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Integration of natural stone features and conservation of the Upper Palaeolithic Côa Valley and Siega Verde open-air rock-art

António Batarda Fernandes ^a, Mário Reis^b, Cristina Escudero Ramirez^c and Carlos Vázquez Marcos^d

^aEducational Services at the Foundation, Fundação Côa Parque, Rua do Museu, Vila Nova de Foz Côa, Portugal; ^bResearch Department, Fundação Côa Parque, Rua do Museu, Vila Nova de Foz Côa, Portugal; ^cServicio de Planificación y Estudios, Dirección General de Patrimonio Cultural de la Junta de Castilla y León, Avda. Monasterio Nuestra Señora de Prado s/n., Valladolid, Spain; ^dSiega Verde Archaeological Site, Calle del Tejar, Villar de la Yegua, Vila Salamanca, Spain

ABSTRACT

This paper considers the established phenomenon of the integration of pre-existing natural features into Western European Upper Palaeolithic parietal imagery, aiming to present a preliminary inventory of such cases in the Côa Valley and Siega Verde rock-art sites. Attention is also given to other cases at these sites from which it can be inferred that areas of the engraved surfaces persisted since the original motifs were made until today in quite reasonable condition. It is concluded that the present research further emphasizes the complex traits behind the creation of Upper Palaeolithic artistic motifs in both the Portuguese and Spanish sites, and also suggests a reasonable preservation rate of Côa and Siega Verde rock-art.

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Introduction

The incorporation of natural features of rock surfaces, such as shapes, fissures or even fractures, is a known aspect of Upper Palaeolithic Western Europe rock-art, particularly of cave art (Alcalde del Río, Breuil, and Sierra 1912; Breuil 1985, 51–73; Leroi-Gourhan 1992, 273–288, 351; Ewing 1997; Groenen 2000). A few monographic studies are available on the matter, such as those dedicated to the Font-de-Gaume Cave – in which the concept of integration is proposed to describe ‘the often found correspondence between the surface rock relief and the outlines of the animals depicted’ (Ogawa 2005, 117) – and to the Horse Gallery at Tito Bustillo Cave (Balbín Berhmann and Moure 1980). Likewise, there is Martínez Bea’s (2001–2002) analysis of a single figure at El Castillo Cave. Occurrences of such cases at open-air sites of the same spatio-temporal context have received less attention, probably due to more

recent discovery and relatively low numbers, when compared to cave sites that have preserved much better, at least until public exposure (Zilhão 1998, 195–198).

Cave sites are evidence of the geological permanence of the karstic dynamics that produced them and ultimately provided the canvas that pre-historic artists painted and engraved upon. For instance, the Altamira ceiling humps where bison were depicted by Upper Palaeolithic artists taking advantage of those pre-existing natural features, have kept their original appearance for the last circa 15,000 years (Múzquiz and Pérez-Seoane 1988, 304; Bahn 2010a, 140). Hence, it can be suggested that present conservation issues affecting cave sites have more to do with human impact in such delicate environments, as discovery exposes sites to public interest, triggering or enhancing biodeterioration processes (but see Bahn 2010a, 170–196). Conversely, it is proposed that the main issue facing the survival of open-air rock-art, once identified and targeted by continued preservation efforts, lies in physical alteration processes (Fernandes 2014) – although it is obviously not immune to human impact, and notwithstanding increased pressure on sites due to economic development and overall large-scale resource procurement in the last two centuries.

The research presented here draws on the Upper Palaeolithic imagery of the Côa Valley (Portugal) and Siega Verde (Spain) rock-art sites with the aim of identifying and producing a first inventory of pre-existent natural shapes that were taken advantage of by Upper Palaeolithic artists to integrate with their engraved motifs. To that end, the chronology and interpretation of such motifs are examined, as are the techniques employed in their production. Moreover, inferences regarding the survival of the rock-art corpus present at both sites are discussed.

The Côa Valley and Siega Verde rock-art sites

The prehistoric rock-art sites in the Côa Valley and Siega Verde (www.arte-coa.pt ; www.siegaverde.es/) are recorded in UNESCO's World Heritage List as a 'trans-boundary property' (UNESCO 2015) because they are located on either side of the Portuguese–Spanish border in, respectively, the district of Guarda and province of Salamanca, and are distanced some 50km apart. While the Côa Valley was placed on the World Heritage list in 1998 (in the wake of its discovery in 1994 and a subsequent battle for preservation, threatened by the construction of a large dam on the Côa River: Baptista and Fernandes 2007), Siega Verde attained such status in 2010 as an extension of the Portuguese site (Fernández Moreno and Burón Álvarez 2011; Burón Álvarez and Del Val Recio 2013).

Siega Verde rock-art is closely related to that of the Côa Valley. The site occupies a relatively small area, mostly along the left bank of the Águeda River, which, like the Côa River, runs from SE to NW. Both rivers are left margin tributaries of the Douro. In the Portuguese site about 80 different rock-art sites (comprising more than 1200 engraved outcrops, with motifs ranging from the Upper Palaeolithic to the present) have been identified, distributed along both

banks of the last 30km of the Côa and a few kilometres more alongside both margins of the Douro, right after the Côa's mouth (Reis 2014). Siega Verde possesses 91 engraved outcrops concentrated in an area just one kilometre long featuring imagery solely attributable to the Upper Palaeolithic (Alcolea González and Balbín Berhmann 2006).

Dating the Côa and Siega Verde rock-art

As methods for direct dating of engraved rock-art are unreliable (Pope 2000), the Côa rock-art was, in the first instance, attributed to the Upper Palaeolithic by means of stylistic similarities with well-dated art of the same period from sites located in France and Spain, either in caves (the majority) or in the open-air (Baptista 1999, 2009). Fortunately, in 1999, a large decorated outcrop (Fariseu Rock 1) was found with almost all of its 94 engraved individual zoomorphic motifs covered by sealed archaeological deposits. The oldest of these layers covering the engraved motifs has been dated using C-14 to 18,400 BP (Aubry, Santos, and Luís 2014). Nevertheless, it is believed that the oldest rock-art was created a few millennia before, considering that the presence of anatomically modern humans in the region consistently dates back to at least 30,000 BP, as well as the stylistic parallels mentioned above (Aubry and Sampaio 2008). Neither the good fortune of finding such well-preserved archaeological layers covering an engraved outcrop such as Fariseu Rock 1, nor even the emergence of a 'Post-stylistic era' in rock-art studies (Lorblanchet and Bahn 1993), renders stylistic analysis irrelevant. It is believed still to be quite useful for establishing more reliable chronological contexts for rock-art when combined, as feasible, with other currently available dating methods: especially if a rapprochement, widely accepted by rock-art scholars, in the application of both practices takes place – something that has not always been the case (see for instance Pettitt and Bahn 2015 contra Quiles et al. 2016).

At an initial stage of research, it was proposed that the Côa Valley rock-art of Upper Palaeolithic chronology would fit into two main artistic periods: a Gravettian-Solutrean period, circa 25,000 to 20,000 years BP, and a Magdalenian one, closer to the end of the Pleistocene era (see for instance Baptista 1999). More recent insights have put forward the hypothesis of not two but three distinct artistic sub-periods: Gravettian-Solutrean, Solutrean-Magdalenian and Late Magdalenian (Santos 2012, 46). Spanish researchers have proposed that rock-art production at Siega Verde lasted from the Gravettian-Solutrean until the Late Magdalenian (Alcolea González and Balbín Berhmann 2006; Balbín Berhmann and Alcolea González 2014, 604; Bueno Ramírez, Balbín Berhmann, and Alcolea González 2008, 259). It is also believed that the most ancient period is not as old as that of the Côa: the earliest motifs are thought to have a chronology of around 20,000 to 18,000 years BP. Such chronological classification is not solely based on the styles suggested by Leroi-

Gourhan, since data arising from the excavation and dating of the different layers that covered Fariseu Rock 1 at Côa can also be applied to Siega Verde. The most represented period at Siega Verde, both in number of engraved surfaces and of motifs, indicates a chronology that corresponds to the shift between the Solutrean and the Magdalenian. A smaller number of motifs are believed to belong to the Late Magdalenian, namely in the central and north sections of the site (Vázquez Marcos 2014, 2015). As in the Côa, this transition period is characterized by a small but relevant group of small-sized, fine-line incised zoomorphic and non-figurative motifs, often made on top of older engravings. This period, which is believed to correspond to the end of the Upper Palaeolithic (Magdalenian/Azilian), has also been documented at other Iberian open-air, cave and sheltered rock-art sites ranging from 11,500 to 9,000 years BP (Bueno Ramírez, Balbín Behrmann, and Alcolea González 2008, 279; Reis 2014, 38, 42).

Artistic themes at Côa and Siega Verde

Regarding thematic characteristics of the Pleistocene Côa Valley rock-art, large mammals constitute the subject of choice, with aurochs, wild goats,¹ horse and deer being the four most represented species. The least depicted motifs include fish and chamois. Whilst the first three of the most represented species were more abundantly engraved in the archaic Gravettian-Solutrean period, deer are more common in Magdalenian art. Anthropomorphic depictions, although rare, are all from this later period (Santos 2012). Other animals present at Western Europe rock-art sites of the same chronology, such as bison, mammoths or woolly rhinoceros, are absent.

Overall, rock-art in Siega Verde is stylistically and technically akin to the Côa Valley (and Western European) Upper Palaeolithic rock-art. As in the Côa, the engraved motifs overwhelmingly depict large quadrupeds, namely horses (which account for half of the depictions), deer, aurochs and goats (Alcolea González and Balbín Behrmann 2007, 519–520). Among the specificities of the site, Spanish authors note the existence of depictions that are otherwise uncommon in the context of Upper Palaeolithic art in the Iberian Meseta, among which the representation of a single canid stands out (Alcolea González and Balbín Behrmann 2006, 182, 231).

Conservation of rock-art at both sites

A large portion of the area constituting the Portuguese site is composed of low to medium grade metamorphic formations (mostly meta-greywaches and schists) resulting from regional metamorphism processes. Exposure of the surfaces that were used for rock-art inscription results from river down-cutting processes. The metamorphic bedrock created 'ideal' surfaces for rock-art, as hydraulic pressure caused the emergence of smooth vertical panels taking

advantage of previously existing well-defined and recurrently oriented regional diaclasses (fracture) families (Aubry, Luís, and Dimuccio 2012; Ribeiro 2001).

Recent research on the conservation of the Côa rock-art has dealt with the identification of the most worrisome natural weathering and erosion dynamics, their effects on engraved outcrops and the creation of an intervention urgency scale based on the current condition of the imagery (Fernandes 2014). It should be noted that available evidence points to partial motif loss in the course of the millennia. The expression 'partial motif loss' is used since it is impossible, at both sites, to exactly know how many rock-art surfaces and motifs have been completely lost as no traces survive after such total destruction episodes. Nevertheless, there are a quite limited number of cases at Côa where fractured fallen slabs featuring traces of engraved lines were found near to engraved outcrops.

The Siega Verde outcrops originated from local low grade metamorphic and tectonic deformation processes resulting in a variety of slate (Pérez García 2011), presenting highly visible sedimentation strata where crisscross-shaped kink bands (Anderson 1987) have formed. In the area where outcrops with rock-art exist, the Águeda progressively cut through rock terraces forming a V-shaped valley. The most relevant morphological structures formed by river erosion are the so-called 'Giant's kettles', which present concave-shaped polished rock surfaces (Pérez García 2011). Some of the largest surfaces resulting from this erosion process were used to engrave rock-art motifs during the Upper Palaeolithic.

Research and monitoring carried out at Siega Verde suggest that the existing outcrops are structurally more stable than those at Côa. Nevertheless, some rock-art motifs present a high degree of weathering, notably those located closest to the water level, subject to periodic flooding (Escudero Remirez 2011). Rock surface areas neighbouring kink bands display more active scaling and splintering due to higher water retention. In the north area of the site an intense red coating, resulting from superficial weathering processes (oxidation, washing and precipitation of iron minerals), can be observed (Pérez García 2011). In the central area, another coating occurs in the form of a manganese purple cover, certainly due to microbiologic activity (Pérez García 2012).

During the collaborative fieldwork campaigns pursued by the authors over the last 15 years, it became apparent that one of the most worrisome conservation issues at both sites lies in physical weathering dynamics – notably affecting precisely those fractures and fissures that were used in the rock-art motifs considered in the present paper. More importantly, it was also apparent that both sites share a significant use of pre-existing natural features as a component of engraved imagery. Further work, reported here, allowed the completion of an initial inventory of such cases.

Inventory of relevant cases at Côa and Siega Verde

An important issue must be clarified regarding the research methodology applied, as the authors have opted to consider only pecked and abraded motifs at the two sites. Generally speaking, at Côa, motifs accomplished via these two engraving techniques belong to its most ancient phase, the Gravettian-Solutrean. The few pecked and abraded motifs to which a more recent chronology is attributed are exceptions that confirm the rule (Baptista 1999, 2009; Santos 2012). When considering Siega Verde, pecked and abraded motifs are present during the whole span of the site, thus attributed to the Gravettian-Solutrean, Solutrean-Magdalenian and Late Magdalenian. Moreover, there are six rock-art surfaces at Siega Verde that only present fine-line incised motifs. These, as well fine-line incised motifs at Côa, have not been included in the study. The reason for this decision lies in the scarcer examples of integration of natural features resorting to fine-line incisions, regardless of chronology, at both sites. Hence, within the Côa Valley artistic complex, the number of analysed outcrops presenting pecked and abraded motifs is 88, out of a total of 558 outcrops with Upper Palaeolithic rock-art. Regarding Siega Verde, out of a total of 91 engraved outcrops, 85 have pecked and abraded motifs and thus are considered in this study.²

It was decided to group into five different categories the cases at Côa and Siega Verde in which rock-art motifs show evidence of the integration of natural stone features, or suggest that the present-day condition of the stone surfaces is similar to that on which the imagery was originally inscribed during Gravettian-Solutrean times. At the Côa Valley, within the total of 88 engraved outcrops considered here, 18 possess motifs suggesting use of natural features and similar condition to the present day (Table 1). Siega Verde presents somewhat higher values: of 85 studied rock surfaces, 25 provide such evidence (Table 2).

Examples

It should be noted that some panels possess more than one example belonging to the different Groups as displayed in Tables 1 and 2. Due to limited space and the considerable number of occurrences, it will be impossible to detail all cases or to include Figures pertaining to each. Nevertheless, the most relevant cases will be illustrated with at least a Figure per site and per each of the Groups.

Group 1: Use of outer limit to complete motif Such occurrences were identified in four outcrops at the Côa Valley. The most noteworthy case is Fariseu Rock 1, where part of the head of a goat is given by the natural outline of the outcrop (Figures 1 and 2).

Table 1. Total of outcrops in the Côa Valley featuring motifs using integration and made in distinct surface planes.

Rock ID	Groups	# of motifs
Canada do Inferno 15	4 – Motif establishing connection with fracture	2
Canada do Inferno 16	3 – Fissure/fracture/kink band integrated in motif	2
Canada do Inferno 22	4 – Motif establishing connection with fracture	2
Canada do Inferno 26	1 – Use of outer limit to complete motif	3
Canada do Inferno 27	5 – Motif made in distinct surface planes	1
Canada do Inferno 28	1 – Use of outer limit to complete motif	1+1
	3 – Fissure/fracture/kink band integrated in motif	
Canada do Inferno 30	4 – Motif establishing connection with fracture	2+2
	5 – Motif made in distinct surface planes	
Canada do Inferno 31	1 – Use of outer limit to complete motif	1+1
	4 – Motif establishing connection with fracture	
Faia 6 (Figures 11 and 12)	4 – Motif establishing connection with fracture	4
Fariseu 1 (Figures 1, 2, 9)	1 – Use of outer limit to complete motifs	1+2
	3 – Fissure/fracture/kink band integrated in motif	
Penascosa 4	3 – Fissure/fracture/kink band integrated in motif	1+1
	5 – Motif made in distinct surface planes	
Penascosa 5 (Figures 5, 6, 8, 14)	2 – Use of convex/concave area to place motif	1+1+2
	3 – Fissure/fracture/kink band integrated in motif	
	5 – Motif made in distinct surface planes	
Penascosa 6	1 – Use of outer limit to complete motif	2
Penascosa 11	5 – Motif made in distinct surface planes	1
Quinta da Barca 17	5 – Motif made in distinct surface planes	1
Ribeira de Piscos 1	2 – Use of convex/concave area to place motif	1
Ribeira de Piscos 13	3 – Fissure/fracture/kink band integrated in motif	2
Vale de Figueira 2	3 – Fissure/fracture/kink band integrated in motif	1
Σ = 18		39

Siega Verde has three such cases, most notably Rocks 19 and 46 (Figures 3 and 4).

Group 2: Use of convex/concave area to place motif At Côa only two occurrences were identified. One is at Ribeira de Piscos Rock 1, where a convexity in the panel is used to provide volume to the ventral area of one of the depicted horses (Baptista 1999, 120). The other is at Penascosa Rock 5, where a fish motif was engraved in a convex area of the rock surface as to suggest volume to the figure (Figures 5 and 6).

Siega Verde presents seven cases pertaining to this group, such as Rock 21 (Figure 7). It should be noted that convex areas are rare and concave areas almost non-existent at the Côa Valley outcrops. Conversely, these are common at Siega Verde, namely concave shapes located inside ‘Giant’s kettles’.

Group 3: Fissure/fracture/kink band integrated in motif At the Côa Valley, six instances were identified, all comprising the use of fissures or fractures, including Penascosa Rock 5 (Figures 5 and 8) and Fariseu 1 (Figure 9).

The use of kink bands has only been identified at Siega Verde (see above) comprising a total of seven cases (Figure 10). At the Spanish site the use of fissures or fractures was only identified in one instance.

Group 4: Motif establishing connection with fracture This group comprises cases in which animal motifs appear to emerge from or plunge inside

Table 2. Total of outcrops in Siega Verde featuring motifs using integration and made in distinct surface planes.

Rock ID	Groups	# of motifs
Siega Verde4	4 – Motif establishing connection with fracture	1
Siega Verde 7 (Figures 13)	4 – Motif establishing connection with fracture	1
Siega Verde 15	3 – Fissure/fracture/kink band integrated in motif	2
Siega Verde 19 (Figure 3)	1 – Use of outer limit of panel to place motif	1
Siega Verde 20	1 – Use of outer limit of panel to place motif	1
Siega Verde 21 (Figure 7)	2 – Use of convex/concave area to place motif 3 – Fissure/fracture/kink band integrated in motif 5 – Motif made in distinct surface planes	7+1+1
Siega Verde 23	2 – Use of convex/concave area to place motif 3 – Fissure/fracture/kink band integrated in motif	1+1
Siega Verde 26	2 – Use of convex/concave area to place motif	1
Siega Verde 27	4 – Motif establishing connection with fracture	2
Siega Verde 31	4 – Motif establishing connection with fracture	1
Siega Verde 32 (Figure 15)	3 – Fissure/fracture/kink band integrated in motif 4 – Motif establishing connection with fracture 5 – Motifs made in distinct surface planes	1+1+3
Siega Verde 39	4 – Motif establishing connection with fracture	1
Siega Verde 40	4 – Motif establishing connection with fracture	1
Siega Verde 44	2 – Use of convex/concave area to place motifs	2
Siega Verde 45 (Figure 10)	3 – Fissure/fracture/kink band integrated in motif	1
Siega Verde 46 (Figure 4)	1 – Use of outer limit of panel to place motif	1
Siega Verde 48	3 – Fissure/fracture/kink band integrated in motif. 4 – Motif establishing connection with fracture 5 – Motifs made in distinct surface planes	2+1+1
Siega Verde 51	3 – Fissure/fracture/kink band integrated in motif 4 – Motif establishing connection with fracture	1+1
Siega Verde 67	2 – Use of convex/concave and convex area to place motifs	1+1
Siega Verde 74	4 – Motif establishing connection with fracture	1
Siega Verde 75	2 – Use of convex/concave area to place motifs	1
Siega Verde 81	5 – Motifs made in distinct surface planes	1
Siega Verde 82	4 – Motif establishing connection with fracture	1
Siega Verde 84	3 – Fissure/fracture/kink band integrated in motif	1
Siega Verde 89	2 – Use of convex/concave area to place motifs	1
Σ = 25		45

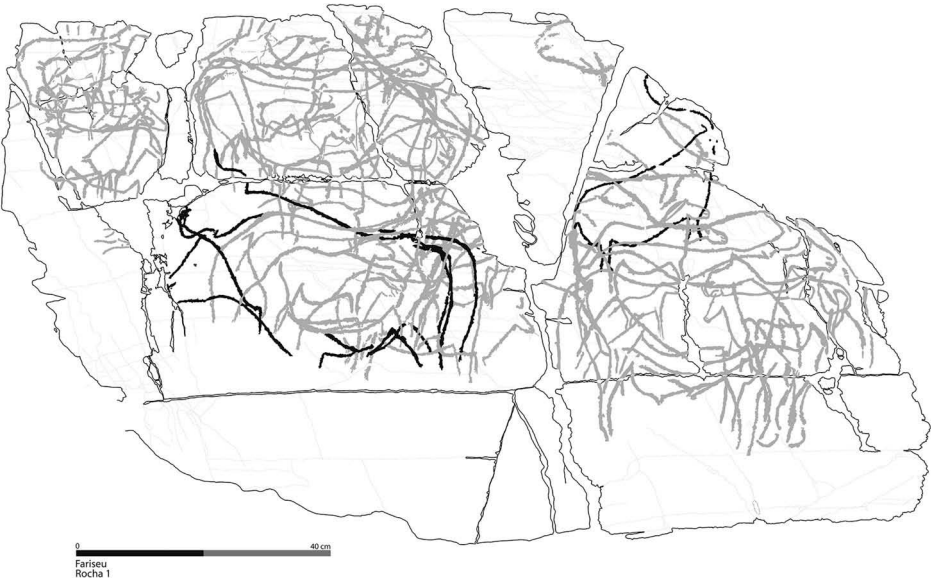


Figure 1. Drawing of the centre and right-hand panels in Fariseu Rock 1 (Côa Valley), highlighting the three existing motifs suggesting use of natural features. Drawing: CNART.



Figure 2. Photo detailing the use of the natural outline of the panel to complete the goat's head featuring a single horn, ear, back of the head and part of the animal's neck and back. See also [Figure 1](#). Photo: António Batarda Fernandes.

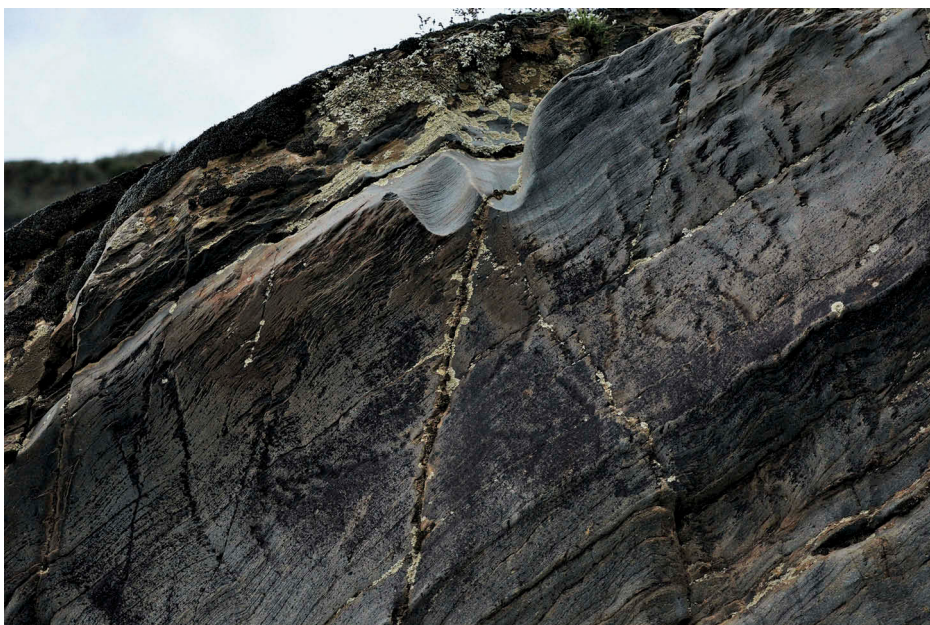


Figure 3. Photo detailing use of outer limit of panel to complete an aurochs' dorsal line. Siega Verde, Panel 19. Photo: Carlos Vázquez Marcos.



Figure 4. Photo detailing use of outer limit of panel to complete a horse's dorsal line. Siega Verde, Panel 46. Photo: Rodrigo de Balbín Behrmann (Alcolea González and Balbín Behrmann 2006, 407).



Figure 5. Drawing of the three panels that constitute Penascosa Rock 5 (Côa Valley), highlighting the 4 cases included in the present inventory. Drawing: CNART.

fractures (see discussion). At Côa, these cases comprise examples such as Faia Rock 6 (Figures 11 and 12), within a total of seven incidences.

At Siega Verde a total of 11 cases present evidence for inclusion in this group, such as Rock 7 (Figure 13).

Group 5: Motif made in distinct surface planes Motifs included in this group give evidence not of using natural shapes in inscribed figures but of a



Figure 6. Photo detailing the use of a convex area of the surface rock to place a fish depiction at Penascosa Rock 5 (Côa Valley). See also [Figure 5](#). Photo: Mário Reis.

similar condition of the rock surface when motifs were engraved (see discussion). At the Côa Valley, six occurrences give such evidence, including Penascosa Rock 5 ([Figures 5](#) and [14](#)).

At Siega Verde four cases were identified, including Rock 32 ([Figure 15](#)).

Discussion: matters of interpretation and considerations regarding the survival of the Côa Valley and Siega Verde rock-art

Matters of interpretation

When considering the connections that are established between inscribed motifs and pre-existent features of rock surfaces, the authors acknowledge that rock-art interpretation is always a biased exercise. It is impossible to

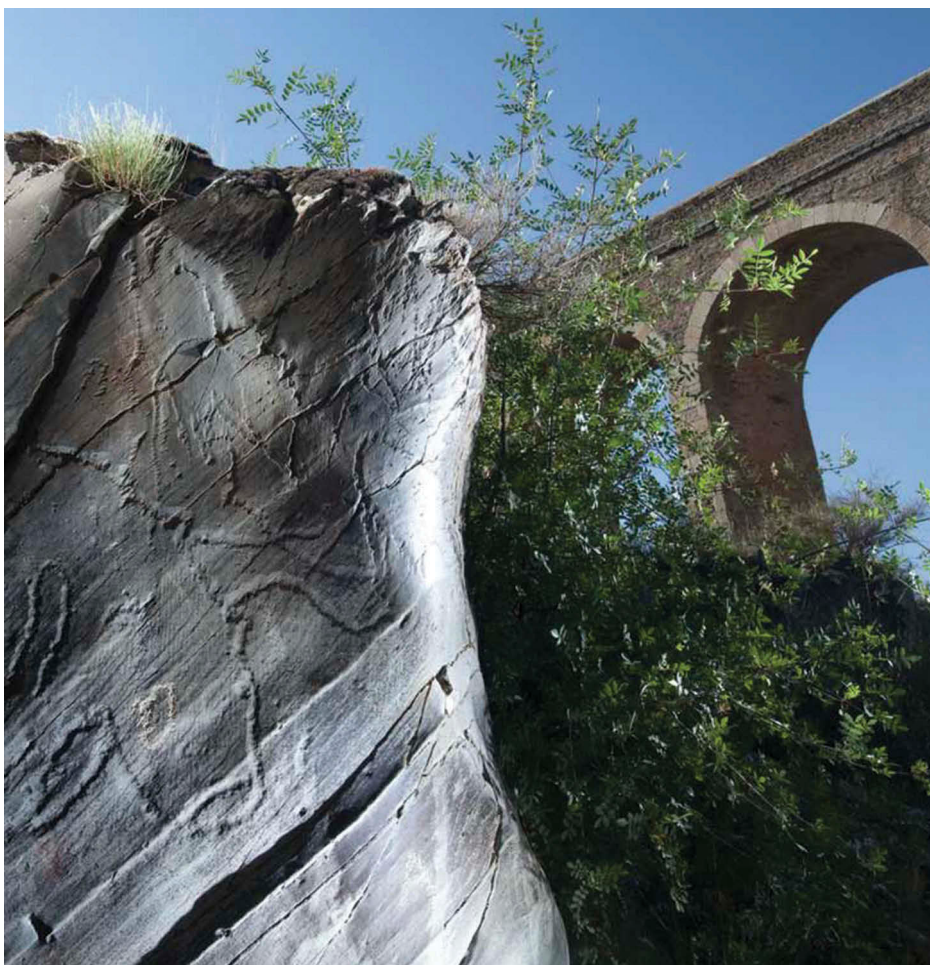


Figure 7. Photo detailing the use of both a convex and concave area of the rock surface to place depictions of a horse and an aurochs. Siega Verde, Panel 21. Photo: Pedro Guimarães (www.pedroguimaraes.net/studio).

determine whether there is any correspondence between today's concepts and those used in prehistory by the people who created and viewed the art in the first place. As Bahn (2010b) comments, however, although it is impossible to be completely confident, if the original intention was to depict a motif that could be easily recognized by viewers while looking at the image then Upper Palaeolithic artists often excelled in mastery when creating parietal zoomorphic depictions. Nevertheless, it should be noted that some Côa and Siega Verde motifs, belonging to the most ancient artistic phase at each site, give the strong impression of having been left deliberately incomplete; while others seem to have been re-done later on within the Upper Palaeolithic. The most paradigmatic case of the latter is the goat motif at Penascosa 5 included



Figure 8. Photo detailing the incipient fracture that completes the goat's front leg at Penascosa Rock 5 (Côa Valley). See also [Figure 5](#). Photo: Mário Reis.



Figure 9. Photo detailing two aurochs using fractures to complete the muzzle (lower motif) and part of the head (top motif) at Fariseu Rock 1 (Côa Valley). See also [Figure 1](#). Photo: António Batarda Fernandes.



Figure 10. Kink band integrated (part of the neck of the animal) in a deer motif. Siega Verde, Panel 45. Photo: Pedro Guimarães (www.pedroguimaraes.net/studio).



Figure 11. Drawing of the right panel at Faia 6 featuring four engraved and painted aurochs' heads pictured – at least in the case of the motif to the left, if not all – as if emerging from existing fractures. This panel also features anthropomorphic painted depictions belonging to the Neolithic or the Chalcolithic (Baptista 1999, 154). Drawing: CNART.

in Group 5 (Figures 5 and 14), to which a second head was added, executed in a more ungainly style and hence probably accomplished by a different artist.

In any case, there are instances in which analysing the rapport between motifs and natural features is considered to be more straightforward and less subject to bias (Groups 1 and 2) and those in which interpretation is prone to more subjective input (Groups 3 and 4). The authors have carefully reviewed each of the instances included in this inventory and, following a cautious approach, decided only to consider the less ambiguous cases, especially regarding those included in Groups 3 and 4. This filtering was motivated partly by the fact that such motifs can be suggested to be evidence of ritualistic practices, but mostly due to concerns regarding how to objectively value the long-term preservation constraints concerning rock outcrops: how they have been exposed, how fracture networks have formed and how gravitational dismantling acts upon them (see following subsection).

Considering the former constraint, following an ethnographic approach to San rock-art paintings in Southern Africa, Lewis-Williams and Dowson (1989) propose that in cases in which some of the paintings are apparently missing the body or the head, that part of the figure was depicted as if disappearing



Figure 12. Photo detailing the aurochs head located to the left-hand side of the panel on a sheltered area due to the particular configuration of the granite bedrock. See also [Figure 11](#). So far, Faia is the only site at Côa where Upper Palaeolithic imagery created on granite bedrock has been identified. Photo: Mário Reis.



Figure 13. Aurochs motif establishing connection with fracture. Siega Verde, Panel 7. Photo: Carlos Vázquez Marcos.

into a fracture. Other figures, they argue, were placed as emerging from fractures in the rocks. Hence, Lewis-Williams and Dowson suggest that fractures in rock-art panels are understood by the San as a sort of communication membrane with the nether worlds, thus helping to build the case for a shamanistic interpretation of that particular rock-art ensemble.

The authors are aware of the robust yet reasonable resistance with which shamanistic interpretations of rock-art have been met (Bahn 2001), namely overreaching approaches addressing imagery produced by past human



Figure 14. Photo detailing a goat (top area of the photo) made in two different planes of the rock surface, which roughly cut the figure in two, and an aurochs (lower image) whose muzzle is located on a distinct plane to that of the rest of the body. Note also the right-facing second head of the goat. (See also [Figure 5](#).) As with the fish motif illustrated in [Figure 6](#), the goat motif bears evidence of both permanence and loss of imagery. Indeed, while taking advantage of the pre-existing convex natural shape of the rock, the fish motif also appears to have lost the tail to weathering and/or erosion dynamics (thus not having been made deliberately incomplete) and a portion of the contour due to gaping (see [Fernandes 2014](#)). As for the goat motif, while the use of two planes gives evidence of permanence, the depiction of a second horn of the left 'original' head seems to have been lost due to fracturing. Photo: Mário Reis.



Figure 15. Photo detailing an aurochs, a horse and a canid rendered in two different planes of the rock surface, a similar case to what was illustrated at Côa by the previous Figure. Siega Verde, Panel 32. Photo: © Pedro Guimarães (www.pedroguimaraes.net/studio).

communities, such as Western European Upper Palaeolithic hunter-gatherers (Clottes and Lewis-Williams 1998). The authors do not contend that the connection established with fractures by motifs included in Group 4, and indeed in Group 3, was of a ritualistic or even shamanistic nature. Rather, it results quite likely, considering the wealth of information present at Côa and Siega Verde on the rapport between motifs and natural features present in cases included in Groups 1 and 2, an intentional placing of imagery interacting with, but not being completed by, fractures, as occurs in Groups 3 and 4.

As several authors have suggested regarding the Côa, Siega Verde and Ice Age rock-art in Western Europe (Baptista 1999, 2009; Fernandes 2008; Santos 2012; Alcolea González y Balbín Behrmann 2006, 218; Leroi-Gourhan 1992; Bahn 2010a, 137–159), the choice of themes, caves, areas of caves, open-air outcrops, panels and areas of panels that were engraved, painted, or both, by Upper Palaeolithic artists was hardly random. This being the case – and as also noted for rock-art in different geographical and chronological contexts (Steinbring 1992; Bahn 2010a, 137–159) – various attributes may have been important enough to determine which outcrops, panels and areas of panels were suitable as the object of artistic attention: hardness; tone; texture; shape or volume of stone surfaces; inclination or orientation of rock surfaces; accessibility; articulation with waterways and paths; prominent location; resonance qualities of the setting; and existence of previous motifs. In addition,

motifs at Côa and Siega Verde are often superimposed upon each other while other available areas of panels are left blank, reinforcing the notion of a completely conscious choice of areas to be engraved (see below on the condition of outcrops and panels when rock-art was inscribed). The potential for integration of fractures or fissures into rock-art imagery, besides the more obvious use of convex or concave areas, can also be regarded as being among the factors that contributed to selection.

Long-term survival of the Côa Valley and Siega Verde Upper Palaeolithic rock-art

The first issue to consider is the important distinction between motifs that willingly took advantage of pre-existing natural features (Groups 1–4) and imagery engraved in two distinct planes of rock surfaces (Group 5). The authors believe that the Figures above pertaining to Group 5 demonstrate that these distinct planes already existed when the motifs were engraved. Hence, these cases do not suggest a conscious use of natural stone features to accomplish rock-art motifs. Rather, these instances suggest that when these specific rock-art motifs were created, the areas where engravings have been inscribed were in a quite similar condition to that observed today. Even if this suggestion may be regarded as a truism, since these motifs indeed survive since their original moment of creation some 20 millennia ago, such instances imply a (human-scale) long-term optimum conservation of the rock-art motifs listed in Group 5 and of the rock surface area upon which these have been directly inscribed. The same can be stated regarding motifs included in the other Groups, but it is worth detailing this proposition further. Fariseu Rock 1 is a relevant case-study regarding the rapport between motifs integrating natural shapes and the condition of the media on which they were created, both when the rock-art was inscribed and today. The imagery present in this outcrop forms a complex palimpsest featuring 94 individual motifs superimposed over an area of circa 11m². To explain why some motifs in this outcrop that suggest the use of natural features were not considered in the present inventory while others relatively nearby were, it is necessary to consider micro-scale conservation dynamics working at surface level and beyond. Previous research (Fernandes 2014) suggests that within the same outcrop – and considering the dissimilar sediments that later became the heavily stratified metamorphic formations existing today at both sites – less cohesive areas are present that are more prone to physical weathering. In addition, these areas have been quite affected by percolation. Nonetheless, existing fracture networks do not result only from percolation but also from original metamorphic ‘packaging’, tectonic, fluvial down-cutting and outcrop emergence processes as well as posterior mechanical dismantling. To put it more plainly, the outcrops were

exposed already with fractures and fissure networks³ crossing their surfaces, even if in a quite incipient development stage.

Data collected by Phillips, Montgomery, Elmore, and Sharma (1997) indicates that schist outcrops located at the bottom of the valley in the final section of the Côa began to be exposed at least around 140,000 years BP. Hence, it is reasonable to assume that the diversely oriented fracture networks that traverse outcrops mostly developed over the course of the previous c.15,000 years, i.e. before Gravetian-Solutrean artists engraved the earliest motifs, as indeed these fractures had already to be available in order to be integrated into the rock-art imagery discussed in this paper. Broadly speaking, it is reasonable to assume that in the last 25,000 years these fracture networks have not developed much further.⁴ This is not to say that no alteration occurred in them, or indeed that the whole panels and outcrops have been immune to differently originated weathering and erosion forces such as biodeterioration, slope dynamics or flooding regimes (Fernandes 2014). In fact, time took its toll, rendering quite a number of cases ineligible for inclusion in this inventory as only the less ambiguous cases have been considered. Fariseu Rock 1 thus constitutes a significant example, suggesting that most of its surface has been moderately affected by partial motif loss while some less numerous sections remained relatively unchanged, as illustrated in Figures 1, 2 and 8. Yet another example is Penascosa Rock 5 (see Figures 5, 6 and 14).

Siega Verde also presents noteworthy cases that illustrate how Paleolithic artists engraved motifs that took advantage of previous natural alterations to the panels. Moreover, the lines resulting from kink bands, a geological phenomenon occurring only at Siega Verde, have been used to complete engraved motifs (see Figure 10). On the other hand, there is also evidence of motifs accomplished in different planes of the rock surface, notably the examples displayed in Figure 15.

The relatively large number of rock-art panels at Côa and Siega Verde known to bear evidence of partial motif loss, as in the case of some motifs included in this inventory (see Figures 1, 2, 5, 6, 8 and 14), counsels caution when drawing firm conclusions regarding the overall survival of Upper Palaeolithic imagery at both sites solely from the cases at hand. Nevertheless, research carried out in the last two decades allows the inference of two main reasons supporting a reasonable conservation level and thus survival rate of the Côa and Siega Verde rock-art (Escudero Ramirez 2011; Fernandes 2014; Reis 2011, 34–55):

- (a) Low human impact on the landscape, namely that arising from economic land use. Both areas are quite peripheral within Portugal and Spain and limited major development projects have been carried out in the area. In fact, the discovery of the Côa Valley rock-art complex led to the cancelling of the construction of a major dam on the Côa River. On the other hand, in

the Côa, traditional agricultural activities have had low impact in the rock-art outcrops, due to their predominant location in steep areas less suitable for agriculture, and the considerable time and effort needed to dismantle outcrops. The only human activity that might have caused serious damage to rock-art outcrops is quarrying. However, historically speaking, this activity was quite limited both in the areas affected and in the quantity of extracted rock; today, the major industrial quarries operating in the region are all located on just one relatively elevated hill top, a type of location where rock-art from all the periods known in the Côa has seldom been identified. In the significantly smaller area possessing rock-art at Siega Verde no major agricultural land use existed prior to its discovery, the area having mostly been used for grazing sheep and goats. On the other hand, there was some small-scale stone extraction activity carried out by local inhabitants in the 1940s and 1950s. Potentially more disruptive for the conservation of the rock-art, although it is impossible fully to assess its impact, is the use of local stone in building the bridge that crosses above the site, and a windmill.

- (b) At Côa, the resilience of local schists, characterized by the geologist Delgado Rodrigues as 'perhaps the only geological and geomorphological combination allowing the permanence, also considering the mild climate of the region, of the rock-art for such a long period of time. That combination consists in the association of fine grain schist, possessing a moderate degree of metamorphism, with quite regular and continuous diaclasses' (Rodrigues, 2008: 116, authors' translation). According to this author, the cohesion of the outside edges of the diaclasses, together with the high chemical stability of its mineral components, gave these outcrops the required strength to endure for many millennia (*ibid.*). These observations are in line with the measured 'old-age' exposure of (rock-art) outcrops noted above (circa 140,000 years BP). The Siega Verde outcrops, likewise quite chemically and structurally stable, also benefit from the existence of the above-mentioned surface patinas which help reduce their weathering susceptibility.

Therefore, considering what was detailed above, it is suggested that the use of pre-existing natural shapes to complete motifs, as well as depictions placed in different planes, help to strengthen the case for a relatively low global rate of rock-art imagery loss at Côa and Siega Verde. Nevertheless, the present research aims to make available a preliminary inventory on the use of natural features by the creators of Côa and Siega Verde Upper Palaeolithic pecked and abraded rock-art motifs. Further research, expanding on the examination of the condition of a sample group of 40 engraved outcrops already carried out by one of the authors at Côa (Fernandes 2014), comprising an exhaustive analysis of the condition of a wider selection of motifs and of the outcrops

where they are located, may provide more definite conclusions regarding the overall survival of rock-art at both sites.

Conclusion

The research presented here reinforces the case for a reasonable degree of preservation of rock-art at Côa and Siega Verde. Moreover, cases in which the same rock surface presents evidence both for partial loss of motifs and for the use of pre-existent features make it clear that different areas within the same outcrop present different deterioration dynamics that may be diversely impacted upon by weathering and erosion forces, rather than each outcrop just being a singular case that requires a specific condition diagnostic. Hence, a thoughtful approach to the conservation of Côa and Siega Verde rock-art must be determined not only by correctly identifying risk susceptibility at each outcrop, but also by the vulnerability of different areas within the same outcrop, especially when considering direct stabilization interventions on the art objects (Fernandes 2008).

In having ingeniously taken advantage of the full potential of the media used, the motifs considered in this paper illustrate the highly complex traits of Upper Palaeolithic art, in which different creative nuances should be recognized. Most of all, they further suggest that producing rock-art wasn't 'just' a mechanical act, even if taking into account the stereotyped nature of the most depicted themes (large herbivores), or a pure instinctively driven casual deed, at least considering the manual labour invested in achieving it. The case at hand denotes that the accomplishment of rock-art motifs was a carefully thought-out endeavour in which random choice played a limited part, if any.

Notes

1. It is considered that at Côa and Siega Verde, depicted individuals belong to Iberian caprine subspecies, such as the *Capra pyrenaica pyrenaica*, with its characteristic S-shaped horns eloquently featured in numerous engraved motifs. Henceforth in the text, the term 'goat' refers to 'wild goat'.
2. Values subject to update as fieldwork progresses. The occurrence of fine line incised motifs is the major dissimilarity between the Côa and Siega Verde, with the latter site possessing a quite lower number of the said motifs, relatively speaking. Moreover, despite the younger age of the most ancient rock-art in the Spanish site when compared with the Côa, the great majority of pecked and abraded motifs belong to each site's oldest artistic period.
3. Not to be misinterpreted as diaclasses, the steadily oriented tectonic joint families that in fact constitute the exposed outcrops faces (on weathering and physical properties of rocks see Bland and Rolls 1998, 46–49).
4. Nevertheless, it should be noted that the present (and past) condition of fractures present in each outcrop, and of whole outcrops, is obviously case-specific (see Fernandes 2014).

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Notes on contributors

António Batarda Fernandes is an archaeologist at the Côa Museum and Archaeological Park where he coordinated the Conservation Program of the Côa Valley rock-art, co-coordinates the Educational Services and manages social media presence. He holds an MA in Managing Archaeological Sites from University College London, and a PhD in Archaeology from Bournemouth University. Visiting Fellow, Centre for Archaeology and Anthropology, Bournemouth University.

Mário Reis is an archaeologist at the Côa Museum and Archaeological Park where he is in charge of surveying, inventorying and recording the Côa Valley rock-art. He holds a BA in History–Archaeology variant from University of Porto.

Cristina Escudero Ramirez is a conservator-restorer of inorganic materials and archaeological sites with more than 30 years of experience. She currently works as a technician in the Service for Planning, Investigation and Dissemination of the General Directorate of Cultural Heritage of Castilla y León Regional Government (<http://www.jcyl.es/>). She has been in charge of the Conservation and Maintenance Plan of the Siega Verde rock-art site since 2009.

Carlos Vázquez Marcos is an archaeologist and guide at the Siega Verde site where he also develops activities to promote rock-art and its conservation, mainly aimed at primary and secondary school audiences. His research activities focus on open-air Iberian Upper Paleolithic and Iron Age rock-art. He holds a BA in History–Heritage variant from University of Salamanca and an MA from the same University.

ORCID

António Batarda Fernandes  <http://orcid.org/0000-0003-3956-6549>

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