

## Usewear analysis of Mesolithic and Neolithic stone tools from Mala Triglavca, Trhlovca and Pupičina peč

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**ABSTRACT** – *In this paper the results of the usewear analysis of Mesolithic and Neolithic stone tools from three cave sites – Mala Triglavca and Trhlovca in the Slovenian Karst and Pupičina peč in Croatian Istra will be presented. Stone tools were examined under the light microscope at 50 – 200 x magnifications, and some additional physical and chemical analyses were undertaken. Various uses of the tools were determined and conclusions regarding the economies at those sites were drawn.*

**IZVLEČEK** – *V članku predstavljamo rezultate preiskav sledi uporabe na mezolitskih in neolitskih kamernih orodjih iz treh jamskih najdišč, Mala Triglavca, Trhlovca in Pupičina peč. Orodja smo preiskali pod mikroskopom pri povečavah 50- do 200-krat. Naredili smo tudi fizikalno-kemijske analize. Določili smo različne načine uporabe, povezane z različnimi paleogospodarstvi.*

**KEY WORDS** – *usewear; stone tools; Mesolithic; Neolithic*

### METHOD

There are two kinds of usewear traces on stone tools: flaking of the working edges and polishes, which appear on the working edge, but can also extend further over the surface. The most important property of the polish is its increased brightness compared to the surrounding surface. The polish has other features which enable us to identify the material that caused its formation. Flaking is the direct result of mechanical pressure, while the physical and chemical formation of polish is not successfully explained yet.

The most common method for the analysis of usewear traces is optical investigation under a microscope with incident light at 50–600 x magnifications. The stone tools from Mala Triglavca, Trhlovca, and Pupičina peč were examined at 50–200 x magnifications, and some additional physical and chemical analyses were undertaken.

In collaboration with the Jozef Stefan Institute in Ljubljana a trace element analysis of the working edge was done with the PIXE (proton induced X-ray emis-

sion) method. Most of the results have already been published (*Šmit et al. 1996; Petru 1997*); here I will present the results of the microbeam PIXE mapping technique, which was done at the University of Oxford and at the R. Bošković institute in Zagreb.

The analysis was carried out on some experimental tools and on three end-scrapers, and one flake from the Mesolithic layers of Mala Triglavca. The results of the analysis of the deposit on experimental tools were similar to those in previous research (*Šmit et al. 1996; Petru 1997*).

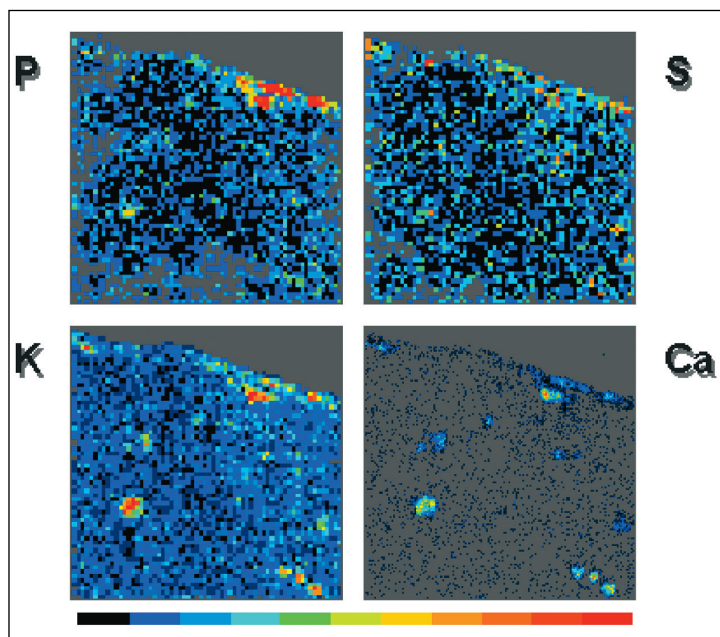
In the deposit on the working edges of two end-scrapers and the flake from Mala Triglavca, sulphur, potassium and calcium were the most important elements (Fig. 1). Such a combination of elements in the deposit can be connected with the scraping of hide (*Šmit et al. 1999*).

On one of the end-scrapers, there was also a point where phosphorous was present together with cal-

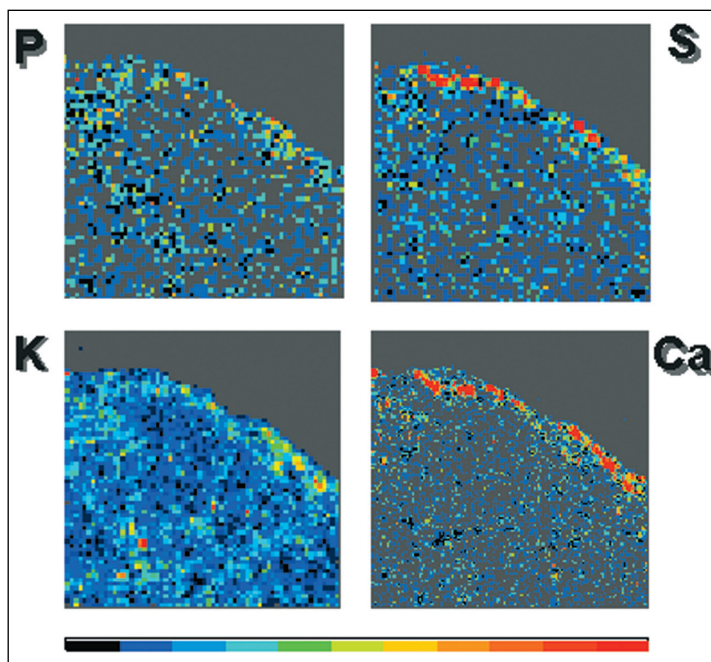
cium. Their ratio was close to the value found in the deposit on experimental stone tools used for bone working, so it was concluded that this tool was used for butchering rather than for scraping.

On the working edge of the third end-scraper the most important elements were phosphorous and calcium. Their ratio was similar to the ratio of these elements in bone tissue (*Smit et al. 1999*), so the end-scraper was probably used for some sort of bone fashioning (Fig. 2).

In collaboration with the Institute of Chemistry in Ljubljana, an Infra Red Spectroscopy of macroscopically detected organic residue on one of the stone tools from Trhlovca was made (Fig. 3). At first, the presumption was that the residue might be wax or some other glue used for fastening the blade to a haft. The analysis of the residue indicated that our presumption was wrong. The residue was a mixture of inorganic and organic components. It was not possible to fully identify the organic fracture, but it was composed of sterates which originated from some sort of plant oil or animal fat. The inorganic fracture represented the sediment in which the tool was buried.



**Fig. 2.** Elemental mapping on the working edge of the end-scraper from Mala Triglavca (MT 15), used on bone. Size of the examined area is 1.2 x 1.2 mm.



**Fig. 1.** Elemental mapping on the working edge of the end-scraper from Mala Triglavca (MT 8), used for hide scraping. Size of the examined area is 1.2 x 1.2 mm.

#### MALA TRIGLAVCA

At Mala Triglavca, below the younger layers, there was 1m thick prehistoric complex in which neolithic pottery and stone and bone tools were found. The bones of domesticated animals were mixed with the bones of wild animals. Next to the cave wall fragments of a human skull were found. Beneath this complex lie the oldest holocene layers, with Mesolithic microlithics. Antler and bone tools were also present (*Leben 1988.69–71*).

#### Mesolithic

Analysis of the usewear on Mesolithic stone tools from Mala Triglavca indicates that the most important activity was hunting. Projectile tools and tools for processing animal remains (meat cutting, hide working) prevail in this complex. (Fig. 4).

There was a lot of hide working usewear on the Mesolithic end-scrapers and also on other stone tools from Mala Triglavca. Less important was wood working – they probably used tools for making the wooden handles for projectiles. It is notable that there were many antler and



**Fig. 3. Trhlovca – macroscopic residue on the blade.**

bone tools in the Mesolithic layers (Leben 1988.71), while just a small number of accompanying stone tools was used for working bone.

Damage on the trapezes is characteristic of projectile points, while microburins were not merely unused byproducts of geometric tool manufacture, but were intensively used, since there are a lot of striations and microflaking present. One tool might even be a projectile point. Flakes were intensively used for different tasks. The mode of their use depended on the form of the working edge of the flake (Petru 1997. 84, 85).

### Neolithic

In the Neolithic the increase in the number of the tools used for plant and wood working reflects the appearance of new activities at the site (Fig. 4), one of which could have been the cutting of trees and creating clearings for herding and pasture. The tools from Mala Triglavca are large enough to be used as axes. Pollen analysis confirms that during the Neolithic in the Karst region, clearings were made for pasture (Culiberg 1995.204). Human influence on plants is also known from the Karst site at Podmol pri Kastelcu (Turk et al. 1993.70).

There are not enough stone tools in Mala Triglavca to indicate long occupation during the Neolithic. The site was probably a temporary shelter for herders and their animals, while they exploited pasture in the vicinity of the cave. This is confirmed by the bones of domesticated animals in the Neolithic layers. The occupants of the cave sustained themselves with mostly by hunting, since wild animals bones exceed those of domesticates (Leben 1988.70). Tools for processing animal remains are rare. There are two possible explanations for this – the site was not occupied long enough for such activities to be accompi-

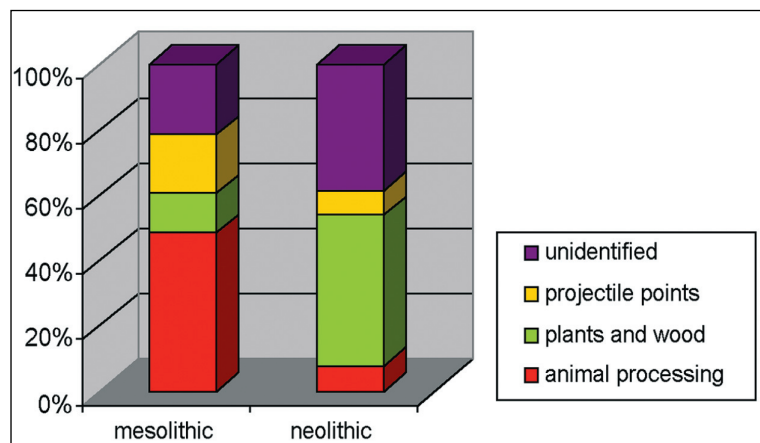
shed or the herders took most of the stone tools with them when they left the site.

In Northern Italy Neolithic stone tools with a sickle gloss were found together with tools used for wood working (Biagi and Voytek 1992. 275–276; Biagi et al. 1993.63). Since

herders needed grass for winter supplies for their animals, sickles can be related also to herding, not only to cultivation.

Sickle gloss appears on one of the blades from Mala Triglavca. This blade was found in the highest part of the Neolithic complex with some bronze age pottery, and it is possible that it is not Neolithic, but younger. This coincides with the pollen analysis, since the first cereal pollen in the Karst region is known from the Eneolithic (Turk et al. 1993.71). Even if the blade is Neolithic, this single find indicates that agriculture had just started at that time and was far from being a well established practise. The blade is made from very good material which is not known locally, so it is also possible, that it was used as a sickle elsewhere and the herders bought it to Mala Triglavca.

There is a huge difference in the numbers of Mesolithic and Neolithic stone tools found at Mala Triglavca. While in the Mesolithic layers more than 800 stone tools were found, there were just 16 in the Neolithic layers. The raw material had also changed. In the Mesolithic, local chert was used, whereas the Neolithic stone tools were made mostly from much better chert not known locally. In the Mesolithic there is a lot of unused flakes and a lot of by-products of flaking, while in the Neolithic almost all the



**Fig. 4. Mala Triglavca – usewear results for Mesolithic and Neolithic stone tools.**

stone artefacts have usewear. One possible explanation is that since the Neolithic tools are of imported chert, people tried to make as much use of them as possible. Since herdsman did not stay in cave for long, they also had little time for the production of new tools.

The activities were also different – while in the Mesolithic, Mala Triglavca was a typical hunting site, occupied long enough to process animal remains and manufacture stone tools, in the Neolithic site was used by herders for short periods during their seasonal movements. While in the Mesolithic the tools were used for hunting and processing animal remains, the Neolithic saw new activities, probably connected to herding, which can be detected from the stone tools.

## TRHLOVCA

In Trhlovca, the Neolithic layers were covered by younger ones, dating from prehistory up to the modern era. In the Neolithic layers F, G and H, pottery, stone and bone tools were found with the bones of wild and domesticated animals, with wild species prevailing (*Leben 1988.69*).

There is a similar amount of processing of animal remains and of plant working usewear on the stone tools from the Neolithic layers (Fig. 5). The number of tools used for woodworking is a little bit lower than in Mala Triglavca, but it is still possible to connect them with tree cutting and making clearings for pasture, since the presence of herdsman is confirmed by the bones of domesticated animals (*Leben 1988.69*). They were hunters also, because a projectile point and wild animal bones were found in the Neolithic context. Similar conditions are known from North Italian sites, where subsistence strategy was based on the hunting of wild animals and the rearing of domesticates (*Biaggi et al. 1993. 58*). No signs of cereal harvesting were found on the stone tools from this period, but two tools from succeeding Eneolithic layers have sickle gloss. Since cereal pollen is known from the Eneolithic layers at the Karst site of Podmol pri Kastelcu (*Turk et al. 1993. 71*), it is possible that at that time cereals were raised somewhere in the vicinity of Trhlovca.

The small number of stone tools and the absence of flaking by-products in the Neolithic layers may indicate that visitors to the cave brought most of their tools with them and that the site was temporary – inhabited by nomadic herders for a short period or periods of time. Later, in the Eneolithic, when signs of agriculture are already present, Trhlovca might have been a pen for domesticates. Since the first domesticates in this area are known from late Mesolithic contexts (*Budja 1996.73, 74*), it is possible that the tradition of herding, which started in the late Mesolithic, continued and was intensified in the Neolithic and later periods.

## PUPIČINA PEĆ

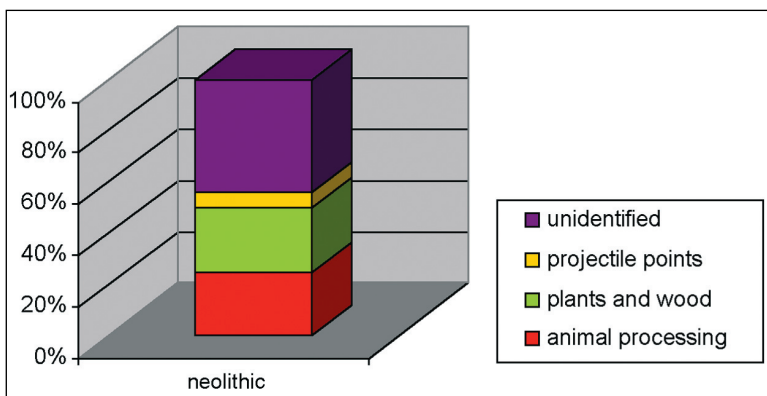
Pupičina peć is located in the Vranjska Draga canyon beneath Mt Učka in Croatian Istria. The cave was settled from the Paleolithic onwards. An analysis of usewear on stone tools from the Neolithic and Mesolithic layers was carried out.

### Mesolithic

In the Mesolithic, stone tools were used for hunting and the processing of animal remains. Hunting as the main activity is confirmed by the presence of projectile points among the stone tools and also by the bones of wild animals found at the site. Plant and wood working usewear was found just on few tools (Fig. 6).

### Neolithic

The tools from the Neolithic layers were used for hunting, butchering, hide working and for wood working (Fig. 6). Some were used for more than one task, since they display more than one variety of usewear.



**Fig. 5. Trhlovca – usewear results for Neolithic stone tools.**

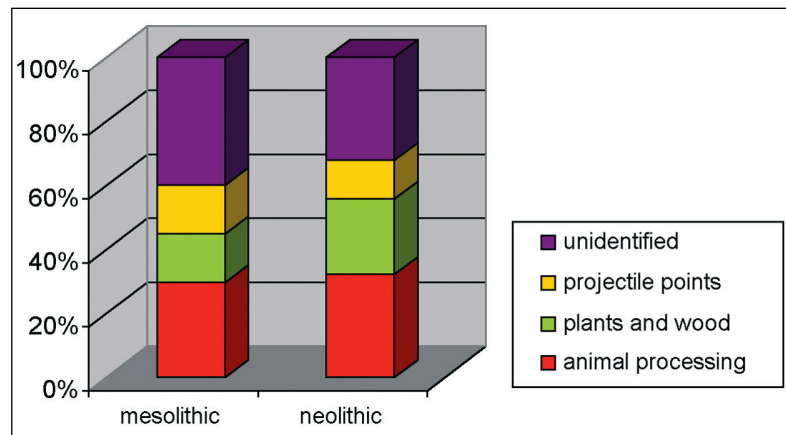


Neolithic stone tools do not greatly differ from Mesolithic ones (*Miracle 1997.46*). Continuity in the typology of stone tools is also known from Northern Europe, where it is almost impossible to distinguish late Mesolithic from early Neolithic types. The only difference is the occurrence of polished tools (*Price, Gebauer and Keeley, 1996.115–119*).

In Pupičina peč similar conclusions can be drawn as to their use – in both periods they were used for the same tasks, mainly hunting. The main difference is that in the Neolithic there is a small increase in the number of tools used for wood working. This might reflect the introduction of a new activity, probably herding, but this activity is not so obviously reflected in the stone tools as in Mala Triglavca. Herding is confirmed by the bones of the domesticates, which outnumber those of wild species, which means that domestication was fully established at the time, but the beginning of the process is not known, due to a hiatus between the Mesolithic and Neolithic layers (*Miracle 1997.46*).

The projectile points among the stone tools indicate that the Neolithic visitors were also hunters. The butchering tools may be connected to hunting, or butchering domesticates. Hide working was not extensive, with hide polish found on only two implements. There are no traces of bone or antler usewear on the stone tools. There are also no signs of usewear traces from grass cutting or cereal harvesting.

An examination of the usewear found on the stone tools indicates that the Neolithic visitors to Pupičina peč were hunters and herders, but there are no signs of agriculture in the vicinity of the cave. The only traces of plant usewear were those of wood. Because the hilly hinterland of the Adriatic coast was not suitable for agriculture, the inhabitants of those areas were probably not sedentary farmers, but seasonal nomadic pastoralists. The animal remains indicate that during the Neolithic the cave was occupied primarily in spring (*Miracle 1997.57*), which could coincide with seasonal movements of herders. In later periods Pupičina peč continued to keep the role as animal pen (*Miracle 1997.48*).



**Fig. 6. Pupičina peč – usewear results for Mesolithic and Neolithic stone tools.**

## CONCLUSION

A usewear analysis of Mesolithic and Neolithic stone tools from the Karst sites at Mala Triglavca and Trhlovca, indicates that new activities were introduced during the Neolithic. In the Neolithic fewer tools are used for processing animal remains, while tools for wood working become more frequent. New activities may be connected to herding – tools were needed for cutting down trees, so that clearings for animal grazing could be created. The number of hunting tools decreases in the Neolithic contexts of Mala Triglavca and Trhlovca. But at the Croatian site at Pupičina peč usewear indicates that hunting was almost as important in the Neolithic as in the Mesolithic.

Nomadic hunters and gatherers might more easily develop herding than agriculture, which demands a sedentary way of life. The late appearance of agriculture in the Slovenian Karst region probably also reflects unfavourable conditions for raising crops. Similar conditions are found at early Neolithic sites in Iberia, where agriculture first appeared in more favourable areas and later expanded to more marginal areas. The process was gradual, early farmers coexisted with hunters and gatherers in both the marginal and more favourable areas (*Bernabeu Auban 1997.13*).

All three caves probably remained animal shelters even in the Eneolithic, although the sickle gloss on stone tools from Mala Triglavca and Trhlovca indicates that agriculture was already present in the Karst region by that time.

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