

BONE RETOUCHERS FROM TWO NORTH ITALIAN MIDDLE PALAEOLITHIC SITES: RIPARO TAGLIENTE AND GROTTA DELLA GHIACCIAIA, VERONA

Abstract

The use of retouching tools made on hard animal materials has a broad chronological and geographical distribution throughout the European Palaeolithic. In Italy, analyses of retouchers are not particularly numerous. The current work presents the preliminary results obtained from the study of 79 retouchers recovered from two sites located in northern Italy: Riparo Tagliente and Grotta della Ghiacciaia, Verona. Results from Riparo Tagliente provide both qualitative and quantitative data, span several occupation levels, and the use traces on the cortical surfaces of these bone tools show great variability. Grotta della Ghiacciaia yields only qualitative data because of a restrictively small sample size. Overall, the retouchers analysed are mostly made on bone shafts of medium- to large-sized ungulates, especially red deer and other cervids, which were the most commonly hunted animals at the sites. Many examples were also made on the bones of small-sized mammals, such as roe deer. This variability can contribute to the identification of such tools at other sites and to better define a methodology for their analysis.

Keywords

Retouchers; Use areas; Middle Palaeolithic; Northern Italy

Introduction

One of the primary objectives of researchers in the field of prehistory is to understand the mechanisms involved in the behavioural evolution of ancient hominin groups. Even today, the degree of technological and cultural development of prehistoric hunter-gatherer groups is assessed mainly through stone tools (Blasco et al., 2013). The contribution of other disciplines, zooarchaeology in particular, has brought added value to the acquisition of information related to hominin behaviour. The analysis of

faunal remains has not only aided the formulation of hypotheses regarding hominin prey spectra and the methods of animal carcass exploitation, but also the use of bones derived from butchery activities as raw materials.

The use of bone was not regularly included in the manufacture of stone tools until well into the Acheulean cultural complex, when various osseous materials were used both as raw material to be shaped and as tools for shaping lithic implements (Blasco

et al., 2013). Retouchers on ungulate long bones were identified for the first time in the beginning of the 20th century (Daleau, 1884; Henri-Martin, 1906, 1907, 1907-1910) at the Middle Palaeolithic site of La Quina (Charente, France) and have since been recognized in numerous Middle Palaeolithic faunal assemblages from Europe.

Patou-Mathis and Schwab (2002) defined bone retouchers generically as fragments of large mammal remains, without modification of the original morphology, that present on their surfaces one or more impressed areas with various crushing marks, cupules and scores made by impact against a sharp edge of a stone flake, tool or handaxe. The absence of retouching tools in the archaeological record of many regions and chronological periods can be attributed to two principal factors: specific economic choices of the hunter-gatherers and the difficulty in recognizing these objects by archaeologists and faunal specialists.

In Italy, analyses of retouchers are not particularly numerous, beginning only in the second half of the 1990s with the recovery of such artefacts at Grotta di San Bernardino (Vicenza), Grotta di Fumane (Verona) and Riparo Tagliente (Verona) in northern Italy (Malerba and Giacobini, 1998). In a more recent study, 148 retouchers from the Mousterian and Uluzzian layers of Grotta di Fumane were analysed to assess the selection criteria of osseous blanks and their further patterns of retoucher use and discard by Middle Palaeolithic hominin populations in each of the stratigraphic units (Jéquier et al., 2012, 2013).

The current work presents the preliminary results obtained from the study of retouchers recovered from two other sites located in northern Italy: Riparo Tagliente and Grotta della Ghiacciaia, Verona. Our research is in progress, and this study represents the first step in the collection of basic descriptive data using current methodologies. This will provide a foundation for an interdisciplinary investigation devoted to a better understanding of Palaeolithic hominin behaviours in northern Italy related to bone retoucher use, including hunting strategies, bone blank selection, retouch typology and the relationship between the retouch type and bone blanks.

Background to the sites

Riparo Tagliente (Stallavena di Grezzana, Verona) is a key Mousterian site in northern Italy, located at the base of Monte Tregnago under a rockshelter formed by oolitic limestone. This strategic location features several karst cavities and an abundance of lithic and mineral resources, such as flint outcrops, which were heavily exploited by Palaeolithic groups, first by Neanderthals and later by anatomically modern humans. The rockshelter lies at 250 m a.s.l. on the eastern slope of Valpantena, one of the main valley bottoms of the pre-Alpine massif of the Lessini Mountains (Figure 1).

The discovery of the site is attributed to Francesco Tagliente in 1958. Initial investigations were conducted from 1962 to 1964 by the *Museo Civico di Storia Naturale* of Verona. In 1967, excavations were started once again by the University of Ferrara and are still ongoing. Cumulatively, these excavations have highlighted a long Upper Pleistocene stratigraphic series (over 4.5 m deep), comprising two main deposits separated by a fluvial erosion event: a lower deposit containing Mousterian (levels 52 to 31) and Aurignacian industries (level 25) and an upper deposit characterised by a Late Epigravettian materials (levels 18 to 4). Geological, bioarchaeological and lithic typological data suggest that the lowermost series corresponds to an entire glacial cycle dating to between about 60,000 and 30,000 years ago (Bartolomei et al., 1982, 1984; Guerreschi et al., 2002; Fontana et al., 2009).

Lithic assemblage analyses testify that raw material supply came from slope waste deposits in the vicinity of the site and coarse gravels were procured from the streambed opposite the rockshelter. However, from level 37 upwards, blade production was carried out using one specific kind of flint. Peresani (2009) observed that the Levallois method was still used even in the uppermost sequence, although uni- and bidirectional modalities were more frequent from level 37 upward. Centripetal reduction was featured in earlier levels. Discoid and unelaborated flaking methods may be attributed to specific reduction sequences or to discard of exploited

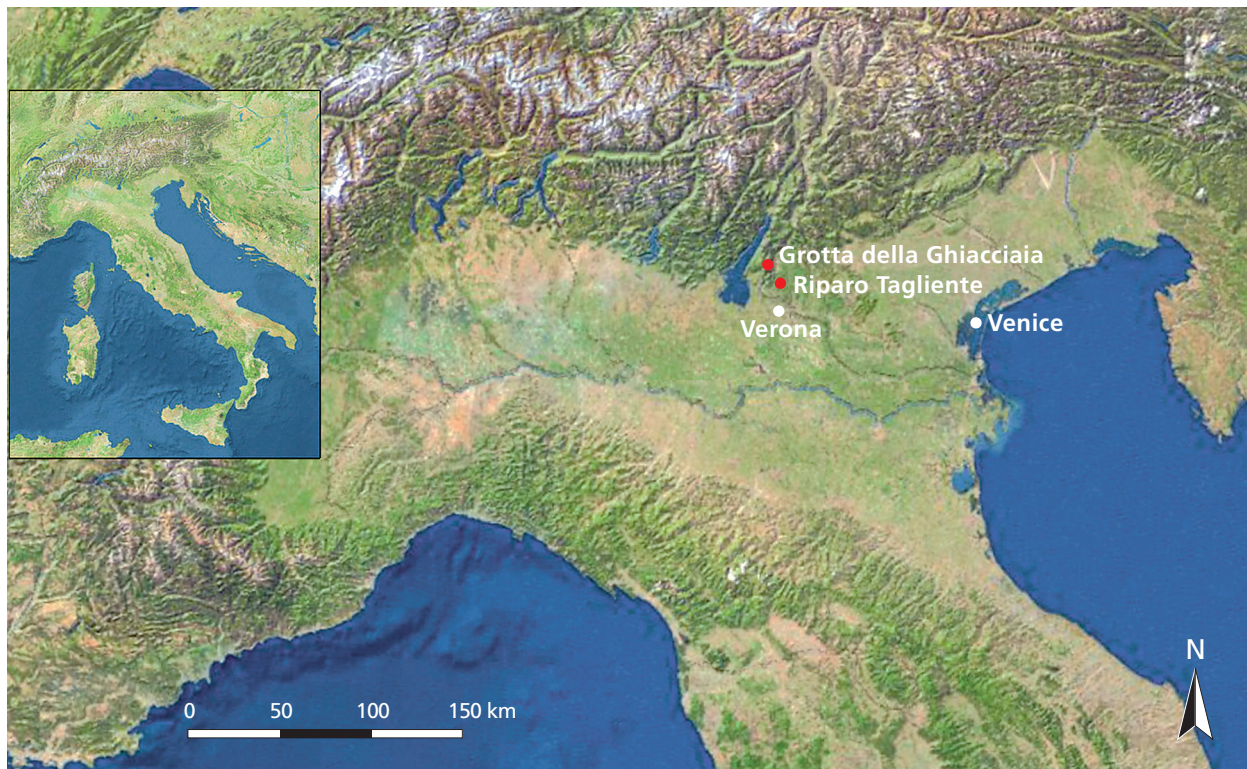


Figure 1 Map of Italy showing the locations of Riparo Tagliente and Grotta della Ghiacciaia, Verona.

Levallois cores (Arzarello and Peretto, 2005). The upper levels (37-34) show a greater diversity of re-touched tools, likely a result of intense and long-term occupations of the site, as suggested by larger amounts of lithic and faunal remains relative to the lower levels.

Faunal analysis revealed an abundance of roe deer (*Capreolus capreolus*) and red deer (*Cervus elaphus*), followed by chamois (*Rupicapra rupicapra*) and ibex (*Capra ibex*), along with the presence of elk (*Alces alces*) and marmot (*Marmota marmota*) (Table 1). Palaeoenvironmentally, these species reflect a moderately humid, temperate-cold climate. A mixed biotope comprising forest, woodland areas and open steppe-grasslands marked the initial Mousterian phase. Increased aridity is indicated in levels 44-40, with a reduction in forest-dwelling species in favour of continental, Asian steppe fauna. In the upper part of the sequence, forest and woodland micro-mammals reappeared, but are less numerous than the open grassland or woody grassland forms (Fiore et al., 2004).

The frequency of anthropic modifications to ungulate remains indicates that Neanderthals played an important role in the accumulation of the faunal assemblage (Thun Hohenstein et al., 2001; Alhaique et al., 2004). Evidence of carnivores at the site is sparse, possibly due to the long duration of hominin occupation.

Grotta della Ghiacciaia is located at 250 m a.s.l. on the left side of Progni Valley, near Grotta di Fumane in the western Lessini Mountains (see Figure 1). Preliminary investigations were carried out in 1979-80 under the direction of Carlo Peretto in collaboration with the *Museo Civico di Storia Naturale* of Verona. The approximately 3.5 m thick deposit preserves an Upper Pleistocene series with three pedo-stratigraphic macro-units (Units 1, 2 and 3), which can be used to document palaeoenvironmental changes at the site. At the base is the sterile Unit 1 associated with the Last Interglacial, succeeded by short-term anthropic levels of Units 2 and 3 associated with the First Pleniglacial (beginning of MIS 4). This chronology is derived from sedimentologi-

Table 1 Number of identified specimens (NISP) and percentage contribution (%NISP) by taxa at Riparo Tagliente and Grotta della Ghiacciaia.

Taxa	Riparo Tagliente						Grotta della Ghiacciaia			
	Level 35		Level 36		Level 37		Unit 2		Unit 3	
	NISP	%NISP	NISP	%NISP	NISP	%NISP	NISP	%NISP	NISP	%NISP
<i>Aves</i>	3	2.6	6	2.2	2	1.1	-	-	-	-
<i>Lepus sp.</i>	-	-	1	0.4	1	0.5	-	-	-	-
<i>Marmota marmota</i>	4	3.5	15	5.4	24	12.8	-	-	-	-
<i>Vulpes vulpes</i>	-	-	3	1.1	-	-	1	11.1	1	8.4
<i>Canis lupus</i>	3	2.6	2	0.7	1	0.5	1	11.1	3	25
<i>Ursus sp.</i>	2	1.8	2	0.7	-	-	2	22.2	3	25
Carnivora	1	0.9	-	-	4	2.2	-	-	-	-
<i>Sus scrofa</i>	-	-	-	-	2	1.1	-	-	-	-
<i>Equus sp.</i>	1	0.9	-	-	-	-	-	-	-	-
<i>Rupicapra rupicapra</i>	5	4.4	31	11.2	2	1.1	-	-	-	-
<i>Capra ibex</i>	4	3.5	17	6.2	14	7.5	4	44.5	1	8.3
<i>Capreolus capreolus</i>	79	69.3	137	49.6	108	58.1	-	-	2	16.7
<i>Cervus elaphus</i>	8	7	38	13.8	14	7.5	-	-	-	-
<i>Alces alces</i>	-	-	4	1.4	2	1.1	-	-	-	-
Cervidae	4	3.5	2	0.7	5	2.7	-	-	-	-
<i>Bison priscus</i>	-	-	-	-	-	-	1	11.1	1	8.3
<i>Bos sp.</i>	-	-	-	-	7	3.8	-	-	1	8.3
Medium-sized ungulate	-	-	9	3.3	-	-	-	-	-	-
Large-sized ungulate	-	-	9	3.3	-	-	-	-	-	-
Total	114	100	276	100	186	100	9	100	12	100

cal and palaeobotanical evidence (Peretto and Thun Hohenstein, 2002).

The lithic assemblages discovered in Units 2 and 3 are techno-typologically variable. While the Levallois method was exclusively employed in the later units, mainly by means of unidirectional modality, Quina and semi-Quina scrapers are present among the few artefacts found in the earlier units. Moreover, throughout the series it is possible to recognise variation in the lithic assemblages, well evident in the frequency of retouched tools (Bertola et al., 1999).

Among the faunal remains (21 identified specimens), ibex (*Capra ibex*) is the most abundant species, followed by roe deer (*Capreolus capreolus*) and

bison (*Bison priscus*) (see Table 1). Red deer (*Cervus elaphus*) is conspicuously absent. The predominant species in both units are characteristic of high altitude grassland and cold steppe, although species typical of open forest environments are present in Unit 2. Changes in the small faunal composition suggest a gradual drying of the climate, from cold and humid to cold and arid.

No traces of carnivore activity were identified, although the remains of bear (*Ursus sp.*), wolf (*Canis lupus*) and fox (*Vulpes vulpes*) are present (Peresani et al., 2001). In contrast, Neanderthal butchery and intentional bone breakage are well documented. Some bones were also used as retouchers for stone tools (Bertola et al., 1999; Thun Hohenstein, 2001).

Material and methods

The study material for the present research comprises 79 bone retouchers sourced from Riparo Tagliente and Grotta della Ghiacciaia. Both sites are characterised by the occurrence of the same lithic technologies: volumetric Levallois and laminar débitage that is correlated by some authors with an important climatic fluctuation, which may have caused a change in Neanderthal techno-economic behaviour (Ameloot-Van Der Heijden, 1993; Tuffreau, 1993; Révillion, 1995; Arzarello and Peretto, 2005).

The total number of bone retouchers from the upper part of the Mousterian series of Riparo Tagliente amounted to 75; however, 12 retouchers from this sample were not considered here, as their stratigraphical provenance was doubtful and their original morphology was not preserved. Therefore, only three levels (35, 36 and 37) with 63 bone retouchers were taken into consideration for our study: five (8.0%) from level 35, 22 (34.9%) from level 36, and 36 (57.1%) came from layer 37. Only four retouchers from the anthropic levels of Grotta della Ghiacciaia were examined. Since the Riparo Tagliente sample has a higher number of bone retouchers than at Grotta della Ghiacciaia, we ascribe to it greater significance. Accordingly, our preliminary results will focus more on Riparo Tagliente.

The corpus of bone retouchers from the present study has been identified in previous zooarchaeological analyses (Thun Hohenstein, 2001, 2006; Thun Hohenstein and Peretto, 2005). The methodological approaches for formulating our analysis are based mainly on individual works published in the edited volume, *Retouchoirs, compresseurs, percuteurs... Os à impressions et éraillures* (Patou-Mathis, 2002), particularly those by Giacobini and Patou-Mathis (2002) and Schwab (2002).

Our protocol commenced with taxonomic and anatomic identification of each bone retoucher. In a few cases, whenever precise taxonomic identification was not possible, the bone fragments were assigned to animal size class based on cortical thickness. In addition to identifying the skeletal element

from which the bone retoucher was derived, further attempts were made to determine the portion of the element and its laterality. The primary dimensions of the retouchers (maximum length, width and thickness) were measured in millimetres using a digital calliper. The weight of each retoucher was recorded in grams using an electronic scale.

The second step was to carry out a taphonomic analysis of the surfaces and edges of the retouchers to determine the state of preservation, type of fracture and degree of fragmentation. Bone fractures were classified following Villa and Mahieu (1991). The taphonomic study was carried out using a Leica SD6 (6-40x) microscope. Fractures were either assigned to anthropic or post-depositional factors, or a combination of both, and the bone tools were assessed to be complete, partially complete or fragmented. Within these three categories, we documented the shape and morphology of the bone blanks and the locations of the use areas.

For the sake of consistency in our analysis of the use areas, the retouchers were oriented by always placing the use area on the cortical surface in the apical (top) position on the bone blank (Mallye et al., 2012). In relation to the long axis (i.e., maximum length), the opposite end of the "apical" edge is designated as the "basal" edge. Similarly, the remaining two sides lying on either side formed the "right" and "left" sides of the retoucher. When a retoucher preserved multiple use areas, the bone was reoriented to bring the use area to the apical position and the edges were re-designated.

To mark the exact location of the traces on the surface, we subdivided the surface of the tool into a grid, as proposed by Schwab (2002); rows were marked alphabetically and the columns numerically. For measurement of the use areas and their distances from the margins of the retoucher, the approach advocated by Giacobini and Patou-Mathis (2002) was implemented. This entailed measuring the distance from the tip of the apical edge of the retoucher to the tip of the top portion of the use area (D_{p-e}), the maximum length (L_{pu}) and width (l_{pu}) of the use area, and computing the area ($S_{pu} = L_{pu} * l_{pu}$) of the used portion on the retoucher.

Table 2 Taxonomic identification of the bone blanks used as retouchers at Riparo Tagliente and Grotta della Ghiacciaia.

Taxa	Riparo Tagliente			Grotta della Ghiacciaia	
	Level 35	Level 36	Level 37	Unit 2	Unit 3
<i>Rupicapra rupicapra</i>	-	1	-	-	-
<i>Capreolus capreolus</i>	-	-	1	-	-
<i>Cervus elaphus</i>	2	3	2	1	1
<i>Alces alces</i>	-	2	1	-	-
<i>Bos</i> sp. / <i>Bison</i> sp.	-	-	3	1	-
Small-sized ungulate	-	2	-	-	-
Medium-sized ungulate	-	12	17	-	-
Large-sized ungulate	3	2	12	1	-
Total	5	22	36	3	1

With regards to codification of the morphology of the use areas, reference was made to the work of Mallye et al. (2012). The use area was assigned a nearest approximate shape: triangular, square, short or long rectangle, circular, semi-circular, ovoid or elliptical. Use areas were further categorised into the following three types based on superposition of traces: “hatched areas” characterized by the overlapping of numerous scores on the surface; “pitted areas” with overlapping pits; and, “scaled areas” created by the superficial detachment of small bone plaques. The intensive use of a retoucher leads to overlapping traces.

The next procedure was the description of individual traces within the use area. Nomenclature was again borrowed from Mallye et al. (2012). Pits are defined as triangular or ovoid depressions in the bone. Scores are shallow or deep incisions produced by the edge of a stone flake; score morphology can vary between rectilinear and sinuous, and the interior surfaces of scores can be smooth or rough. Individual traces orientations were recorded using the codification scheme of Schwab (2002), with angles ranging from 0° to 180°.

Our protocol also included revised identifications of bone surface modifications present on the retouchers, such as trampling marks and cut marks related to skinning and defleshing. The alphabeti-

cal and numerical grid used for pinpointing the exact location of use areas (Schwab, 2002) was once more adopted to locate the other traces. The methods adopted for orienting and describing the morphology of the other traces were the same as those adopted for use areas. For instance, linear surface modifications were described as oblique, longitudinal or transverse, while their arrangement with respect to each other was described as isolated, parallel, perpendicular, intersecting or chaotic. The retouchers were inspected for presence or absence of additional post-depositional traces such as weathering stages (Behrensmeyer, 1978), exfoliation, root etching, discolouration by oxides (manganese and iron), rounding, combustion and carnivore marks.

All retouchers were photographed at various magnifications. The traces were analysed and photographed using a Leica SD6 stereomicroscope with an integrated EC3 camera. The more interesting tools were subsequently examined under SEM.

Results

Riparo Tagliente

Retouchers from Riparo Tagliente demonstrate well-preserved bone surfaces. Weathering (medium to

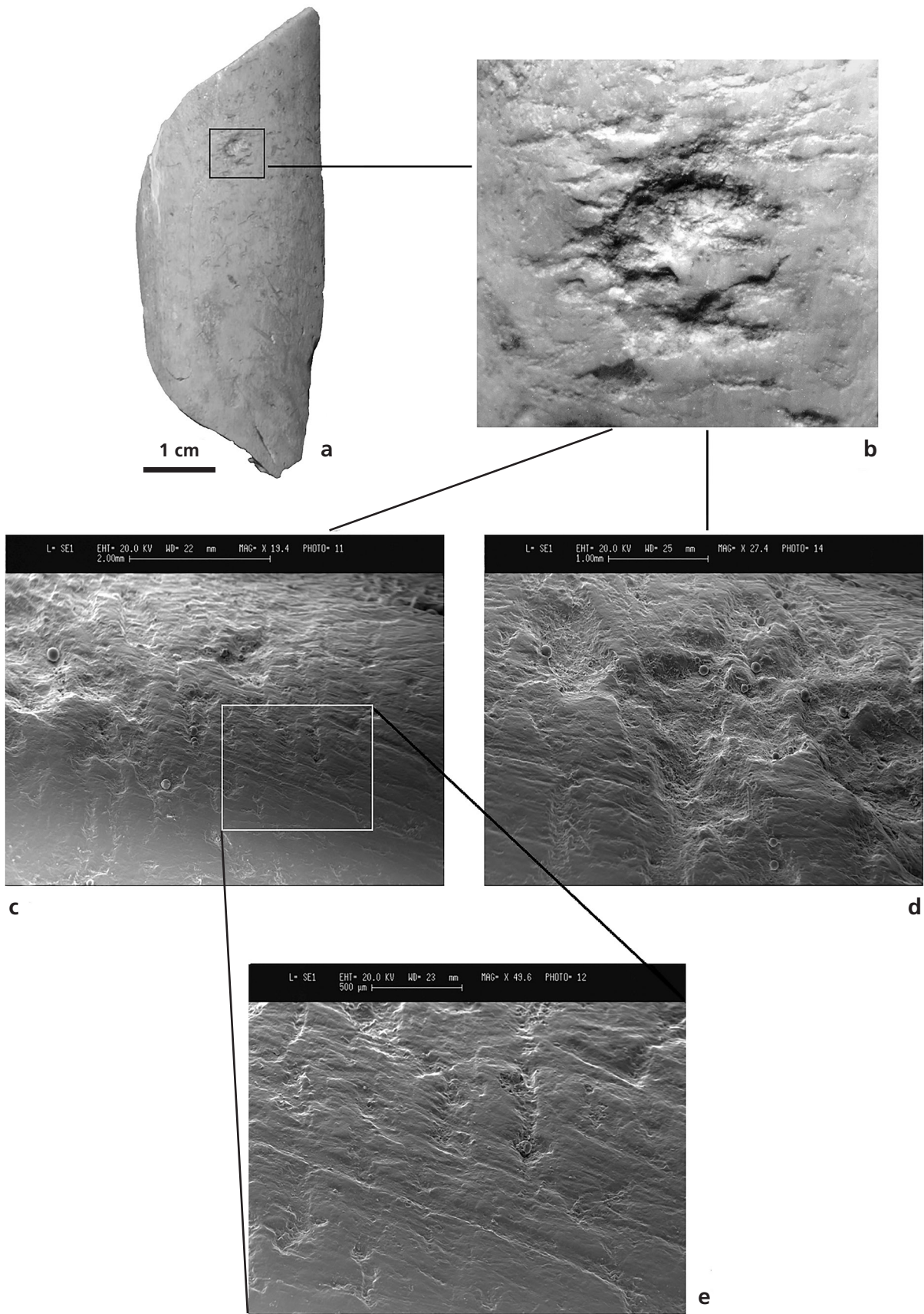


Figure 2 Diaphyseal fragment of a large-sized ungulate utilised as a retoucher from Riparo Tagliente.

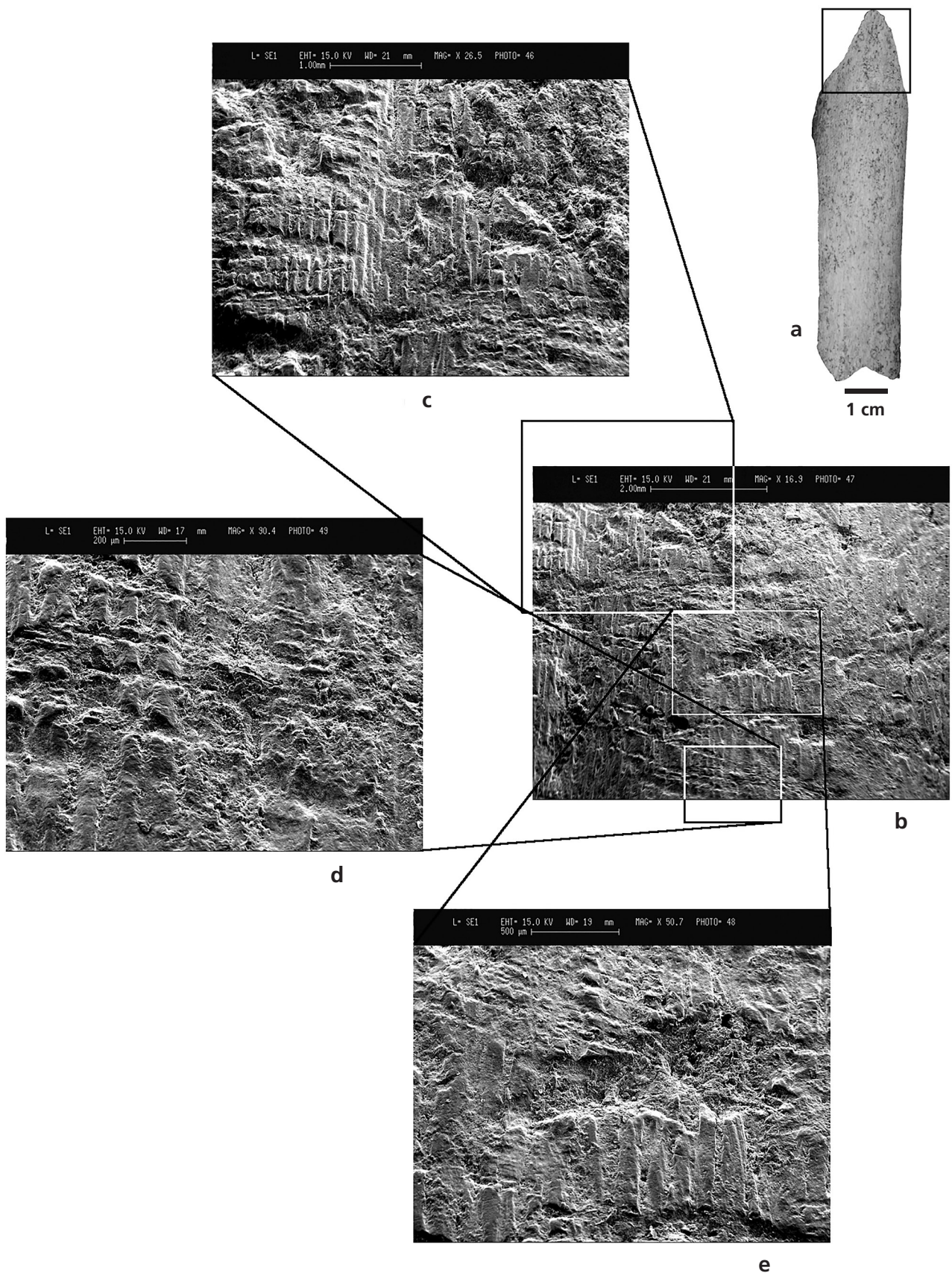


Figure 3 Retoucher on an indeterminate bone blank from Riparo Tagliente.

high degree) was one of the two chief alterations, observed on 44% of the retouchers. Weathering was associated with bones showing longitudinal fractures, which may have caused a general reduction in blank width. The second primary alteration was manganese oxide pigmentation, observed on 46% of retoucher surfaces. Exfoliation (5%) and root etching (5%) did not severely damage the bone surfaces.

The raw material for retouchers was obtained from red deer long bone diaphyses, followed in abundance by aurochs/bison and elk from layer 35 and 37 of Riparo Tagliente (Figure 2). Retouchers on chamois bones were present only in level 36. The use of small-sized animals such as roe deer and chamois was noticed in level 36 and 37 (Table 2).

In terms of anatomical part representation, long bones with flat surfaces, such as metapodial, tibia and numerous indeterminate limb shaft fragments (Figure 3), were preferred; less frequent were humerus, radius and femur (Figure 4). In level 37, two interesting exceptions were the exploitation of a first phalanx of roe deer (Figure 5) and rib of a large ungulate.

Analysis of diaphyseal fragments showed that complete and partially complete retouchers accounted for approximately 70-80% of the total, whereas the remaining 20-30% were fragmented and only preserved a fraction of their original morphology.

Roughly 70% of the bone retouchers have only one use area when all three levels are taken into consideration. Two use areas were documented on around 20% of retouchers, and only two examples from level 37 have three use areas. There is no association between the number of use areas and the length of the bone blanks. In fact, there are retouchers longer than 100 mm with just one use area. Many retouchers with two use areas are at least 50 mm long, but shorter than some retouchers with only one use area.

The ratio of length to width of the use area is homogenous in all the three levels of Riparo Tagliente. There is a clear increase in use area dimensions in levels 36 and 37 (Figure 6), which could be related to the débitage method utilized. This will be investigated in future studies.

There does seem to be a positive association between the use area dimensions and the length of

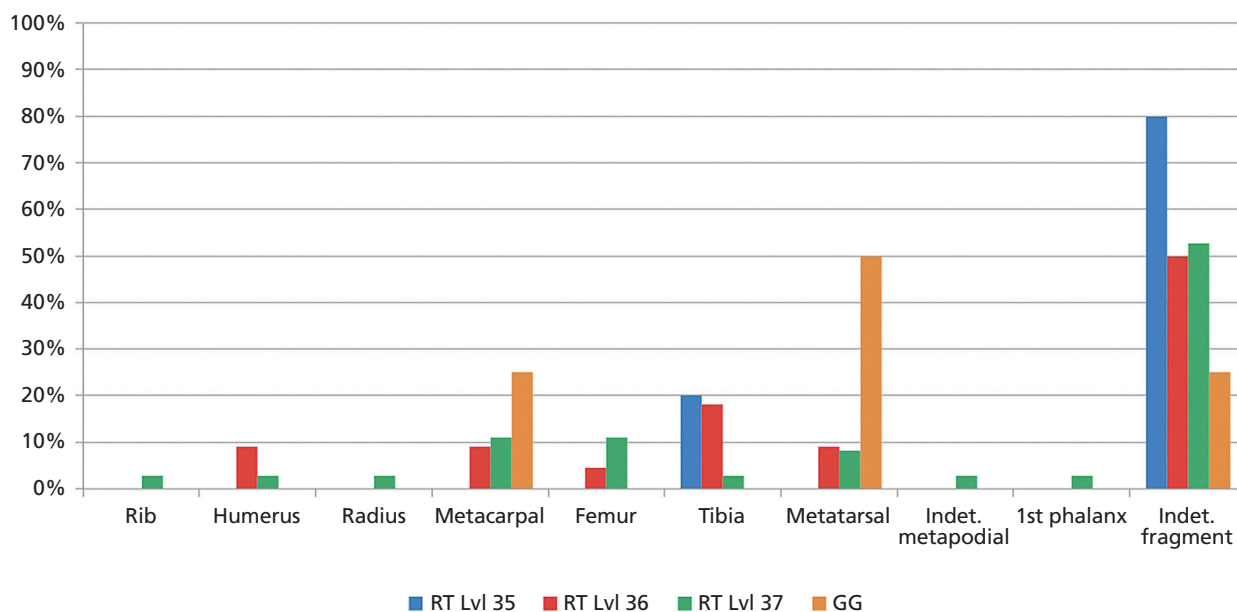


Figure 4 Percentage contribution of anatomical elements as raw material sources at Riparo Tagliente (RT) and Grotta della Ghiacciaia (GG).

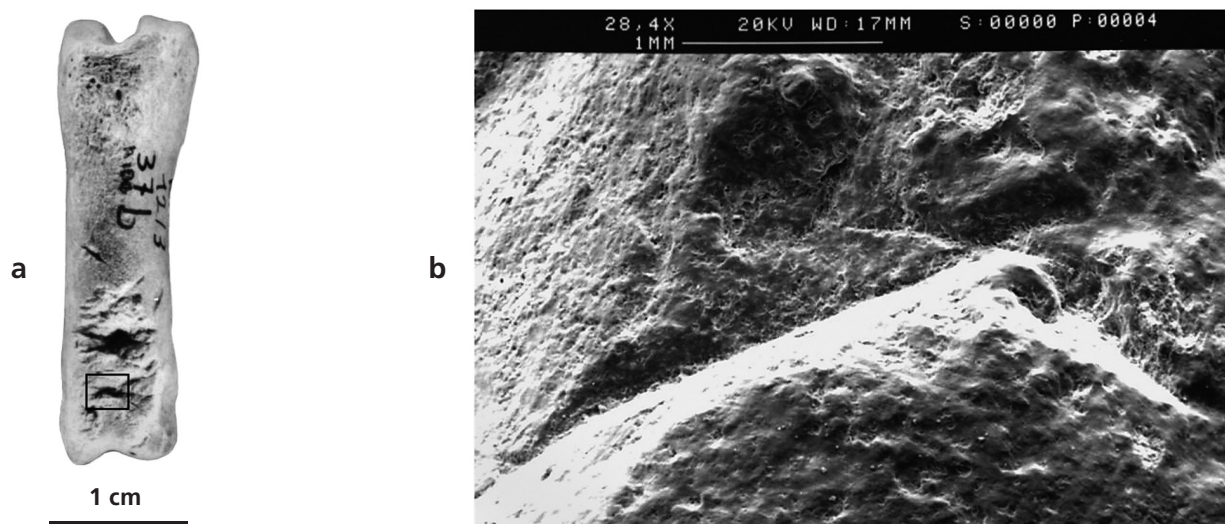


Figure 5 Retoucher on a roe deer (*Capreolus capreolus*) first phalanx from Riparo Tagliente.

the tool. This was observed mainly in level 37, due to the presence of long and intensively used retouchers from limb shafts of large-sized ungulate shafts, such as aurochs/bison and elk (**Figure 7**).

The Riparo Tagliente sample revealed diversity in use area shape. Morphologically, the most prevalent shape was rectangular, accounting for 44% and 54% in levels 36 and 37, respectively (**Figure 8**). In level 35, 40% of the use areas were circular; square, rectangular and oval/semi-circular contributed equally with 20% each. Trapezoidal use areas were recorded only in level 36 and accounted for only 4% of the use area shapes on retouchers in that level. Triangular use areas were absent in level 35, but made up roughly 15% of the total use areas in level 36 and 5% in level 37.

Linear scores associated with cupules were common, occurring together in 71% of retouchers in level 36 and in 61% in level 37. In level 35, 75% of the traces were linear scores with cupules, while the remaining 25% was a combination of linear scores, cupules and pits (**Figure 9**). This relationship may be explained by an intensive exploitation of the tools. Cases in which the traces were isolated or diffuse are rare.

Among retouchers, there were variations in the depths of the traces that could be associated with

the state of the blanks, whether fresh or of intermediate freshness. Although it is difficult to quantify, Mallye et al. (2012) suggest that some traces are shallower on fresh bone than on bones of intermediate freshness. The traces observed on the retouchers from Riparo Tagliente were fairly deep, suggesting a preference for bones with an intermediary freshness for use as retouchers.

Linear scores were mostly oriented transversely (0° - 30° and 150° - 180°) with respect to the main axis of the tool, which indicates that there was a standard positioning of the bone retoucher with respect to the flint edge. This observation was better represented in retouchers from levels 35 and 37. Scores oriented parallel or sub-parallel (60° - 90° and 90° - 120°) to the main longitudinal axis of the tool were rare in all three levels (**Figure 10**).

To sum up, with respect to the characteristics of the use areas, the favoured blanks for retouchers at Riparo Tagliente were diaphysis fragments from medium- to large-sized ungulates of intermediate freshness.

Grotta della Ghiacciaia

The raw material for retouchers at Grotta della Ghiacciaia is similar to Riparo Tagliente: red deer and

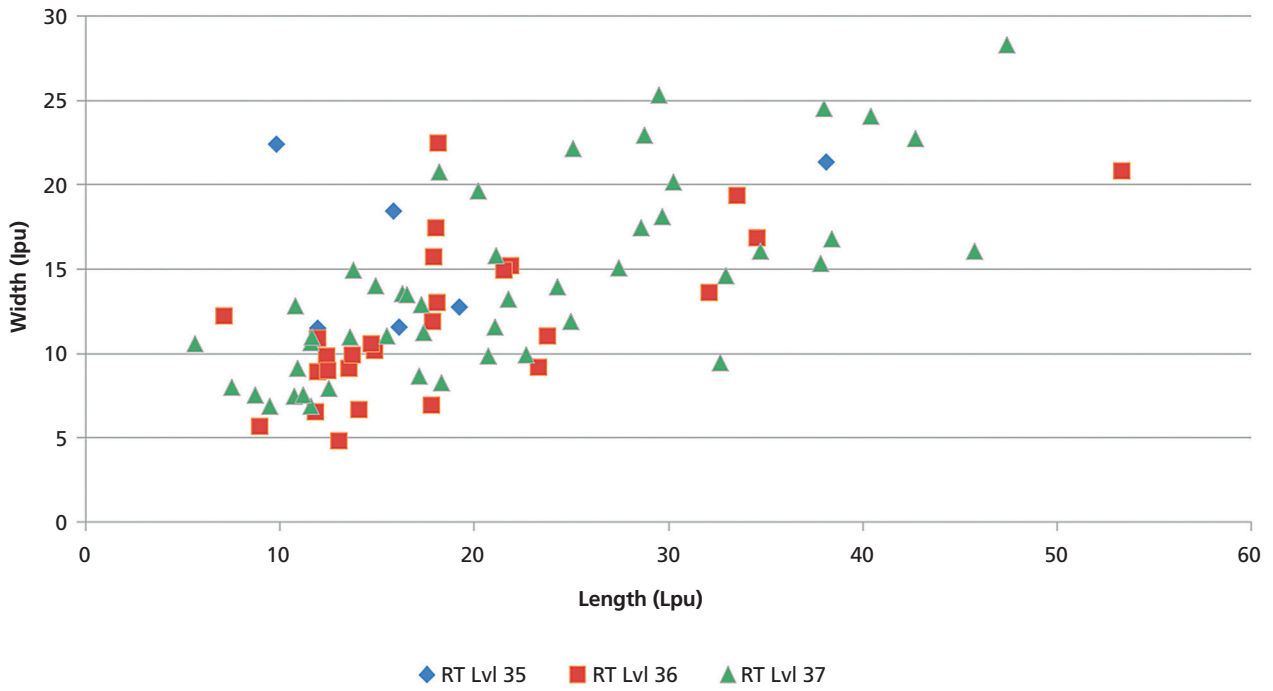


Figure 6 Ratio of length (Lpu) to width (Ipu) of the use areas in the three levels at Riparo Tagliente (RT). Lpu and Ipu are measured in mm.

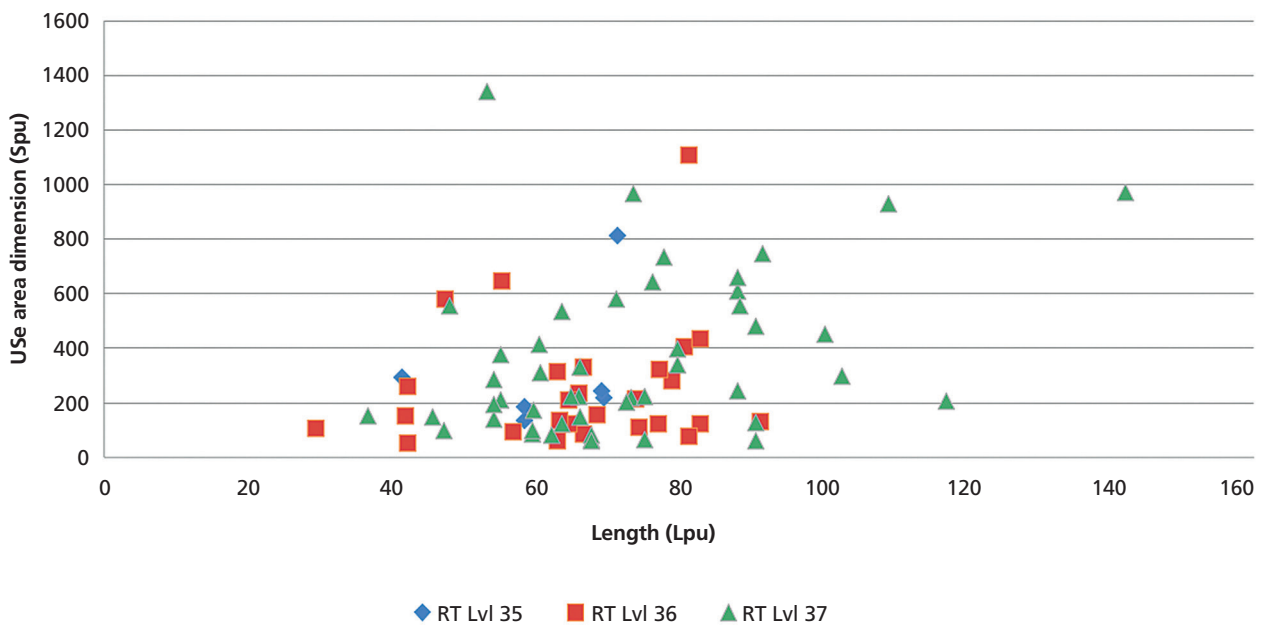


Figure 7 Ratio of the use areas dimensions (Spu) to length of the tool in the three levels at Riparo Tagliente (RT). Spu is measured in mm²; length is measure in mm.

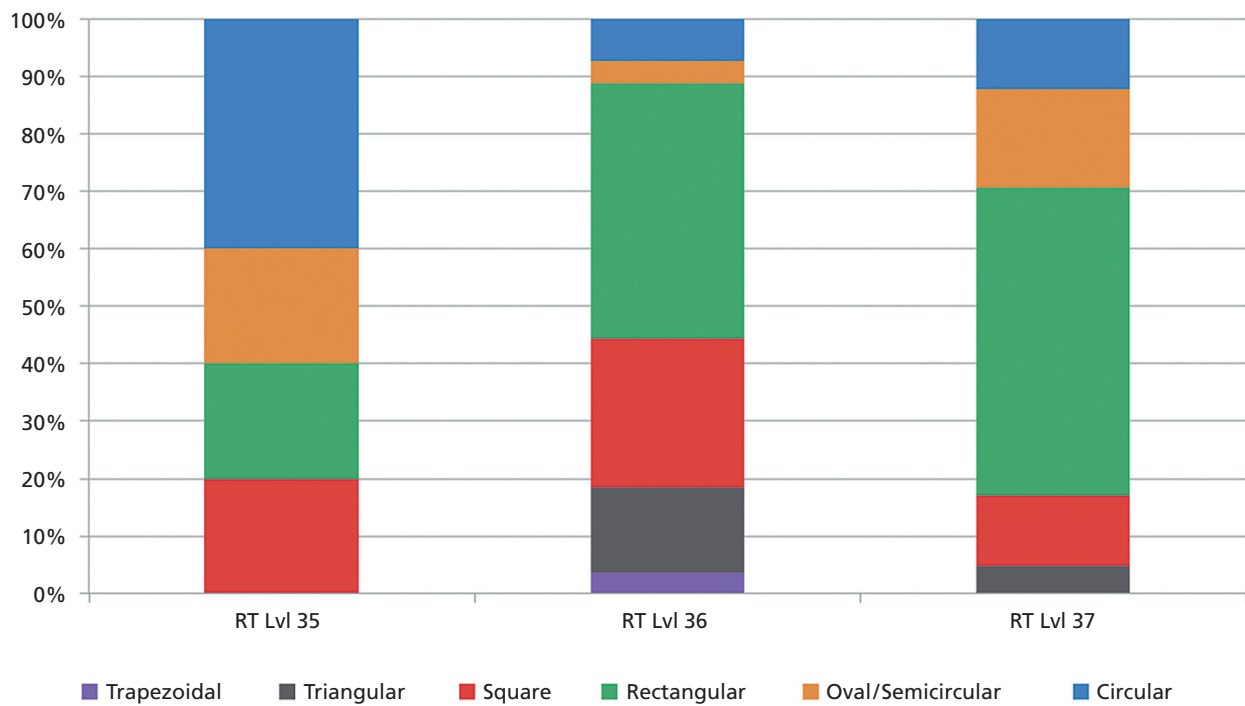


Figure 8 Percentage distribution of use area shapes on retouchers from Riparo Tagliente (RT). Total number of use areas = 74.

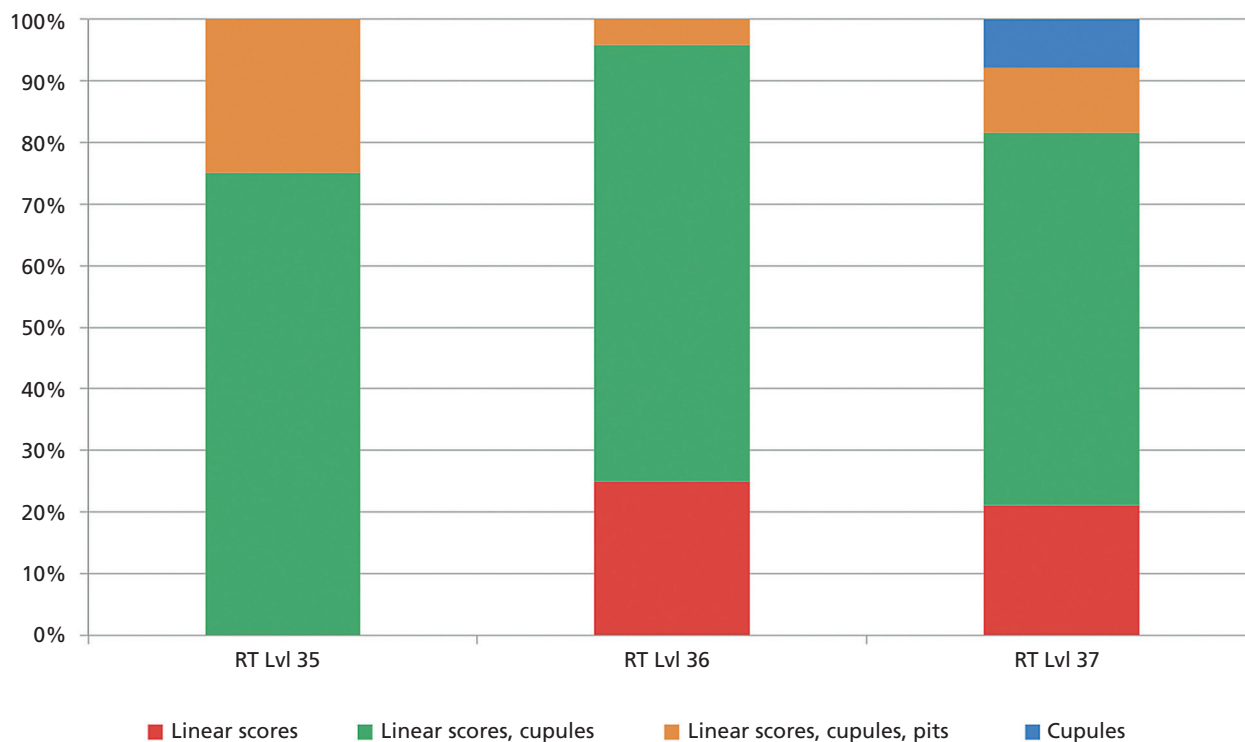


Figure 9 Percentage distribution of use trace types on retouchers from Riparo Tagliente (RT). Total number of use areas = 74.

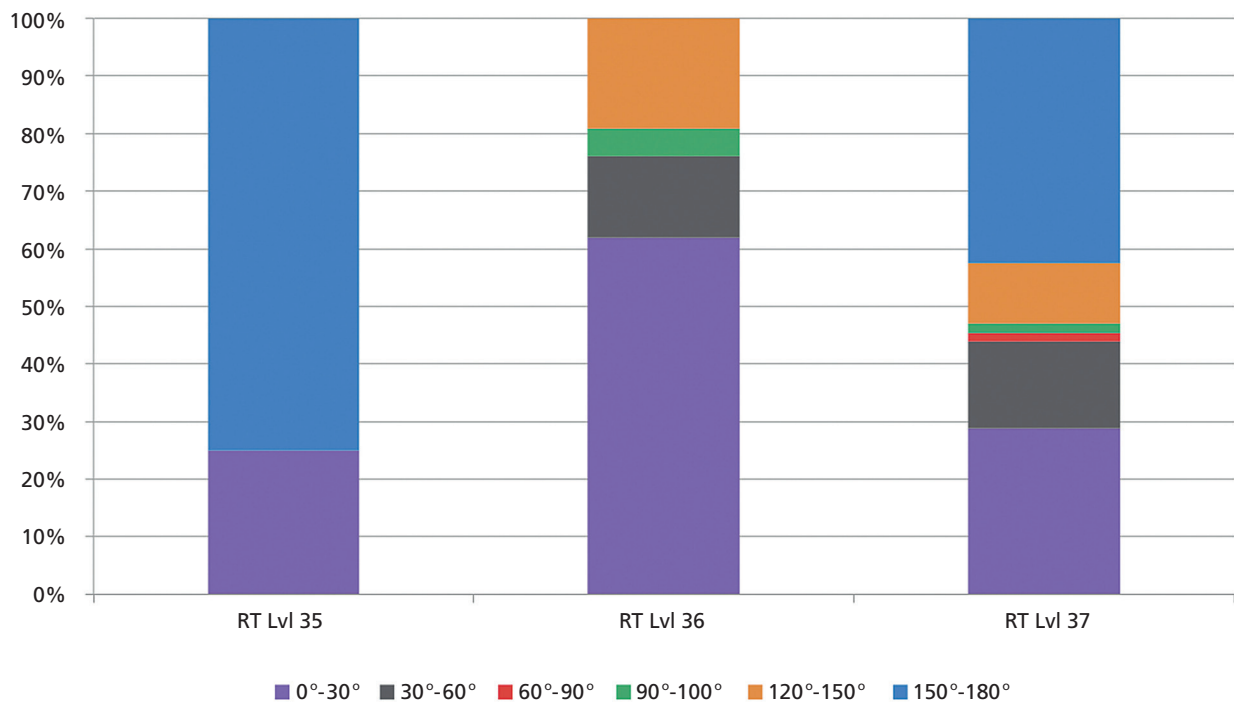


Figure 10 Percentage distribution of use trace orientations on retouchers from Riparo Tagliente (RT). Total number of use areas = 74.

aurochs/bison long bone diaphyses (Table 2). Two of the four retouchers were identified as red deer metapodia, the third is a metatarsal diaphysis of aurochs/bison, and the fourth is an unidentified diaphysis of large ungulate, likely aurochs or bison (see Figure 4; Figure 11).

All four retouchers were stained by manganese and iron oxides. The initial stages of weathering were seen on three of the four retouchers. The cortical surfaces on all four retouchers showed post-depositional trampling marks. These marks were mostly oriented obliquely to the main longitudinal axis of the bone and only a few were oriented transversely.

Out of the four retouchers, three had only one use area and the other had three use areas. Among the six total use areas, rectangular shapes were documented in two retouchers. Triangular, square, oval and circular use area shapes occurred only once each. Linear traces and cupules were observed together in two retouchers and separately in the other two retouchers. In three out of four retouchers, a majority of the linear traces were oriented trans-

versely (0°-30° and 150°-180°) to the main longitudinal axis of the tool. On the contrary, cupules on one retoucher were found to be oriented parallel to the main longitudinal axis. Obliquely oriented traces were less common overall.

Conclusions

The analysis of retouchers from Grotta della Ghiacciaia provided only qualitative information whereas Riparo Tagliente yielded both qualitative and quantitative data. The heavily fragmented bone retouchers from Grotta della Ghiacciaia were found to be impacted by post-depositional processes. Bone blanks of intermediate freshness from large ungulates seem to have been the preferred raw material for utilisation as retouchers. Riparo Tagliente is the more significant sample analysed here. Blanks of intermediate freshness were most frequently utilised and the best-preserved specimens were also from large ungulates.

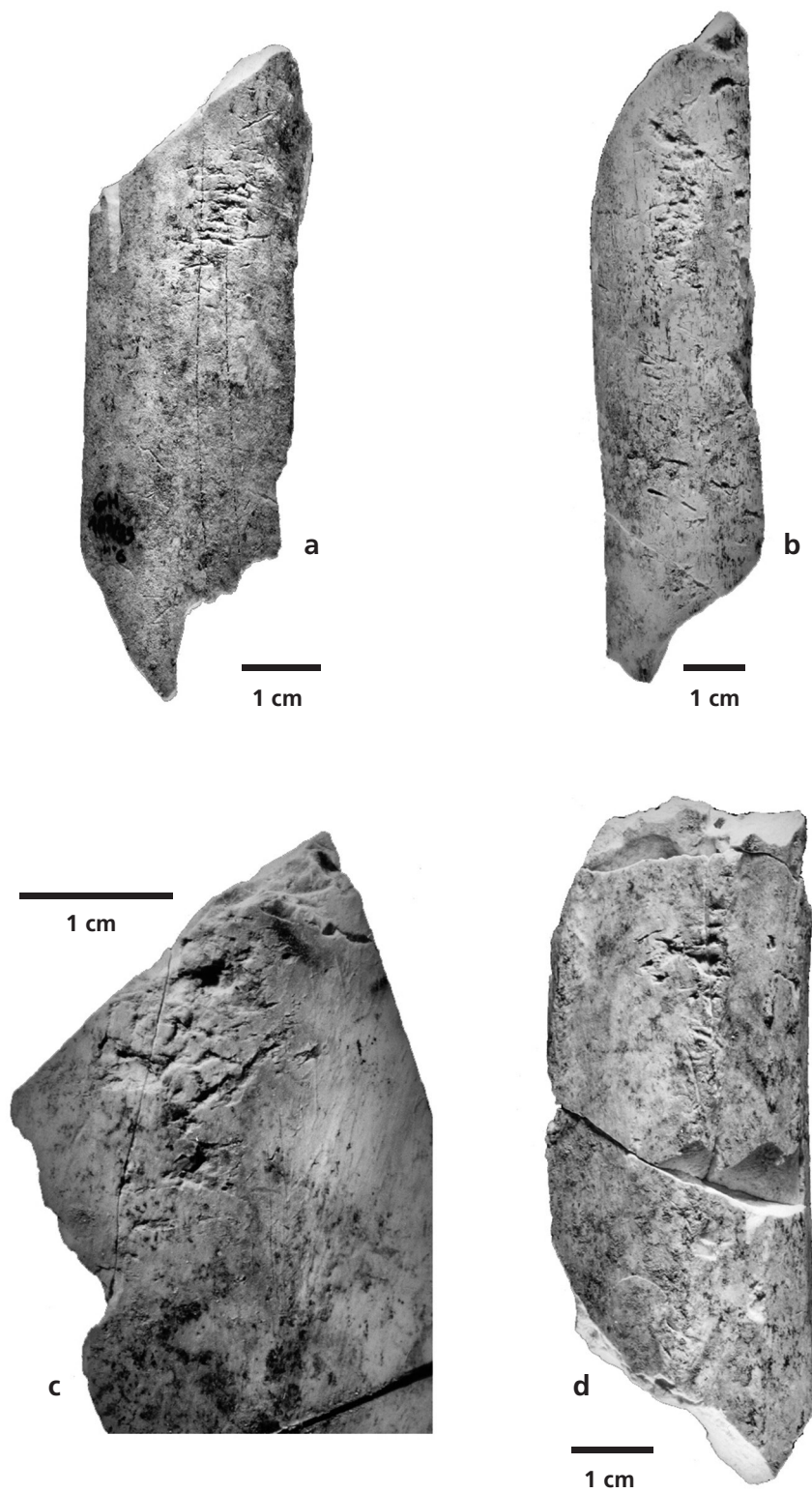


Figure 11 Retouchers on metapodial blanks (A, B), a large-sized ungulate diaphysis (C) and a tibia shaft (D) from Grotta della Ghiacciaia.

This was a preliminary study of retouchers from Riparo Tagliente and Grotta della Ghiacciaia. Future studies will address the completeness and original shape of the bone blanks, correlations between scraping marks and the use areas and the description of other traces and use areas in order to determine their relationship to knapping and/or butchery activities. These further studies, paired with an experimental programme, will clarify the association between bone retouchers and débitage methods at these sites and will aid in increasing our understand-

ing of the use of bone retouchers in northern Italy during the Upper Pleistocene.

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