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Project Gallery

The Early Upper Palaeolithic bone industry of the Central Altai, Russia: new evidence from the Kara-Bom site

Natalia E. Belousova[1,*], Alexander Yu. Fedorchenko[1,*], Evgeny P. Rybin[1], Maxim V. Seletskiy[1], Samantha Brown[2], Katerina Douka[2,3] & Tom Higham[3]

[1] Institute of Archaeology and Ethnography of the Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia
[2] Department of Archaeology, Max Planck Institute for the Science of Human History, Germany
[3] Oxford Radiocarbon Accelerator Unit, University of Oxford, UK
[*] Authors for correspondence: ✉ nataliabelousovaarch@gmail.com & winteralex2008@gmail.com

The first formal bone tool in the Central Altai of Russia was found in an Early Upper Palaeolithic assemblage at the Kara-Bom open-air site. Here the authors report the results of AMS dating, use-wear analysis, 3D-modelling and zooarchaeological and collagen fingerprinting analysis, which reveal important new insights into the osseous technology of the Kara-Bomian tradition.

Keywords: Russia, Early Upper Palaeolithic, bone-tool technology

Formal bone tools and personal ornaments are considered elements of cultural identity, as well as chronological markers of the first Upper Palaeolithic societies in Northern and Central Asia. The oldest collections of formal bone tools from these regions have been documented in the Initial and Early Upper Palaeolithic assemblages of Altai, almost exclusively from karst caves, whose microclimate contributes to the excellent preservation of organic remains (Figure 1a). Most of these objects come from Denisova Cave and have been recently subjected to direct and indirect dating (Douka *et al.* 2019). Outside the cave, a much smaller number of such items has been identified. In this article, we present the results of analysis of the first antler projectile point with a direct radiocarbon date from an Early Upper Palaeolithic assemblage at the Kara-Bom open-air site.

Kara-Bom is located in an intermontane basin of the Central Altai of Russia (50°43′23″ north, 85°34′27″ east) (Figure 1b). Kara-Bom is an excellent source of information on the technological, adaptation and cultural processes that occurred in the region during the Initial Upper Palaeolithic (Derevianko *et al.* 1998). The Upper Palaeolithic cultural-stratigraphic sequence at the site (excavation unit 4) includes two archaeological assemblages attributed to the same Kara-Bomian tradition (~48.0–34.0 ka cal BP; all dates were modelled in OxCal v.4.3, using the IntCal13 calibration curve (Reimer *et al.* 2013)), but associated with different stages of its development.

This article concerns the analysis of a point that was identified through reanalysis of a faunal assemblage carried out in 2017. The artefact was recovered from square M–8 during

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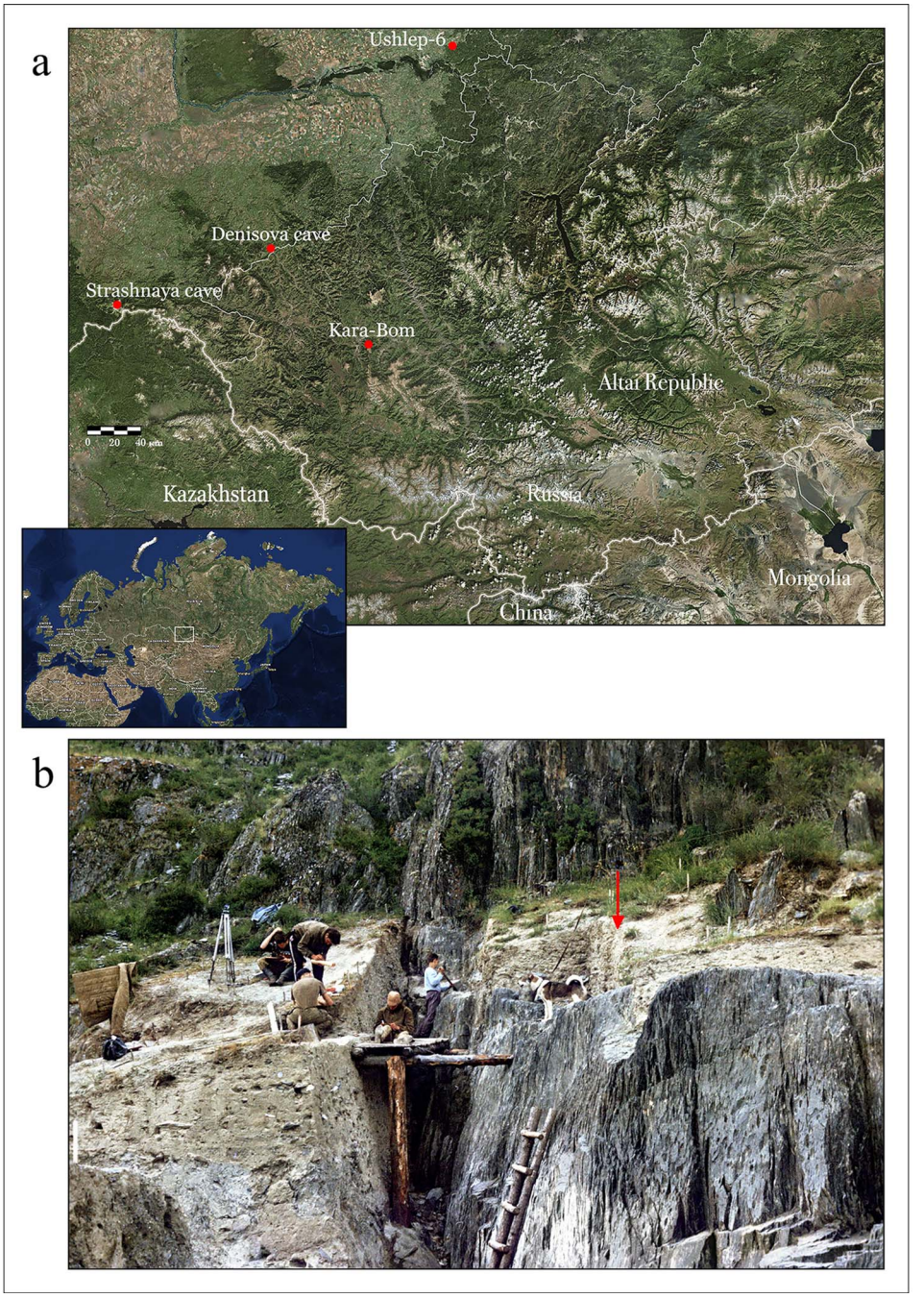

Figure 1. Study area: a) location of Initial and Early Upper Palaeolithic sites with bone points in the Altai region (map produced using the National Geographic Basemap and ArcGIS Online); b) excavation at the Kara-Bom site in 1991, the red arrow indicates the location of the 2016 stratigraphic profile (photograph from the personal archive of V.T. Petrin, figure by N. Belousova).

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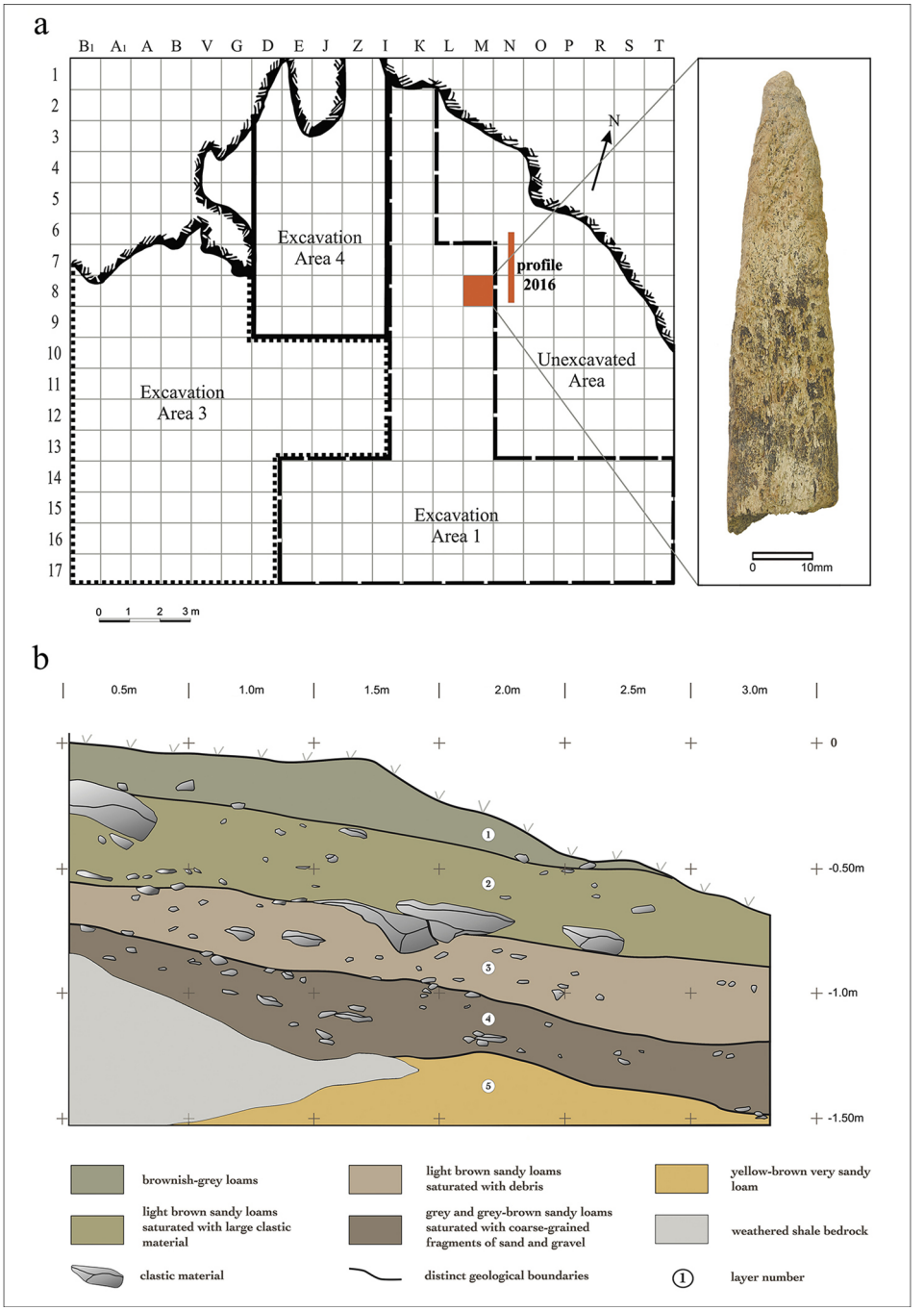

Figure 2. Spatial analysis: a) bone-point location on the plan; b) stratigraphic profile produced in 2016 on the line 'N' (figure by N. Belousova).

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Figure 3. Manufacture traces on the bone point from the Kara-Bom site (figure by A. Fedorchenko).

the 1991 excavations (Figure 2a). It was found at a depth of 0.30m below datum in deposits associated with the upper part of section 2016 (layer 1–2) (Figure 2b), which correlates with the archaeological complex of cultural horizon Upper Palaeolithic 1 (38.5–34.0 ka cal BP) (Belousova *et al.* 2018). The Upper Palaeolithic 1 stone industry is characterised by blade and bladelet production from bidirectional prismatic and narrow-faced cores. The toolkit includes retouched blades, points and end-scrapers on blades, as well as convergent scrapers.

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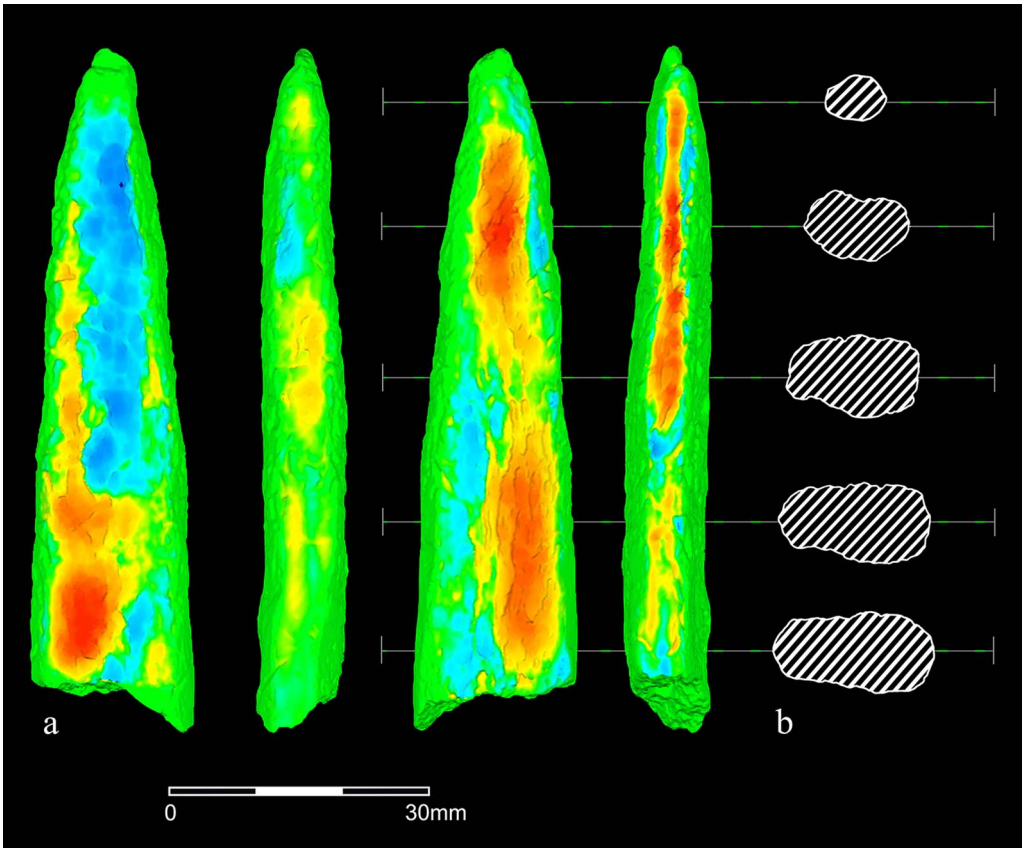

Figure 4. 3D model of the bone point: a) height map; b) cross-sections (figure by M. Seletskiy).

We performed a use-wear analysis with an Altami CM0745-T stereomicroscope equipped with a Canon EOS 5D Mark IV digital camera and an Olympus BHM microscope. A 3D-Scanner RangeVision Pro 5m was used to build a 3D model of the artefact. The identification of use-wear and manufacture traces is based on published data (Bradfield & Brand 2015; Pétillon *et al.* 2016). The results of analysis indicate that evidence associated with the artefact's manufacture is disguised over much of its surface by drying, root etching and other post-depositional effects (Figure 3b–d). This observation accords with the information we have about its stratigraphic context—the enclosing sediments of layers 1–2 were subjected to gravitational drift and root impact.

The bone tool is a distal-medial fragment (Figure 4a). It is 75.83mm long, 6.00–17.83mm wide and 3.90–8.64mm thick, the artefact volume is 6.94cm^3. Zooarchaeological analysis shows that red deer antler (*Cervus elaphus*) was the raw material used as a blank for manufacturing this point. These data were independently verified by peptide mass fingerprinting (ZooMS) analysis, which showed that the point belongs to a non-species-specific group—*Cervidae*/*Gazella*/*Saiga*. The specimen has a narrow, elongated, symmetrical shape. The cross-section of the artefact varies from rounded in the proximal part to subrectangular in the middle, to oval in the distal portion (Figure 4b).

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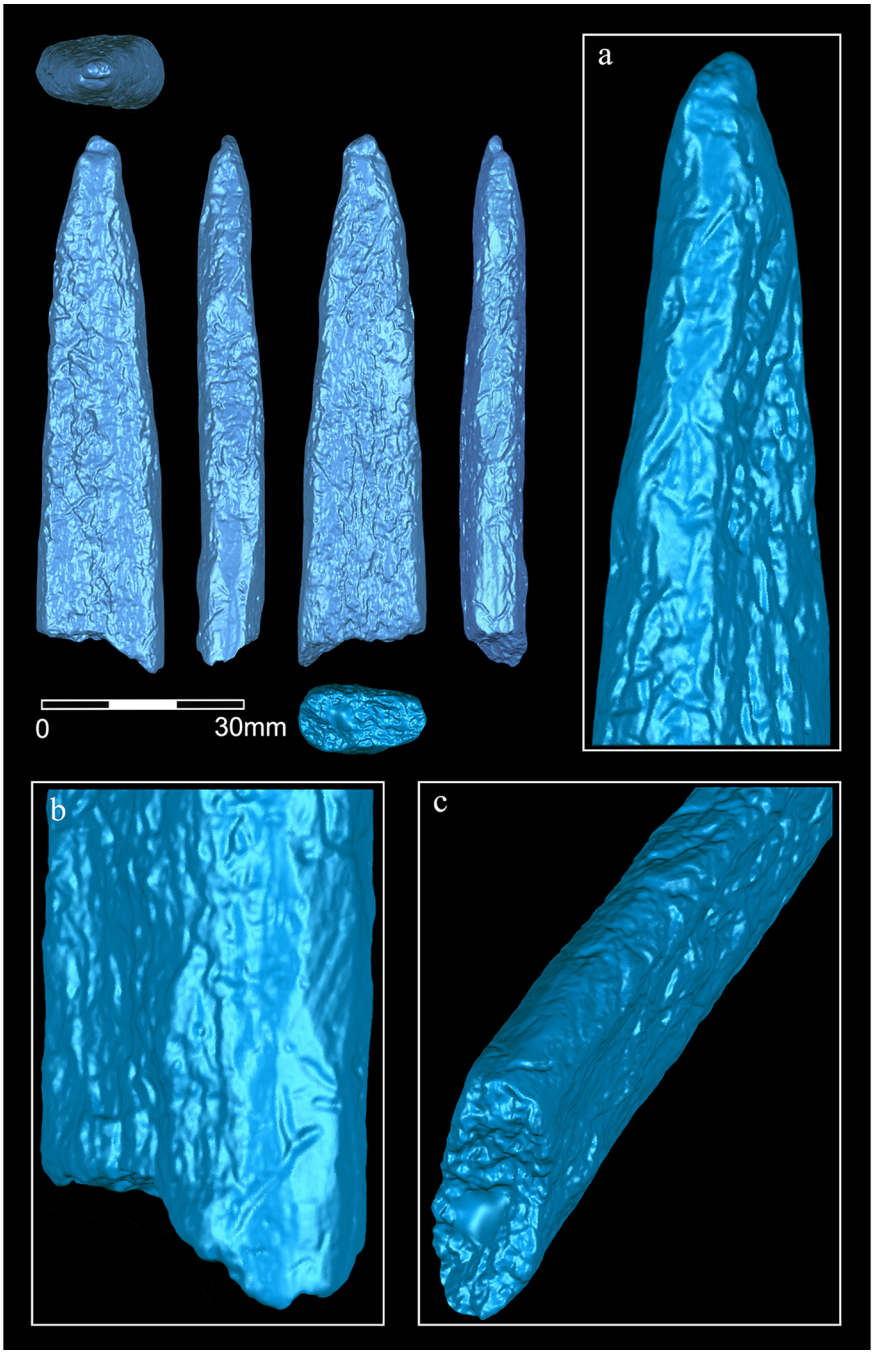

Figure 5. 3D model of the bone point: a–c) treated surfaces (figure by M. Seletskiy).

Despite the problems with surface preservation generally, the most well-preserved manufacture traces can be observed on the lateral sides of the tool on its proximal and medial parts (Figures 4–5). Elongated irregular grooves extending parallel and diagonal to the

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Figure 6. Use-wear traces on the tool: a) step-terminating fracture; b) evidence of a transverse fracture (figure by A. Fedorchenko).

tool axis provide evidence of a planing technique used in the manufacture of the tool (Figure 4c–e). The tool base is fragmented due to a transverse fracture that appears to have resulted from utilisation (Figure 6b). Functionally, we interpreted the artefact as an element of composite hunting weapons. No deer remains were previously identified in the Early

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Upper Palaeolithic faunal complex from Kara-Bom, which indicates that Palaeolithic inhabitants could have manufactured the tool away from the site. A step-terminating fracture recognised in the artefact (Figure 6a) (Bradfield & Brand 2015) suggests that the artefact was brought to the site along with an animal carcass, and was then discarded after butchering. To place the point in its correct chronological context, we directly dated it using AMS. The result we obtained is *29 110±320 BP* (OxA-36907) (34 000–32 450 cal BP).

The osseous technology was an essential part of the cultural assemblage of the Kara-Bomian tradition. The antler point from Kara-Bom has counterparts in other Upper Palaeolithic assemblages from the Altai region (Figure 1a). The Early Upper Palaeolithic assemblages recovered from Denisova Cave (>50.0–34.0 ka cal BP) include the most extensive set of points made from bones, antler and ivory using the planing technique (Derevianko *et al.* 2003). Two bone points from Denisova Cave were directly AMS dated to 48.1–42.6 ka cal BP (Douka *et al.* 2019). Three fragmented points were found at Strashnaya Cave (49.1–45.6 and 23.2–22.9 ka cal BP) (Krivoshapkin *et al.* 2018). The Early Upper Palaeolithic layer 8 at Ushlep-6 site (45.7–42.0 ka cal BP) has yielded another industry with ivory points. The much younger group of points with a pointed base and slotted tools were found at archaeological sites and among surface scatter in the northern foothills of the Altai, dated 21.7–14.5 ka cal BP (Kungurov 2005). Outside the Altai region, the closest analogies with a similar age are the Malaya Syia site at Kuznetsk Alatau, southern Siberia (38.2–30.0 ka cal BP; Barkov & Lbova 2017), Ma'anshan Cave in south China (35.4–33.0 ka cal BP; Zhang *et al.* 2016) and the Yana site in the Siberian Arctic (33.4–30.8 ka cal BP; Pitulko *et al.* 2012).

The chronometric data on the Palaeolithic bone points from the Altai have rendered them the oldest formal bone tools in Eurasia discovered thus far. The formal antler tool from the Kara-Bom Early Upper Palaeolithic layer is one of the earliest directly dated Palaeolithic bone points in the Altai, and it conforms with other dates for the site. Cultural horizon Upper Palaeolithic 1, which is the direct successor of the southern Siberian and Central Asian Initial Upper Palaeolithic cultural unit, appears as the upper chronological boundary of the Kara-Bomian tradition in the Altai region.

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