



## TOWARDS A NEW PERSPECTIVE ON THE ROCK ART SITES-LANDSCAPE RELATIONS IN THE UPPER PALAEOLITHIC OF VALCAMONICA (N-ITALY).

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**ABSTRACT:** Valcamonica, an Alpine valley in Northern Italy, boasts one of Europe's largest concentrations of open-air rock art that had been produced over millennia, from the Upper Palaeolithic up to historical times. The richness and the long chronology of its rupestrian heritage pose crucial questions around the dynamic dimension of the rock art sites, according to the geomorphology of the territory and the selection of the rocks to be engraved, in the different chronological phases of the Valcamonica human occupation. Within the frame of the new research project PARC-Paesaggi dell'Arte Rupestre Camuna (Landscapes of Valcamonica Rock Art), we elaborate a DTM map providing a characterisation of the landscape surrounding those rock art and settlement sites attributed to the Upper Palaeolithic. This led to the recognition of some features linked to the two site typologies. Crossrelating the viewshed projections from LUINE.034, LCR.006 and Cividate Camuno hut, we access the intervisibility patterns among the sites, highlighting how the Valcamonica territory was conceived as a structured space, and performing a Least Cost Path Analysis we propose the optimal path between the living and rock art sites. Finally, this first step highlights how the implementation of the available data and the elaboration of PARC will provide a useful tool to investigate the dynamic aspects of the prehistoric Valcamonica, accessing the relationship with the environment resources, the landscape features and the cultural choices along the different rock art chronologies of the valley, and the taphonomy of the rock art too, favouring the elaboration of preservation plans in the future.

**Keywords:** Northern Italy; rock art; Alpine landscape; geomorphology; Late Pleistocene.

### 1. INTRODUCTION

#### 1.1. Prehistoric rock art and landscape

In the last 30 years, the study of the rock art context has become a main topic of investigation (Bourdier & Fuentes, 2015; Bourdier et al., 2017; Chippindale & Nash, 2004; Clottes, 1993a, 1993b; Jouteau et al., 2019, 2020; Nash & Chippindale, 2002; Ochoa & García-Diez, 2018; Ortega Martínez, 2014; Rodríguez-Rellán & Fábregas Valcarce, 2016; Sacchi, 1999; Sakamoto et al., 2020). Beyond the stylistic and chronological aspects, the attention paid to the analysis of the spatial features has permitted to get into different dimensions of rock art, including social, economic, ritual, cognitive, functional, taphonomic and ecological (Bourdier, 2013; Chippindale & Nash, 2004; Fairén-Jiménez, 2008; McDonald, 1998; Nash, 2011; Sigari, 2022; Sognnes, 1998; Walderhaug, 1998).

Together with portable art, rock art is the main source to approach non-literate societies in terms of cultural systems and provides a key tool for any archaeological and anthropological research to assess how ancient cultures responded to environmental change. Indeed, it is part of dynamic systems that involve both the changes in the environmental context and the cultural relationships of the populations that chose the site and signified it, acting within the landscape and the site

itself, and making rock art (Arsenault, 2004; Bourdier, 2013; Hartley & Wolley Vawser, 1998; Hyder, 2004).

Within the dynamic relationship between the artist/viewer and the physical environment, where the rock art is placed, several studies have been investigating at both macro and micro-scales, focusing on the relationships with the environment, topography and rock properties (see: Chippindale, 2004; Gjerde, 2006). Differently, other studies have approached the issue of how culturally driven choices might influence rock art locations: being rock art a visual production with strong implications in the communication systems of human groups it may respond to visibility and/or perceptibility reasons (see: Bourdier et al., 2017; Fossati, 2016; Jouteau et al., 2019).

Within this framework, the open-air rock art contexts are a valid object of study to access the information behind the artistic production, those social and cultural reasons that might have played a role in the selection of the sites and the themes, the use of the territory, and those environmental conditions that influenced the preservation of the rock art evidence. So, the open-air rock art heritage of Valcamonica in Italy represents a preferential case study to investigate the rock art-landscape-settlements relationships after the Last Glacial Maximum (LGM).

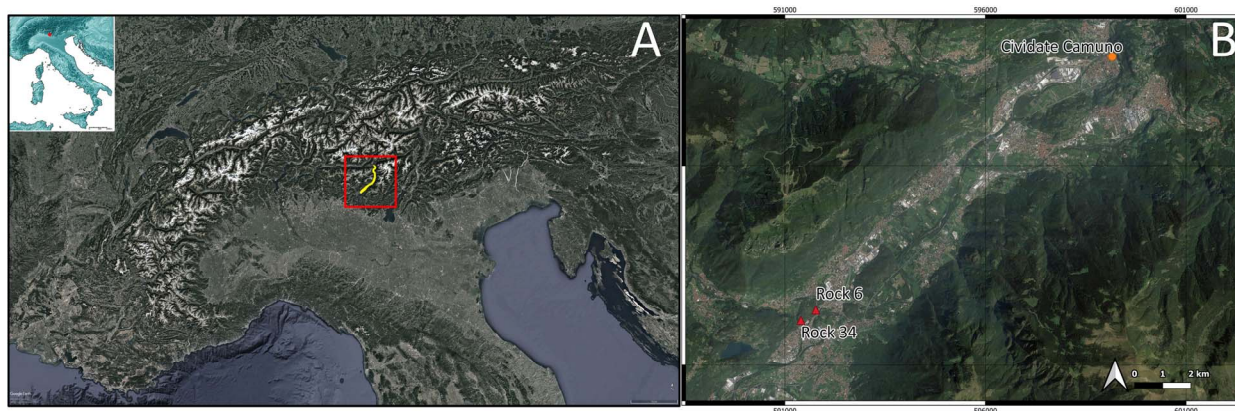


Fig. 1 - (A) Location of the Valcamonica (yellow) in the Italian Peninsula located in the southern sector of Italian Alps (red square). (B) Physiographic map with the location of the Palaeolithic engraved Rocks No. 6 and 34 of Luine Hill and the Cividate Camuno hut (map editing: L. Forti).

## 1.2. The Valcamonica landscape between the LGM and the Holocene

The Camonica Valley, commonly called Valcamonica, is a N-S narrow valley located in the Rhaetian Alps in Northern Italy. It develops from the headwaters of Tonale Pass toward the Iseo Lake in the province of Brescia and it is crossed by the Oglio River (Fig. 1). The valley has a typical U-shape profile that reveals the glacial origin. Reconstructions of the Palaeolithic landscape of the valley were provided by Pini et al. (2016) and Ravazzi et al. (2012). According to these authors, during the LGM, the valley was covered by the Oglio Glacier, which collapsed around 18.5-17.5 ka cal. BP. The deglaciation, with the melting of the ice masses and paraglacial activities, shaped the valley. Here, the onset of fluvial networks and slope instability reworked the unconsolidated sediments, and coalescent alluvial fans developed at the outlet of the lateral valleys and at the toeslopes of the valley walls. Furthermore, the maximum extent toward N of the Iseo Lake shore reached the area surrounding Cividate Camuno.

The subsequent climate amelioration of the Bølling-Allerød Interstadial (14.7-12.9 ka cal. BP) led to the development of an open environment characterised by coniferous forest with the timberline located at c. 1,700 m above sea level (a.s.l.), that lowered at 200 m a.s.l. during the Younger Dryas deterioration (12.8-11.7 ka cal. BP).

Finally, at the beginning of the Holocene the rise of temperature around 4-6°C led to better climatic conditions with the treeline located at 2,400 m a.s.l..

## 1.3. Valcamonica rock art

The human presence in the Valcamonica is witnessed by a unique heritage etched in the stone outcrops, with more than 300,000 engraved figures, belonging to a long chronology from the late Upper Palaeolithic to historical times (Anati, 1992; Arcà & Fossati, 1994; De Marinis & Fossati, 2012; Sigari & Fossati, 2021b).

The rock art, which is mainly located in the open-air, extends for c. 90 km along the whole length of the valley, on both sides with areas of primary clusters,

attributed to the three main areas into which the valley space is commonly divided: the lower, mid and upper valley.

The rock art of this valley constitutes an archaeological, artistic, ethnographic and historical heritage of inestimable value, inscribed in the UNESCO World Heritage List in 1979, making the Valcamonica the first Italian site and the first rock art site in the world to have the UNESCO World Heritage Site recognition (Fossati, 2003).

With its open-air rock art and the long chronology of human occupation, the Valcamonica cultural heritage reflects human behaviour in giving special meaning and values to certain places that lasted and changed over millennia. Understanding how much this attitude had been influenced by the landscape, according to its natural resources richness, visibility, accessibility, location of the rocks and how the cultural variable might have played is a new research field into which the new project *PARC-Paesaggi dell'Arte Rupestre Camuna* (Landscapes of Valcamonica Rock Art) wants to investigate.

The present paper reports the first step of this research project that was focused on those sites that are considered to belong to the most ancient human presence in the valley. Specifically, within this work, authors introduce the first results linked to the analysis of the most ancient phase of the Valcamonica occupation, including Rocks No. 6 and 34 (sometimes respectively named LCR.006 and LUINE.034, according to their registration code (see: Sigari, 2022)) in Luine hill and the Cividate Camuno Palaeolithic site (Fig. 1), to understand, according to the geomorphology of the Valcamonica, if the site locations may respond to visibility reasons, if and how they were crossrelated, and the valley space was culturally conceived by the first human groups that lived the valley.

## 2. HISTORY OF ROCK ART STUDIES

The rock art of Valcamonica was officially discovered at the beginning of the 20<sup>th</sup> century, thanks to the geographer Walther Laeng, who found and published the Cemmo boulders in Capo di Ponte (Laeng, 1914).

In the following decades, thanks to the anthropologists Raffaello Battaglia and Giovanni Marro, most discoveries in Valcamonica were made. However, only in the sixties and seventies, more attention was focused on the chronology of different phases of rock art, with the studies undertaken by Emmanuel Anati (Anati, 1975), Raffaele De Marinis (De Marinis, 1995), and others.

Over the last decades, the development of the documentation methodologies and the increasingly collected data have favoured further precision in the chronology of the Valcamonica rock art. So, researchers have been investigating the definition of the socio-cultural context in which the rock art was produced and the understanding of the meaning of some themes (see: Arcà, 2007; Arcà et al., 2008; Bossoni et al., 2016; De Marinis & Fossati, 2012; Fossati, 1991, 2015; Montanari, 2011; Sigari, 2016; Tognoni, 2007). In particular, the discussion has been focused on the beginning of the 4<sup>th</sup> Style of Valcamonica rock art and the attribution of the so-called '*oranti*', praying figures. Finally, in the very last few years, the review of the Palaeolithic engravings of Luine has led to discuss the concept of the "Proto-Camunnian" style (Anati, 1975; Sigari, 2022; Sigari & Fossati, 2021b). Indeed, the earliest phase of the rock art of Valcamonica shows connections at a large scale with more contemporary contexts, but nothing in common with the most recent phases. The earliest phase is not in continuity with the Holocene phases, it is not a proto-phase. So, the definition of "Proto-Camunnian" becomes misleading and has to be avoided (Sigari, 2022; Sigari & Fossati, 2021b).

### 3. THE FIRST HUMAN GROUPS IN THE VALLEY

#### 3.1. Palaeolithic rock art of the Valcamonica

Despite the high concentration of prehistoric rock art in Valcamonica, the number of graphic units attributed to the Upper Palaeolithic is very limited and concentrated only in two rocks, Rock No. 6 and Rock No. 34. According to Anati (1982), these figures portray only animal figures and number 10: 9 are on Rock No. 6 and 1 on Rock No. 34. The graphic units can be grouped into two categories: zoomorph (8) and unidentifiable (1). The zoomorphs are deer (2), elk (3), fish (3) and a generic caprid (Anati, 1982).

A recent review updated the number of graphic units up to 15: 2 deer, 3 elks (6 more elks are actually under-study), 2 fish, 1 caprid and 1 non-figurative motif (Sigari, 2022). Among the worth mentioning themes, we recognise the elk figures that disappear from the rock art production of the Holocene of Valcamonica. Conversely, more examples of elk representations can be found in the Palaeolithic parietal and portable art of Italy, respectively in the Caviglione cave and Tagliente shelter (Sigari, 2022), confirming the presence of the animal in the imagery of the human groups that lived in the north of the Italian peninsula after the LGM and possibly saw and hunted the animal, as witnessed in the Tagliente shelter (Fasser et al., 2022). Further elk representations can be found in the Palaeolithic art of Europe as already discussed both in (Braun, 2020) and (Sigari, 2022). These representations are a valid reference in the study

of the palaeoenvironment of the area, since their presence indicates the existence of open humid areas, rich in water, in the vicinity.

The 15 petroglyphs of Luine were chronologically attributed to the late Upper Palaeolithic graphic tradition according to their style, theme (especially for the elks, whose presence in the valley was limited to a very short period of time), and to the analysis of the palimpsests, i.e. the overlapping relationships with other motifs (Sigari, 2022; Sigari & Fossati, 2021b). In terms of graphic composition, all the figures, with the exception of the idol-form on LUINE.034, portray big size animal figures, traced with a main outline marking a disproportioned body and the description of secondary details, e.g. the eye, the nostril and the mouth. They have a strong naturalism and are overlapped by all the other petroglyphs attributed to more recent chrono-cultural horizons (inscriptions, warriors, cup marks, circles...) (Sigari, 2022; Sigari & Fossati, 2021b).

#### 3.2. The oldest human occupation of the valley

According to the literature, the human occupation of the valley during the late Upper Palaeolithic is witnessed only by two sites: the Cividate Camuno hut (Poggiani Keller, 1988) and Breno castle (Fedele, 1988).

The discovery of the Cividate Camuno hut offered an absolute date to what is the most ancient settlement found in Camonica valley so far, 13,805±440 BP 14C, 18,067-15,577 cal. BP (Poggiani Keller, 1988, 2010; Sigari & Fossati, 2021a). So it can be assumed that the bottom of the valley and the areas sitting at the lowest altitudes, including Luine, were freed by the glacier around 16-17 ka BP, offering new territories to be settled (Biagi, 2003; Ravazzi et al., 2012). The site is located on the left bank of the Oglio River, in a sheltered area under the Santo Stefano Cliff at c. 280 m a.s.l.

The second site attributed to the Epigravettian, according to the lithic assemblage found, is the Breno Castel site 3 (BC3) with its layer A2 (Biagi, 2003; Fedele, 1988). However, the few reported data and the absence of dating series to confirm the antiquity of the human occupation of BC3, invite us to prudently not take it into account for the moment.

### 4. METHODS

Preliminary geomorphological analyses were performed through remote sensing mapping to obtain a general flightview of the landscape into which the Palaeolithic sites of Valcamonica, i.e. Cividate Camuno hut, Rock No. 6 and 34 are. The two rocks are located c. 500 m apart from one another and so are considered two different sites.

Recent high-resolution satellite imagery was visualised and extrapolated from the QuickMapServices plugin (NextGIS, 2011) within QGIS 3.16 (QGIS Development Team, 2021). Digital terrain models-DTM at 5X5 m grid of resolution and the channel network and geological, geomorphological and structural elements were derived from the *GeoPortale of Lombardia* and from the geological sheet "Breno" (Regione Lombardia, 2020; Furlanetto et al., 2018) (Fig. 2).

Elevation-dependent colour scale, hillshade mod-

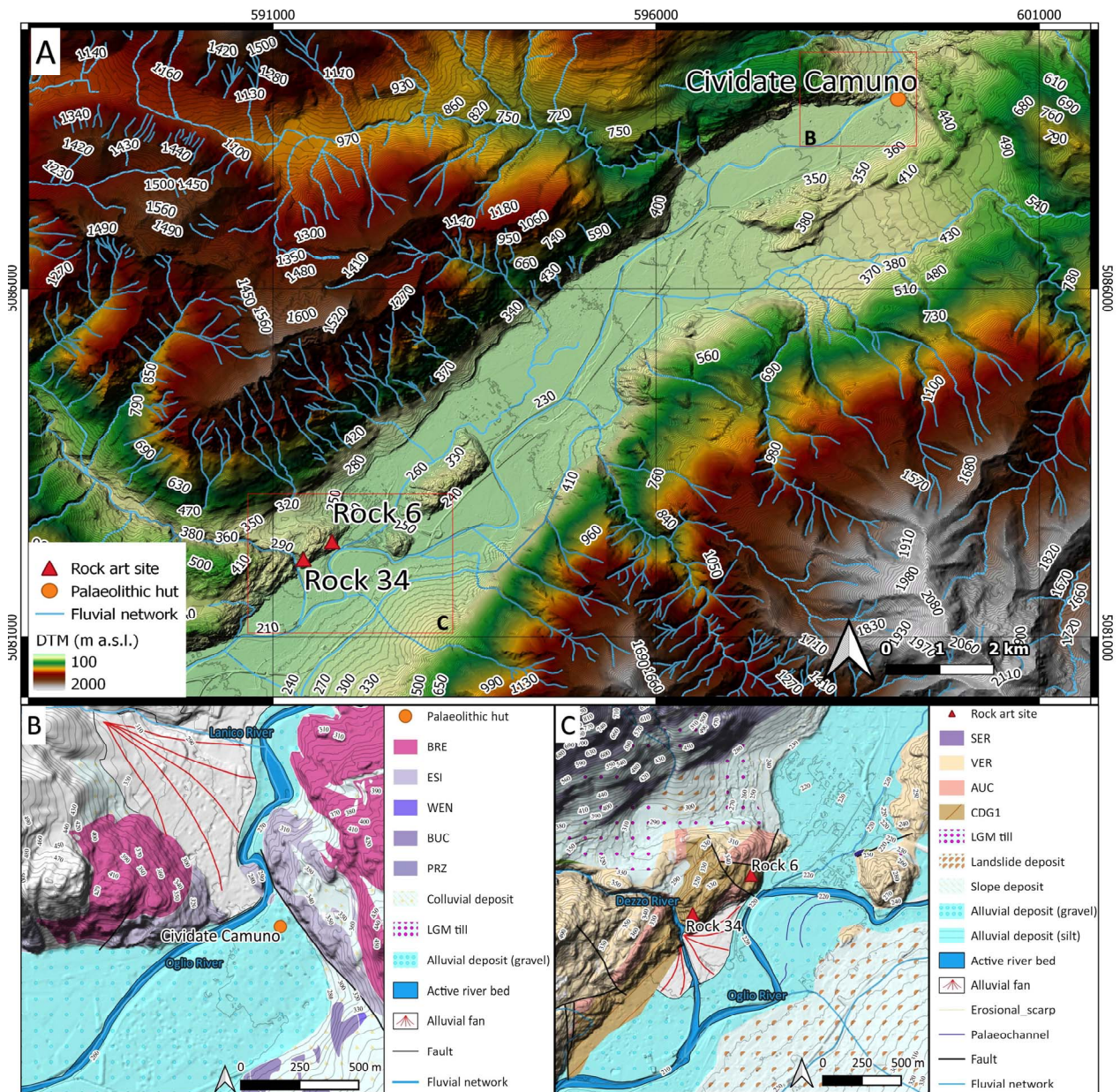


Fig. 2 - (A) Digital Terrain Model of the study area. (B) Schematic geological and geomorphological sketches of the area surrounding Cividate Camuno. The legend reports the acronyms of the bedrock as in the geological sheet "Breno": "BRE" Breno Formation (from here onwards: Fm.) (Lower- Middle Carnic), "ESI" Esino Limestone Fm. (Upper Ladinic-Lower Carnic), "WEN" Wengen Fm. (Upper Ladinic-Lower Carnic), "BUC" Buchenstein Fm. (Upper Anisian-Lower Ladinic), "PRZ" Prezzo Limestone Fm. (Upper Anisian). (C) Schematic geological and geomorphological sketches of the area surrounding the Luine Hill. The legend reports the acronyms of the bedrock as in the geological sheet "Breno": "CDG1" Pietra Simona Member of Dosso dei Galli Conglomerate Fm. (Lower Permian), "AUC" Auccia Vulcanite Fm. (Lower Permian), "VER" Verrucano Lombardo Fm (Upper Permian) and "SER" Servino Fm. (Lower Trias) (geological sheet "Breno" available at [https://www.isprambiente.gov.it/Media/carg/78\\_BRENO/Foglio.html](https://www.isprambiente.gov.it/Media/carg/78_BRENO/Foglio.html)) (map editing: L. Forti).

els and contour lines at 10 m derived from digital terrain models were elaborated to highlight the distribution of the landforms. In addition, an aspect model map, elaborated on the DTM-Digital Terrain Model, was employed to understand the directions of slope exposures, especially in the proximity of the sites

Topographic relationships between the sites and their intervisibility were investigated with a QGIS plug-in

for the viewshed analysis (Cuckovic, 2016). A viewpoint was fixed after identifying the observer's location which corresponds to the position of the sites. From here the reference DTM, a radius of 10 km, observer's height, 1.65 m were set up. Afterwards, the visibility analysis was started utilising a binary viewshed that returned two parameters of visibility and non-visibility indicated with the colour red (visible) and white (non-visible). After that

through the “r.mapcalsimple” tool of QGIS, each viewshed of Rocks No. 6 and 34, and Cividate Camuno was interpolated to extract a map into which the common view areas are highlighted.

Lastly, the pathways between the Cividate Camuno hut and the Luine Hill were investigated with the “Least Cost Path Analysis” plugin in QGIS to find the optimal path between two points in a raster.

All the data have been re-projected to WGS 84-UTM Zone 32N reference system.

## 5. PRELIMINARY RESULTS

### 5.1. Cividate Camuno: Geomorphological and archaeological settings

Cividate Camuno is located along the left banks of the Oglio River, in an area characterised by an upstream narrowing of the valley, where the river displays meandering plan geometry. This narrowing is associated with the development of an alluvial fan to the NW of the town, formed by the right tributary Lanico River that shifts the flow of the Oglio River towards SE, and by the action of the fault that borders the ridge NE Cividate Camuno. In the proximity of the town, the valley widens and the plan geometry of the Oglio River becomes less meandering and straight. From this point, the river flows through an alluvial plain composed of pebbles and fine sediments. Moreover, several colluvial and till deposits were recognised along the slope (Forcella et al., 2012) (Fig. 2B).

In the 80's, archaeological investigations carried out in 1988, 1992 and 1995, focused on the Roman house in via Palazzo in Cividate Camuno. The site is located close to an Oglio River bend, in a sheltered area under the Santo Stefano Cliff at c. 280 m a.s.l..

Here, different archaeological layers were ex-

posed, confirming the long use of the site since the late Upper Palaeolithic. Indeed, the stratigraphic sequence revealed a level dated to 13,805±440 BP, covered by a Mesolithic layer, over which lay, in order, a Neolithic (c. 6 ka BP) level, traces of a Copper Age frequentation (c. 2.5-3 ka BP), evidence of human presence during both Bronze and Iron Age, and finally the Roman house, whose foundations compromised the conservation of the Bronze and Iron Age layers (Poggiani Keller, 2010).

The extent of the excavated area is limited but, in correspondence with the so-called *vano 1*, under a thick sterile sandy level, which was interpreted as the effect of the river flooding (Poggiani Keller, 2010), a circular living area was brought to light. The size of this surface has a c. 5.6 m diameter and some traces, i.e. pole-holes, led to interpret it as the evidence of a hut.

Lithic industry, including short scrapers and a bipolar backed point (Biagi, 1997), and faunal remains, with the identification of deer, roe deer and ibex (Poggiani Keller, 2010), were recovered within the area. This material is currently under-review and we are confident that new important novelties will come out.

### 5.2. Luine Hill: Geomorphological, rock art and archaeological settings

The Luine Hill (45°53'17"N, 10°10'46"E) covers an area of approximately 850 x 600 m that is commonly divided into three parts/localities: Crape, Simoni and Luine. At the confluence of the Oglio and Dezzo Rivers, it reaches an altitude of 365 m a.s.l. (Anati, 1962, 1982; Laeng, 1956; Sigari & Fossati, 2021b). The hill is composed of the lower Permian sandstone of Pietra Serena, member of Dosso Dei Galli Conglomerate Formation (Assereto & Casati, 1965; Lombardi, 2006; Furlanetto et al., 2018) (Fig. 2C).

The geomorphological setting of the area was

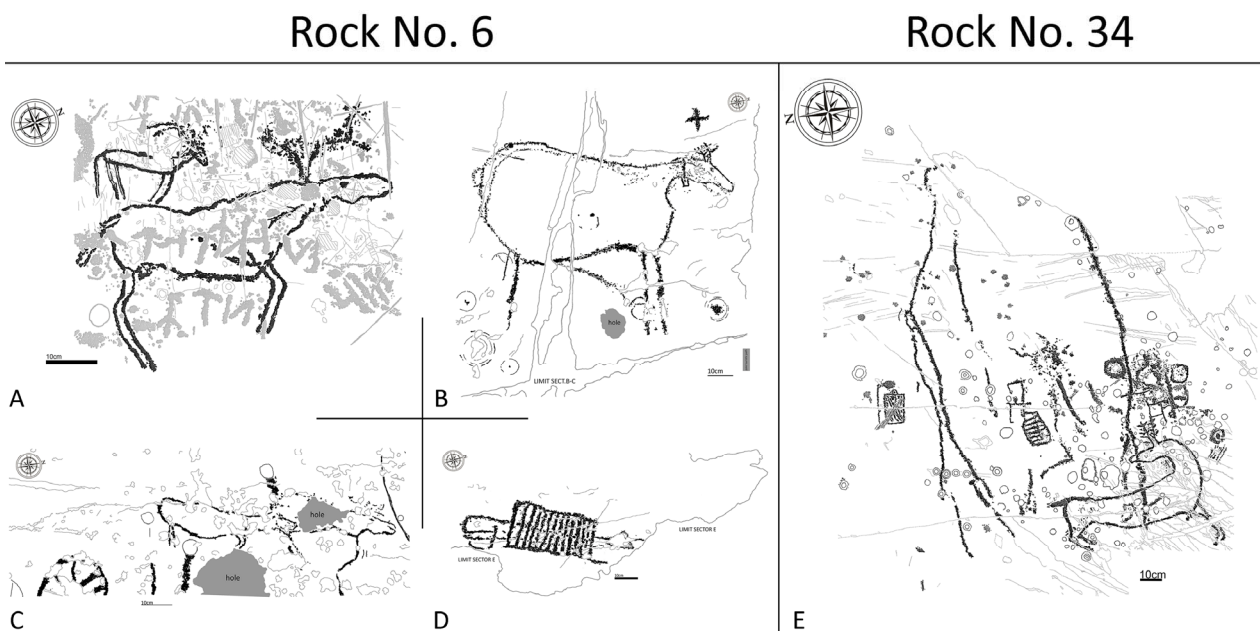


Fig. 3 - Tracings of the Palaeolithic engraved figures of Luine Rocks No. 6 (A-D) and 34 (E) (kindly provided by the Archaeological Cooperative Society “Le Orme dell’Uomo”).



Fig. 4 - Panoramic view over Rock No. 6 and the valley (photo: D. Sigari).

modelled after the melting of LGM ice masses. The hill is bordered to the east by the valley floor where the Oglio River flows in the alluvial plain with a meandering river planform. Here, the alluvial plain is composed of gravel and fine sediments. Despite the heavy anthropisation, with impactful urbanisation in this part of the alluvial plain, different palaeochannels were recognised in the inner part of the main meander, which is SW to Luine Hill. Differently, southwards, where the Dezzo River flows into the Oglio River, the wide alluvial fan shifts and influences the river shape of Oglio River with the development of a straight reach. Finally, west to the Luine Hill, at the footslope of the walls of the valley, till and slope deposits were recognised with several erosional scarps (Fig. 2C).

Thanks to its 102 engraved rocks, with c. 20,000 petroglyphs, Luine Hill boasts the third richest concentration of rock art of Valcamonica. Though all the engraved motifs belong to a long chronology, the majority of them date between the Neolithic and Bronze Age, in contrast with the mid-valley where most of the petroglyphs belong to the Iron Age. Among the main figurative themes of Luine we recognise zoomorphic, anthropomorphic, and geometric figures, other symbols including circles, meanders, spirals, zig-zags, labyrinths, and Camunian roses, weapons, shield-forms, and tools, idol-forms, topographics, dwellings and inscriptions. All these graphic units were engraved in the rocks, both pecking and scratching. Sometimes both techniques were used to do a figure.

Among the whole record of engraved rocks, two are worth mentioning, Rock No. 6 and 34, which have the most ancient petroglyphs of Valcamonica (Anati, 1974, 1975, 1982; Sigari & Fossati, 2021a, 2021b). The figures of this ancient period are very few and represent animals, mainly elk, deer, and fish figures, and a geometric motif that show features that tie them to the style and chronology of the Upper Palaeolithic art of Western Europe (Sigari, 2022; Sigari & Fossati, 2021a, 2021b) (Fig. 3).

To deepen the issue of the chronology and the use of the site, during the triennium 1968-1970, Anati and his team excavated 26 test pits to explore the possible presence of any archaeological deposit within the area of the hill. They discovered small deposits from the Neolithic, Bronze and Iron Ages (Anati, 1974, 1982). In the test pit N. 5, in front of Rock No. 53, archaeologists brought to light the residuals of a burning area, though no evidence of material culture were found associated with it. Nevertheless, Anati hypothesised that it would represent the most ancient stratigraphic layer, witnessing the human presence “soon after the retreat of the glacier” since it “probably dates back to the Pre-Boreal or beginning of Boreal, so c. 9,000 years ago” (Anati, 1982: 53).

### 5.3. Rock No. 6

Rock No. 6 (45°53'19"N, 10°10'58"E) is a large and wide rock outcrop on the north-eastern side of the Luine Hill. It is located in Crape at 290 m a.s.l.. The main en-



Fig. 5 - (A) Panoramic view from Rock No. 34 toward South over the valley to the Iseo Lake; (B) the deer with the turned head of Rock No. 34 (photos: D. Sigari).

graved surface slopes eastwards to the Oglio River. On its western side, the inclination of the rock changes to an almost vertical surface exposed to the west. LCR.006 measures 25 x 11 m. Rock No. 6 is situated just above an 80 metres high overhang, as such it is impossible to access it from the bottom of the valley. The only accessible way to reach it is from the west, following a relatively easy path along the eastern side of the hill (Sigari & Fossati, 2021b) (Fig. 4). The rock was discovered by G. Laeng and E. Süss in 1955. Three years after their brief report in the *Commentari dell'Ateneo di Brescia* (Laeng, 1956). E. Anati and his team started the recording of the rock, counting up to 342 figures (Anati, 1962, 1982). However, the scholar never completed the documentation work, admitting that “*It was a chore and remained incomplete*” (Anati, 1982: 7).

The main figurative themes of this engraved rock are: animals, topographic, inscriptions and weapons, circles. All of them were pecked and/or scratched.

#### 5.4. Rock No. 34

Rock No. 34 (45°53'11"N, 10°10'40"E) is a multi-faceted sandstone outcrop at an altitude of 315 m a.s.l. in the locality of Luine. It is one of the largest rocks within the Luine Hill and has one with the most abundant amount of engravings in Valcamonica. The LUINE.034 is set on the southern slope of the hill, dominating the lower part of the valley and the area of confluence of the Dezzo River and Oglio River. It can be accessed both from its upper part and from the lower section, according to the visit direction path (Sigari & Fossati, 2021b) (Fig. 5). The rock was fully brought to light in the early seventies, and, at the end of its cleaning, around 1,000 engravings were identified (Anati 1974; 1982). Among the most impressive graphic units found on this rock, there is a deer figure with the head turned backwards dated to the Palaeolithic (Sigari, 2022). The recent review undertaken by one of the authors (D.S.) showed

that the deer overlaps a big non-figurative motif, witnessing two graphic phases at least (Sigari, 2022). These graphic units are in the so-called sector A which corresponds to the most elevated part of the rock outcrop. The sector is westward oriented and is characterised by different figurative themes: animals, weapons, shield-forms, warriors. All of them were pecked and/or scratched. Conversely, the panel B that is southward oriented extends over a wider surface than panel A and has more figurative themes, including labyrinth, zigzag, and Camunnian rose which were all done from the Neolithic onwards.

#### 6. DISCUSSION AND FURTHER PERSPECTIVES

The first maps elaborated within the framework of the *PARC Project*, here presented and discussed, consider the evidence of the most ancient human presence in the Valcamonica, which seems to be datable soon after the LGM, i.e. around 17,000 years BP (see: Sigari, 2022).

At that time the valley floor of Valcamonica was completely occupied by the water of the paleolake of Iseo that reached the area just south of Cividate Camuno. Therefore, the landscape in which the Palaeolithic human groups lived at that time was characterised by water and steep walls of the valley. Within this scenario, the main topographic features visible from Cividate Camuno were the ridges that actually rise from the valley floor. One of these was surely the Luine Hill, which is at the footslope of the valley wall and in the correspondence of the junction of the Dezzo and Oglio Rivers, forming an elevated and protected place.

The abundance of water resources after the retreat of the glacier supports the chronological *terminus post quem* for the engraved elk figures that were probably inspired by the presence of this animal in the area at that time. To further strengthen it, we recall the elk re-

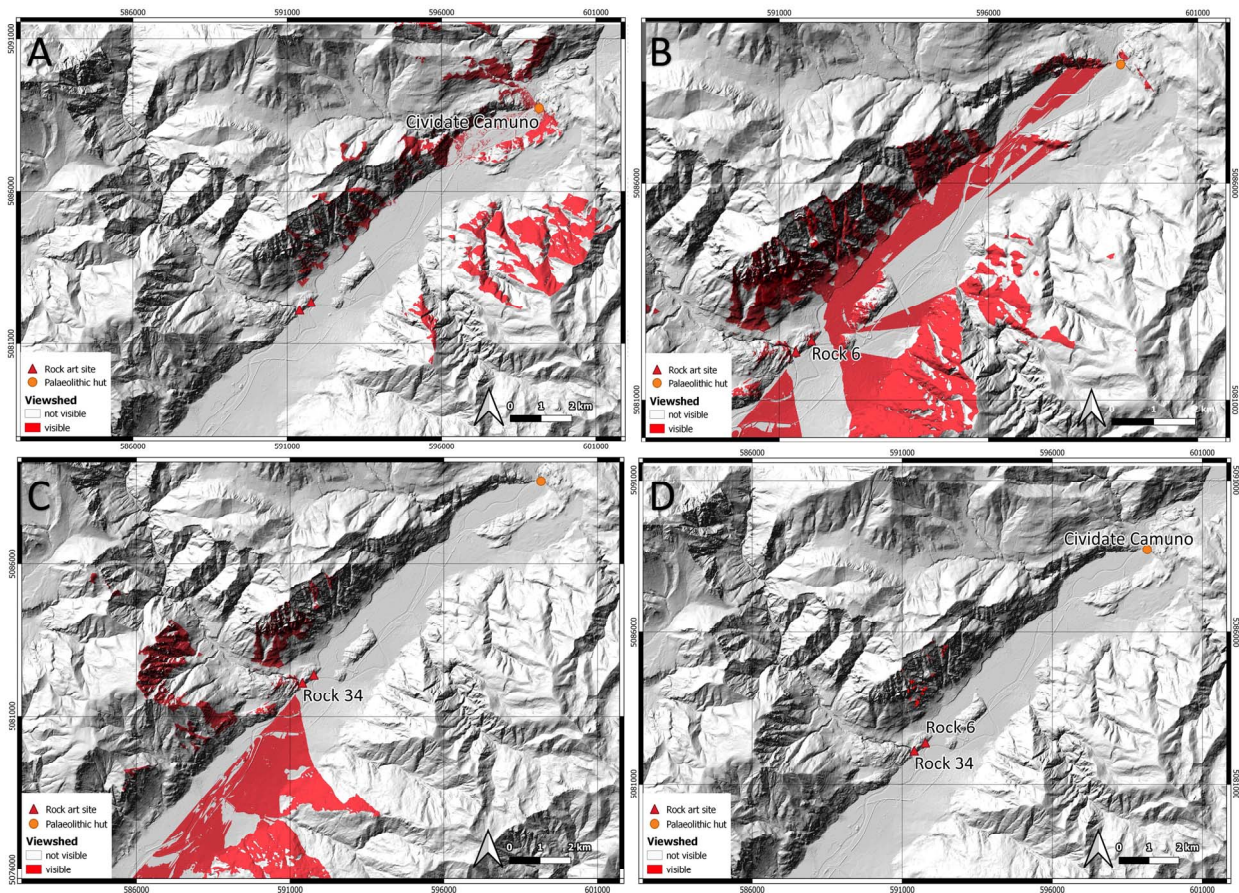


Fig. 6 - (A) Viewshed elaboration map where the visible and non-visible areas within a 10 km of circle buffer from the Cividate Camuno hut are reported. (B) Viewshed elaboration map where the visible and non-visible areas within a 10 km of circle buffer from the engraved Rock No. 6 of Luine Hill are reported. (C) Viewshed elaboration map where the visible and non-visible areas within a 10 km of circle buffer from the engraved Rock No. 34 of Luine Hill are reported. (D) Viewshed elaboration map where the common visible areas from all the three considered sites are reported (map editing: L. Forti).

mains from the Tagliente shelter dating back to between c. 17-14 ka BP (Fasser et al., 2022).

To provide a characterisation of the post-LGM Palaeolithic landscape surrounding the selected sites, the DTM map clearly enhances the features of the Camonica Valley, which is an alluvial valley with very steep sides (Fig. 2). The DTM served as well as a base-map to understand some key issues, i.e. where the sites are, what the relationship between landscape and rock art is and how the rock art was spatially organised into the valley space if there was any relationship between the symbolic space and the living areas and finally between rock art and visibility.

What emerges so far is that the living area is at the bottom of the valley under the Santo Stefano Cliff and close to the river, at a lower altitude, in order to have the best protection and the easiest access to water resources too. Differently, the position of the engraved rocks on the hill sides and the edge of an overhang favours a wide view over the surrounding territory, but a scarce, almost unfeasible view over the sites from the bottom of the valley.

Assuming that the Cividate Camuno hut and the

engravings of the Luine Hill were done in the same period, and aiming to understand any mobility system between the two sites, the cross correlation between palaeoenvironmental reconstruction and preliminary geomorphological analysis suggests that possible linking routes were located on the right footslope side of the valley, that was some metres above the level of the actual alluvial plain.

Furthermore, with the goal of establishing the existence of any visibility pattern between the rock art and settlement sites, and any intentionality in terms of territory control from them, we used the viewshed analysis to estimate the visibility range from each site over the surrounding territory. The hut location in Cividate Camuno offers a limited view over the valley and the control area does not cover all of the Luine Hill area (Fig. 6A). Differently, from the elevated position of Rock No. 6, the viewshed projection highlights a visibility area that reaches the vicinity of the Santo Stefano Cliff, under which the hut was found (Fig. 6B).

The location of Rock No. 34 on the southern slope of the Luine Hill excludes any territory control to the north. Nevertheless, it provides a preferential view over





Fig. 7 - (A) View over the valley from Rock No. 6 (photo: D. Sigari). (B) Historical photo taken during the first documentation activities of Rock No. 6 (photo kindly provided by the Historical Archive of the Centro Camuno di Studi Preistorici, EUR62:LXXX-10). The white arrows point common key-elements of the landscape surrounding Rock No. 6, that clearly show how much the landscape has changed and the urbanisation has grown during the last 60 years (editing: D. Sigari).

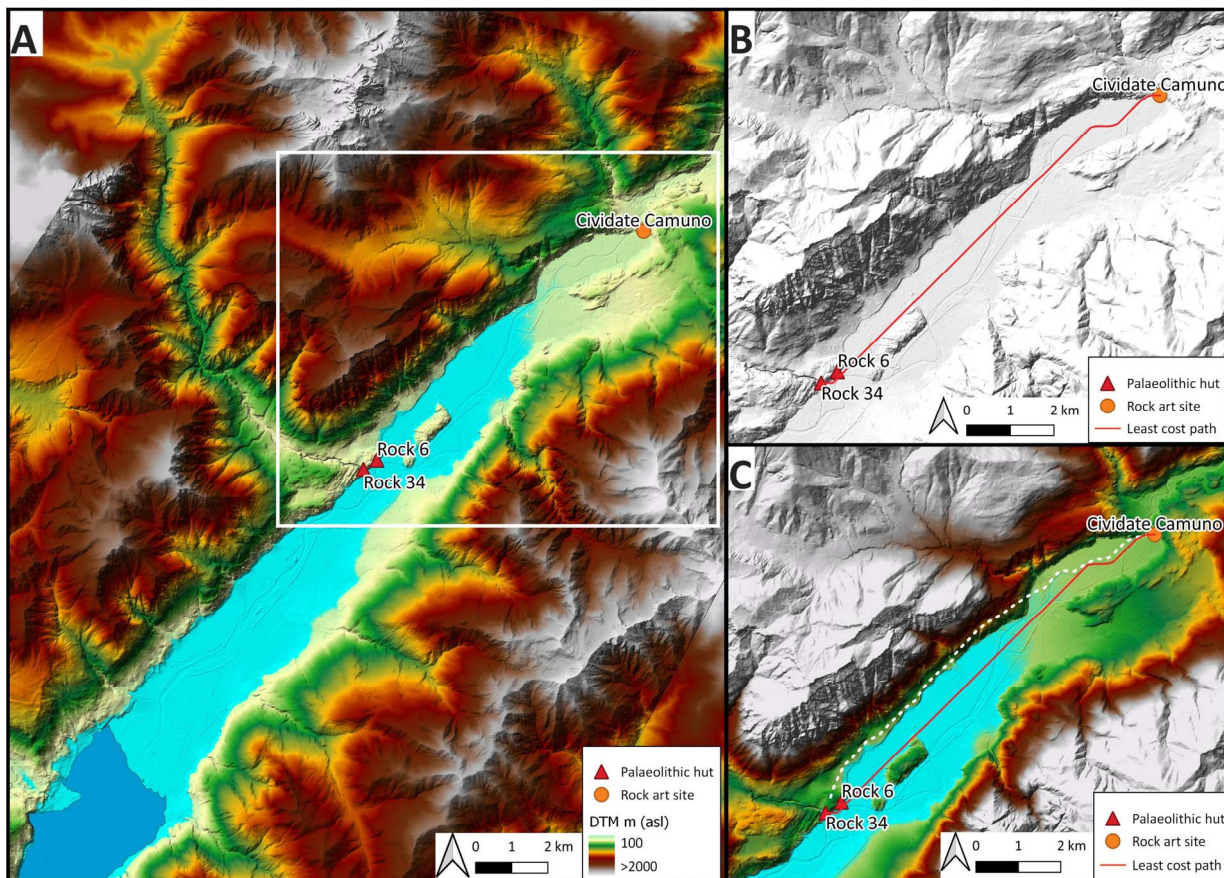


Fig. 8 - (A) Digital Terrain Model of the lower sector of Valcamonica where the Palaeolithic paleoshore of the Iseo Lake based on the reconstruction by Pini et al., (2016) is reported in light blue. The dark blue colour indicates the actual shore of the lake. (B) Least cost path analysis applied to the study area between Cividate Camuno and Luine Hill. (C) Interpolation of the ancient shore line of the Iseo Lake and the least cost path analysis. With the white dash line we hypothesised a possible road that connects Cividate Camuno and the Luine Hill rock art site (map editing: L. Forti).

the valley till the Iseo Lake for some kilometres. Furthermore, the Palaeolithic engravings of LUINE.034 are on an almost vertical panel, which faces the west. So, hiding the figures from the bottom of the valley and making them visible only to the viewers who get close to it is evident (Fig. 6C).

The invisibility of the engravings from a distance invites us to consider cultural choices in selecting hidden places from where there is a good view over the surrounding territory, but that requires a displacement to the site. So, the concept of private and public art in the Valcamonica rock art, which has recently been sketched in a paper about the Holocene parietal evidence (Fossati, 2016), seems to be finally relevant in approaching the Palaeolithic rock art too.

More comparative cultural suggestions that may confirm the intentional selection of specific hidden sites can be found in the ethnography, where scholars report how some populations chose isolated places with a panoramic view of the surrounding landscape (e.g.: Loubser, 2010; Sundstrom, 2006).

To check and establish any intervisibility pattern among the selected sites and to understand the use of

the landscape and the relationships among the rock art and settlement sites, we crossrelated the viewshed projections from LUINE.034, LCR.006 and Cividate Camuno hut highlighting how the commonly visible areas are almost absent and limited to a few steep points on the right hydrographic bank and on escarpment edges of the Altissimo Mountain (Fig. 6D). Therefore, the almost total absence of common intervisibility points reinforces the idea of driven cultural choices in selecting isolated and hidden sites to produce parietal engravings during the Palaeolithic. The Luine rock art of the Pleistocene responds to limited access and visibility rules. In other words, it was not public art but required knowledge of the place, and the maker/viewer was obliged to go on the site to finally access the panel.

Undoubtedly, the issue of visibility is strictly linked to the changing landscapes. Difficulties in advancing hypotheses based on the modern landscape of Valcamonica are clearly evident already by the use of historical photos, which show how much the anthropic impact transformed the valley aspect during the last 80 years (Fig. 7). Therefore, it is easy to imagine how much the Valcamonica landscape has changed over the last 17

millennia, both for climatic and environmental reasons and for anthropic actions. However, despite the almost lack of data for prehistoric times, we can reasonably consider how dynamic environmental conditions may have favoured the selection of the rocks, the accessibility to the sites and the visibility among them. So, according to the previous literature, we can suggest that the amelioration of the climatic conditions and the subsequent environmental changes led to differently characterise the visibility patterns within the valley space. If after the LGM an open environment characterised the valley, possibly exposing the sandstone outcrops and/or facilitating the intervisibility between the sites, later the expansion of the timberline at lower altitudes reduced any visibility pattern.

So, the Valcamonica territory was possibly conceived as a structured space with living areas which were easily accessible going upriver, and ritual places which were hidden and required the knowledge of the valley to access the rock art.

Finally, crossrelating the DTM elaboration with the paleoenvironment reconstruction based on what was reported in Pini et al. (2016) (Fig. 8A), and the Least Cost path analysis that highlights the fastest and easiest path connecting Cividate Camuno and Luine Hill (Fig. 8B), we suggest that the possible path, between the Cividate Camuno hut and the Luine Hill followed by the first settlers of the valley, run along the western foothills of the valley beside the paleolake shore (Fig. 8C).

Surely, we are aware that we could take into account only very little data. However, we keep an open mind to further integrate any novelty that may implement our knowledge about the first settlers of the Valcamonica. Moreover, we consider the implementation of the record as a useful tool to evaluate more parameters such as the terrain orientation to analyse the taphonomic impact on the rock art preservation according to the vegetation growth, humidity, weathering and anthropic impact.

Indeed, the elaboration of the topographic parameters through the application of the automated plugin QGIS at a higher resolution with a bigger number of data will certainly provide more interesting information. To do that, the PARC project that we are undertaking considers approaching more recent chronologies of the Valcamonica rock art too. The next focus will be the Paspardo territory in the mid-valley, where there is a higher concentration of engraved rocks with images belonging to different phases. This approach will consider a multi-scale analysis that will permit to access the relationship with the environmental resources, the landscape features and the cultural choices along the different rock art chronologies of the valley.

Therefore, we are confident that the newly started PARC project will finally provide new insight into the dynamic aspects of the rock art both in Valcamonica and other open-air contexts, tracing new research avenues for the archaeology of Valcamonica and the rock art research.

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