



## Krapina 3: Cut Marks and Ritual Behavior?

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### Abstract

*Incisions on the frontal of the Krapina 3 cranium differ from other cut marks from the site. Thirty-five, mostly parallel marks course up the frontal from right of the midline, just posterior to the supraorbital point to left of the midline, slightly anterior to bregma. They are angled mostly perpendicular to the midsagittal plane, averaging 5.2 mm in length and are on average 1.2 mm apart. The marks' characteristics are not consistent with scalping, cannibalism, defleshing or other perimortem activities described for Neandertals or modern groups. These marks represent a type of funereal behavior yet to be documented in Neandertals and suggest a kind of ritual treatment of the deceased.*

### INTRODUCTION

One modification attributed to cannibalism in fossil humans were recorded at the Krapina Neandertal site in 1899 by Dragutin Gorjanović-Kramberger. These observations were some of his first interpretations of the Neandertal bones from Krapina and the first, anywhere for cannibalism at a Neandertal site. In his initial description of the newly discovered fossils to the Yugoslav Academy of Arts and Sciences on November 19, 1899 Gorjanović remarked that the Neandertals »evidently did not coexist peacefully with [their] neighbors, because our Diluvial man was apparently a cannibal, judging by the fragments of charred skull and extremities« (translation from *l*). Subsequently, Gorjanović (2–6) presented this argument in more detail expanding the evidence to include cut marks, smashed and battered long bones, along with the few burned pieces. In 1918 (7) he summarized his earlier work by:

*It is difficult to imagine early man from Krapina enjoying the wealth of his hunt in peace and undisturbed. No doubt he was attacked on his territory from time to time by neighboring hordes who may not have had such abundant hunting grounds... People fell on each side, and the victors proceeded with the dead as they did with the catch from a good hunt.*

This was the first time anyone provided evidence for cannibalism in the fossil record and Gorjanović's statements were likely influenced by popular understanding and 19th century European ethnographic literature claiming that »primitive« people were behaviorally aberrant and brutish. There is no evidence he thought this way, but proposing cannibalism at Krapina bolstered his major concern of establishing Krapina's antiquity.

As Gorjanović documented, most of the Krapina human and nonhuman remains are fragmentary with ancient and fresh breaks and many have nicks, bashes, scratches and cut marks, some old and some new. Various explanations have subsequently been proposed for these conditions: dynamiting and cave roof fall (8), »actions of modern workers« (9), disturbance of primary burials by cave bear denning (10), defleshing and dismemberment (11–12), funeral preparations associated with secondary burial (9) along with the original arguments for cannibalism (2–7, 13–16, 17). All but dynamiting likely contribute to the explanation of the *mélange* of marks and bone damage. As Radovčić (1) and Smith (18) argue, explosives were only used to remove a dangerous rock overhang and, cave bear crania in the uppermost levels of the deposits, which would have been most directly affected by the blasting, are some of the most intact remains from the cave. Underlying fossils are considerably more fragmentary, suggesting that explosives had no effect on cave bears above or the Neandertals below. More likely, excavation damage, trampling (prehistoric and more recent), solifluction and other site formation processes, along with prehistoric corpse processing and cannibalism were responsible for the fragmentation of the skeletal material.

Of all the suspicious marks on the various bones, we describe what appear to be evidence of perimortem corpse manipulation unrelated to scalping, cannibalism or defleshing associated with secondary burial. These marks occur on the most famous specimen from the site, Krapina 3 and are definitely perimortem in that they show no signs of healing. This fragmentary cranium also known as Krapina C was found at the end of Gorjanović–Kramberger’s excavations and preserves a large portion of the right half of the vault and the face. It was re-assembled by Gorjanović–Kramberger in 1906 from one large neurocranial piece and four facial fragments as the »signature« skull from the site. The specimen remained this way for 70 years (*viz.* 18) until Wolpoff attached a large fragment comprising of mostly the right frontal squama in 1976 (19–20). This piece was originally assembled from three triangular fragments sometime in the past, presumably by Gorjanović, but never specifically recorded by him. The right frontal consists of the squama, running from just medial to *frontotemporale* about 60 mm to *bregma* then crossing the midsagittal plane for another 17 mm. A narrow piece of the right parietal (42 x 11 mm) is also retained, but this piece bears no cut marks. From the midline, the frontal is preserved from *bregma* anteriorly to where it joins the posterior supraorbital region just above the supraorbital sulcus, corresponding to the *supraorbitale* point. Contrasting with the light yellow color of the cranium, the attached fragment is stained by blotchy, red-brown deposits occurring only on the ectocranial surface. Despite its different coloration from the main Krapina 3 bone tables, there is a perfect join with the root of the frontal squama, the frontal trigone, the lateral-most portion of the frontal and the parietal where the regions join together on the cranium. As argued by Wolpoff this piece must have separated after death (21),

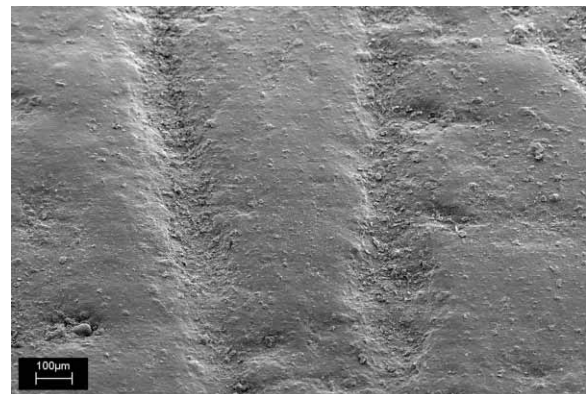
but did not travel far since there is no evidence for marginal smoothing and very minor surface weathering. A few other specimens, unassociated with Krapina 3, are stained a similar red-brown color including:

- an occipital fragment attached to the Krapina 6 cranium,
- a left temporal fragment 39.13,
- a femur shaft 257.24, and
- a left scapula 130.

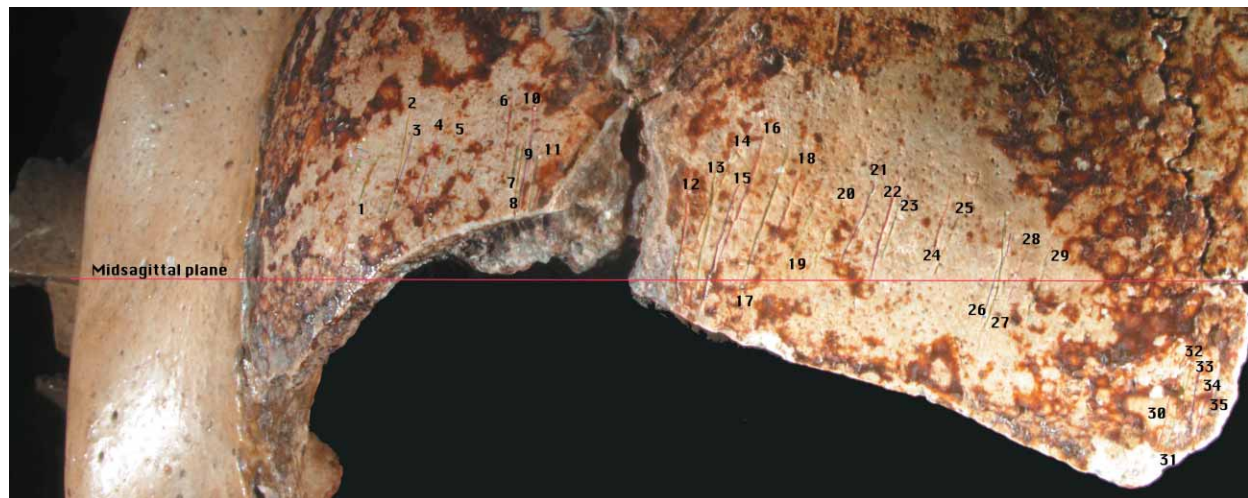
For the most part, this blotchy, red-brown discoloration is rarely found on the Krapina Neandertals or in the faunal remains. Chemical analysis indicates it is a limonite deposit, presumably deriving from cave seepage. No detailed horizontal locational information is available for any of the stained specimens, other than that they all derive from level 4 (the hominid zone) and are dated, along with the other hominin remains to about 130,000 BP (22).

## METHODS AND ANALYTIC APPROACH

Russell (11) described difficulties in producing high resolution images of the Krapina cut marks due the heavy shellac applied to the bones. She was unable to remove the preservative to make impressions for SEM analysis and relied exclusively on low resolution light microscopic images (10–40x magnification). Our work confirms Russell’s observations. We made an impression of a small area of Krapina 3 and the SEM of this region clearly shows the masking effect of the shellac. (Figure 1) Details of the bone surface or scratch attributes are not visible under the preservative. Consequently, like others, we used low resolution, light microscopy, but we were able to improve image quality with advanced technology. An Olympus DP70 12 megapixel camera and Olympus Analysis Docu software were used for producing, recording and analyzing very high quality, light microscopic images. This program also corrects for depth of field problems by producing computer overlays and merging sequential images to produce one continuous photograph (Figure 2). In addition, computer software directly



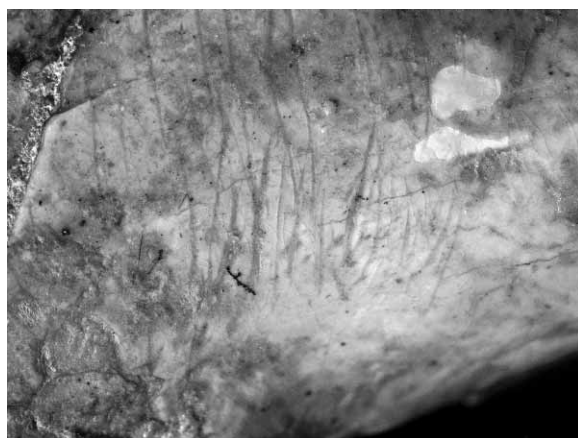
**Figure 1.** SEM image (x72) of two cut marks on the Krapina 3 frontal. The shellac preservative fully obscures details of the surface and the nature of the incisions.



**Figure 2.** The Krapina 3 frontal with identified cuts numbered from 1–35. The midsagittal line was determined by locating the internasal suture and approximating bregma.

measured cut mark length and the minimum interval between neighboring incisions. These measurements were transferred to Microsoft Excel files for data analysis. Cuts were numbered sequentially from the most anterior (1) to the most posterior (35).

Marks were first determined to be not recent instrument damage nor due to the various diagenetic forces affecting bone surfaces. Fresh scratches (*e.g.*, from calipers) are easily recognized by the white appearance of the scratched surface and none of the Krapina 3 marks are white. Those made decades ago and smoothed by handling or manipulation are more difficult to discern, but in several cases we were able to identify recent marks on other specimens when incisions penetrated matrix. For the Krapina 3 marks many of the incisions were under the matrix, showing they were ancient, not recent. Moreover, none of the marks running across the frontal coincide with osteometric landmarks or old techniques designed to quantify cranial shape (23) and, since the frontal squa-



**Figure 3.** Cut marks on the inner symphyseal region of the K53 mandible. Unlike Krapina 3, these marks are closer together, angled to each other and intersecting. Presumably, the marks relate to severing genioglossus and geniohyoideus with the aim of removing the tongue.

ma piece was not attached until 1976, it could never have been involved in such metric procedures.

Krapina 1, 2, 4, 5, 6, and all isolated cranial remains were surveyed to determine if any other cranial fragments possessed similar marks. None did. Of the isolated bones, the left parietal 16 (a different individual from Krapina 3) is heavily scored over most of its surface. The majority of these marks appear to be ancient, but they are not organized in a regular manner as in Krapina 3. Some mandibles show cut marks (12–13), but these are confined to a limited area, show considerable over-scoring and appear to relate to removal of muscle tissue (Figure 3).

In Zagreb, working with the Olympus technicians, Frayer identified the marks on the computer screen at 20x magnification, numbered them sequentially, measured their lengths and the minimum distance between them. Re-evaluating these data months later, it was apparent that two lines were numbered out of sequence (26, 27) so they were re-labeled. Another mark (36) was initially considered an extension of line 30, but after further evaluation was determined to be too faint and obscured by matrix so it was eliminated. Another short, <0.5 mm mark (42) between marks 23 & 24 was recorded in error at the end of the microscopic session in Zagreb. This mark was eliminated and is not considered further here. There may be a few additional marks on the frontal, but because they are obscured by matrix and heavy shellac, they could not be confirmed and are excluded from our analysis.

### KRAPINA 3

The Krapina 3 cuts are found on the vault's ectocranial surface with no marks located endocranially. They occur only on the frontal squama piece attached by Wolpoff and do not extend anteriorly to the glabellar region nor to the small right parietal fragment. For the most part, the marks are aligned along the saggital plane. All are perpendicular to the midline, are relatively straight



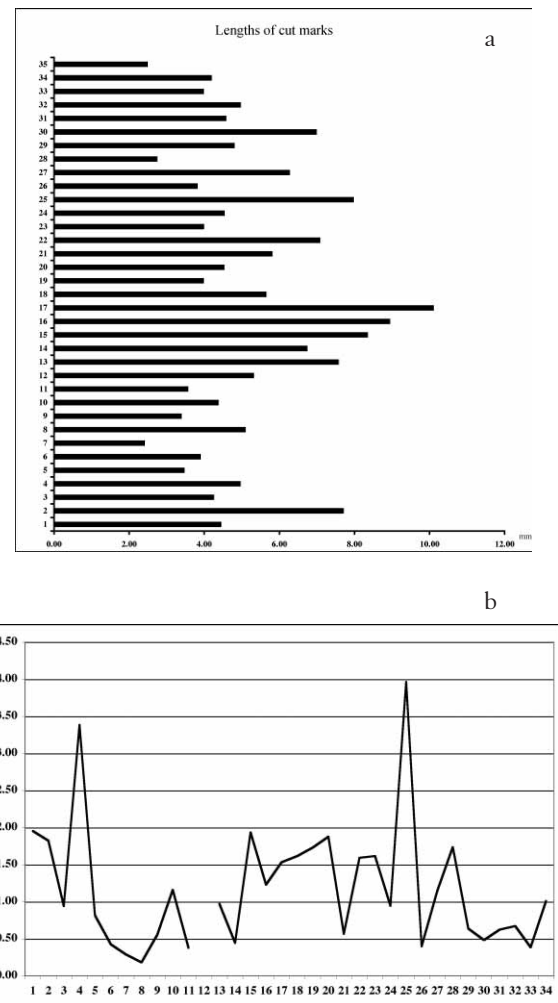
and most have a red-brown matrix embedded into the incision (*e.g.* marks 5–10). A few others disappear under the matrix (*e.g.* marks 30 and 32) which persists sporadically over the frontal squama. The marks course up the frontal in a slightly diagonal direction from a right-lateral position to the midsagittal plane to slightly left of it. They begin ~25 mm superior, posterior and right-lateral to *glabella* and extend up the squama for about 65 mm where they terminate on the left half of the frontal, slightly anterior and left-lateral to *bregma*. We determined the midsagittal plane on our microscopic composite images by locating the internasal suture anteriorly and *bregma* posteriorly (Figure 2). From this image it is apparent that the marks occupy a position right of the midline in the most anterior aspect of the squama, cross the midsagittal plane at about the frontal's midpoint between *glabella* and *bregma*, then extend over to the small, remaining segment of the left frontal. Complete documentation of the marks is hampered by the break and missing triangular fragment in the frontal squama's center, between marks 11 and 12.

Tracking the cut marks by our numbering system, mark 1 begins about 6mm right of the midsagittal plane and is followed by cuts 2–7 which are clearly off the midline. Marks 8, 9, and 11 touch, or nearly touch the broken edge, so it is impossible to determine their extension beyond the midline. Cut mark 10 is a short mark, paralleling the others, but more laterally oriented and clearly terminates right-lateral of the midline. Posterior to cut mark 11 the external table is missing for approximately 8.5 mm. Directly behind this break, 14 marks (numbers 12–25) continue in a posterior direction, touching (or terminating nearly at) the midline. With mark 26 the next four incisions (26–29) straddle the midsagittal plane. The most posteriorly positioned marks (30–35) are located entirely left of the midline, although their medial-most aspects are covered by ancient matrix and recent lacquer making it impossible to fully document their approach to (and beyond) the midline.

The marks average 5.2 mm ( $\sigma = 1.9$ ) with a minimum and maximum length of 2.4 mm and 10.1 mm respectively (Figure 4a). The average minimum distance between contiguous cuts is 1.2 mm ( $\sigma = 0.9$ ), ranging between 0.2 mm and 4.0 mm, not including the postmortem gap between marks 11 and 12 (Figure 4b). Only two sets of parallel cut marks are separated by more than 2 mm (marks 5–6 and 29–30) and 85% (29/34) have a minimum distance of separation between ~0.5 mm and 2 mm. In the gap between marks 5 and 6, the bone is not obscured by matrix, so it appears to be a real or intentional gap. However, the gap between marks 29 and 30 is in part covered by matrix and lacquer and shows some surface weathering, so it is unclear if some marks in this gap are obscured or obliterated. Throughout their course up the frontal parasagittal midline, the incisions roughly parallel each other, but tend to be slightly closer to each other near the midline than lateral to it. Only two sets of marks cross-over one another (cut marks 13 and 14; 26 and 27) with the overall pattern a continuous set of

incisions along the parasagittal midline. This pattern contrasts with all other Krapina specimens where cut marks are either more isolated, more scattered across a bone, or more concentrated with overlapping marks (Figure 3)

Besides these, there are two parallel marks located at the lateral, inferior angle of the right orbit and another two on the left zygomatic-frontal process. They are both short (<5 mm) and deep under lacquer. Compared to the marks on the frontal, these are not especially convincing as perimortem. We also found a small nest of marks just anterior to cut mark 1 on the frontal squama. These marks are not etched deeply into the bone and (with one exception) are perpendicular to the row of cut marks described above. They are barely visible without a microscope and range in length from 0.85 mm to 1.44 mm. Additional marks just anterior to these, are also deep under matrix and difficult to verify as cut marks. We believe that these, especially the nest of marks, are unrelated to cut marks 1–35 and are likely due to sediment



**Figure 4.** a) Krapina 3 cut mark length plotted in mm. Most incisions are between 2mm and 8mm long. b) Graph of the distance between contiguous cut marks for Krapina 3 (in mm). Except for two, the interval between incisions is generally between 5 and 2mm. The gap separating marks 11 & 12 is due to a postmortem break.

scratching or preparation damage. Like all the marks, they are under the lacquer and, at present, beyond further scrutiny.

## THE ORIGIN/INTENT OF THE CUT MARKS?

### Evidence against post-mortem, »natural« causes

The regularity of the marks indicates they are not due to diagenesis. Many studies have documented microscopic signatures of taphonomical processes (24–27) and have shown that trampling, predator activity and other natural activities lead to scratches and damage on bone surfaces in a scattered, diffuse distribution. The cut mark patterning on the Krapina C frontal does not resemble these types of bone modifications and absence of any endocranial surface involvement makes an artificial explanation for the marks doubtful. Nor can the scratches be attributed to measurement or instrument damage as in the Engis 2 cranium (23) since the marks are not associated with osteometric points nor with techniques using a craniophore and craniometric or stereoscopic techniques. Furthermore, since the frontal piece was never described nor included in any of the metric data by Gorjanović and since it was not attached to the main Krapina 3 craniofacial piece until 1976, measurement damage can be eliminated from the list of possible explanations for the marks. Attributing the marks to the specimen's cleaning (initially or later) is unlikely given the marks consistent location under matrix and under the lacquer coating. All these attributes suggest a perimortem explanation for the cut marks.

### Evidence against scalping and defleshing

Smith (28) has described cut marks associated with scalping as »highly diagnostic and identified by a series of cuts made in a somewhat circular path around the crown of the head. They are most commonly found in the hair-line region of the frontal, on the mid-parietal and more inferiorly on the supraceutical crest of the temporal bone and the nuchal crest of the occipital.« Similar descriptions have been provided by other researchers with Native American prehistoric and historic groups (29–33) with the signature characters of scalping related to a circular or perpendicular nature of multiple scratch marks on the frontal, parietals, temporals, and occipital. While the left side is not present on Krapina 3, the right parietal, temporal and occipital show no evidence of cuts marks peripheral to the 35 marks running down the midline.

There are dangers in using Amerind customs to predict or explain Neandertal behavior, but there is no reason to suspect that these marks are related to scalping since they roughly parallel each other and would not have been effective in removing tissue no matter whose cranium is considered. Scalping is not a reasonable explanation for the marks. Marks attributed to defleshing have been described by White (34) on the Bodo *Homo*

cranium. His description of the 17 areas with concentrations of marks, often close together and overlapping, bear no resemblance to the track of cuts on Krapina 3. Russell (11) reviewed evidence for defleshing at Krapina material, but focused exclusively on the postcranial material. She found concentrations of scratches, which sometimes overlapped and for the most part were short, close to each other and more numerous when compared to a Neandertal reindeer butchery site. In addition she was able to link the scratches to muscular, ligament and tendon attachments or where bone contours changed, as flakes were presumably drug across the surfaces to remove tissue. These patterns are not consistent with the marks on Krapina 3 and we exclude defleshing as a likely cause of the marks on the frontal.

### Evidence against cannibalism

Evidence for cannibalism has been reviewed by White (29) and includes perimortem cranial trauma, crushing and extensive fragmentation. Compared to the collections at Mancos in the American Southwest, the Krapina 3 cranium is much more intact and does not fit the pattern established for prehistoric North America. Ullrich (12–16) has provided evidence on cut marks on bones from Krapina and has long been an advocate for the presence of cannibalism at the site. While there may be evidence for cannibalism in some of the Krapina remains, butchery can be rejected as an explanation for the Krapina 3 marks for the reasons used to reject scalping or defleshing. The parallel cuts are not effective in removing tissue. Moreover, there is scant muscular tissue in this region of the cranium, which is limited primarily to the superficial scalp fascia and the very thin, frontal portion of *epicranium*. The only muscle of any size in this region is the anterior-most portions of *temporalis*, but its fascia never approaches closer than 47 mm from the most lateral of any of the cut marks. Just as the cutting would be unsuccessful in removing the scalp, even if plentiful muscle tissue existed in the region, the parallel incisions would not have been effective in removing the scalp or any of the underlying tissue.

### SYMBOLIC MARKING?

The marks left on the Krapina 3 frontal do not resemble the typical scatter seen in cave diagenesis and natural taphonomical processes. They do not match patterns of cut marks on other Krapina crania, which are much less organized. They also do not resemble the mélange of marks described for the postcrania. The uniqueness of the pattern of these marks, both at Krapina and other Mousterian sites, makes their interpretation difficult. For example, at Moula-Guercy (35) cut marks are associated with much more fragmented cranial remains and are considerably more angled and intersecting with each other. The evidence for butchery and cannibalism at Moula-Guercy resembles other specimens at Krapina, but not the pattern found on Krapina 3. At Combe-Grenal and Marillac (36) cranial cut marks are typically found in areas of muscle attachment and appear to fit

into the category of cannibalism or defleshing. When found on specimens from the two sites, the cut marks are more closely packed together, more intersecting and more irregular in their appearance.

Based on the dissimilar appearance, we suspect the series of cut marks on Krapina 3 has a different origin representing some type of symbolic, perimortem manipulation of the deceased. The person responsible for the marks held the cranium and scored the frontal at least 35 times across the deceased's forehead. It is impossible to know if the marks began at the front or back of the frontal, but the regularity of their appearance suggests they were made in one episode. In the future, if the shellac can be removed, it might be possible to determine if the same tool was used to score the frontal, but nothing we can see now suggests otherwise. The *deep* purpose of this manipulation remains unclear, but it suggests a ritual where at least the cranium of the individual was marked intentionally in a way unrelated to cannibalism or defleshing.

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