Which uses for the Late Glacial microblades of Eastern Siberia? Functional analysis of the lithic assemblage of Kovrizhka IV, level 6

Eugénie Gauvrit Roux, Aleksei V. Teten'Kin, Auréade Henry

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
ИРКУТСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ
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Which uses for the Late Glacial microblades of Eastern Siberia? Functional analysis of the lithic assemblage of Kovrizhka IV, level 6

© Eugénie Gauvrit Roux[a], Aleksei V. Teten'kin[b], Auréade Henry[a]

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Abstract: Microblade productions are a structuring element of the Upper Palaeolithic technical traditions of Northeast Asia that spread throughout an immense territory and accompany the Final Pleistocene settlements of Northeast Siberia. Yet, the functioning and the function of the Upper Pleistocene microblades are little known. This paper presents the first functional data for the Upper Palaeolithic microblades of Eastern Siberia. It aims at investigating the technical purposes for which they were produced ca. 19 ky cal. BP ago in the Lower Vitim at the site of Kovrizhka IV, layer 6. This open-air site is multistratified and yields the earliest occupation layer of the North-Eastern Baikal region with the level 6 dated of ca. 19 ky cal. BP. Results show that microblades were both used as projectile inserts, probably fixed laterally, and as knife elements to cut soft materials. Faunal remains are rare and the osseous industry is absent from the archaeological record of Kovrizhka. This functional analysis therefore offers an indirect evidence of the repairing of the hunting equipment at the site and of the probable osseous or wood projectile points and knife handles to which microblades were hafted. At Kovrizhka IV, impact damage rates are low, notably because they include microblades that were not used as projectile inserts and microblades that were not used at all. In these cases, we could exclude the immediate consumption of the knapping products but hypothesize the constitution of a stock to replace damaged inserts. The concentration of microblades in the southern part of the dwelling of level 6 could therefore be partly interpreted as an area dedicated to the production and replacement of microblades into composite tools, including projectiles. The relatively flexible functioningof microblades seems to be common to other Upper Palaeolithic (Kashidawai I, Yoshiizawa, Hopyeong-dong, Ushki I) and Mesolithic sites (Pavlova I, Zhokhov) of Japan, Korea, Northern and Eastern Siberia.

Keywords: Eastern Siberia, North Baikal, Upper Palaeolithic, Kovrizhka IV, stone tools, functional analysis, microblades, projectiles, knife inserts

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Как использовались в позднем ледниковом периоде микропластины Восточной Сибири? Функциональный анализ каменного ассамбляжа 6 культурного горизонта стоянки Коврижка IV

© Э. Говри Ру[a], А.В. Тетенькин[b], О. Анри[a]

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Аннотация: Производство микропластин является структурирующим элементом верхнепалеолитических технических традиций Северо-Восточной Азии, которые распространяются на огромной территории и сопровождают известные поселения Северо-Восточной Сибири в конце плейстоцена. Однако о функционировании и функциях микропластин верхнего плейстоцена известно мало. В данной статье представлены первые функциональные данные для микропластин верхнего палеолита Восточной Сибири. Анализ направлен на исследование технических целей, для которых микропластины были произведены ок. 19 тыс. кал. л. н. на Нижнем Витиме на стоянке Коврижка IV, культурный горизонт 6. Это местонахождение под открытым небом является мультистратифицированным и представляет самый ранний стратифицированный культурный слой в Северо-Восточном Прибайкалье с культурным горизонтом 6, датируемым ок. 19 тыс. кал. л. н. Результаты идентифицированной амортизации предметов показывают, что микропластины использовались как вкладыши дляударных наконечников, вероятно, фиксированные сбоку, и как элементы ножа для резки мягких материалов. Остатки фауны здесь редки, а костная индустрия в археологических остатках Коврижки отсутствует. Таким образом, этот функциональный анализ предлагает косвенное свидетельство ремонта охотничьего снаряжения на стоянке и возможных костяных или деревянных ударных наконечников и рукояток ножей, к которым были прикреплены микролезвия. На Коврижке IV степень повреждений низка, особенно потому что они включают микропластины, которые не использовались в качестве вкладышей для ударных наконечников, и микропластины, которые не использовались вообще. В этих случаях мы могли бы исключить немедленное потребление продуктов дробления, но выдвинуть гипотезу о создании запаса для замены поврежденных пластин. Таким образом, концентрацию микропластин в южной части жилища культурном горизонте 6 можно частично интерпретировать как зону, предназначенную для производства и замены микропластин на композитные инструменты, включая наконечники. Относительно гибкое функционирование микропластин, по-видимому, характерно для других памятников верхнего палеолита (Кашидавай I, Ёсидзава, Хопхёндон, Ушки I) и мезолита (Павлова I, Жохова) Японии, Кореи, Северной и Восточной Сибири.

Ключевые слова: Восточная Сибирь, Северный Байкал, верхний палеолит, Коврижка IV, каменные орудия, функциональный анализ, микропластины, ударные наконечники, вкладыши для ножей

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1. Introduction

Microblade productions are a structuring element of the Upper Palaeolithic technical traditions of Northeast Asia that spread throughout an immense territory and accompany the first known settlements of Northeast Siberia (e.g., Gómez Coutouly, 2011; Graf, Ketron, Waters, 2014; Gómez Coutouly, 2018a). Yet, the functioning of the Upper Pleistocene microblades remains a widely unexplored field of the technical systems and the only functional data available for Upper Palaeolithic microblades of Northeast Asia come from sites located in Japan (Iwase, 2016; Iwase et al., 2016), Korea (Kononenko, 2008) and Kamchatka (Dikov and Kononenko, 1990). In this paper we present the first functional data for the microblades of the Upper Palaeolithic of Eastern Siberia. We aim at investigating the technical purposes for which they were produced ca. 19 ky cal. BP at Kovrizhka IV level 6 in the Vitim valley (North-Baikal region). Questioning the functioning of microblades through use-wear analysis should allow linking production and functional objectives, and better understanding the status of the microblade productions which are highly standardized and invested technically in the North-Pacific Upper Palaeolithic (e.g. Flenniken, 1987; Gómez Coutouly, 2018b).

The Lower Vitim valley is rich with Upper Pleistocene and Holocene open-air sites discovered in the last decades (Ineshin, Teten'kin, 2010; Teten'kin, 2014;

Teten'kin et al., 2017). Kovrizhka IV is one of these sites and is undergoing a pluridisciplinary study involving a Franco-Russian team exploring Late Pleistocene hunter-gatherer adaptations to tundra environments in North-Baikal Siberia (Lichens project, A. Henry and A.V. Teten'kin coord.). The site is multistratified and yields the earliest well stratified occupation levels known so far in the North-Eastern Baikal region, with the level 6 dated of ca. 19 ky cal. BP (Teten'kin et al., 2017). Kovrizhka therefore has an important role in our understanding of the regional human occupation and technical traditions during the Upper Palaeolithic. In this paper we present a first traceology evaluation of this early microblade assemblage.

2. Material

Kovrizhka IV is located in the central part of the Baikal-Patom Upland (Northern Cisbaikalia), on an 11-meter terrace on the right bank of the Vitim River (Fig. 1). The site was opened by A.V. Tetenkin in 2004 and level 6 was excavated between 2015 and 2016. Twelve cultural horizons aged ca. 19-18 ky cal. BP are identified at Kovrizhka IV (Teten'kin et al., 2017).

The level 6 is formed of deposits of fine alluvial sands due to overfloodings of the close Vitim River. This sedimentation process allowed the spatial preservation of the archaeological remains and this level is therefore one of the most informative of the stratigraphical sequence. It yielded an occupation structure which consists of: a) a semi-circular layout with a diameter of 4.2 m formed by 13 stone boulders and slabs, b) two fireplaces in the radial centre, and at the North of the semi-circle, c) artefacts concentrated within the semi-circle, and immediately at the North of it. A feature of the arc includes three pairs of stones which associated a rounded boulder with an unrolled slab (Teten'kin et al., 2017). The central fireplace was overlapped by an overflow of local river sand and black clay sand brought from outside. A boulder and a tile lay on top of the sand cover on the outer limits of the fireplace. The second fireplace had a thickness of up to 6 cm. It was located between the last gneiss slab of the arc of the structure, and the pit of the pressed surface with a diameter of up to 13 cm, which may correspond to a log pit.

The level yielded several thousands of artefacts including lithic remains, bone fragments, charcoals and ocher and an anthropomorphic ivory figurine (Teten'kin et al., 2018; Henry et al., 2019). The lithic assemblage is composed of 9918 units, which are mostly untreated flakes and chips, and includes few formal tools. The assemblage notably comprises end-scrapers, side-scrapers, burins, knifes, *pièces esquillées*, retouched flakes, flake cores and wedge-shaped microcores. The level 6 is the richest microblade site among the Final Paleolithic sites of the Lower Vitim, as 37 % (n = 392) of the lithic assemblage are microblades (excepting microflakes). Tools found within the radial structure are mainly localized in the Eastern half of the dwelling, whereas the vast majority of microblades were found in the North-Western area (Fig. 2).

3. Methods

Sampling was necessary facing the large quantity of lithic material. We applied a spatial sampling strategy considering the well-preserved and precise spatial distribution of artefacts of the level 6 and the presence of a dwelling feature. All the lithic elements larger than 1 cm from squares 21, 16, and 11 were analyzed; theses squares are within the dwelling structure of level 6 (Fig. 2). The total sample is composed of 364 elements and mostly includes flakes (76 %). The microblades (n = 73) and blades (n = 11) represent 84 artefacts.

The wear observation combines macro- and microscopic approaches: we used a binocular МФУ МБС-10 (× 4.8-× 98) and a metallographic optic microscope with reflected light (Olympus BH2-UMA, × 100-× 200). Macrophotographs were taken using a digital microscope Dino-Lite (*Dino-Lite Digital Microscope Premier*, × 30-× 250), and microphotographs were taken with a camera Leica EC3. We used multifocus for some microphotographs (*Helicon Focus* software).

Different types of damages were observed and recorded: fractures, scars, rounding, shine, polish, striations and residues. Fractures develop from one lateral edge to the other or one surface to the other (Coppe et Rots, 2017) and lateral scars develop on a surface from a lateral edge. The damages considered diagnostic of the use of blanks as projectile inserts include diagnostic impact fractures (DIF), lateral impact scars (LIS) and

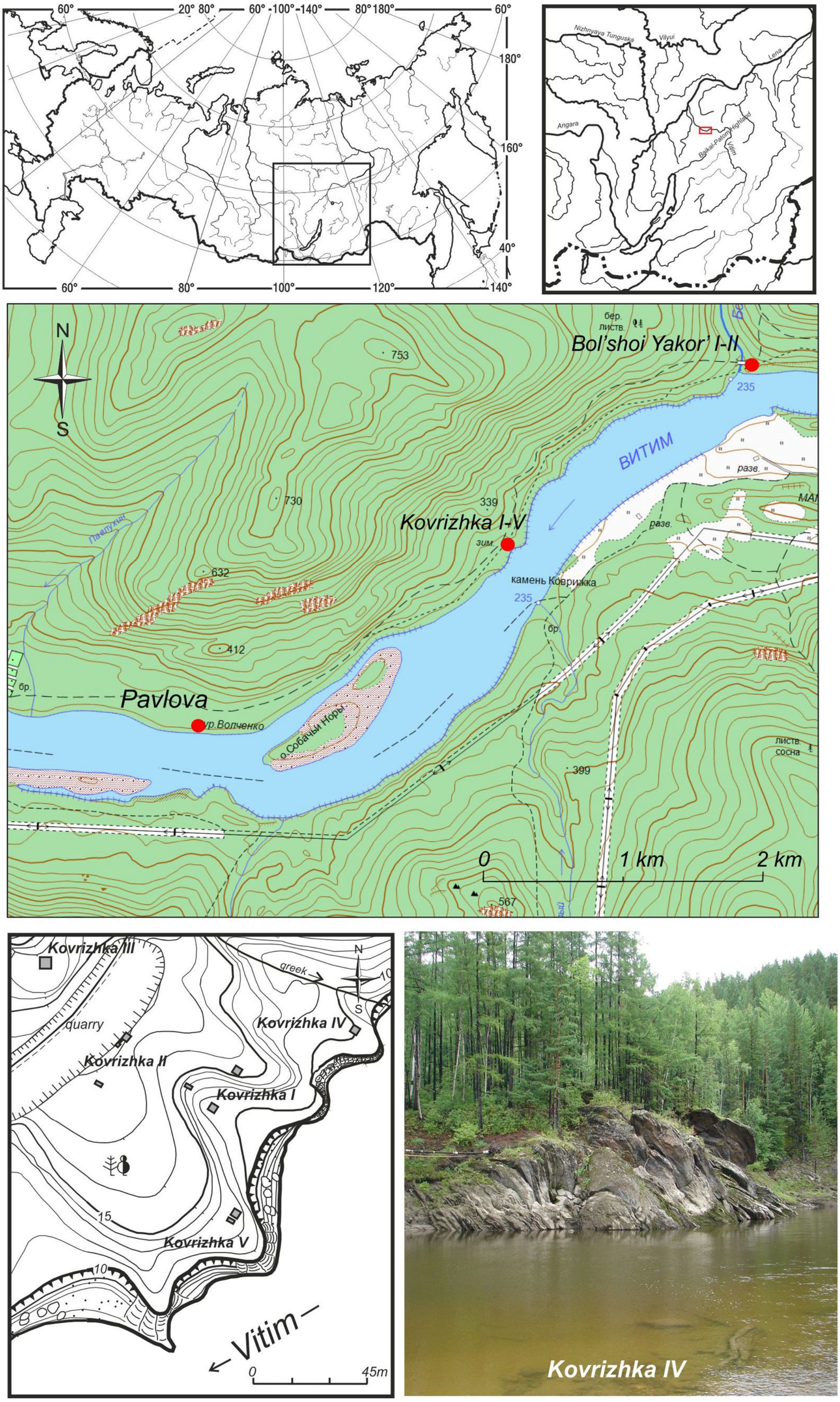

Fig. 1. Location of Kovrizhka IV site
Рис. 1. Местонахождение стоянки Коврижка IV

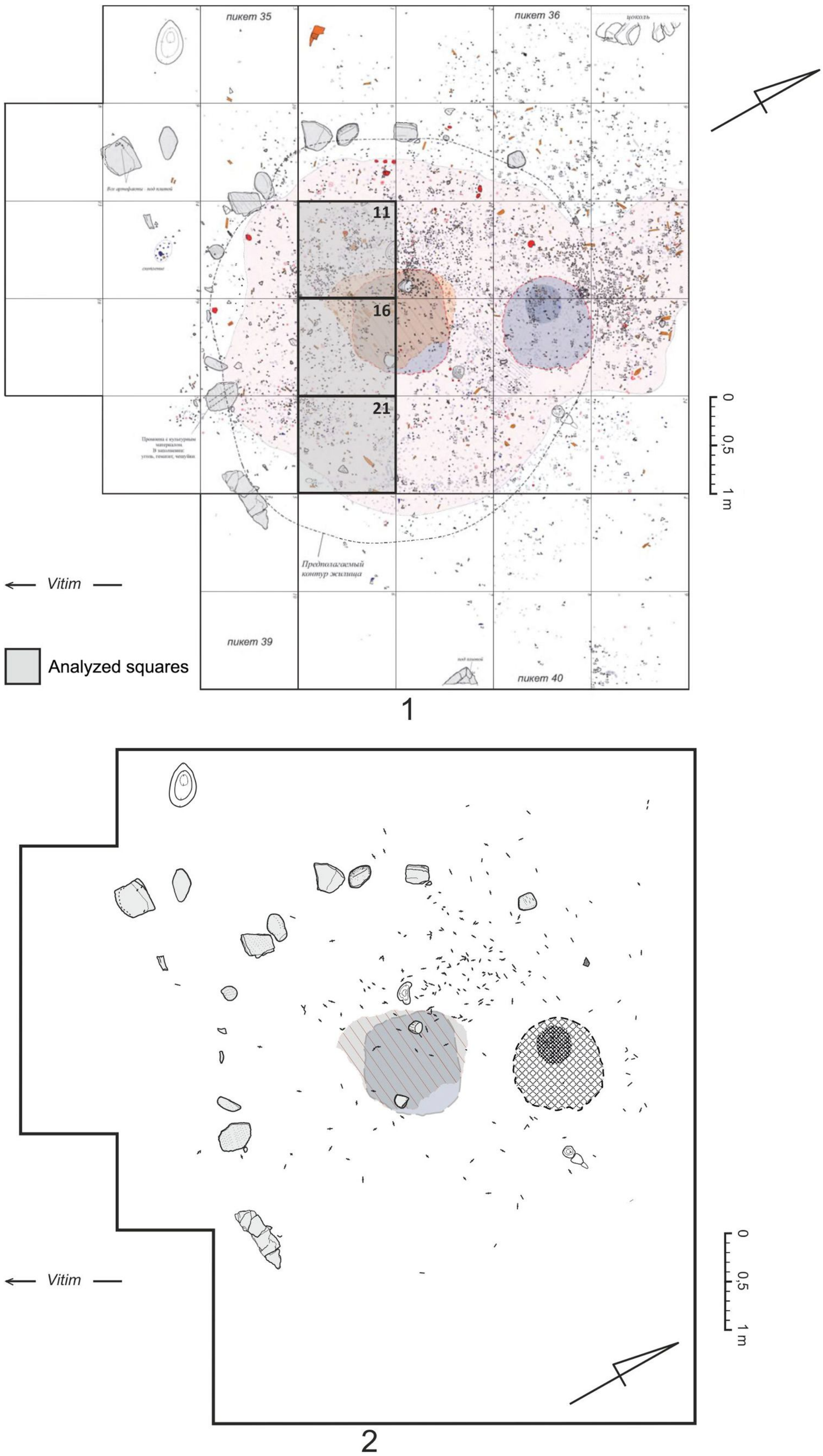

Fig. 2. Kovrizhka IV site: *1 – map of the level 6; 2 – distribution of the microblades in level 6*
Рис. 2. Коврижка IV: *1 – план 6 культурного горизонта; 2 – схема расположения микропластин*

microscopic linear impact traces (MLIT). According to experimental models developed for flint microliths, DIF generally include bending, burin-like, and facial or burin-like spin-off fractures that exceed 2 mm length. LIS include scars that are bending initiated, low-angled and oblique to the length of the blank and exceed 1 mm length. Striations are considered to be due to the impact when associated with a DIF of a LIS (Fischer et al., 1984; Chesnaux, 2014; Gauvrit Roux et al., 2020).

After a first macroscopic observation of the artefacts, sediment and handling grease remains were removed from the surface by soft cleaning: artefacts were lightly brushed with soap under running water with a soft toothbrush. Alcohol was then locally applied with paper napkins to clean the surfaces for microscopic observation. If residues other than sediment were observed on the surface of the artefacts during the preliminary macroscopic observation, artefacts were not cleaned at all or only locally.

4. Results

4.1. A standardized microblade production

Microblades are the second-best represented type of blank at the site after flakes. Their morphology, dimensions and raw materials are highly standardized. Their widths range from 1.5 mm to 9 mm, and their thicknesses range from 0.5 mm to 3 mm (Fig. 3). They fit within the dimensional variability of Late Glacial microblades which is 12 mm width and 3 mm thickness (Gómez Coutouly, 2018b). Microliths are obtained from flaking surfaces that are well-bent and weakly careenated. They are almost exclusively produced from medium- to fine-grained black to greenish-black effusive rocks (undergoing analyses by E.I. Demonterova, Earth Crust Institute, Russia), and none is cortical. Microblades of the sample show no retouch, except for two specimens: one possible microburin, and one laterally retouched item.

Blades are the least common blank in the lithic assemblage (3 %) and are not retouched. Contrary to microblades, their dimensions are variable, and they do not have a standardized morphology, showing no systematic parallelism between the edges and ridges.

The refitted knapping sequences in level 6 evidence that at least part of the microblade assemblage was produced at the site. The shaping out phase is important on the refitted knapping sequences. Blades that refit to a microblade knapping sequence may correspond to by-products of microblade production.

There is a clear preference for fragments with parallel edges. The 73 analyzed microblades have a thin straight profile (88 %) with parallel edges and arise(s); they are composed of two regular straight unretouched lateral edges that have a closed angle. Most blanks have a trapezoidal section (70 %), less often a triangular one (30 %). Hackles are visible on the lower face, but ripples are not. Abrasion of the overhang is well-developed and butts are small, generally punctiform (64 %), less often

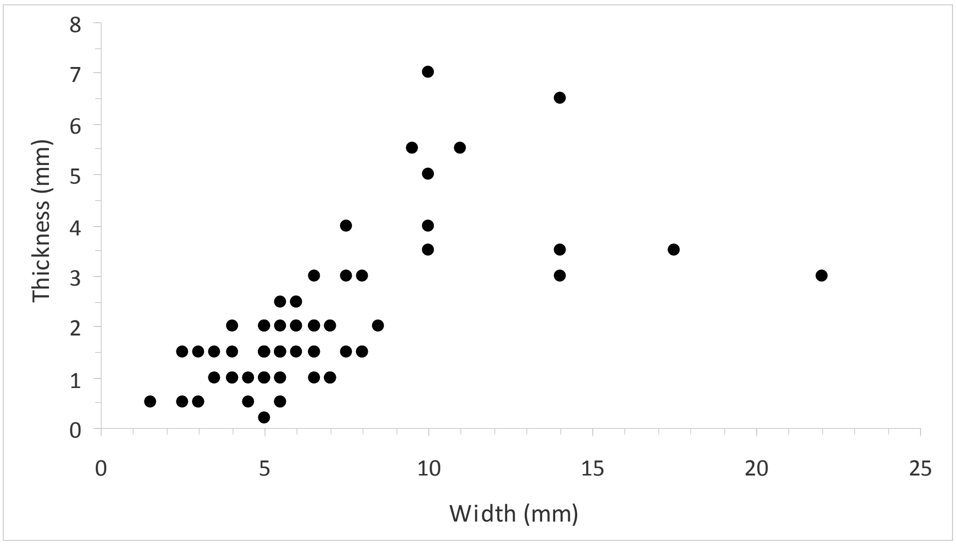

Fig. 3. Distribution of the width and the thickness of the microblades and blades analyzed in the level 6
Рис. 3. Распределение ширины и толщины микропластин и пластин, исследованных в 6 культурном горизонте

linear (23 %) or scarred (13 %). A small lip is often observed under the butt, and the bulb is short and pronounced. These elements indicate that the knapping technique is likely to be pressure or indirect percussion. The absence of concavity on the butt, the marked parallelism of the lateral edges and ridges, as well as the well-developed bending of the flaked surface on the cores would rather tend to indicate that we are facing pressure retouch. The Yubetsu method is recognized in level 2B of Kovrizhka (ca. 18.5 ky cal. BP) where it is the earliest evidence of the use of the method in the North-Baikal region (Teten'kin et al., 2017). The Yubestu method is however absent from level 6. Different knapping methods appear to have been used in this level, and further analyses will need to be performed. The probable absence of the Yubetsu method is original, as this technique accompanies many of the first occupations of the Last Glacial and Late Glacial of North-East Siberia (Gómez Coutouly, 2018b). The level 6 may therefore attest of another technological component in Eastern Siberia.

4.2. Post-depositional surface alterations

The analysis of post-depositional surface alterations is indispensable prior to conducting any functional analysis, as it allows assessing the limits of the archaeological interpretations. Several types of ancient and recent alterations are recognized on the lithic material from level 6.

Rounding and shine slightly smooth the prominences of several implements. Their distribution indicates that they were caused by mechanical processes. Two artefacts present cone initiating scars that can be due to ancient mechanical alteration such as trampling, compaction or movement within the sediments. Ancient mechanical damages remain occasional and of low intensity, indicating that mechanical processes had a limited influence on tools.

Fresh fractures or scars that occurred during or after the excavation are observed on six artefacts. They are differentiated from ancient damages by the negatives of the removals that have fresh arises and present a different shine from the rest of the surface of the artefact.

Thermic alteration due to fire is uncommon; it is not observed on microblades and was only identified on two unretouched flakes knapped from a medium-grained rock.

Microscopic use polish and striations are generally absent from the tools, which most often prevents us for determining precisely the worked material. This absence is not due to the composition of the raw materials as our first experimental tests of butchery, bone scraping, wood sawing and schist engraving show that use polishes and striations develop on fine- and medium-grained raw materials. We hypothesize that the scarcity of micro-wear is due to the influence of chemical processes. Experimentation of chemical alteration of use micro-wears with alkaline solutions indeed shows that they are subjected to dissolution on flint implements (Plisson, 1985). Our understanding of the influence of chemical processes is however little known for effusive rocks, as experimental reference datasets of use and alteration are mainly developed for flint.

4.3. Functioning of the microblades

Among the 73 microblades included in the functional analysis, 11 present use-wear (4 uncertain) and none of the analyzed blades show use-wear traces. All the used pieces are unretouched (Table 1, Fig. 4).

Two types of activities were performed with the microblades: a pressure longitudinal action and the use as projectile inserts.

4.3.1. Knife inserts

Three microblades (including one uncertain) were used to saw a soft material: two proximal fragments have traces on their right edge and one mesial fragment presents use-wear on its left edge. The traces are weakly developed and/or preserved. The edges present few small, isolated scars (their length does not exceed 1 mm), which are developed on both faces, have variable orientations, with mostly semi-circular morphologies, and feathered or hinged terminations. Rounding is weakly developed and consists of a slight regularization of the prominences of the edge. Microscopic striations are present on the three pieces: they are thin, have a rough bottom, and are parallel or slightly oblique to the edge. The small size of these implements makes their handling difficult, that is why, despite no hafting traces could be evidenced on these tools, it can be hypothesized that they were hafted and worked as knife inserts.

Table 1. **Synthesis of the results of the use-wear analysis of the microblades from squares 11, 16, 21**
Таблица. 1. **Синтезис результатов трасологического исследования микропластин из квадратов 11, 16, 21**

Fragment location	Nb of used bladelets					Total
	0	Projectile impact	Projectile impact?	Cutting soft material	Cutting soft material?	
Not fractured	1					1
Distal fragment	5					5
Mesial fragment	30	3		1		34
Proximal fragment	25	2	3	1	1	32
Undetermined	1					1
Total	62	5	3	2	1	73

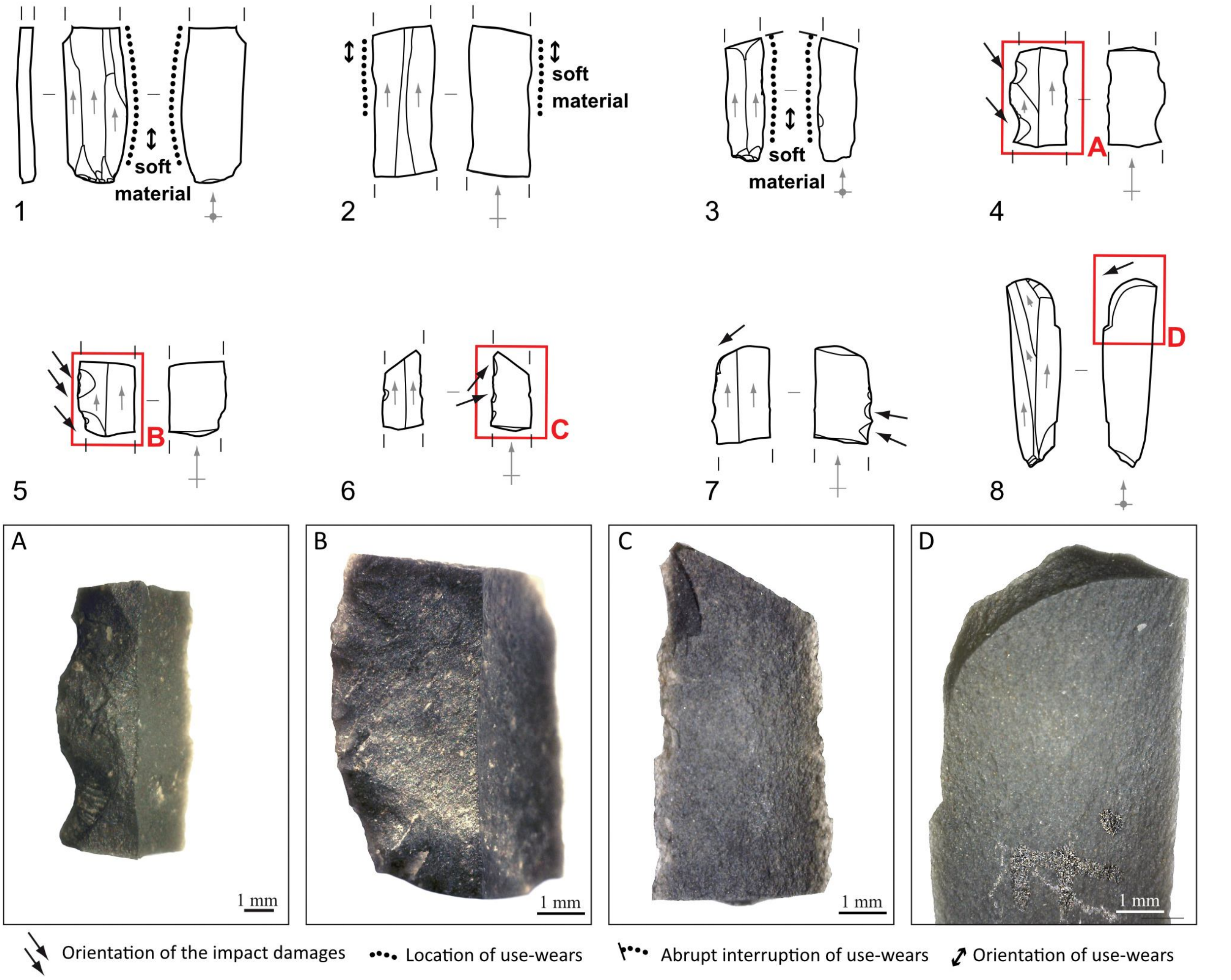

Fig. 4. Used microblades from level 6: *N°1 to 3 – Microblades used to cut or saw soft materials; N°4 to 8 – Microblades with impact damages; A to C – Low-angled overlapped or isolated scars that are oblique to the lateral edge of microblades, and have a trapezoidal, semi-circular or irregular morphology, with a bending initiation and a step or feather termination; D – Burination fracture with a step termination*

Рис. 4. Микропластины со следами утилизации из 6 культурного горизонта: *1–3 – микропластины, использованные в резании или пилении мягких материалов; 4–8 – микропластины с ударными повреждениями; А–С – низкоугольные наложенные или изолированные рубцы, которые наклонены к латеральному краю микропластин и имеют трапециевидную, полукруглую или неправильную морфологию с началом изгиба и ступенчатым или перьевым окончанием; D – резцовый перелом со ступенчатым прекращением*

4.3.2. Projectile inserts

The impact traces are the most common traces on the microblades: 8/73 have damages associated with their use as projectile inserts (including three uncertain cases). The damages are fractures or lateral scars; no microscopic linear impact traces were observed. Used blanks are only proximal or mesial fragments (Table 1).

4.3.2.1. Fractures

The fracturing rate of the microblades is particularly high (98.6 %). The distal edges are more often fractured (94.5 %) than the proximal ones (53.4 %). The distal fragments are underrepresented in the analyzed squares.

Snap fractures are the most common type on both extremities (80.6 % of the fractured edges). They can develop in various situations, such as mechanical alteration due to compaction, intentional breakage, or use. Such fractures are thus not diagnostic of any of these causes. Nonetheless, considering the quasi-systematical fracturing of the microblades, it can be hypothesized that at least some of them were intentionally broken.

In two cases, burinating spin-off fractures are developed on a snap fracture located in one case on the proximal edge, and in the other, on the distal edge. The length of these spin-offs is lower than 1 mm and cannot be considered diagnostic: experimental models for flint microliths show that they can be due both to compaction mechanisms such as trampling or to projectile impact when inferior to 2 mm (Fischer et al., 1984 ; Chesnaux, 2014).

Bending fractures are the second most frequent fractures (14.8 %) and are only developed on the distal edge. In nine cases, their length is inferior to 2 mm, and in one case it is 2.1 mm long. These damages occur at the impact of the projectile and during knapping and can exceed 2 mm in both cases. In the absence of retouch, it is not possible to differentiate the origin of the damage even when these fractures exceed 2 mm, as only when the fracture cuts through a retouched edge it is possible to infer that it happened after manufacture and is potentially due to use (Chesnaux, 2014).

Burinating fractures are present on four microblades and are the least frequent fractures (3.7 %). They can be considered diagnostic of impact on two bladelets when they are 2 mm and 2.2 mm long. Indeed, according to the experimental models, this type of damage can only be caused by impact when exceeding 2 mm (Fischer et al., 1984; Chesnaux, 2014).

4.3.2.2. Lateral scars

Three microblades present scars considered specific to the impact: they have a more or less deep bending initiation, various morphologies and terminations. They are overlapped or isolated, low angled, oblique to the edge, and their length equals or exceeds 1 mm.

On three other microblades, it remains uncertain if the scars are related to impact, because they share characteristics with alteration or retouch scars. The morphology of these scars is similar to the ones described above, except for their inclination (they are generally semi-abrupt) and size (they are slightly smaller than 1 mm).

5. Discussion

Microblades are highly standardized blanks that present traces associated with sawing of soft materials and the cynegetic activity. Overall, both impact and sawing traces are uncommon and little traumatic. When impact damages are present, there is only one type of damage per microblade (i.e., fracture *or* lateral scar), and these are weakly developed since their length does not exceed 3 mm for fractures, and 1.5 mm for lateral scars.

The low rate of microblades with use damages (9.6 % without the uncertain) can be attributed to several factors: the resistance to breakage of the raw materials, the hafting arrangements, the spatial organization of the site (e.g., zones dedicated to the production of microblades *vs* zones of maintenance of damaged tools with the dehafting and rehafting of inserts), the extensive use of tools (i.e., short uses or on soft and non-abrasive materials that generate only tenuous traces on tools), and of course the absence of use.

Most of the experimental reference collections for use-wear analysis were constituted on flint and to date and to our knowledge, there is no experimentation of use of bladelets made of effusive rocks such as basalt as projectile inserts. The reaction of both rocks to shocks and pressure however necessarily varies as they have different hardness (i.e., on the Mohs scale, the hardness of most unaltered flint is 6-7 and 5-6 for basalt for example), yield points (or limit of elasticity), densities and porosities. Consequently, the damaging rates and the size of the impact damages are likely to vary between flint and effusive rocks. This underlines the necessity to perform experimental tests with raw materials and microblades similar to the material of Kovrizhka, in order to constitute reference collections adapted to the functional interpretation of the materials at the site.

At Kovrizhka, damage rates are also low because they include microblades that were not used as projectile inserts and microblades that were not used at all. None of the microblades refitted to the microcores show any use-wear. In these cases, we could exclude the immediate consumption of the knapping products but hypothesize the constitution of a stock to replace damaged inserts. The concentration of microblades in the Southern part of the dwelling of level 6 could therefore be partly interpreted as an area dedicated to the production and replacement of microblades into composite tools, including projectiles.

Tools management can be approached by the means of four pieces presenting traces of transport or alteration prior to their knapping and fracturing (two microblades without use-wear), or prior to an edge retouch and use (one scraper, one endscraper). The two microblades present a well-developed rounding and a shine on their dorsal ridges, interrupted by the fracture facet, and/or the preparation of the butt. These traces suggest that the microblade cores were transported or altered before a new knapping phase; in the absence of microwear, transport traces cannot be distinguished from alteration. These artefacts could attest of an anticipation of future needs (i.e., the keeping of microcores as a supply of raw material, or the circulation of preformed microcores), or of an opportunistic recycling behavior (i.e., the recycling of a previously prepared core). The analysis of the recurrence of this phenomenon in other contexts will allow distinguishing between these two causes.

Lithic inserts can be placed on projectiles according to three main positions: axially (i.e., as points), disto-laterally (i.e., leaning against the point) and laterally (i.e., a distance away from the point). The experimental model developed by L. Chesnaux (2014) shows that these positions can be differentiated through the rate and the specificity of the impact damages on the lithic inserts. The lowest damaging rates occur when microliths are placed laterally because the inserts do not undergo directly the forces of impact as they are placed away from the perforating point. One other major consequence of lateral hafting is that most of the forces apply on the lateral tearing/slashing edge of bladelets, and the most frequent damages are therefore lateral scars, whereas fracture rates remain low. Experimentally, DIF occur on 6 % (Chesnaux, 2014) to 1 % (Gauvrit Roux et al., 2020) of the flint inserts placed laterally. DIF rates are higher when the inserts are positioned axially (30 %) or disto-laterally (10 %; Chesnaux, 2014). Impact scars mostly occur when the microliths are placed laterally; they occur in 6 % (Chesnaux, 2014) to 27 % (Gauvrit Roux et al., 2020) of the cases. The damaging rates of the microblades from Kovrizhka appear closer to the damaging pattern of laterally hafted projectile inserts: the rate of fracturing that can be considered related to the impact is 3 % and the rate of lateral impact scar is 4 %.

Lateral hafting is consistent with the archaeological data from Bol'shoï Iakor (layer 6, ca. 14 ky cal. BP, Fig. 1), which is 2 km away from Kovrizhka IV on the Lower Vitim Valley and where microblades were produced using the Yubetsu method of pressure knapping. This site yields an exceptional example of osseous point with a series of five microblades still hafted laterally in a groove (Ineshin, Teten'kin, 2010. Fig. 6.43).

Few Upper Palaeolithic sites of Northeast Asia were subjected to functional analysis and gave evidence of microblades use. They are located in Kamchatka (Ushki I; Dikov and Konenko, 1990), Korea (Hopyeong-dong; Kononenko, 2008) and Japan (Hokkaido, sites of Kashidawaï I and Yoshiizawa) and microblades were produced with the Yubetsu method or variants of this pressure knapping method (Gómez Coutouly, 2011; Gómez Coutouly, 2018b). At Kashidawaï I (ca. 25.3-22 ky cal. BP), the microblades were used as projectile inserts and also present low fracturing rates: five out of the 120 analyzed microblades present a spin-off fracture (4 %), with only 2 of them being equal or over 2 mm long (2 %; Iwase, 2016). At Yoshiizawa (ca. 21-18.5 ky cal. BP), none of the 18 analyzed microblades present impact damages, but one was used to scrape, whittle or plane with one lateral edge (Iwase et al., 2016). It can be noted that the microblades presenting use damages are always particularly low in the Japanese cases as well as at Kovrizhka (Table 2).

Microblades are found to be mostly used as knife inserts for various activities in Holocene contexts. The first use-wear analysis of microblades from the Vitim River valley was carried out at the early Holocene site of Pavlova (ca. 11-10 ky cal. BP; Fig. 1; Ulanov et al., 2020). Results show that they were used for diverse economic purposes: scrape or cut meat, hide or osseous materials. The mesial fragments of microblades from the Mesolithic site of Zhokov in Yakutia (ca. 9-7.5 ky cal. BP) were also used for a wide range of activities: butchery, and processing of wood, antler, or ivory (Girya et Pitul'ko, 1994; Girya et Pitul'ko, 2003). The site also yields a rich osseous industry preserved in the permafrost and the peat bog with, in particular, several elements of projectile points or knives handles with microblades hafted laterally. These data show that microblades were polyfunctional tools, especially in the Holocene contexts.

6. Conclusion et perspectives

Faunal remains are rare and the osseous industry is absent from the archaeological record of Kovrizhka. This functional analysis therefore offers an indirect evidence

Table 2. **Comparison of results with two sites of Northeast Asia for which functional data are available**
Табл. 2. **Сравнение результатов с двумя стоянками Северо-Восточной Азии, по которым доступны функциональные данные**

Site		Kovrizhka IV	Yoshiizawa	Kashidawaï I
Reference		this study	Iwase et al., 2016	Iwase 2016
Layer or concentration		6	BL2-A, BL2-B	BE-B
Region		North Baikal, Eastern Siberia	Hokkaido Island	Hokkaido Island
Country		Russian Federation	Japan	Japan
Datation		ca. 19 ky cal. BP	ca. 21-18.5 ky cal. BP	ca. 25.3-22 ky cal. BP
Raw materials	Major	effusive rocks such as porphyrite, diabase, dacite, basalt (95 %)	obsidian (86 %)	high quality hard-shale similar to flint and chert (97 %)
	Minor	argillite, quartz cristal (5 %)	high quality hard-shale similar to flint and chert (13 %), tuff (0.6 %)	obsidian (3 %)
Microblades production	Method	no Yubetsu (under study)	Oshorokko*	Yubetsu, Rankoshi*
	Technique	probable pressure (under study)	pressure	pressure
Sample of microblades for use-wear analysis		73	18	120
Use as projectile insert	Impact fractures (bending, spin-off, or burinating fractures that are over 2 mm long)	1	–	2 (?)
	Impact scars	3	–	not mentioned
	Impact striations	–	–	not mentioned
	Total with impact damage	4	–	not mentioned
Other uses	Sawing soft material	3	–	–
	Scraping/whittling/planing	–	1	–

* Oshorokko and Rankoshi methods are variants of the Yubetsu method according to Y.A. Gómez Coutouly (Gómez Coutouly, 2011; Gómez Coutouly, 2018a)

of the repairing of the hunting equipment at the site and of the probable osseous or wood projectile points and knife handles to which microblades were hafted.

The layer 6 of Kovrizhka IV has an excellent preservation of the distribution of archaeological remains and the pursuit of the functional analysis in this context will allow a fine understanding of the spatial organization of the activities at the site. The second step will be to compare these results diachronically with the other levels of the site. Traceological studies of the 2G cultural horizon are being carried out by G.N. Poplevko (IIMK RAS, St. Petersburg), and we will extend comparisons to the level 2B. In this layer, microblades were produced using the Yubetsu method and data comparison will allow determining if the functioning of microblades changes with their production technique. By extending collaborations with traceologists, the third step will be to compare functional results regionally with Upper Palaeolithic components of Eastern and Northern Siberia, in order to get a better understanding of techno-economical or even social dynamics in this wider region at the end of the Palaeolithic.

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A.V. Teten'kin made the excavations, E. Gauvrit Roux got the functional analysis, all authors contributed equally to the writing of this article, bear the authors copyright and full responsibility for its originality.

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