatra Neamț; 3. rama montană a Carpaților Orientali (după https://visualwallmaps.com/collections/countries?).

During these first attempts to colonise the Bistrița Valley, the communities attributed to the Early Upper Palaeolithic stopped at the contact with the Subcarpathian Depression and the mountain area. It is not excluded that the real cause of this first stop may have been the shock suffered by these communities, who came from the open area of the Moldavian Plateau and the Russian Plain, when they encountered the steep mountain right after crossing the Siret, a completely different relief from what they had previously faced (fig. 12). Having reached the Bistrița Valley, the narrow route of the Bistrița in the mountain area

must have been another impediment prompting them not to venture into the mountain landscape from the beginning and especially on the mountain route of the Bistrița Valley.

The presence of modern man in the Bistrița Valley between 32,000 and 28,000 BP has not been documented so far, but it is not excluded that this situation may have been entailed by the current stage of research. Between 28,000 and 26,000 BP, *Homo sapiens* was present in the Bistrița Valley both at Piatra Neamț and in the Răpciuni Basin. It was the first half of the habitation attributed to the Gravettian III at Piatra Neamț, with several dates ranging from 27,321 BP (tab. 1) (31,551-30,921 cal BP) (Erl 11,859) to 26,000 ± 100 BP (30,679-29,840) (Beta 507,491).

Gravettian III hunters arrived around the present-day city of Piatra Neamț in the midst of the glacial stage (GS-5) (fig. 10-11). One should consider that in this glacial stage, as in others like it, rapid and deep variations of the environment occurred over a millennium and even over shorter, even secular periods, the periodicity of which followed no rule. We do not rule out that the bison, whose osteological remains were found in the sedimentary deposit contemporary with the period between 28,000 and 26,000 BP, may have been hunted by the *Homo sapiens* in the settlement of *Poiana Cireșului* precisely during these stages with a somewhat favorable environment, which normally favored the existence of this species in the area.

In the Răpciuni Basin, Gravettian hunters emerged only at *Cetățica II*, in which there is the date of 26,700 ± 1,100 BP (33,630–28,778 cal BP) (tab. 2) with a margin of error hard to accept to allow estimates of environmental features when the first communities arrived in the Răpciuni Basin (fig. 10-11). Still, it should be mentioned that this may have been the Palaeolithic man's first attempt to colonise the Răpciuni Basin. Curiously, they preferred the most upstream settlement known so far in the Răpciuni Basin, that of *Cetățica* (fig. 13). As such, one may hypothetically speak about the first colonisation of the Răpciuni Basin from Central Europe.

Depth (cm)	**Layer**	**Material**	**AMS Lab. Nr.**	**Age BP (uncal)**	**Age (cal BP) (95.4% probability)**
144-147	Gravettian I	Charcoal	GrN 14,632	21,050 ± 650	26,825-23,870
174-177	Gravettian II	Charcoal	GrN 14,633	26,700 ± 1,100	33,630-28,778

Tab. 2. ^{14}C dates from Ceahlău *Cetățica II*.
Datele ^{14}C de la Ceahlău *Cetățica II*.

It is interesting that, in this stage between 28,000 and 26,000 BP, the Bistrița Valley sector from Buda *Lespezi* (fig. 1, 10, 13) was not an attractive area for Gravettian hunter-gatherers, given that one might think there were enough animal species in the area to draw them.

During the next two millennia, between 25,000 and 23,000 BP, the Bistrița Valley was inhabited in all the mentioned sectors (fig. 13), both in its mountain course, *i.e.*, the Răpciuni Basin (fig. 14), and in the outer Carpathian area, in the Piatra Neamț and Buda *Lespezi* sectors. In this last sector, in the lower course of the Bistrița, not far from its confluence with the Siret, the presence of Gravettian communities is attested for the first time, first in the *Lespezi* settlement and later in that of Buda. At *Lespezi*, the evidence is the date 24,620 ± 190 BP (29,103-28,202 cal BP) (OxA-31556) (tab. 3) (Tuffreau *et alii* 2018), which proves that the

first Gravettians arrived here during the period covering interstade 4 (Gl-4) and glacial stage 4 (GS-4) in order to hunt, roughly to the same extent, for *Rangifer tarandus, Equus* sp., *Bison priscus* and *Alces alces* (Bolomey 1989). There are three ^{14}C dates at Buda which point to the existence of Gravettians between 23,810 ± 190 BP (28,330-27,580 cal BP) (GrN-23072) and 23,300 ± 160 BP (27,781-27,286 cal BP) (OxA 29525) (tab. 4) (Păunescu 1998; Tuffreau *et alii* 2018). Chronoclimatically, we should accept that they may have settled at Buda between the end of glacial stage 4 (GS-4) and the end of interstade 3 (GI-3). This means they stayed only during the time when the climate was more suitable for habitation in order to hunt mainly for bison, which, according to A. Bolomey (1961), was captured at a rate of 92.33%, being timidly followed by reindeer, 7.67%. Another study mentions two other species: *Bison priscus*/*Bos primigenius* – 88.55%, *Rangifer tarandus* – 10.77%, *Cervus elaphus* – 0.11%, *Equus* sp. – 0.55% (Necrasov, Bulai-Știrbu 1971). Finally, the following table of identified mammals has been relatively recently published: *Bos*/*Bison* – 89.83%, *Rangifer tarandus* – 10.17%. It is mentioned that the reindeer was captured at the beginning of the cold season, but it is not excluded that the hunting season extended throughout the entire hibernal season (December-March). Interestingly, a similar hunting period was also estimated for the steppe bison identified at Buda (Dumitrașcu, Vasile 2018).

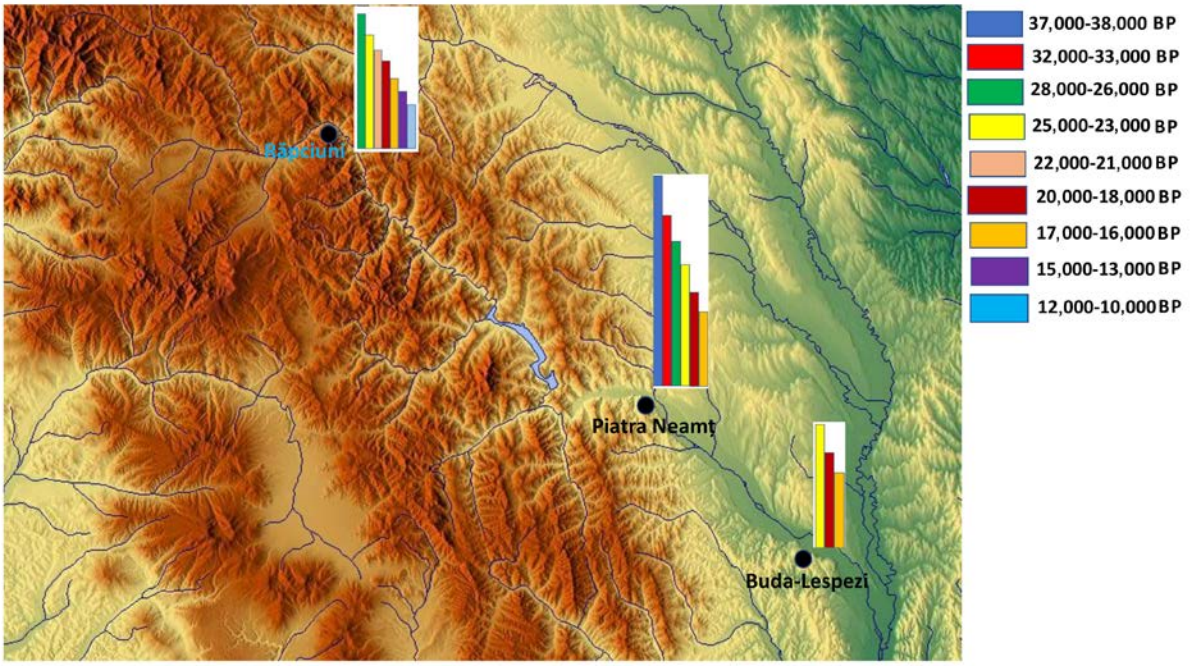

Fig. 13. Sectors of concentration of Palaeolithic settlements in the Bistrița Valley and the periods in which they were inhabited.
Sectoare de concentrare a așezărilor paleolitice de pe valea Bistriței și perioadele când au fost locuite.

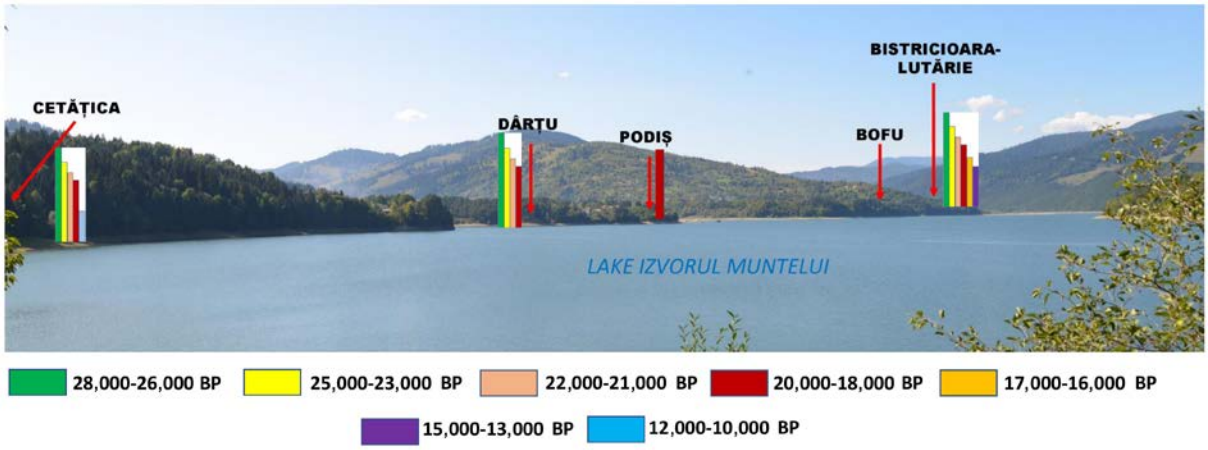

Fig. 14. Palaeolithic settlements in the Răpciuni Basin (after Cârciumaru *et alii* 2023).
Așezările paleolitice din Bazinul Răpciuni (după Cârciumaru *et alii* 2023).

Depth (cm)	Layer	Material	AMS Lab. Nr.	Age BP (uncal.)	Age (cal. B.P) (95.4 % probability)
140-160	Epigravettian	Charcoal	Bln-805	17,620 ± 320	22,170-20,530
250-300	Epigravettian	Charcoal	Bln-806	18,110 ± 300	22,570-21,121
450-380	Epigravettian	Charcoal	Bln-808	18,020 ± 350	22,580-20,900
140-160	Epigravettian	Bone	OxA-31557	18,500 ± 110	22,607-22,027
-	Gravettian	Bone	OxA-31556	24,620 ±190	29,103-28,202

Tab. 3. 14C dates from Lespezi.
Datele 14C de la Lespezi.

Depth (cm)	Layer	Material	AMS Lab. Nr.	Age BP (uncal.)	Age (cal BP) (95.4 % probability)
	Gravettian	Bone	OxA 29525	23,300 ± 160	27,781-27,286
	Gravettian	Bone	OxA 29526	23,440 ± 160	27,855-27,376
125-150	Gravettian	Bone	GrN-23072	23,810 ± 190	28,330-27,580

Tab. 4. ^{14}C dates from Buda.
Datele ^{14}C de la Buda.

Gravettian III hunter-gatherers continued to exist in the *Poiana Cireșului* settlement from Piatra Neamț, as proven by the seven ^{14}C dates which are in fact above the 25,000 BP limit. They are between 25,860 ± 170 BP (30,620-29,570 cal BP) (Beta 224,157) and 25,390 ± 140 BP (29,895-29,030 cal BP) (OxA-36,790) (tab. 1). Occupation of the Gravettian III level carried through in an oscillating stadial climate (GS-5), which had its short but rather important warming episodes and also peak periods of stadial cold during the so-called Heinrich 3.

In this stage between 25,000 and 23,000 BP, occupation in the Gravettian II level continued at *Poiana Cireșului*, which is shown by the eleven ^{14}C dates that are extremely coherent, as are almost all radiometric dates in this important Palaeolithic settlement in Romania (Cârciumaru *et alii* 2016; 2018; 2019; 2023; Cârciumaru, Nițu 2018; Nițu *et alii* 2019; 2021). They range between 25,135 ± 150 BP (29,556-28,801 cal BP) (Beta 244,072) and 23,420 ± 310 BP (28,200-27,112 cal BP) (OxA-X-2,762-25). Transposed to the paleoclimate curve based on isotope studies

(fig. 11), it follows that the hunter-gatherers attributed to the Gravettian II were able to reach *Poiana Cireșului* before the end of glacial stage 5 (GS-5), possibly went through the two interstades 4 and 3 (GI-4 and GI-3) with the glacial stage separating them (GS-5) and left the settlement when the climate became unfavorable at the onset of glacial stage 3 (GS-3). The communities that were contemporary with interstade 3 would hunt, as those from Buda, for the bison in autumn (Dumitrașcu, Vasile 2018). They may be the same communities that chased bison on its seasonal migrations.

We believe that the margin of error of calibrated dating may sometimes create a false picture of the moment a group reached and left a settlement. Therefore, these two benchmarks should be considered as possible, not mandatory. Otherwise, one might create the impression of continuity between the Gravettian III and II at *Poiana Cireșului*, when in fact, stratigraphically, there is a significant sterile layer between them (Nițu *et alii* 2021; Cârciumaru *et alii* 2023).

The existence of Gravettians in the Răpciuni Basin between 25,000 and 23,000 BP is supported by several ^{14}C dates. Although many of them have far too large a margin of error to be considered, there are enough reliable dates. Three reasonable dates from Bistricioara *Lutărie I* prove the presence of hunter-gatherers in this settlement between 24,396 ± 192 BP (28,812-27,967 cal BP) (Erl 11855) and 24,213 ± 299 BP (28,805-27,725 cal BP) (Erl 9968) (tab. 5). A date from Bistricioara *Lutărie II* is very close to those from Bistricioara *Lutărie I*: GrN 11,586: 24,760 ± 170 BP (29,236-28,420 cal BP) (tab. 6). These dates point to the existence of those communities throughout interstade 4 (GI-4), in a climate that was definitely suitable for the occupation of this region at the foot of the Ceahlău Mountains (fig. 11). This explains the variety of hunted animals, such as *Equus transilvanicus, Bison priscus, Rangifer tarandus, Megaceros giganteus, Lepus* sp., *Vulpes vulpes* (Păunescu 1998). The various species prompt us to believe that Bistricioara *Lutărie* was rather a stable settlement in this era and a number of species, like *Rangifer tarandus* and even *Bison priscus*, were expected here in their summer migrations. Unfortunately, there are no zooarchaeological estimates regarding the season in which such species were captured.

Depth (cm)	Layer	Material	AMS Lab. Nr.	Age BP (uncal.)	Age (cal BP) (95.4% probability)
70/80-100	**Gravettian I**	**Charcoal**	**Erl 11,854**	**21,541 ± 155**	**25,549-26,090**
70/80-100	**Gravettian I**	**Charcoal**	**Erl 12,164**	**22,181 ± 112**	**26,069-26,748**
95-103	Gravettian I	Charcoal	GX 8,730	19,055 ± 925	25,485-21,005
135	**Gravettian II**	**Charcoal**	**Erl 9,968**	**24,213 ± 299**	**27,725-28,805**
134	**Gravettian II**	**Charcoal**	**Erl 9,967**	**24,370 ± 300**	**27,795-28,976**
125	**Gravettian II**	**Charcoal**	**Erl 11,855**	**24,396 ± 192**	**27,967-28,812**
170	No archaeological context	Charcoal	ER 9,970	26,869 ± 447	29,964-31,576
180	No archaeological context	Charcoal	ER 9,969	28,069 ± 452	31,141-33,136

Tab. 5. ^{14}C dates from the settlement of Bistricioara *Lutărie I* (**red/bold** – dates with low margin of error).
Date ^{14}C din așezarea Bistricioara *Lutărie I* (**roșu/îngroșat** – date cu marja de eroare scăzută).

Depth (cm)	Layer	Material	AMS Lab. Nr.	Age BP (uncal.)	Age (cal BP) (95.4% probability)
87-96	**Epigravettian**	**Charcoal**	**GrN 10,528**	**16,150 ± 350**	**20,364-18,754**
108-118	Gravettian I	Charcoal	GX 8,728	18,800 ± 1.200	25,900-20,140
118-122	Gravettian I	Charcoal	GX 8,729	20,995 ± 875	27,289-23,450
140-148	**Gravettian I**	**Charcoal**	**GrN 12,670**	**18,330 ± 300**	**22,885-21,455**
132	**Gravettian I**	**Charcoal**	**GrN.16,982**	**20,310 ± 150**	**24,942-24,022**
135-146	Gravettian I	Charcoal	GX 8,726	20,300 ± 1,300	27,649-21,851
150-165	Gravettian II	Bone	GX 8,727-G	23,450 + 2,000/- 1,450	
195-220	Gravettian II	Charcoal	GrN 10,529	24,100 ± 1,300	31,211-26,011
195-220	**Gravettian II**	**Charcoal**	**GrN 11,586**	**24,760 ± 170**	**29,236-28,420**
200-215	Gravettian II	Charcoal	GX 8,845-G	23,560+1,150/- 980	
200-215	Gravettian II	Charcoal	GX 8,844	27,350+2,100/- 1,500	

Tab. 6. ^{14}C dates from the Palaeolithic settlement of Bistricioara *Lutărie II* (red/bold – dates with low margin of error).
Date ^{14}C din așezarea paleolitică de la Bistricioara *Lutărie II* (roșu/îngroșat – date cu marja de eroare scăzută).

Recently, the excavations conducted in the new settlement of Bistricioara *Lutărie* III, located nearby, have produced more reliable AMS dates for this stage, with a small margin of error. Four dates range between 23,699 ± 137 (28,051–27,551 cal BP) (RoAMS 1417.101) and 23,284 ± 139 BP (27,754-27,300 cal BP) (RoAMS 1413.101) (fig. 10). They extend the presence of the Palaeolithic man in the Bistricioara *Lutărie* settlements, in that, they are contemporary with a stage posterior to those of Bistricioara *Lutărie I* and *II*, more specifically, with the second half of glacial stage 4 (GS-4) and entirely with the climate amelioration during interstade 3 (GI-3). It may be said that Gravettian communities first settled down at Bistricioara *Lutărie I* and *II* in Gl-4 interstade, then moved to Bistricioara *Lutărie III*, enduring the climate hardships during glacial stage GS-4, and finally enjoyed a more favourable climate specific to the interstade that followed GI-3 (fig. 11). In other words, they moved from an upper terrace to a lower one, which was closer to the Bistrița riverbed. Naturally, in the special dynamics of Gravettian populations, the hypothesis of different communities coming at sufficiently large time intervals is more plausible.

The pollinic analyses also revealed the cold nature of the climate the first communities of Bistricioara *Lutărie II* and Dârțu experienced, when the only more consistently represented tree was the pine, in a landscape that remained open (GS-4), and then the more favourable climate, when the forest began to take shape through the presence of such tree species as *Fagus* and *Corylus*, at first, *Quercus* and *Ulmus* afterwards, typical of interstade 3 (Gl-3) (fig. 15) (Cârciumaru 1980; 1985; 1989; 1999; Cârciumaru *et alii* 2023; Păunescu *et alii* 1977). The mammalian fauna is also consistent with this succession from a hostile environment in the beginning, when only species like *Rangifer tarandus*, *Bos* s. *Bison*, *Bison priscus*, *Lepus* sp., *Vulpes vulpes* would survive, to one that was more favourable to species such as *Equus caballus fosillis* (Bolomey 1966) or *Equus transilvanicus* according to P. Samson and C. Rădulescu (Păunescu 1998). It is difficult to ascertain why Gravettian communities chose to settle down in the mountain area of the Bistrița Valley during a glacial stage, when the permanent snow line had dropped to about 1,850 m in the mountains. An

explanation of the reasons they penetrated so deep into the Bistrița Valley in the midst of a glacial stage may be that they were either in pursuit of reindeer herds in their summer migrations, if we accept the hypothesis of a hunting settlement, or waiting for certain species to come here during the summer, in the case of a permanent settlement. It is interesting that climate estimates, obtained by transposing them to the climate curve based on isotopic studies (fig. 11), coincide with the dates resulted from palynological and mammalian fauna studies.

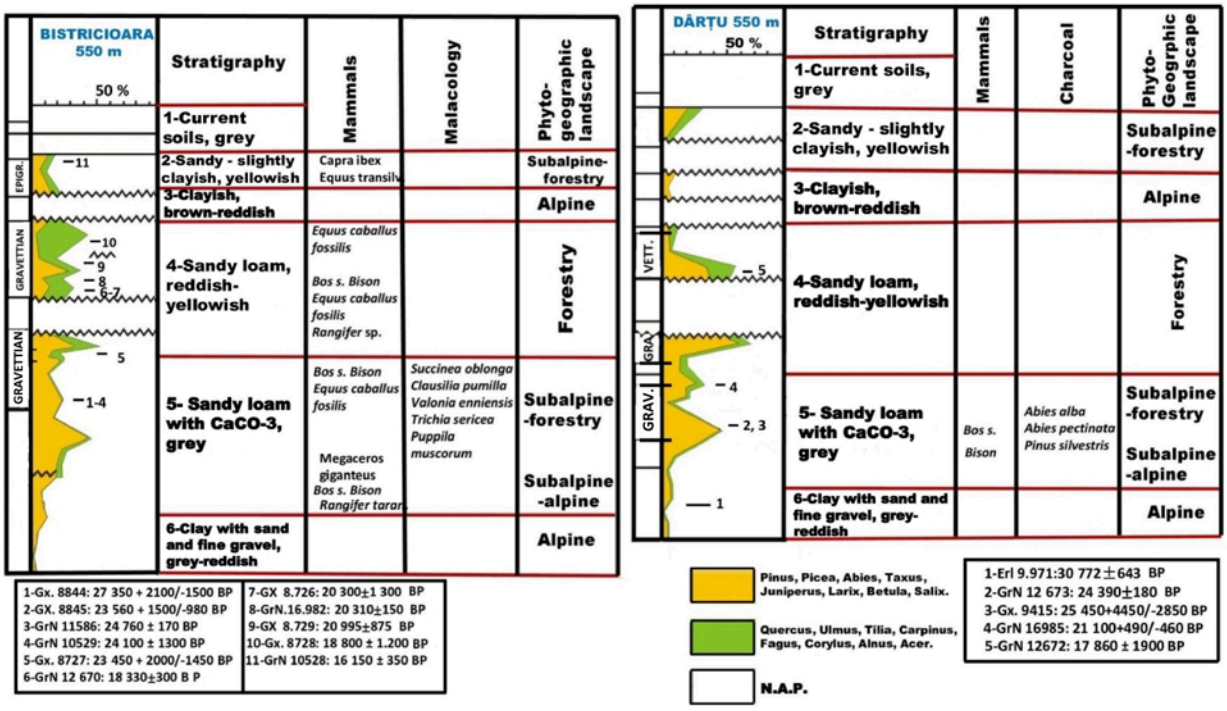

Fig. 15. Synoptic table of interdisciplinary research in the settlements of Bistricioara *Lutărie II* and Dârțu (after Cârciumaru *et alii* 2023).
Tabel sinoptic al cercetărilor interdisciplinare din așezările Bistricioara *Lutărie II* și Dârțu (după Cârciumaru *et alii* 2023).

The timespan of 22,000 to 21,000 BP offers a special surprise regarding the Bistrița Valley occupation, in that, according to the available data, only the Răpciuni Basin seems now to have been inhabited. The presence of Gravettian communities is attested at Bistricioara *Lutărie I* by a date of 21,541 ± 155 (25,549-26,090 cal BP) (Erl 11,854), at Bistricioara *Lutărie III* – 21,543 ± 129 BP (26,059-25,604 cal BP) (RoAMS1418.101), probably at Dârțu – 21,100 + 490/- 460 BP (GrN 16,985) (tab. 8) and Cetățica II – 21,050 ± 650 BP (26,825-23,870) (GrN 14,632) (tab. 2). Surprisingly, they lived at Bistricioara *Lutărie* in the midst of glacial stage 3, which prompts us to believe that this was a hunting settlement in the summer. Palaeontological studies have established that in this period the captured animals were *Equus transilvanicus*, *Bison priscus* and *Rangifer tarandus*. The question arises as to where those hunting communities came from, and where their base settlement was located. If they moved to and fro across the Bistrița Valley, having their permanent settlement downstream, in an area with a somewhat milder climate, it means this site is still unknown. On the other hand, we should take into account that between 26,000 and 25,000 cal BP a cold, arid maximum

occurred in Europe, the permafrost reached high levels and the ocean level had dropped by 130 m due to water storage in ice caps (Fontana 2023).

The 20,000-18,000 BP interval is spectacular due to the presence of Gravettian communities all along the Bistrița Valley and especially at *Poiana Cireșului*, where, as mentioned before, important evidence of symbolism and art has been uncovered (fig. 4, 6). The Gravettian I of *Poiana Cireșului* is therefore a pole of Gravettian art in the Bistrița Valley; the numerous ^{14}C dates available to us show it was mostly contemporary with the chronological interval between 20,000 and 18,000 BP The *14C* limits of the Gravettian I are between 20,154 ± 97 BP (24,484-23,959 cal BP) (Erl 12,163) and 18,607 ± 87 (22,696-22,300 cal BP) (RoAMS 67.33) (tab. 1). This means that the earliest Gravettian I communities arrived at *Poiana Cireșului* towards the end of glacial stage GS 3, went through interstade GI 2 and remained until the middle of GS 2, thus covering the first half of the Last Glacial Maximum (LGM). The most hunted animal during this period, over 85%, was *Rangifer tarandus*, *Bos*/*Bison, Cervus elaphus, Equus* sp., *Rupicapra rupicapra, Vulpes*/*Alopex* were captured to a modest extent. Two other species are present following the identification of mammoth ivory, wolf canine and ulna artefacts. The study of reindeer teeth and antlers have revealed that seasonal hunting took place from early autumn to early winter and focused mainly on adult females and young males and females (Cârciumaru *et alii* 2023). This confirms that the human groups of those times did not have sufficient reasons to adopt a selective hunting strategy (Fontana 2023). *Poiana Cireșului* should not be considered a mere hunting stop specific to the hibernal reindeer capturing season. It may also fall under the category of 'residential mobility' or 'logistic mobility' (Binford 1980, p. 18-19). *Residential mobility* refers to the mobility of habitats in the sense that the groups of hunter-gatherers establish their habitats around food resources. They are small, highly mobile and opportunistic groups. *Logistic mobility* refers to group mobility, *i.e.*, the existence of larger base camps where families lived and of satellite camps in which a part of the group travelled in order to hunt, procure lithic raw materials etc. (Djindjian 2014, p. 646-647). Logistics-based strategies may be the answer to the degree of incongruence of critical resources. We consider that the possibility of certain settlements changing their function over a season should not be ruled out (Binford 1980; 1982). The very high percentage of reindeer within the economy of hunter-gatherer communities of *Poiana Cireșului* is consistent with the situation in other regions, such as France, where reindeer reached its maximum distribution, 78% (Fontana 2023).

The hypotheses regarding the territory occupation and mobility of hunter-gatherer communities are confirmed by the fact that the Bistrița Valley was densely populated over a wider area in the Piatra Neamț zone, as shown by the dates obtained for the Piatra Neamț 2 settlement: 19,180 ± 70 BP (23,407-22,871 cal BP) (Beta 545,814) and 18,360 ± 50 BP (22,415-21,998 cal BP) (Beta 545,812) (tab. 9). Continuous habitation and occupation of vast spaces in the Piatra Neamț area, mainly in the Epigravettian, is remarkable and is well highlighted by the excavated deposits which provided important ^{14}C dates (fig. 16).

Towards the end of this period, Gravettian communities were present at Bistricioara *Lutărie II*, which is proved by the ^{14}C date GrN 12,670: 18,330 ± 300 BP (22,885-21,455 cal BP) (tab. 6). Their existence was somehow confirmed at Bistricioara *Lutărie I* as well, according to the ^{14}C date GX 8,730: 19,055 ± 925 BP (25,485-21,005 cal BP) (tab. 5). However, five important dates point to the certain presence of hunting groups at Bistricioara *Lutărie III* between 18,378 ± 66 BP (22,438-21,994 cal BP) (DeA 7574) and 19,864 ± 94 BP (24,180-23,620 cal BP) (RoAMS 1411.101) (tab. 7).

These latter dates from Bistricioara *Lutărie III*, transposed to the isotope curve, entitle us to say that Bistricioara *Lutărie* settlements were inhabited in the second part of glacial stage 3 (GS-3), during interstade (GI) 2c until the middle of glacial stage (GS) 2c. In the absence of considerations on the period in which reindeer was hunted, we may presume that it was captured, along with the horse (*Equus transilvanicus*), particularly in the interstadial periods during its summer migrations to mountain areas. We do not exclude that groups of hunters from *Poiana Cireșului* may have come to Bistricioara *Lutărie* during this period in pursuit of animals towards the mountainous regions of the Bistrița Valley. On this occasion, they would not dare venture to the higher ridges and catch *Capra ibex* specimens.

Depth (cm)	Layer	Material	AMS Lab. Nr.	Age BP (uncal.)	Age (cal. B.P) (95.4% probability)
			DeA 7465	**16,949 ± 57**	**20,630-22,228**
			DeA 7574	**18,378 ± 66**	**22,438-21,994**
G2	**Epigravettian**	**Charcoal**	**RoAMS1067.101**	**18,992 ± 121**	**23,232-22,515**
	Epigravettian		**DeA 7575**	**19,486 ± 98**	**23,777-23,111**
115	**Epigravettian**	**Charcoal**	**Erl 12.851**	**19,749 ± 149**	**23,393-24,154**
G2	**Epigravettian**	**Charcoal**	**RoAMS1411.101**	**19,864 ± 94**	**24,180-23,620**
G2	**Epigravettian**	**Charcoal**	**RoAMS1069.101**	**20,108 ± 141**	**24,525-23,829**
G2	**Gravettian I**	**Charcoal**	**RoAMS1418.101**	**21,543 ± 129**	**26,059-25,604**
176	No archaeological context	Charcoal	DeA 3685.1.1	21,950 ± 90	25,940-26,419
	No archaeological context		DeA 7577	22,257 ± 111	26,922-26,145
G2	**Gravettian II**	**Charcoal**	**RoAMS1413.101**	**23,284 ± 139**	**27,754-27,300**
G2	**Gravettian II**	**Charcoal**	**RoAMS1070.101**	**23,332 ± 185**	**27,824-27,274**
186	**Gravettian II**	**Charcoal**	**DeA 7462**	**23,342 ± 133**	**27,346-27,773**
G2	**Gravettian II**	**Charcoal**	**RoAMS1417.101**	**23,699 ± 137**	**28,051-27,551**
196	No archaeological context	Charcoal	DeA 3688.1.1	24,153 ± 112	27,873-28,515
276	No archaeological context		DeA 4462	24,490 ± 99	28,270-28,783
222	No archaeological context	Charcoal	DeA 4466	27,249 ± 240	30,879-31,488
	No archaeological context		DeA 7466	29,243 ± 207	33,868-32,944
246	No archaeological context		DeA 4460	30,249 ± 169	33,929-34,623
237	No archaeological context	Charcoal	DeA 7464	31,938 ± 279	35,180-36,384
G3			RoAMS1415.101	23,450 ± 152	27,851-27,391
G3			RoAMS1236.101	28,142 ± 100	32,442-31,511

Tab. 7. ^{14}C dates from the Palaeolithic settlement of Bistricioara *Lutărie III* (red/bold – dates with low margin of error).
Datele ^{14}C din așezarea paleolitică de la Bistricioara *Lutărie III* (roșu/îngroșat – date cu marja de eroare scăzută).

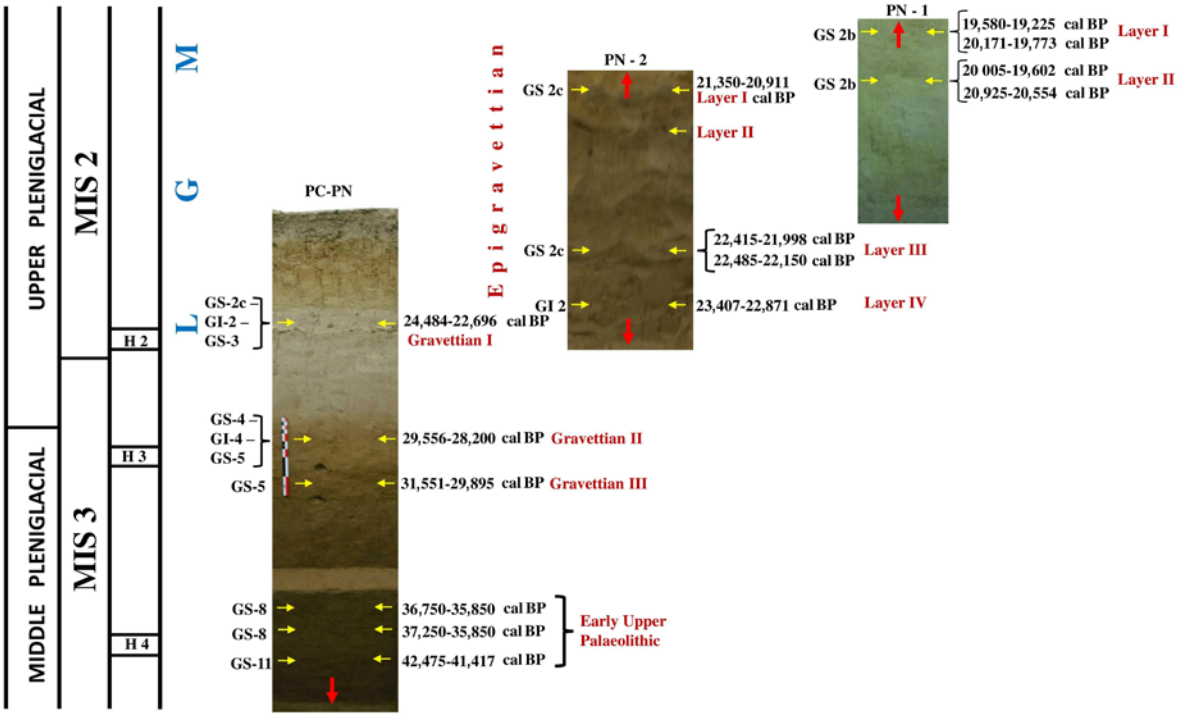

Fig. 16. Chronostratigraphic and palaeoclimatic correlations of the deposits in the Piatra Neamț sites.
Corelări cronostratigrafice și paleoclimatice ale depozitelor din siturile de la Piatra Neamț.

Depth (cm)	Layer	Material	AMS Lab. Nr.	Age BP (uncal.)	Age (cal BP) (95.4% probability)
108-113	**Epigravettian**	**Charcoal**	**GrN 12,672**	**17,860 ± 190**	**22,155-21,068**
170	Gravettian I	Charcoal	GrN 16,985	21,100 + 490/- 460	
164-174	**Gravettian II**	**Charcoal**	**GrN 12,673**	**24,390 ± 180**	**28,800-27,987**
168-171	Gravettian II	Charcoal	GX. 9,415	25,450 + 4,450/- 2,850	
230	No archaeological context	Charcoal	Erl 9,971	30,772 ± 643	36,123-33,748
230	No archaeological context	Charcoal	Erl 12,165	35,775 ± 408	41,331-39,528

Tab. 8. ^{14}C dates from the Palaeolithic settlement of Dârțu (red/bold – dates with low margin of error).
Datările ^{14}C din așezarea paleolitică de la Dârțu (roșu/îngroșat – datări cu marja de eroare scăzută).

A ^{14}C date points to human presence at Cetățica I as well during this time, namely, GrN 14,631: 19,760 ± 470 BP (25,084-22,727 cal BP) (tab. 10).

One may refer to human presence in the lower course of the Bistrița only towards the end of this period, according to dates obtained at Lespezi, *i.e.*, between 18,500 ± 110 BP (22,607-22,027 cal BP) (OxA-31557) and 18,020 ± 350 BP (22,580-20,900 cal BP) (Bln-808) (tab. 3), which is equivalent to glacial stage (GS) 3. Reindeer (*Rangifer tarandus*) was most

frequently hunted, closely followed by horse (*Equus* sp.), bison (*Bos/Bison*) and more rarely *Alces alces*, *Elephas primigenius*, *Canis lupus*, *Gulo gulo* and *Lepus* sp. Reindeer was hunted during the cold season (Bolomey 1989). Hence, an important variety of species in relation to the communities documented in the upper course. We do not exclude that the mobility of the communities attested at Lespezi during this time may have been quite high in pursuit of certain animal species.

Depth (cm)	Layer	Material	AMS Lab. Nr.	Age BP (uncal.)	Age (cal BP) (95.4% probability)
SII -	Epigravetian	Charcoal	Beta 646,478	17,480 ± 60	21,350-20,911
SI - 230	Epigravetian	Bone	Beta 545,812	18,360 ± 50	22,415-21,998
SI - 230	Epigravetian	Bone	Beta 545,813	18,440 ± 50	22,485-22,150
SI - 275	Epigravetian	Bone	Beta 545,814	19,180 ± 70	23,407-22,871

Tab. 9. ^{14}C dates from the Piatra Neamț 2 site.
Datele ^{14}C din situl Piatra Neamț 2.

Depth (cm)	Layer	Material	AMS Lab. Nr.	Age BP (uncal)	Age (cal BP) (95.4% probability)
152-159	**Gravettian I**	**Charcoal**	**GrN 14,631**	**19,760 ± 470**	**25,084-22,727**
213-220	**Gravettian II**	**Charcoal**	**GrN 14,630**	**23,890 ± 290**	**28,583-27,545**
270-280	Gravettian II	Charcoal	GrN 14,629	>24,000	-

Tab. 10. ^{14}C dates from Ceahlău *Cetățica I* (red/bold – dates with low margin of error).
Datele ^{14}C de la Ceahlău *Cetățica I* (roșu/îngroșat – date cu marja de eroare scăzută).

Between 18,000 and 16,000 BP, human presence remained quite important for all sectors of the Bistrița Valley. As yet, no sites dated to the end of this stage have been found so as to certify the presence of Epigravettian communities in the lower course of the Bistrița Valley and the Piatra Neamț area. After 16,000 BP, Epigravettian communities would retreat upstream, gathering in the Răpciuni Basin and probably in the Izvorul Alb sector (fig. 10).

As regards Lespezi, there is a ^{14}C date, 17,620 ± 320 BP (22,170-20,530 cal BP) (Bln-805) (tab. 3), which attests the presence of Epigravettian communities at the confluence of the Bistrița River with the Siret. Human presence is not only a certainty at Piatra Neamț 1, but it also has a spectacular side to it, for this site has produced the only Venus figurine in Romania (fig. 7). Several ^{14}C dates testify to the consistent existence of the Epigravettian in the Piatra Neamț sector, ranging between 17,190 ± 50 BP (20,925-20,554 cal BP) (Beta 531,210) and 16,080 ± 50 BP (19,580-19,225 cal BP) (Beta 531,207), in the midst of glacial stage (GS) 2b (tab. 11). A first observation would be that the Lespezi communities slightly preceded those who settled at Piatra Neamț 1. As the presence of Epigravettian communities is documented in this period at Piatra Neamț 2 as well by the date 17,480 ± 60 BP (21,350-20,911 cal BP) (Beta 646,478) (tab. 9), one may conclude that the plateaus on the right side of the Bistrița Valley, in the Piatra Neamț sector, were densely populated. The osteological remains recovered from the settlement of Piatra Neamț 1 indicate that the hunted animals were mainly the large horse (*Equus* sp.) and, to a lesser extent, reindeer (*Rangifer tarandus*). Estimates of the season when reindeer was hunted could not be made and as regards the horse, it has been found that only the mature, even old specimens were caught. The occurrence of almost all horse

anatomical elements in the site may suggest the existence of a hunting stop where animals were brought and dismembered (Nițu *et alii* 2023).

A ^{14}C date from Podiș, in the Răpciuni Basin, 16,970 ± 360 BP (21,465-19,615) (GrN 14,640), is the only proof attesting the timid presence of Epigravettian hunter-gatherer groups in the Răpciuni Basin at this moment. However, between 15,000 and 13,000 BP, there was a tendency of Epigravettian populations to withdraw exclusively to the Răpciuni Basin, because they are not attested downstream. Their presence here is documented by the Bistricioara *Lutărie* 'Mal' dates (tab. 12).

Depth (cm)	Layer	Material	AMS Lab. Nr.	Age BP (uncal.)	Age (cal BP) (95.4% probability)
250	Epigravettian I	Bone	Beta 531,207	16,080 ± 50	19,580-19,225
250	Epigravettian I	Tooth	RoAMS 1289,33	16,225 ± 60	19,825-19,390
250	Epigravettian I	Tooth	Beta 531,208	16,560 ± 50	20,171-19,773
290	Epigravettian II	Bone	Beta 531,209	16,410 ± 50	20,005-19,602
290	Epigravettian II	Cărbune	RoAMS 1293,33	16,423 ± 86	20,056-19,575
290	Epigravettian II	Tooth	RoAMS 1291,33	16,422 ± 63	20,027-19,601
290	Epigravettian II	Bone	RoAMS 1290,33	16,477 ± 62	20,082-19,646
290	Epigravettian II	Cărbune	Beta 531,211	17,040 ± 50	20,732-20,361
275	Epigravettian II	Cărbune	Beta 545,811	17,130 ± 50	20,856-20,486
290	Epigravettian II	Cărbune	RoAMS 1292,33	17,174 ± 92	20,987-20,469
285	Epigravettian II	Cărbune	Beta 531,210	17,190 ± 50	20,925-20,554

Tab. 11. ^{14}C dates from the Piatra Neamț 1 site.
Datele ^{14}C din situl Piatra Neamț 1.

Depth (cm)	Layer	Material	AMS Lab. Nr.	Age BP (uncal.)	Age (cal BP) (95.4% probability)
	Epigravettian		Erl 11,856	13,768 ± 70	16,934-16,361
	Epigravettian		Erl 11,857	14,581 ± 87	17,985-17,528

Tab. 12. ^{14}C dates from the Palaeolithic settlement of Bistricioara *Lutărie* 'Mal'.
Datele ^{14}C din așezarea paleolitică Bistricioara *Lutărie* 'Mal'.

Depth (cm)	Layer	Material	Ams Lab. Nr.	Age BP (uncal)	Age (cal. B.P) (95.4% probability)
	Epipalaeolithic	Charcoal	Beta 646,477	9,680 ± 30	11,201-11,071
	Epigravettian	Charcoal	Beta 646,476	11,690 ± 40	13,607-13,459

Tab. 13. ^{14}C dates from Ceahlău *Cetățica IV*.
Datele ^{14}C de la Ceahlău *Cetățica IV*.

Hunter-gatherer communities are to be found exclusively in the Răpciuni Basin, from 12,000 to 10,000 BP, according to the ^{14}C dates produced by the recent research of Ceahlău *Cetățica IV* (tab. 13). They stand proof of the late presence of the Palaeolithic in the Bistrița Valley.

◈ 3. Discussions

The first Palaeolithic hunter-gatherer groups appeared in the Bistrița Valley, in the Piatra Neamț sector, in 37,550 ± 360 BP (42,475–41,417 cal BP) (Beta 507,488), and approximately 5,000 years later, a new wave was to arrive here in the time interval between 32,400 ± 180 BP and 32,630 ± 190 BP

The latest genetic studies conducted on a large part of the osteological remains from the most important Palaeolithic settlements in Eurasia imply, as already mentioned, the existence of pre- 40 ka individuals who left no offspring in current populations, whereas post- 37 ka populations would belong to the oldest genomes from which today's Europeans derived (Posth et alii 2023). This means that the Bistrița Valley was visited by individuals belonging to these two important genetic groups. It is curious that the representatives of these two groups should not have been interested in the plateau area crossed by the Bistrița Valley in the lower course and stopped at the contact with the mountain, more precisely, in the area of the present-day city of Piatra Neamț. Perhaps it is even more interesting that both preferred the same location, *Poiana Cireșului*, more than 5,000 years apart. This means that, regardless of genetic affiliation, the impulse made them perceive the genetic virtues of this place in a similar way. This may indicate that the possible genetic differences, detected after the fortuitous study of individuals randomly belonging to certain Palaeolithic cultures or facies, identified in different areas in Eurasia, were not necessarily decisive in the transmission of traditions and the cultural definition of certain communities. In other words, cultural traditions transcend human genotypes and adaptation to a physical environment may influence and even generate similar behaviours.

It has been claimed that in glacial stage (GS) 5, *i.e.*, around the date 30,000 cal BP, extreme climate features entailed the disappearance or at least the decrease in human populations in the Kostenki region, and in the area north of the Black Sea this process lasted even longer (Reynolds *et alii* 2015). If we consider that the hunter-gatherer communities arrived at *Poiana Cireșului* in the midst of glacial stage (GS) 5, it means that, at this time, the Bistrița Valley was an area of refuge for the Gravettian populations affected by the extremely harsh climate specific to Eastern Europe. The existence of an ecological niche suitable for habitation, amid the less hospitable conditions of glacial stage (GS) 5, was favoured by the position of the Piatra Neamț site at the contact between the mountain area and the Subcarpathian depression Cracău-Bistrița, protected, to the east, by the heights of the Subcarpathians against the dry winds from the Russian Plain. Furthermore, those communities from *Poiana Cireșului* belonging to the Gravettian III were prosperous and made their ornaments from shells of the snail species *Lithoglyphus naticoides* and *Homalopoma sanguineum*. The latter species is of Mediterranean origin, which implies that the shells were procured from about 900 km away through extremely well-organised exchange networks or perhaps following a massive migration of some Gravettian communities. In both cases, the almost certainly long-term intergenerational mechanisms of spatial and temporal circulation are remarkable, materialising through the transfer of information over long distances, both verbally and materially, between groups sometimes perhaps of mixed 'ethnical' composition (Whallon, Lovis 2011, p. 282). We do not know whether these contacts between groups or individuals were periodic or if the aim was solely the procurement of those ornaments for aesthetic, ritualistic or ceremonial purposes (Whallon 2006, p. 2). If we consider that the *Homalopoma* shells were the only items thus obtained, as it results from the set of materials found in the Gravettian III from *Poiana Cireșului*, we may conclude that these exchanges were probably separated from subsistence activities, and such exotic objects were transported and

distributed according to mechanisms that fundamentally differed from those of lithic materials (Floss 1994, p. 207). They were nevertheless an important part of the existence of Palaeolithic hunter-gatherers adapted to uncertain environments and such social ties were meant to create a 'safety net' in terms of contacts and relationships that were essential for survival in difficult times due to the environment or resource depletion (Gamble 1983; Whallon 1989, p. 3). The permanence of such routes is based on traditions, knowledge of resources in those areas and the art of relationships with other communities etc.

It has been said that during the Last Glacial Maximum, surprisingly considered to have occurred between 25,000 and 20,000 BP (we believe the interval 23,500-17,000 cal BP to be more plausible – see Bocquet-Appel *et alii* 2005) but still contemporaneous with the Epigravettian as well, 'in the Prut region (Moldova and NE Romania), the few site clusters that exist attest the presence of hunter-gatherers with estimates of about 50 people occupying each region' (Maier *et alii* 2016, p. 6). The study starts from several approximate data and models, with many overlooked settlements and poor knowledge of the latest investigations in a number of areas essential for certain regions, in which the Bistrița Valley can also be included. Palynological analyses carried out in the Bistrița Valley (Cârciumaru 1980; 1985; 1999; Păunescu *et alii* 1977) could have represented benchmarks worthy of consideration, if only for specifying that the steppe-tundra landscape had descended at an altitude of about 300 m in this region during the Last Glacial Maximum, whereas the average temperature in July during glacial stages was estimated to have been around 8 °C in the Răpciuni Basin (Ceahlău).

Demographic estimates are indeed an extremely complicated undertaking, which should consider a multitude of variables, and the relativity of data taken into account is inevitable. It is enough to compare the data for LGM regarding the population size assumed in the study of Bocquet-Appel *et alii* (2005), between 2,300 and 37,700 individuals, while Maier *et alii* (2016) claim the population ranged between 1,400 and 6,300 people.

The ^{14}C dates provide calibrated ages with quite large margins of error, inoperable to correlate them with the duration of certain domestic concerns of those communities. Departures and returns to a site are difficult to quantify based on these. Housing structures are too fragile to leave preservation marks for a longer time. According to pollen analyses, in the hibernal season during glacial stages, the climate in the Bistrița Valley was moderate enough to allow the mobility of groups of hunter-gatherers, who could even go as far as the Răpciuni Basin.

On the other hand, not too many Palaeolithic settlements in the Bistrița Valley have preserved osteological remains of the mammalian fauna. In others, too few and often poorly preserved ones have been found, not enough to facilitate estimates of the season when they were hunted and generally of the migrations of certain species.

Setting conventional boundaries, of about 2,000 years (fig. 10), insofar as the ages with margins of error of calibrated dates in a settlement overlap such an interval, does not imply permanent human presence but only the possibility that, within those boundaries, the groups of hunter-gatherers should have passed through that place at some point. Thus, we have obtained a global picture of the population rate in various sectors of the Bistrița Valley in the Palaeolithic and found that, insofar as the Piatra Neamț area was the only one that was visited by the first human waves, the Răpciuni Basin excelled through the very late survival of Palaeolithic communities, up to 10,000 BP The Răpciuni Basin was also the only inhabited region in the Bistrița Valley from 22,000 to 21,000 BP Somehow surprisingly, the Buda-Lespezi area in the lower course of the Bistrița recorded the shortest-lived

presence of *Homo sapiens* in the entire route of the Bistrița, only between 25,000 and 16,000 BP (with that hiatus from 22,000 to 21,000), whereas in the Piatra Neamț sector it spanned between 38,000 and 16,000 BP (with the same hiatus) and between 28,000 and 10,000 BP in the Răpciuni Basin. This implies that the Bistrița Valley began beeing populated in the Palaeolithic from its lower course upstream. For the first time, the groups of Gravettian hunter-gatherers would simultaneously populate the Piatra Neamț area and the Răpciuni Basin between 28,000 and 26,000 BP There are no traces of human presence at Buda-Lespezi during this time. It is only in the next stage, 25,000-23,000 BP, that one can speak about population in the entire Bistrița Valley.

In conclusion, *Homo sapiens* arrived in the Bistrița Valley for the first time around 37,500 BP (42,000 cal BP), being attested at Piatra Neamț *Poiana Cireșului*, and returned after a rather long period around 32,500 BP (36,500 cal BP), curiously settling again in *Poiana Cireșului*. We may speak of a colonisation of the valley only when the first groups of hunter-gatherers, whom we have attributed to the Gravettian III, well-established between 27,000 and 25,000 BP (31,500 and 29,500 cal BP), settled in *Poiana Cireșului*. A timid presence, around 26,500 BP, may also be referred to in the Răpciuni Basin, at *Cetățica*. It is certain that between 25,000 and 23,000 BP the groups of Gravettian hunter-gatherers would periodically populate the entire sector of the Bistrița Valley. The latest groups survived only in the Răpciuni Basin, with those communities being pushed towards the mountainous sector of the valley as the climate warmed around the Holocene.

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