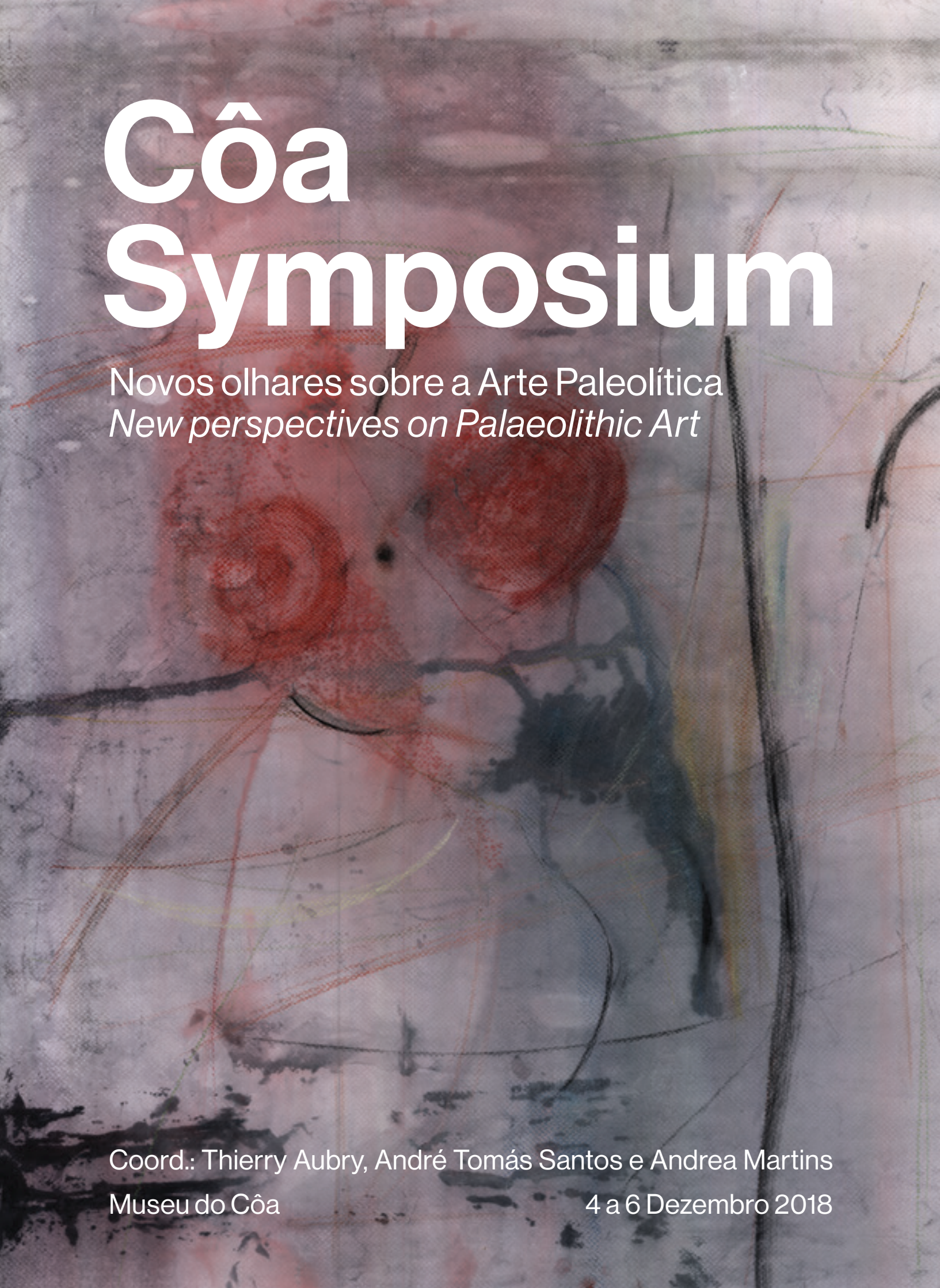

Côa Symposium

Novos olhares sobre a Arte Paleolítica
New perspectives on Palaeolithic Art

Coord.: Thierry Aubry, André Tomás Santos e Andrea Martins

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Índice

Dating the Côa Valley rock art 25 years later: an archaeological and geoarchaeological approach

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Resumo: A datação da arte rupestre é um dos principais problemas inerentes ao estudo deste tipo de vestígios arqueológicos. Esta tarefa não é, no entanto, isenta de dificuldades, sendo a comparação estilística o único método possível para a sua prossecução em numerosas situações. No Vale do Côa, não descartamos a comparação estilística, sendo este método utilizado como complemento essencial de uma estratégia que apresentaremos neste texto. Esta estratégia passa pela utilização da estatística multivariante e de evidências arqueológicas e geoarqueológicas obtidas no decurso da investigação levada a cabo na região. No final do trabalho caraterizaremos cada uma das fases gráficas identificadas no Vale do Côa com recurso a essa estratégia e ilustraremos, com alguns exemplos, a importância da atribuição cronocultural da arte rupestre em outras problemáticas da investigação.
Palavras-chave: Arte rupestre; Faseamento gráfico; Paleolítico Superior; Vale do Côa.

Abstract: The dating of rock art is one of the main inherent problems of the research of this type of archaeological evidence. This task is not, however, devoid of difficulties, stylistic comparison being the only available method to accomplished it in countless occasions. In the Côa Valley, we do not discard stylistic comparison, such a method being used as an essential complement of a wider strategy that we will describe in this text. This strategy involves the use of multivariante statistics and archaeological and geoarchaeological evidence that was obtained during the research carried out in the region. The paper closes with the characterization of each of the graphic phase identified in the Côa Valley by the application of our strategy and with a demonstration, with several examples, of the importance of rock art chronocultural attribution in other problematics of the research.
Keywords: Rock art; Graphic phasing; Upper Palaeolithic; Côa Valley.

1. Introduction

The periodization of a given prehistoric art cycle is not an easy task. However, it is unavoidable if we want to understand the role of those images in the social life of the prehistoric communities that produced them. If dating of prehistoric art in closed contexts, such as caves, is not exempt of problems, the dating of rock art on the open air is even harder. Because of this, much of the rock art that appear on the open air is dated only by the traditional stylistic comparison, this method being the only one available in several occasions. This was also the first method that was used to date the Pleistocene rock art of the Côa Valley (see below). Fortunately, research carried out in the region since its discovery has produced other sorts of evidence – both archaeological and geoarchaeological in nature – that enable us to refine the first chronocultural proposals that were put forward in those early days.

The main goal of this text is to illustrate how can a strategy combining statistical analysis of the morphology of the images, archaeological evidence and geoarchaeological evidence, sustain a more refined periodization of the Palaeolithic rock art of the Côa Valley than one built on the basis of only one of these types of evidence. We will start by presenting a brief overview of the Palaeolithic rock art of the region and its archaeological and geomorphological context. Next, we will recall the main proposals of periodization of this art. This section will be followed by an exposure of our strategy, as well as of the adopted methodologies to fulfil it. The next point will deal with the morphological classification of the studied graphic *corpus* and with the evidences that prove that each of the identified clusters in that process is part of a sequence in time. In the next two sections, we will present the archaeological and geoarchaeological arguments that enable us to locate in time those clusters. The chapter closes with a characterization of the Côa valley's Palaeolithic graphic se-

quence, as well as of the relations between each of its phases with graphic stages of other European graphic sequences. Through it, we will try to demonstrate that, as it was recently observed, several important problems related with prehistoric art are indeed dependent on the chronological debate (Alcolea & González, 2015, p. 3).

2. The Côa Valley and its Palaeolithic rock art: an overview

The river Côa is a tributary of the left margin of the river Douro running quite close to the Portuguese-Spanish border, in the centre of Portugal (**Fig. 1**). It runs along 135 km, from south to north cutting the structural surface of the Iberian *Meseta* (Ferreira, 1978). Tectonics and geology explain the difference between the geomorphology of the valley in its different sections (Meireles, 1997; Aubry, Luís & Dimuccio, 2012). Where the river crosses granites, such as in Faia, the valley is straight and deep, with almost vertical portion in the slopes. Where it crosses phyllites, such as it happens in its last 8 km, the course of the valley is wavier, with a larger and V-shaped section. These factors affect all the hydrological system of the Côa river basin. The landscape can be broadly described as a huge platitude cut deeply by its hidrographic network and surmounted here and there by some residual reliefs, such as the *inselberg* of S. Gabriel, which survived the general erosion of the surface of the Meseta due to the Ordovician quartzites that constitute its substrate (Silva & Ribeiro, 1991, p. 8).

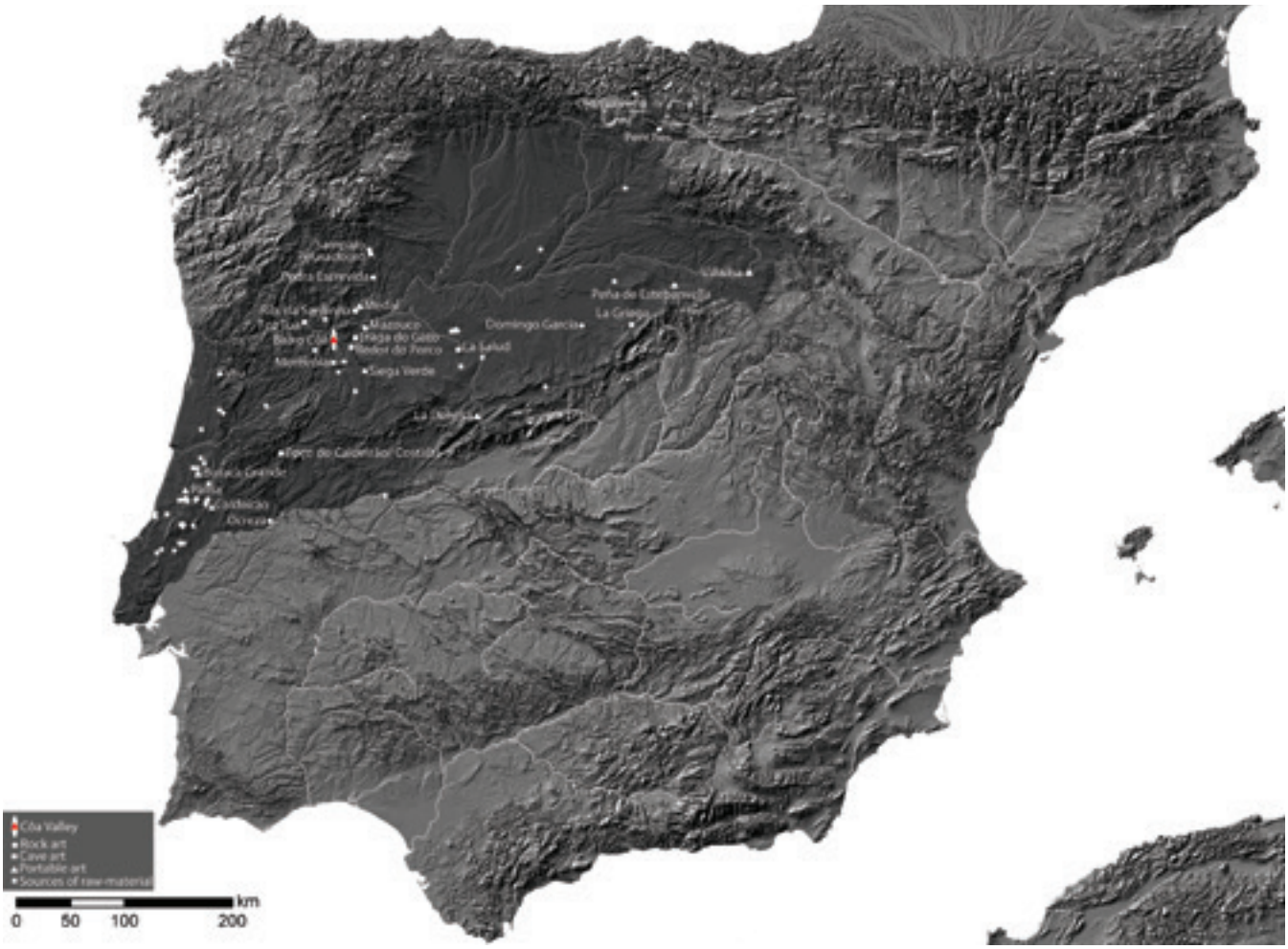

Figure 1: The sites with Palaeolithic art found in the area of distribution of the sources of raw-material identified in the Pleistocenic contexts excavated in the Côa Valley.

1173 engraved rocks were found until 2014 in the Côa Valley and its immediate surroundings, 532 of which containing motifs attributed to the Upper Palaeolithic (Reis, 2014, p. 33)[1]. The engraved rocks are unevenly scattered through 76 sites[2]. 49 out of these sites contain rock art that is attributed to the Upper Palaeolithic (Reis, 2014, 33)[3]. Not all of them are in the margins of the river Côa or even in the versants of the valley by which it flows. The river Côa is, nonetheless, the main axis of the distribution of the Palaeolithic rock art of the region, the rest of the sites being found in the smaller valleys near its confluence with the river Douro (**Fig. 2**).

Most of the rocks with Palaeolithic rock art are phyllites, mainly of the Desejosa facies, but also of the Pinhão facies (e.g. rocks of Foz da Ribeirinha, Penascosa, Quinta da Barca or Ribeira das Cortes) (Ribeiro, 2001, p. 13). A few of the rocks, however, are granites of the Ribeira de Massueime-Galegos facies (Ribeiro, 2001).

All the motifs attributed to the Palaeolithic are found on the joint fractures of the rocks. Their orientation is determined by regional tectonics and, as such, they face directions between east-southeast and east or between west-northwest and west. Due to various factors related to these orientations, namely solar exposition, the best-preserved surfaces are the ones oriented to east-southeast. Not surprisingly, it is in those panels that the majority of the rock art attributed to the Palaeolithic can be found (Aubry, Luís & Dimuccio, 2012). Some exceptions to the rule are, however, known – such as it is the case of the rocks in Penascosa or rock 2 of Fariseu – most probably due to the topography of the slope that favoured conservation in those particular places (Aubry, Luís & Dimuccio, 2017).

28 of the sites with Palaeolithic rock art are located in the versants of the Côa valley or in one of its tributaries. 25 of them are dispersed trough the last 8 km of its basin. Faia is located 7 km upriver from the nearest site (Foz da Ribeirinha) and Alto da Cotovia and Quinta da Moreirola are already located in the upper basin of the valley. The remaining 21 sites are located in the surrounding small valleys that run to the Douro, both in the left (13 sites) and the right margins (8 sites) of this river.

Palaeolithic rock art of the Côa valley is characterized, as usual in other European regions, by a repertoire dominated by zoomorphic depictions. Aurochs, horses, ibexes and red deer are the most commonly represented species, but chamois, fishes, birds, felines, probably a bear and, at least, a bison are also identified. Human figures are known, as well as non-figurative imagery.

Regarding the techniques (**Fig. 3**), although red painting was used (in Faia's rock 6), the vast majority of the identified Palaeolithic motifs were engraved. Several engraving techniques were identified in the valley (Santos, 2019, pp. 61-63): two variants of pecking, distinguished by the degree of adjunction of the resulting negatives; simple incision, repeated incision, multiple incision and scraping. The figures can also be completely or partially filled by fine incised lines, modalities that we identified as "partial striated" and "total striated".

Besides rock art, Palaeolithic portable art was also found in the region, namely in the sites of Cardina (e.g. Aubry & *alii*, 2015, 2017), Quinta da Barca Sul (García,

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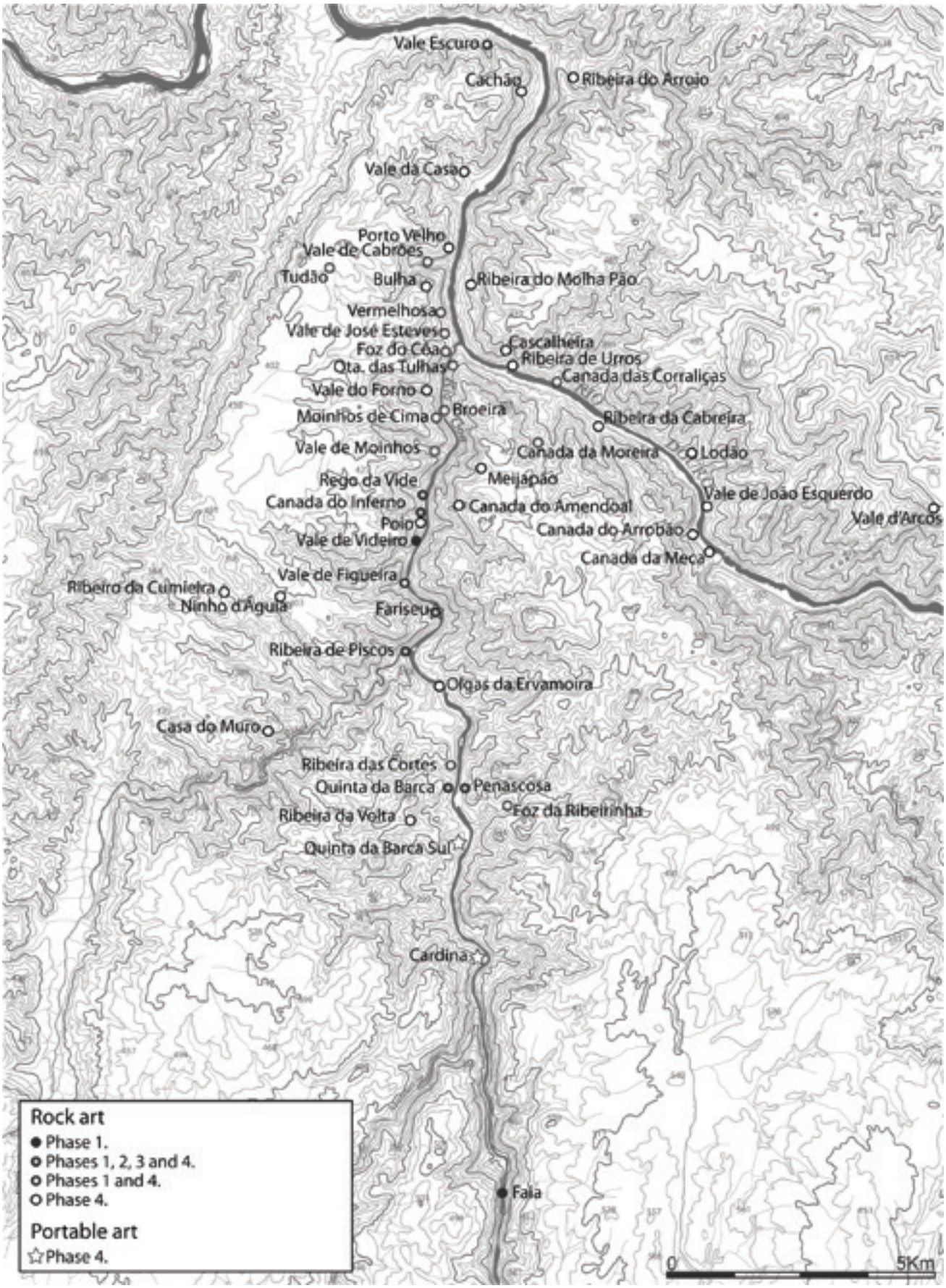
1. In the quoted page of Reis, 2014 appears the number of 1183 "records", 533 of which attributed to the Palaeolithic, but this number comprises not only the rock art *stricto sensu*, but also series of portable art, stelae and other such findings (Reis, 2014, 28).

2. Regarding the difference between this number and the one presented by Mário Reis, see previous note.

3. Once again, in the quoted paper of Mário Reis are referenced 50 sites, but one of those is Cardina, where only portable art was found (Aubry & *alii*, 2017). The discovery of rock art in Quinta da Barca Sul by Mário Reis (Reis, personal information) is also subsequent to the publication of that paper. *Stricto sensu*, until 2014, only 48 sites with Palaeolithic rock art were known.


Vale Escuro
Cachão
Ribeira do Arroio
Vale da Casa
Porto Velho
Vale de Cabrões
Tudão
Bulha
Ribeira do Molha Pão
Vermelhosa
Vale de José Esteves
Foz do Côa
Cascalheira
Ribeira de Urros
Ota. das Tulhas
Canada das Corraliças
Vale do Forno
Moinhos de Cima
Broeira
Ribeira da Cabreira
Vale de Moinhos
Canada da Moreira
Lodão
Meijapão
Rego da Vide
Vale de João Esquerdo
Canada do Inferno
Canada do Amendoal
Vale d'Arcos
Poio
Canada do Arrobão
Vale de Videiro
Canada da Meca
Vale de Figueira
Ribeiro da Cumieira
Ninho d'Aguia
Fariseu
Ribeira de Piscos
Olgas da Ervamoira
Casa do Muro
Ribeira das Cortes
Quinta da Barca
Penascosa
Foz da Ribeirinha
Ribeira da Volta
Quinta da Barca Sul
Cardina
Rock art
Phase 1.
Phases 1, 2, 3 and 4.
Phases 1 and 4.
Phase 4.
Portable art
Phase 4.
Fala
0
5Km

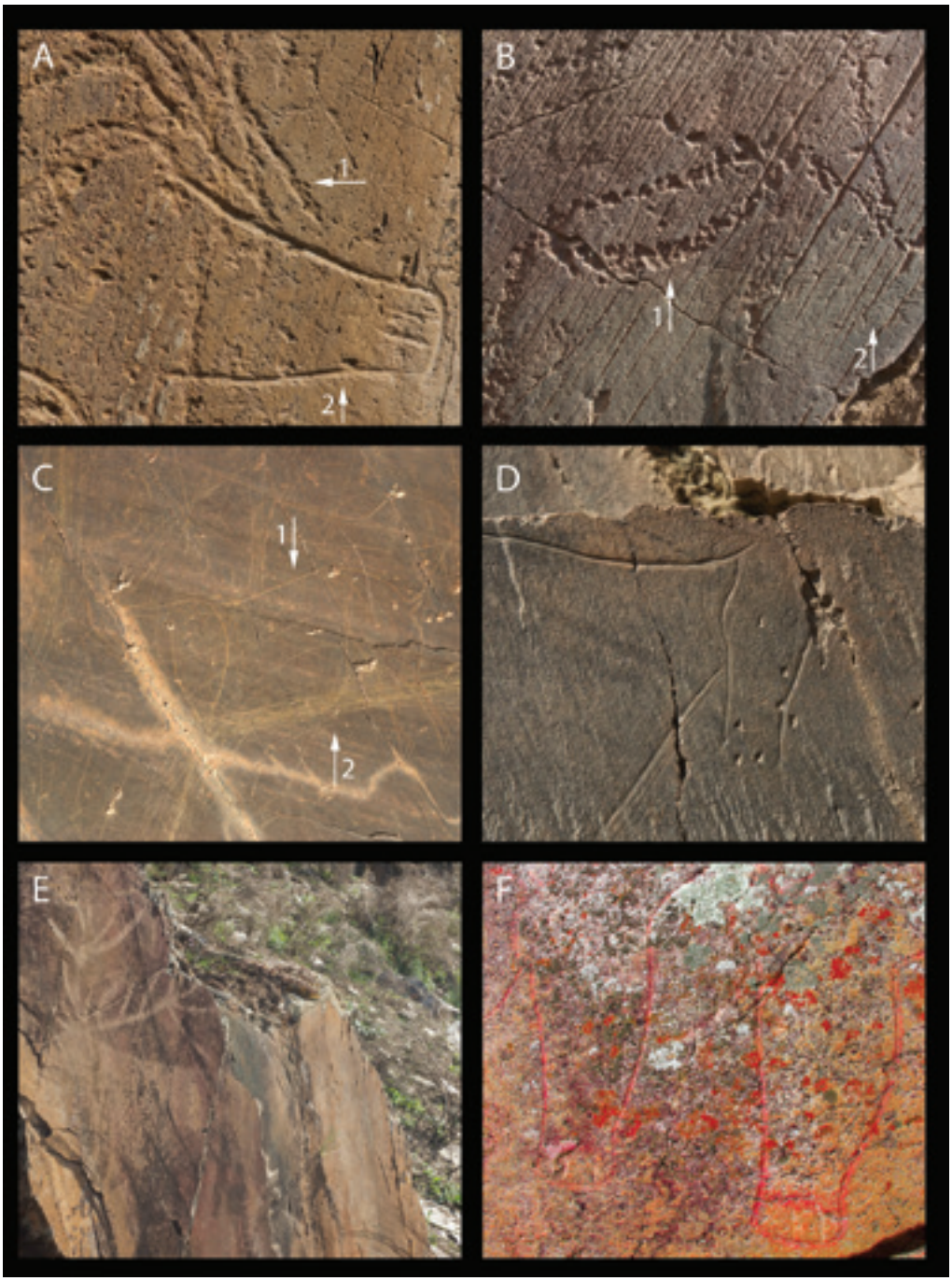


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Figure 2: The sites of the Côa valley with Palaeolithic art.

↑
Figure 3: The rock art techniques identified in the Côa Valley. A.1: Pecking type A; A.2: Abrasion; B.1: Pecking type B; B.2: Animal with the interior totally filled by striated incision; C.1: Male ibex defined by simple incision with the interior filled partially by stiated incision (on the forearm); C.2: Multiple incision; D: Repeated incision; E: Scraping; F: Two heads of aurochs defined by engraved and painted contour (notice how the inner limit of the nose of the right head is exclusively painted).

2009) and Fariseu (Santos *& alii*, 2018). Although red painting and isolated or grouped peckings are also found in some pieces of Fariseu, the vast majority of the motifs are delineated by simple and multiple incision and have their interior totally striated.

Archaeological surveys on the region have revealed the existence of several occupation sites, some of which were later excavated (e.g. Aubry, dir., 2009; Aubry, 2015). The results of these excavations have made possible to propose a chronocultural sequence of human occupation that stretches from the Late Aurignacian to the Azilian (Aubry, 2009, 348-350; Aubry *& alii,* 2017, 2018, 2020a).

3. Previous proposals of periodization of the Palaeolithic rock art cycle of the Côa Valley

Stylistic comparison was the first approach that was adopted in order to date the Côa Valley's Palaeolithic rock art. It yielded much better results than the ones resulting from the application of the so-called scientific methods (e.g. Zilhão, 1995). On the detail, however, depending on the frames of reference adopted by each researcher, the Côa Palaeolithic rock art was attributed to different chronocultures. For instance, regarding the pecked and abraded figures, the researchers who took as frame of reference Leroi-Gourhan's styles and do not interpreted the superposition between figures as chronologically relevant, dated this type of figures to the Solutrean (e.g. Balbín, 1995; Züchner, 1995; Balbín, Alcolea & Santonja, 1996) or to the Solutrean and Early Magdalenian (González Sainz, 1995). On the other hand, the valorisation of the superposition between figures in the same panel as chronologically significant, as well as the use of the Parpalló sequence as frame of reference, led other researchers to defend a longer diachronic sequence for these images (e.g. Zilhão, 1997; Baptista, 1999).

In 1999, Guy, based on a comparative morphostylistic study between the pecked and abraded figures of the Côa valley and other figures assigned to the Gravettian or Solutrean of France and Spain, defended the short diachronic span of the majority of this type of figures, dating them all to a period between the Gravettian and the Solutrean (Guy, 1999).

The excavation at Fariseu in 1999 unburied an engraved panel that was almost completely covered by archaeological layers attributed to the Upper Palaeolithic (e.g. Aubry & García-Díez, 2000). This ended with the polemics regarding the chronological attribution of the rock art to the Pleistocene and also proved that the pecked and abraded figures, although intensely superimposed, should have been made in a short period of time, since all the figures that were under layers 3 to 6 didn't have any patina (e.g. Aubry & García-Díez, 2000).

The similarities between the majority of the pecked and abraded figures of the Côa valley and figures from Gravettian and Solutrean contexts of France and Spain, the non-chronological significance of the great superimposed compositions such as the one from rock 1 of Fariseu, together with the discovery of pecking tools in the Gravettian layers of the site of Olga Grande 4 (Aubry & García, 2000), led to the general acceptance of a Gravettian and/ or Solutrean chronology for the majority of this type of figures (e.g. Baptista, 2001; Zilhão, 2003). Exceptions to this rule were Rego da Vide 1 or Quinta da Barca 3 (e.g. Zilhão, 2003).

But, what about the incised figures? The ones filled with fine incised lines were, since the beginning of investigations and until very recently, compared with the striated figures of the portable art from Parpalló and from the Cantabrian region and, as such attributed to the Late Solutrean/ Early Magdalenian (e.g. Gomes & Baptista,

1996; Baptista, 1999, 2001, 2009). Regarding the remaining incised figures, some of them were attributed to the early phases, because they were at the bottom of the figurative sequence (e.g. Baptista, 1999), but the majority was attributed to later phases of the Magdalenian (e.g. Gomes & Baptista, 1996) or to imprecise phases of the same period (e.g. Baptista, 2001). Ultimately, the Pleistocene rock art of the Côa Valley ended up being attributed to two main phases: one stretching from the Gravettian to the Solutrean and a second exclusively Magdalenian (e.g. Baptista, 2001, 2009).

However, the discovery of an important series of portable art in the Azilian level (then attributed to the Late Magdalenian) of Fariseu with a figurative repertoire characterized by animals filled with very incised lines, very similar to the figures of the Côa Valley generally compared with the striated figures of Cantabria (García & Aubry, 2002; Santos *& alii*, 2018), as well as the study of several cases of vertical and horizontal stratigraphy and a comparative analysis with other figures of Iberia, led one of us to propose a different sequence to the Pleistocene rock art of the Côa valley, this time distributed by three phases (Santos, 2012): phase 1 was characterized essentially by the majority of the pecked and abraded figures (but also by some incised figures) and was attributed to the Gravettian or Early Solutrean; phase 2 was characterized by the figures, done by several techniques, stylistically integrated in the style IV of Leroi-Gourhan and attributed to a large period between the Late Solutrean and the Upper Magdalenian; phase 3 was characterized by the majority of the figures filled with fine incisions and attributed to the Late Dryas stadial and, as such, related with the "style V" group of figures of the Douro Basin (Bueno, Balbín & Alcolea, 2007).

In 2010, it was published a model for the phases of sedimentation and erosion of the deposits at the bottom of the Côa Valley (Aubry *& alii*, 2010). According to that proposal, several of the engraved surfaces were repeatedly buried under sediment, both before and after they were engraved. This paper, although not directly related to the phasing of rock art, was central to some of the arguments that were put forward in a later periodization of the Palaeolithic rock art of the region.

This periodization is anchored in the results of several multivariate analyses that suggest the existence of several clusters of figures in the Douro Basin, differentiated between each other by their morphological traits (Santos, 2019). The study of the relations between figures pertaining to different clusters suggested that these should be seen as the result of four phases of a graphic cycle stretched between the Gravettian and the Azilian (Santos, 2019). This periodization is sustained by archaeological and geoarchaeological evidence and by stylistic comparison.

More recent work done in Cardina and Penascosa, as well as the absolute dating of a sedimentary context in Quinta da Barca Sul, has yielded very important evidences regarding the geomorphological evolution of the valley and the relation between this natural process and the visibility of rock surfaces, which permits us to confirm some aspects of that periodization as well as to refine others (Aubry *& alii*, 2020b). It is this periodization, as well as the strategies and methods used to build it that will be presented in this paper.

4. Strategy and methods

It is not possible to date objectively each rock art motif or composition. The majority of motifs and rock art sites are dated by stylistic comparison and the same happens with the Palaeolithic rock art of the Côa valley, where only the series of portable art of Fariseu (Santos *& alii*, 2018) is objectively dated (*sensu* Lorblanchet, 1995)

and the only *terminus ante quem* defined by absolute dating is for the engravings of rock 1 at Fariseu (Aubry, Santos & Luís, 2014).

The subjacent idea of dating by means of stylistic comparison is the belief that the morphological proximity between two figures can be a strong sign of the temporal proximity of their making. Consequently, if a researcher has a proposal of periodization that can be used in its area of study, he/she only has to look in that proposal for the figure most resembling to the one he/she wants to date and to see to what period is that figure attributed to.

In the course of the 20th century, there were several proposals that were meant to be valid to all Europe, namely those of Breuil (1985 [1952]) and of Leroi-Gourhan (1995 [1965]). The proposal of this last researcher was largely used in the Southwest of Europe until the 90's, when the publication of the first absolute dates for Palaeolithic figures, and especially those of the black series of the Chauvet cave, started a movement of criticism regarding it (e.g. Lorblanchet & Bahn, eds., 1993; Lorblanchet, 1995; Clottes, 2001). Nevertheless, some researchers maintain that this proposal is still valid in many of its points, even if it needs some refinements (e.g. González & San Miguel, 2001; Alcolea & Balbín, 2007).

Despite their position in that debate, the majority of researchers identify, in its own study zones, morphologically homogenous groups of figures or sites to which chronologies are attributed (e.g. González, 2010; Alcolea & Balbín, 2006a; Lorblanchet, 2010). However, because nowadays nobody defends a linear and gradual evolution of the artistic forms, as maintained not only by Leroi-Gourhan, but also by Breuil (1985 [1952]) (e. g. Alcolea & González, 2015, p. 6), it is possible, at least theoretically, to admit that in the same region multiple styles can be contemporaneous (Lorblanchet, 1995, p. 273). That is to say, the possibility of grouping figures based on its morphological traits is not debatable. What is debatable is the chronological relation between those groups and between the images of the same group.

But how are the groups assembled? That is also a very important issue. For instance, Lorblanchet has reminded us the danger that is to take into account poorly defined styles, such as the "striated engraving" as a chronological marker (Lorblanchet, 1995, p. 276).

Taking these issues in mind, we delineated a strategy that is based on the following three principles: groups of figures must be assembled with the maximum possible objectivity; the chronological relation between these groups must be clearly demonstrated; archaeological and geoarchaeological evidence must be favoured in the process of dating these groups, although stylistic comparison should be taken into account either to allow the chronocultural attribution of groups for which there are no other kinds of evidence or to complement the arguments of archaeological and geoarchaeological nature.

The first principle is attained by the adoption of multivariate analysis to assemble the images in different groups. Procedures such as this are widely used in the study of archaeological data (e.g. Binford & Binford, 1966; Renfrew & Bahn, 1993, p. 185), and evidently, also in the study of the Palaeolithic rock art (e.g. Villaverde, 1994; Sauvet & Wlodarczyk, 1995; Tosello, 2003; Bourrillon, 2009; Rivero, 2009; Bourdier, 2010, Gárate, 2010; Petrognani, 2013; Ruiz, 2014; Vázquez, 2014). In our case (Santos, 2019), we have used "multiple correspondence analysis" (Abdi & Valentín, 2007) and "hierarchical ascendant classification", also known as "hierarchical cluster analysis" (Drennan, 2009, pp. 309-310). This type of analysis has the advantage of not favouring one or two morphological traits in the definition of a group (or cluster, expression that we will favour from now on), but several more. We have analysed horses, aurochs, ibexes, red deer stags and red deer hinds. For each of these themes we

have worked with two series of analysis: one in which technical variables (in number of five) were included and one in which they were not. The number of morphological variables was dependent on the theme: 16 for horses, 18 for aurochs, 17 for ibexes and red deer stags and 15 for red deer hinds. A body index was also analysed as a supplemental variable. In order to be sure that we were defining clusters that were created by figures based on their morphology and not in their integrity (Santos, 2019, 174), we have only worked with complete or mostly complete figures. In order to enlarge the number of figures in these analyses and to certify the potential comparisons between portable art and rock art motifs, we have included in the analysis all the figures from the sites and portable art objects located inside the territory where sources of the raw-material identified in the Côa valley were found (e.g. Aubry *& alii*, 2012) (**Fig. 1**). As such, we have also worked with imagery from Domingo García (Ripoll & Municio, dirs., 1999), Siega Verde (Alcolea & Balbín, 2006b), Redor do Porco (Baptista & Reis, 2011), La Griega cave (Corchón, coord., 1997), Ojo Guareña cave (Corchón *& alii*, 1996), Penches cave (Hernández-Pacheco, 1917; Corchón, 2003, pp. 115-117), Mazouco (Jorge *& alii*, 1981), the Sabor valley's and Zêzere valley's rock art sites (Baptista, 2009), and the portable art of Medal (e.g. Figueiredo *& alii* 2016), La Peña de Estebanvella (e.g. García, 2013), Vau (Santos, 2019, pp. 164-165), Villalba (Jiménez & Fernández, 1988) and Fariseu (Santos *& alii*, 2018). This enabled us to work with 170 horses (91 of which from the Côa Valley), 143 aurochs (117 from the Côa Valley), 128 ibexes (108 from the Côa Valley), 91 red deer stags (74 from the Côa Valley) and 65 red deer hinds (57 from the Côa Valley).

The chronological relations between clusters and among motifs of the same cluster were clarified by three main approaches: 1) Stratigraphic analysis of the graphic compositions; 2) Geoarchaeological analysis of the spatial distribution of the engraved rocks located near the bottom of the valley with motifs pertaining to different clusters and 3) Identification of engraved panels exposed by the breaking of previously engraved panels. Regarding the first approach, we try to identify recurrent sequences between motifs pertaining to different clusters. If we observe that motifs of one given cluster are systematically on top of others from another given cluster, there is a strong probability that these two clusters are part of a sequence. The necessity of rigorously analysing and recording the stratigraphic sequence of each composition lead us to adopt the Harris matrix (Harris, 1979) to study and display complex stratigraphic sequences such as the ones of Fariseu 1 (Aubry, Santos & Luís, 2014), Quinta da Barca 1, 23 or Fariseu 4 (Santos, 2019).

The second approach is sustained by the assumption that episodes of erosion of the valley freed rock surfaces previously unavailable to engrave. In consequence, if an erosive event occurred between the making of figures of one cluster and the making of figures of a second cluster, that could have left cues in the landscape, such as the systematic interruption of compositions of the older cluster at a given altitude, bellow which only figures of the later cluster can be found.

The third approach is self-explainable. In the Côa Valley, some examples of engraved surfaces were exposed after the breaking of previously engraved surfaces. If each of these panels is made by figures pertaining to different clusters, it is possible to infer a diachronic relation between them.

Let us now turn to the subject of dating the different clusters. As we have written above, we favoured archaeological and geoarchaeological evidence to accomplish that task.

Three types of available archaeological evidence useful to date rock art can be found in the Côa Valley. The first type of evidence is the stratigraphic covering of panels (e.g. Lorblanchet, 1995, pp. 266-269). This type of evidence gives us, as mini-

mum ages to the making of a given composition, the chronology of the oldest archaeological layer that covers it.

The second type of evidence is the appearance of portable art in very well dated layers. The comparison between portable art and rock art can be problematic, because technic and support-related conditions can affect the outcome of the figures (Lorblanchet, 1995, p. 276). In our case, however, the techniques identified in the portable art are exactly the same that were most used in the rock art. On the other hand, the similarity between the portable art and the rock art are not restricted to one or two criteria, but is based on several ones as it is demonstrated by the results of the multivariate analysis that combines both portable and rock art figures.

The third type of evidence has to do with the stratigraphic position of tools that traceology studies have demonstrated to have been used in the making of figures of a given cluster.

By geoarchaeological evidence we are referring to the evidences that enable us to give maximum or minimum ages to a given cluster by dating the erosion episode that occurred before or after their making. Evidence of the existence of erosive episodes between the making of one cluster and another can be visible in the landscape (see above), but the dating of these events is an entirely different story: they can only be achieved by other means, namely archaeological and geological excavation. One good example for this kind of dating outside the Côa valley can be found in the Nalón valley, in Asturias. There, an Upper Solutrean age was given as maximum age to the rock art of La Lluera shelter because, prior to that period, the shelter was filled with sediments of the Nalón river, as it was possible to infer by a geomorphological study of the valley (e.g. Rodríguez, 2012). On the other hand, among this type of evidence we should also include the dating of the exposure of panels by the measuring of Chlorine-36 (Phillips *& alii*, 1997). The majority of the panels dated by this method in the Côa Valley gave much earlier dates than even the beginning of the Upper Palaeolithic, but one of the dates can be very useful to date one of the clusters.

Not all of the clusters are possible to date if we only use these two types of evidence. In these cases, stylistic comparison is unavoidable. However, it is important to remember that although these clusters are not directly dated, their position in the artistic sequence is well established. They are later or earlier than other clusters that can be better dated. This is in itself very precious evidence that should help us to contextualize the necessary stylistic comparisons with figures from other regions.

Let us now substantiate all that has been said by presenting the results we achieved by means of this strategy.

5. The classification of the graphic *corpus*

The series of multivariate analysis of horses and aurochs suggest the existence of 4 clusters for each of these themes (Santos, 2019) (**Fig. 4**). In the case of horses, this is particularly manifest in the series of analysis that includes the technic variables, while in the case of aurochs that is clearer in the series of analyses without those variables. However, in the remaining series of analyses, the suggestion of 4 clusters, although not so plainly evident, is also tangible. The same goes to both series of analyses of ibexes, stags and hinds. In these cases, the existence of 4 clusters is not without question, but nevertheless highly probable, as it is evident especially in the dendrograms resulting from the respective hierarchical cluster analyses (Santos, 2019). Most probably, the not so evident existence of 4 clusters in the case of ibexes, stags and hinds is due to the lesser number of analysed individuals (see above).

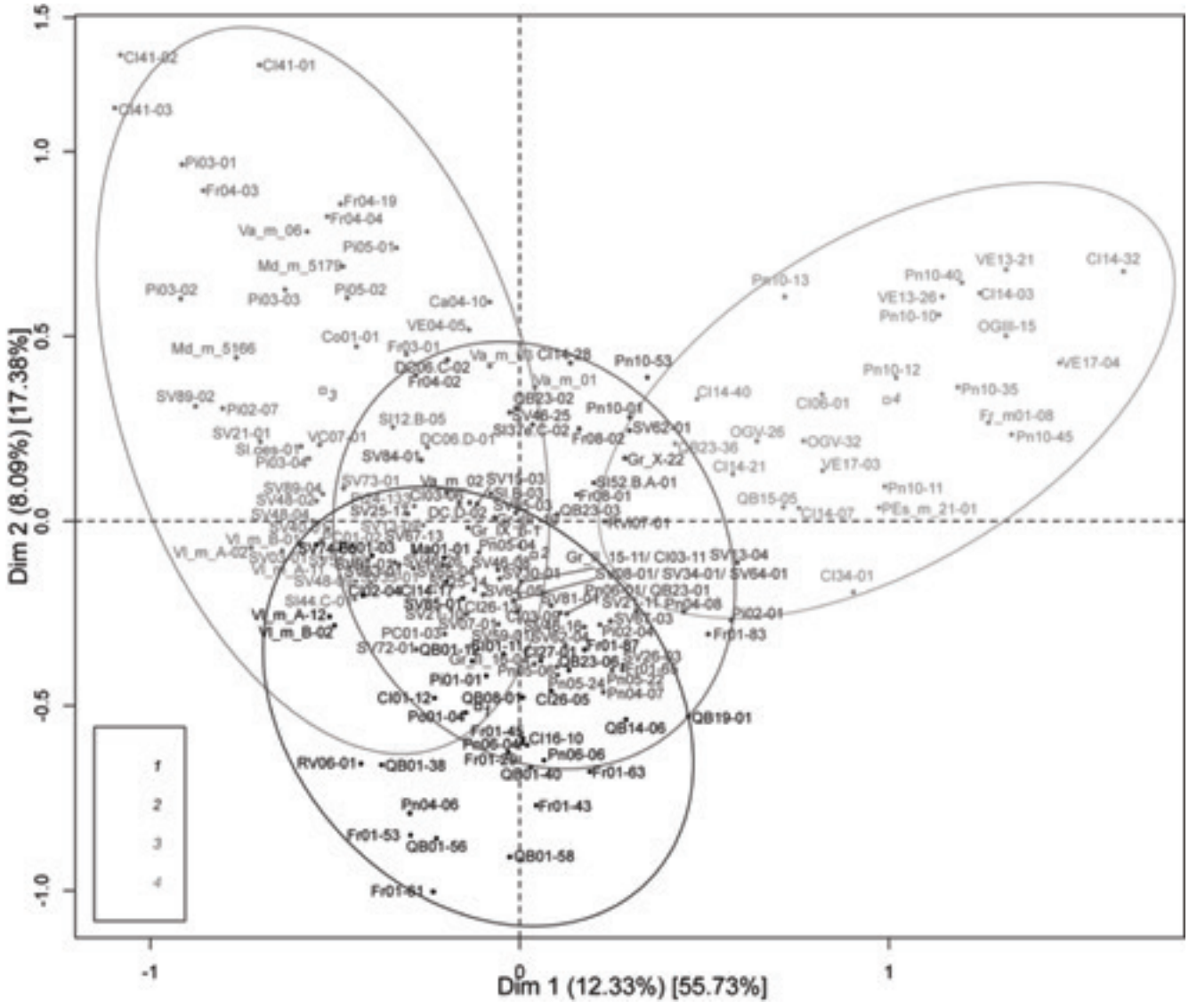


Figure 4: The factorial map of the multiple correspondence analysis made over a sample of 170 horses from the area defined in figures 1. Ellipses define the 95% area of dispersion of each of the clusters suggested by the hierarchical clustering analysis of the sample.

Clusters 1 of all the themes are surely coeval among themselves as eloquently expressed by the figurative stratigraphic sequences of rock 1 of Fariseu (Aubry, Santos & Luís, 2014) or rock 1 of Quinta da Barca (Santos, 2014), in which motifs of those clusters appear in alternation. The same happens between clusters 4 of horses and aurochs and clusters 3 of ibexes, stags and hinds, like it is evident in sequences such as the ones of Quinta da Barca 23, Penascosa 10 (Santos, 2019) or in compositions such as Vale de José Esteves 16 (Baptista, 2009).

The relation of contemporaneity between the remaining clusters is not so clear. General contemporaneity between clusters 2 of aurochs and horses is attested, for example, in the compositions of the upper sector of rock 3 and rock 12 of Canada do Inferno (Baptista & Gomes, 1997). Compositions with aurochs and horses of the respective clusters 3 in which a relation of contemporaneity is evident are harder to find because compositions of this period with both aurochs and horses are not so common (Santos, 2012). However, figurative stratigraphy of rock 4 of Fariseu (Santos, 2019, 623) proves that the engraving of cluster 3's horses are closer in time to the making of cluster 3's aurochs than cluster 2's horses, because the figurative stratigraphy shows the following sequence: cluster 2 horse – cluster 3 auroch – cluster 3 horse.

The relation between ibexes, stags and hinds of cluster 2 with aurochs and horses of both clusters 2 and 3 are documented in several rocks (e.g. Canada do Inferno 3, Rego da Vide 1, Vale de Cabrões 32, Canada da Moreira 7, Piscos 24 [Santos, 2019]), which confirms that clusters 2 of ibexes and of both sexes of red deer contain the figures coeval of clusters 2 and 3 of horses and aurochs. The contemporaneity between clusters 2 of aurochs and horses and certain ibexes, stags and hinds of the respective clusters 1 should not be ruled out, as it is apparent by the obvious association between cluster 1's ibexes and red deer to cluster 2's aurochs and horses in several rocks, such as it is the case in Canada do Inferno 3.

Having approached the synchronic relations between clusters, let us now to tackle their possible diachronic relations. The study of both vertical and horizontal stratigraphy of compositions with figures of different clusters confirms the existence of a sequence between clusters 1 and 4 (or 3 in the case of ibexes and red deer of both sexes) (Santos, 2019, pp. 145-151). In fact, 23 cases respect the diachronic relations established by that sequence (1 case in Domingo García, 5 cases in Siega Verde and 17 in the Côa valley). In only 2 cases of Canada do Inferno (rocks 1 and 11) and 1 of Penascosa (rock 3) aurochs integrated in cluster 2 are overlapped by animals integrated in cluster 1 and in one case of Penascosa (rock 6), one horse integrated in cluster 2 is overlapped by ibexes and horses of cluster 1. These animals are, however, exceptions in panels dominated by figures integrated in their respective clusters 1, appearing in the respective factorial maps inside or very close to the shared zones of the 95% confidence ellipses of both clusters 1 and 2.

On the other hand, in 2 rocks of Penascosa (rocks 4 and 5) too many animals pertaining to different clusters appear together. In rock 4, one ibex and one horse were integrated in cluster 1 and two horses in cluster 2. Something very similar occurs in rock 5, where three aurochs, two ibexes and one stag are integrated in cluster 1 and one aurochs, one hind and four horses are integrated in cluster 2. Figurative stratigraphy in rock 4 does not rule out the sequence, but in rock 5 a cluster 1's aurochs was made between two cluster 2's horses and another cluster 2's horse was made under a cluster 1's ibex. The figurative stratigraphy of rock 5, the high number of motifs pertaining to different clusters in these rocks, the fact that red deer and ibexes integrated in the respective clusters 1 can be coeval of horses and aurochs of the respective clusters 2, as well as our reading of these panels as synchronic compositions (although we admit the subjectivity of this particular judgment) lead us to hypothesize that these two panels were made between the ending of the making of cluster 1's figures and the beginning of the making of cluster 2's figures (Santos, 2019, p. 151).

Now, that these two panels were engraved somewhere during the transition between the two clusters of figures is also possible to infer from the geoarchaeological analysis of the site, the second of our approaches mentioned above to infer diachronic relations between clusters. In fact, as it is patent in the site (**Fig. 5**), rocks dominated by cluster 1's figures are located more or less along a "line" located at higher ground, an important interval existing between that "line" and the location of rocks 4 and 5, as well as of other rocks (37 and 38), recently discovered and still in study, that only contain figures, that although not yet integrated in the multivariate analyses, are similar to those of clusters 2 or 3 of aurochs and horses, 2 of ibexes and 3 of hinds. The interval between the base of the panels dominated by clusters 1' figures and the location of these last-mentioned rocks is parsimoniously explained by the existence of an erosive event between the engraving of both groups of rocks.

This episode left its mark also on other sectors of the valley, namely in the upriver section of Canada do Inferno, where rocks dominated by clusters 1's figures

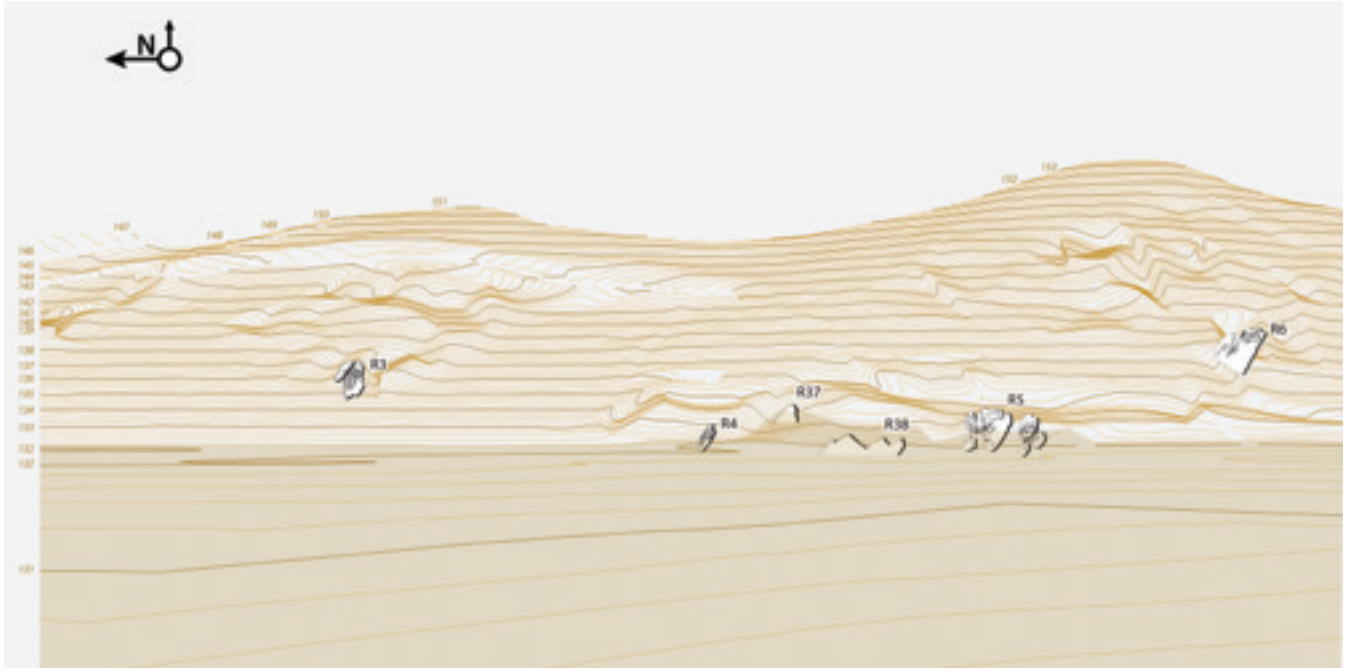


Figure 5: Distribution of rock art in Penascosa between rocks 3 and 6. Rocks 3 and 6 are dominated by cluster 1's figures. Rocks 4 and 5 have figures of both clusters 1 and 2; Rocks 37 and 38 only have figures of clusters 2 or 3 of aurochs and horses, 2 of ibexes and 3 of hinds.

are systematically at higher ground and clearly separated of those rocks which only contain figures integrated in later clusters (Santos, 2019, pp. 151-155).

The engraved surfaces that were exposed by the spalling of previously engraved ones are rare, but they should be mentioned. They are found in rocks 2 and 15 of Quinta da Barca (Santos, 2019, p. 149), both with figures of later clusters appearing in surfaces resulting from the spalling of panels with figures integrated in the respective clusters 1.

The above mentioned approaches confirm that there are several synchronic and diachronic relations between the identified clusters of figures. Those relations allow the distribution of the clusters by four phases of graphic activity in the region: 1) phase 1, during which was made the majority of the figures of the cluster 1 of each analysed theme; 2) phase 2, during which were made the majority of figures integrated in clusters 2 of aurochs and horses, a significant part of the ibexes, stags and hinds integrated in the respective clusters 2, as well as a few figures integrated in the cluster 1 of these last themes; 3) phase 3, during which were made the totality of the aurochs and horses integrated in the respective cluster 3 and a significant part of the ibexes, stags and hinds of the respective clusters 2; 4) phase 4, during which were made the totality of the aurochs and horses integrated in their clusters 4 and the totality of the ibexes, stags and hinds integrated in the respective clusters 3.

The next step is to chronologically constrain each of these phases.

6. Dating the phases

6.1. Archaeological evidences

The first of the abovementioned three types of archaeological evidence appropriated to date rock art was the stratigraphic covering of a panel. Until today, only two engraved panels were found partially buried by Pleistocene sediments.[4]

4. A third case – rock 9 of Fariseu – was identified after the writing of this text (Aubry & alii, 2020c; 2020d; 2020e).

During the 2003 archaeological excavation of panel 24 from Ribeira de Piscos, several engraved sub-panels were uncovered along with few lithic material (Luís, 2009). Only layer 3, where an inverse scraper on quartz flake was found, was interpreted as an *in situ* pleistocene slope deposits. This layer covered the lower part of panel 28, presenting a red deer and two aurochs, all integrated in the corresponding clusters 2. While luminescence dating is still pending, only the quartz inverse scraper could hint to a Magdalenian phase.

More relevant is panel 1 from Fariseu (e.g. Aubry & Sampaio, 2009), where 89 zoomorphic figures were identified (Santos, 2019, pp. 601-619). Only 42 of these figures were included in the multivariate analysis. All of them were integrated in the cluster 1 of the respective theme (Santos, 2019, pp. 81, 101, 114, 126, 138). These results reinforce our interpretation of a highly uniform ensemble already established by one of our previous works (Aubry, Santos & Luís, 2014), in which we applied the index of formal homogeneity proposed by Fortea *& alii* (2004) to the ibexes, horses and female aurochs of the rock. Only one morphotype of horses was identified, and all but one ibex and one aurochs were integrated in the respective main morphotype. The aurochs left out of the main morphotype of the rock (Fr01-46) was nevertheless integrated in the cluster 1 of motifs of the all studied universe of aurochs in the multivariate analysis. The ibex left out of the main morphotype of the theme (Fr01-84) was not integrated in the multivariate analysis because it is reduced to its head.

The oldest layer covering engravings only concealed 8 figures (Fr01-02; Fr01-04; Fr01-11; Fr01-28; Fr01-40, Fr01-44, Fr01-58 and Fr01-64), but the stratigraphic study of the figurative sequence revealed that other 39 motifs were made before at least one of those figures (Aubry, Santos & Luís, 2014, p. 605). As such, at least 47 animals were surely made before the deposition of the oldest layer in the site (layer 8), which was dated by OSL of 18,400±1400 BP (Aubry, Santos & Luís, 2014, p. 262). Furthermore, inside this sedimentary package, at the bottom of the sequence, a rock fragment with the muzzle of an aurochs was found. The similarities between the heads of Fr01-50 and Fr01-36 strongly suggest that this fragment shows the apex of the muzzle of this aurochs (**Fig. 6**).

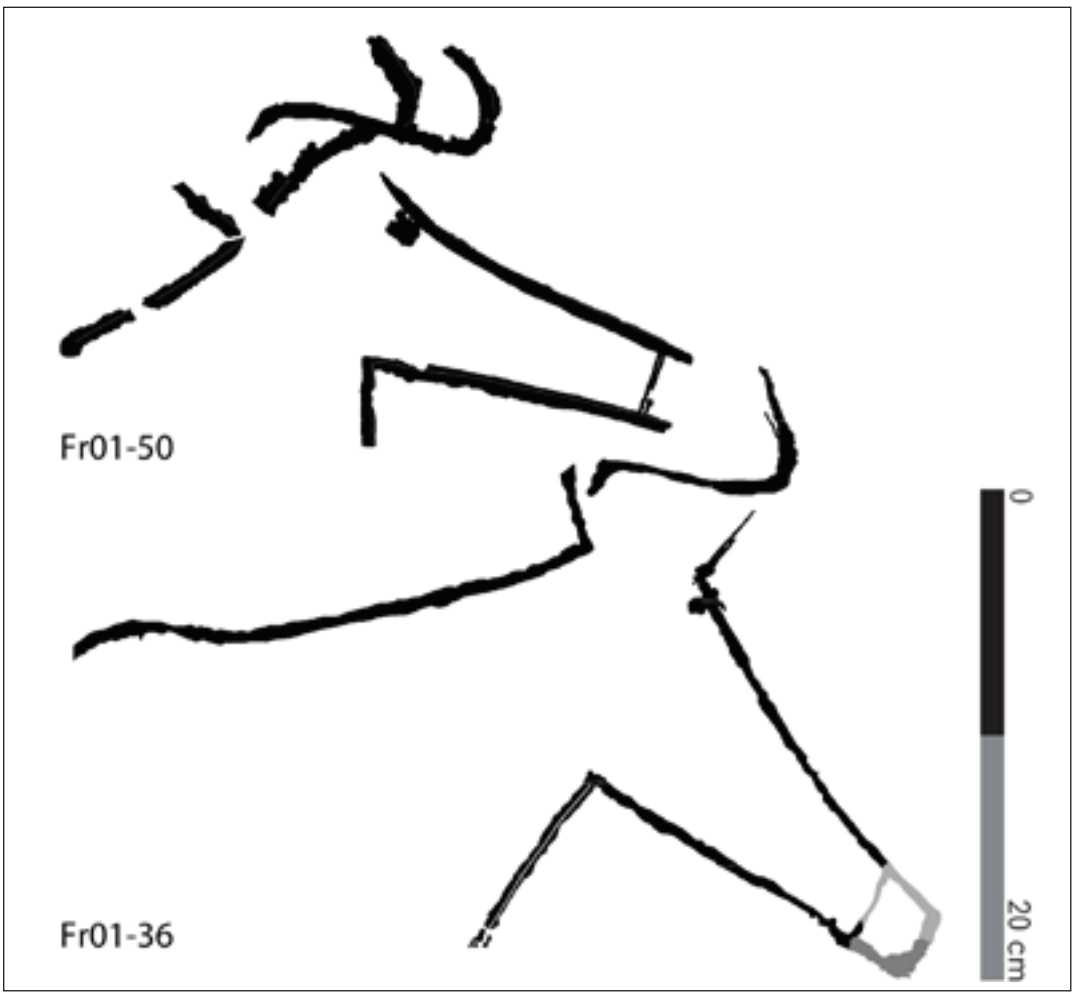
The rest of the figures can, in theory, have been made after this date, but the homogeneity of the composition does not make this hypothesis too parsimonious. Very importantly, the two figures left outside of the main morphotypes of their species could theoretically have been made after 18,400±1700, but not after the deposition of layer 5/6 that yielded the luminescence dates of 15,200±1600 BP, 14,300±1100 BP and 13,700±1000 BP (Aubry, Santos & Luís, 2014). This is irrelevant in the case of the aurochs, but similar shapes of the head of the ibex appear in panel A of rock 27 of Canada do Inferno (CI27-03), in rock 30 of the same site (CI30-05) (Santos, 2019, pp. 684, 688) and in panel C of rock 14 of Foz do Côa (Santos, 2019, p. 292). These figures were all attributed to phase 2 of the periodization that we are now presenting and refining (Santos, 2019, pp. 276, 292).

The stratigraphic covering of rock 1 of Fariseu only give us a minimum date to the engraving of the rock. As such, it is very important to keep in mind that, although not directly in contact with the rock, another archaeological layer was identified in the site. In this layer, a shaping flake with heat treatment and a radiocarbon date of 19,020+/-80 BP (GrA-40167) confirm the occupation of the site at the end of the Solutrean (Auby, 2009, p. 83).

The second type of archaeological evidence that we enlisted above was the finding of portable art in well-dated contexts. In the Côa valley, only the series of Fariseu is a good reference to date the rock art, namely that of phase 4 (Santos *& alii*, 2018). The collection comprises 85 engraved pieces (between pebbles and plaques of schist)

→

Figure 6: On top, photomontage of Fr01-36 with the piece of engraved rock that appeared on the base of layer 8 of Fariseu. On the bottom, comparison between the reconstructed head of Fr01-36 (black: traces on the rock; medium grey; traces of the fragment; light grey: reconstruction) and Fr01-50.


Fr01-50
Fr01-36
0
20 cm

as well as 4 painted pebbles. The large majority of the pieces was exhumed in the layer 4 of the site, attributed to the Late Azilian by the observation of the lithic remains and by luminescence and radiocarbon dating that yielded results comprised between 12,500 and 11,000 calBP (Aubry *& alii*, 2017).

Although red painting was found in four pieces, the majority of the pieces were engraved, mostly by multiple incision. 66 figurative motifs were identified in 45 of those pieces, the majority of them being red deer (Santos *& alii*, 2018). All the 20 motifs of the series that were included in the multivariate analyses were integrated in the later clusters of the respective themes.

Near the Côa valley, an outstanding series of portable art was found in the site of Medal, in the Sabor Valley (e.g. Figueiredo *& alii*, 2016). Unfortunately, the majority of the collection, comprised of 1511 pieces (mainly fragments) (Figueiredo *& alii*, 2016, p. 67) is still unpublished. Nevertheless, some very important evidence must be retained. According with the available information, one piece with a zoomorphic figure came from a Gravettian level. The figure is reduced to its ventral-cranial zone and it seems to be an aurochs. It shares some features with some infrequent figures of the Côa valley, namely with the only figure of rock 1 of Fariseu with two hind legs (Fr01-57), although in the case of Medal we have a pair of front legs. Several Gravettian absolute dates are known from different contexts of the site (Gaspar *& alii*, 2016), but unfortunately no information is given regarding the actual stratigraphic context from which this piece is coming. One piece with a representation of a horse is referred to have been collected in a Solutrean level (Figueiredo *& alii*, 2016, p. 73). The narrowing of the head at the level of both front and throat is similar to what happens in the heads of the horses of the Côa valley integrated by the multivariate analysis in cluster 2 (e.g. Pi02-01, Pi02-04 and RV07-01 [Santos, 2019]). There are no dates for the Solutrean occupations of the site, besides a probable attribution to its middle phase (Gaspar *& alii*, 2015, p. 558).

The largest collection of pieces was exhumed in the level 1055, which was attributed to the Magdalenian *sensu lato*. Here, 1257 fragments were found, the study of which revealed the presence of 91 animals identifiable at the species level and one anthropomorphic figure (Figueiredo, Xavier & Nobre, 2015, p. 1576). Aurochs, horses, and especially ibexes, are the better-represented species, although red deer was also identified (Figueiredo, Xavier & Nobre, 2015, p. 1576). Stylistically, two series were identified, one more schematic and another one more naturalistic, a contrast that was interpreted as a sign of a temporal distance between the makings of each series, although both were attributed to the Magdalenian (Figueiredo, Xavier & Nobre, 2015, p. 1576). The 3 animals of the site that were published at the time that we have done the multivariate analyses were integrated in cluster 3 of horses and cluster 2 of ibexes (Santos, 2019). These animals are part of the naturalistic series. Other animals of these series that were published in subsequent publications confirmed the similitudes between the naturalistic depictions of the site and the animals of phase 3. The same, however, does not happen with the animals of the schematic series.

Unfortunately, we have very few evidences that could help us to better understand the relation between the two series. All we know is that both series come from a secondary depositional context (Figueiredo, Xavier & Nobre, 2015, p. 1575) that was in place before the 12,350 ± 930 BP given by the OSL date of layer 1034, which covers it (Gaspar *& alii*, 2016, table 2). The absolute dates for moments previous to the deposition of the Magdalenian layer are too old and/ or too uncertain to be of any use in refining the chronology inside that chronoculture (Gaspar *& alii*, 2016, table 2). In fact, in the layers directly below the Magdalenian layer, the majority of the dates yielded results older than 30,000 BP. Only two exceptions are known: one OSL date

of 19,200 ± 4630 (X6263), which comes from a layer attributed to the Gravettian (!)[5], and one TL date of 25,100 + 2600/-2300 (BXS1) coming from another layer also covered by the Magdalenian layer and attributed to the Early Upper Palaeolithic[6].

The third type of archaeological evidence that can help us to date rock art is the finding of tools that could have been used to produce it. Regarding this type of evidence, several quartzite picks with triangular flat points were found in layer 3 of Olga Grande 4 (Aubry, 2001, p. 262). Traceology (Plisson, 2009) and experimental archaeological studies (Aubry, Luís & Sampaio, 2011) demonstrated that those were used as pecking tools. In fact, the morphology of the impacts resulting from the hammering of a recently exposed panel is the same as the morphology of the impacts that conform the cranial border of the front leg of CI01-12 and the left horn and back of CI02-06 (Aubry, Luís & Sampaio, 2011), respectively a horse and an ibex that were integrated by the multivariate analyses in the cluster 1 of the respective themes (Santos, 2019). These types of comparisons are only possible when the impact negatives are sufficiently isolated from each other in order to permit their characterization. Nevertheless, the possibility that these tools could have been used not only on pecking, but also in regularizing the resulting trace by abrading it, was confirmed by several engraved replicas made by one of us (António Fernando Barbosa), as documented, for instance, in the movie *Côa. La rivière aux mille gravures* (dir. Jean-Luc Bouvret, 2006). However, other tools could have made this type of engravings. One way or the other, these tools were surely used to engrave the same type of, at least, certain figures of our phase 1. As such, the chronocultural attribution of the layer where these tools were found is highly important as a chronological reference to that phase. The TL dates coming from the layer are comprised between the 26,800 ± 2300 BP and 31,000 ± 2500 BP (Mercier *& alii*, 2001). They are compatible with the lithic material found inside it, attributed to the Gravetian (Aubry, 1998).

Summing-up, the archaeological evidence *per se* allows us to date at least some of the engravings of phase 1 to a period before 18,400 ± 1700 BP (evidence coming from the excavation in front of rock 1 of Fariseu). We also know that some of these engravings were already being made during the Gravettian (evidence provided by the traceological and experimental archaeological studies of the pecking tools of Olga Grande 4). It also confirms that phase 4 should be dated around 12,000-11,000 calBP (portable art of Fariseu). Regarding the other phases, we only know that they were in place between those phases and that phase 3 should be dated to a period before 12,350 ± 930 BP (evidence from Medal). Let us now see if geoarchaeological evidence can help us refine this periodization.

6.2. Geoarchaeological evidences

As we have mentioned earlier, at least in two locations of the Côa valley – the site of Penascosa and the upriver sector of Canada do Inferno –, an altitudinal void exists between phase 1 engravings and phase 2 (and later) engravings. As it was also mentioned earlier, we think that these voids are evidences of one erosional phase that existed between phases 1 and 2 of graphic activity in the zone. As such, the date of that episode is the *terminus ante quem* for phase 1 engravings and the *terminus post quem* for phase 2 engravings.

It was in the excavation of Fariseu that we first notice the existence of an ero-

5. And for which it is also known the OSL date of 32,540 ± 2840 (UGA 13OSL-865)

6. And for which are also known the OSL dates of 39,800 ± 4540 (UGA 13OSL-862), 32,700 ± 2540 and the radiocarbon date of 27,550 ± 140/-130, which calibrated yields the interval 31,573-3115 calBP. Calibration made with OxCal v. 4.3 (Bronk Ramsey, 2009; Bronk Ramsey & Lee, 2013), having been used the IntCal 13 (Reimer *& alii*, 2013).

sional episode occurring after phase 1 engravings (Aubry, Santos & Luís, 2014). In fact, as we have remembered earlier, layer 8 of the site, which was dated by TL of 18,400 ± 1600 BP, covered more than half of the figurative sequence of rock 1. The figures were engraved obviously before the deposition of this sedimentary package. But how much time before that? The fact that the base of the engravings conforms a line very similar to the limit of a layer that was cut by fluvial erosion, such as it happens with layers 3 and 5 of the site, has permitted to infer the existence of a sedimentary package, coeval of the making of the engravings, that was washed away by the river before the deposition of layer 8. This washing away of the alluvial package can be the local manifestation of the erosional episode that we are trying to date. We had related this missing package with layer 9 of the site, which was only identified in a pit several meters away of rock 1, from the top of which comes the radiocarbon date of 19,020 ± 80 BP[7] (GraA-40167) (Aubry, Santos & Luís, 2014).

Further archaeological work in other sites of the Côa Valley yielded, in the meantime, very important data to chronologically refine the sequence of accretion and erosion of the valley (Aubry *& alii*, 2020b). Among these works, the ones undertaken in Cardina should be highlighted.

Cardina is located on the left bank of the Côa river, 2 km upriver the sites of Penascosa and Quinta da Barca. The best-preserved sector of the site is located in a platform situated 20 m above the present-day riverbed of the Côa valley. Archaeological work carried out in the site (e.g. Zilhão *& alii*, 1995; Aubry *& alii*, 2015, 2016, 2018) revealed a 5 m-thick stratigraphic sequence in which 8 field units (GFU 1 to 8) were identified with evidences of prehistoric human occupations since the Middle Palaeolithic until Bronze Age (see Aubry *& alii*, this volume).

Sedimentary clay mineralogy carried out by L. Dimuccio demonstrated that GFU's 8 to 5 were deposited in a low energy environment of an ancient course of the river Côa (Aubry *& alii*, 2020a). Both the luminescence dates obtained over quartz grains and feldspar, and the technology and typology of lithic remains, show that this alluvial environment characterized all the Middle Palaeolithic, Late Aurignacian, Early or Middle, and Late Gravettian occupations.

GFU's 4 to 1, on the other hand, correspond to slope deposits resulting from gravity-driven processes (Bergadà, 2009), containing evidences of occupation of the site from the Middle Solutrean to present day.

The contrast between those two geoarchaeological packages must result from a dramatic change in the fluvial system that occurred between the Late Gravettian (later occupation of the alluvial package) and the Middle Solutrean (earlier occupation of the coluvial package). This change, which was much probably accelerated by the breaking of the rhyolite vein that crosses the riverbed in a perpendicular direction, must have had a huge impact on the hydrologic dynamics downriver. It is much probably on the origin of the erosional episode that washed away the coeval soil of the engraving of rock 1 of Fariseu and of the sediments that covered (before their engraving) rocks 4, 5, 37 and 38 of Penascosa. The boundary between phase 1 and phase 2 of the graphic sequence must be therefore located between the Late Gravettian and the Middle Solutrean.

Besides this erosive event that left its mark on several of the ancient beaches of the Côa Valley, an accretion episode is also attested by alluvial packages in at least two sites of the bottom of the Côa valley – in Fariseu by GFU 6 and in in Quinta da Barca Sul by GFU 4. The alluvial package of Fariseu yielded an OSL date of 15,200 ±

7. The calibration of this date with OxCal (see previous note for technical references) results in the following interval: 23.175-22.595 calBP.

1600 BP and two TL dates of 13,700 ± 1000 and 14,300 ± 1100 (Mercier *& alii*, 2006); GFU 4 of Quinta da Barca Sul yielded OSL dates of 15,000 ± 1.000 and 13.000 ± 1.000 (Aubry *& alii*, in press). These dates are very similar to the OSL dates obtained in alluvial packages identified in the left margin of the Douro River, a few kilometres downriver the confluence of the Côa with the Douro – Cortes da Veiga and Vale Meão (Cunha *& alii*, 2019).

The excavation in Fariseu showed that this package was also eroded before the colluvial deposits of the Late Dryas were in place. As such, the package is preserved only in very particular sites of the valley. In fact, in Quinta da Barca Sul it is reduced to certain pockets and only in Fariseu it has an expressive thickness, due to the fact that here the river runs perpendicularly in relation to the joint fractures of the schists, which has softened the fluvial erosional action of the river (Aubry *& alii*, 2020b).

This aggradation episode before the Late Dryas colluviums explains why phase 3 engravings near the bottom of the valley are systematically lower than phase 4 engravings in all the sectors of the valley' bottom where both phases are represented (e.g. Penascosa, Piscos and Fariseu) (Aubry *& alii.*, 2020b). However, such a contrast was not identified between phase 2 and phase 4 engravings. This shows us several things: 1) erosion must have been taken place (or continued) between phases 2 and 3 (as it is shown by the relation between rocks 4, 5 and 37 of Penascosa, on one hand, and 38 on the other), or at least, there was not aggradation between one phase and the other; 2) Some aggradation must have existed after the making of phase 3 engravings and before the colluviums of the Late Dryas, because all phase 4 engravings are systematically higher than those of phase 3; 3) This aggradation was not sufficient intense to restore the topography of the valley coeval of phase 1, or a new erosional episode (such as the one that has cut the top of the alluvial package 5/6 of Fariseu) occurred after the alluvial package was in place; 4) regardless of this erosional episode having been extensive to all the valley or not, an aggradation episode took place between the making of phase 3 and phase 4 engravings. A new boundary between phases can thus be inferred, this time between phases 3 and 4. This boundary corresponds to the dates of the aggradation episode, the upper limit of which is the beginning of the Late Dryas. Because the available absolute dates are spread along all the GI-1 interstadial, the lower limit is more imprecise.

Let us now turn to the only absolute date obtained on the rock surfaces of the Côa Valley that can be of any use to date a graphic phase. This date was obtained in rock 14 of Canada and it dates the exposure of this surface in which phase 2 figures are the older motifs. This date is, as such, a *terminus ante quem* for these figures. The date was obtained through the method of the Chlorine-36 and yielded the age of 16,200±1500 (e.g. Phillips *& alii*, 1997). This shows us that after that age (between the end of the early Magdalenian and the Middle Magdalenian), this type of engravings was still being made.

Summing-up, geoarchaeological evidence allows us to precise the periodization based solely on archaeological evidence. If with archaeological evidence we had already inferred that some of the phase 1 engravings were being done during the Gravettian and that at least part of the engravings of Fariseu were made before 18,400±1700, now we know that between the making of all the engravings of this phase and the engravings of phase 2, an erosional episode occurred somewhere between the Late Gravettian and the Middle Solutrean. If we, solely based on archaeological evidence, infer that phase 4 was coeval of Late Dryas and phases 2 and 3 were earlier, geoarchaeological evidence allows us to say that phase 3 is previous to an aggradation episode that should be related with the GI-1 interstadial. We also know that phase 2 engravings were still being made after, at least, 17,700.

7. The graphic sequence of the Côa Valley's Palaeolithic art

Now that each phase is chronologically defined, we can characterize its rock art. Comparisons with other rock art sequences can help us to confirm our previous inferences or precise the dating of each phase. Although our sequence is extensive to all the sites of the Douro Basin and of all the territory south of that until the Tagus Valley, in this section the focal point of our analysis is the Côa Valley. In fact, the rock art of each site of this region is integrated in one or more of our phases and, as such, there are relations of contemporaneity between them. However, differences exist between these sites, namely at the level of the quantity, diversity and identity of the represented themes.

Besides several animals of the Côa valley, figures of the sites of the Sabor Valley, of Mazouco, Foz do Ocreza, Redor do Porco, Foz Tua and Siega Verde were also integrated by our analysis in one of the clusters that conform phase 1 (Santos, 2019, p. 166).

Phase 1 figures are characterized by prominent bellies; dorsal borders with pronounced humps, backs and rumps; rounded hips; naturalistic heads with few or without inner details; when these exist, they correspond to linear mouths or nostrils and/ or eyes with rounded shape or simply represented by a dot; only one leg per pair is usually represented; absolute profile is the most commonly adopted perspective solution, especially in the horns and antlers, but oblique biangular profile is also attested. The most common techniques are pecking and abrasion, although simple incision is also attested, especially as previous sketches. Use of red mineral pigment is identified in rock 6 of Faia, filling previously pecked and engraved contour lines of five heads of aurochs and one of horse. The inner delimitation of four of the auroch's heads are, on the other hand, exclusively painted. Compositions involving a high density of superimposed figures are very common (**Fig.** 7).

This type of animal depiction is common throughout all Iberia and France, in contexts systematically dated or attributed especially to the Gravettian, but also to the Aurignacian and/ or the Solutrean, until its middle phase. The parallels for the animals of this phase are essentially the ones already identified by Guy (e.g. 2000) in such sites as Escoural, La Pileta, El Reno, La Croze à Gontran, Pair-non-Pair and Mayenne-Sciences. Similar animals can also be found in other 30 sites across France and Spain (**Fig. 11**). The majority of these parallels are dated or attributed to the Gravettian or the Early Solutrean, although an Aurignacian attribution cannot be ruled out to some of them. A few, already with some features that are also common in our phase 2 figures, are dated or attributed to the Middle Solutrean (Santos, 2019, pp. 166-173). As such, the stylistic comparison confirms our chronological inferences based on archaeological and geoarchaeological data. Phase 1 can, as such, be attributed to a period between the Gravettian (at least) and the Middle Solutrean.

474 animal figures of this phase are inventoried in the Côa valley, distributed by 97 parietal spaces of 10 sites (Santos, 2019, Tabs. 6.5 and 6.7, updated with new findings). Aurochs is the most represented theme (28.48%). Horse (20.25%), ibex (19.83%), red deer (11.18% and chamois (1.69%) are the other themes with more than one representation. Fish, bear and bird of prey are represented by only one figure each. 17.72% of the animal figures is, because of shape or integrity, unidentifiable. Non-figurative repertoire consists mainly of linear and angular forms. In blunt contrast with the figurative repertoire, non-figurative imagery is almost exclusively engraved by incision.

More than half of these animal figures are animated. Dynamism is a feature long identified for Palaeolithic art (Cartaillhac, 1902), notably in the Côa Valley (Luís, 2012, 2019). Following previous studies (Leroi-Gourhan, 1992; Crémadès, 1993; Azéma,

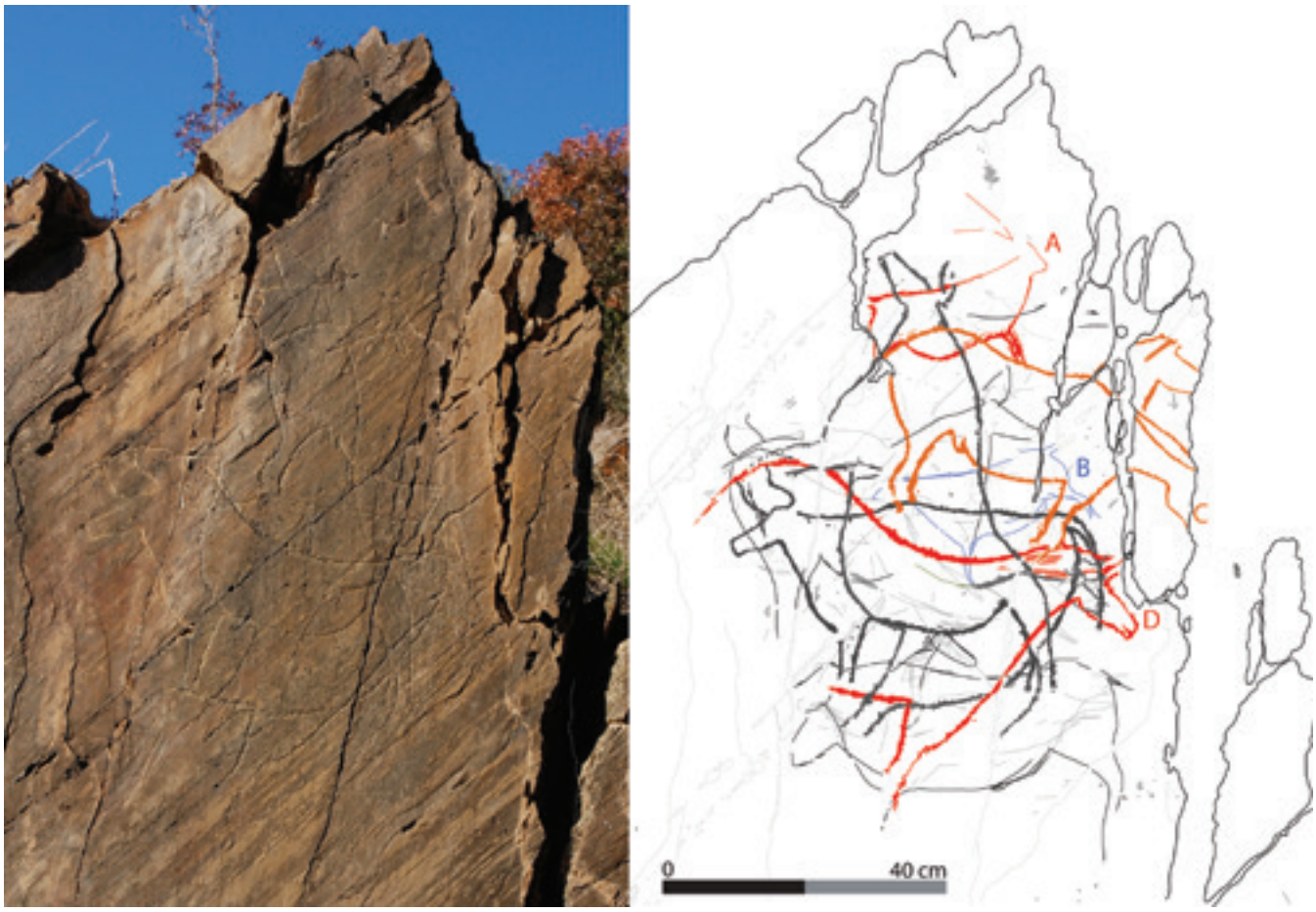


Figure 7: Upper sector of rock 1 of Canada do Inferno, an example of a phase 1 composition. The animals with colour are examples of animated figures in the composition.
A – Symmetrical frozen motion; **B** – complex coordinated frozen motion (symmetrical in the legs and segmental in the head); **C** – Split-action in the head movement by segmental superposition; **D** – segmental frozen motion (ears).

1992), a typology of movement representation has been defined (Luís, 2012), dividing it into three major categories, each subdivided into several subcategories.

The main category for all Palaeolithic art is frozen motion, which includes images portrayed in such a pose as to convey motion (Leroi-Gourhan, 1992). Classical examples are the Myron's Discobolus (5th century BC) or the flying gallop of Géricault's Epsom Derby (1821). If most of the Palaeolithic animal representations are depicted in full profile, the head following facing frontwards, and vertical legs and tails, when an animal is portrayed with its head upwards, legs stretching, or tail over the side, it can be interpreted as the depiction of the animal's motion. Most of the frozen motion in all Côa Valley sites is classified within segmental animation, meaning that motion is suggested by one of the animal's segments (head, tail, ears, mouth, and tongue). When the animated segment is the legs, they are classified in the symmetrical and asymmetrical subcategories, where the front and or hind legs are stretched and/or flexed (symmetrical), or present different lengths (asymmetrical), suggesting locomotion (gallop, jump, etc.), rest, or a perching position. When all four limbs are portrayed in motion, the representations are classified into simple coordinated animation, either lateral (both limbs of the same side are portrayed in the same position, either frontwards or backwards) or crossed (limbs of opposing sides are portrayed in the same position). Finally, when several of these subcategories are combined in the same representation, it is classified in the complex coordinated subcategory.

The second and most notable animation category of the Côa Valley, and of all the Upper Paleolithic art, is split-action animation (Azéma, 1992, Azéma & Rivière, 2012), where the animal's motion is broken up into several stages, or frames, foreshadowing modern cinema by several millennia. The representation of several stages of the same movement can be done by superposition (e.g. Étienne-Jule Marey's chronophotographies [1882]or Duchamp's a Women descending a Staircase No. 2 [1912]), or juxtaposition (e.g. Muybridge's chronophotographies [1877] or a comic book).

Some animals present multiple contours, that other than being motivated by style can confer motion to the animal. These very rare and difficult cases are in between the split-action and the action lines categories, which is the rarest of the animation categories (Crémadès, 1993). These are lines that can be interpreted as a way of conferring action to the animal, which is particularly difficult when multiple "parasitic" lines surround and superimpose most of the Paleolithic representations. However there are cases where lines and signs are clearly associated to certain animals, most notably in its heads or mouths (Leroi-Gourhan's "*souffle vital*"), that present other animation categories, such as frozen motion.

Most of the animated representations of phase 1 are included in the frozen motion category (88%), mostly within the segmental subcategory, followed by asymmetrical, symmetrical and finally, complex coordinated (**Fig.** 7). No simple coordinate animated example is known, since most of this phase's depictions only present one leg per pair. The most animated segment is the legs, mostly the hind, followed by the fore, and all four legs. They are normally stretching, with some cases of flexed limbs. The second most animated segment by frozen motion is the head, mostly stretching, followed by looking upwards, backwards (**Fig.** 7), and to the side, facing the observer. Tails, ears and mouths are also exceptionally animated.

Split-action animation reaches its peak during this phase, with a total of 28 known depictions, an exceptional number of this type of animation in all Paleolithic art. Most of them are included in the segmental superposition, where one body segment is duplicated, tripled (Pn04-07), or even quadrupled (Fr01-45). This concerns mostly heads, and in one case also the front legs (Pn04-07). The heads display generally an upward movement, with some backwards cases (QB02-01). There are also seven cases we define as integral superposition, where the complete animal body is duplicated and superimposed in such a way, and with such stylistic unity, that they are interpreted as being two phases of the motion of the same animal. Like in segmental superposition these cases mainly portray the same head movements, mostly upwards (Fr01-11 and 13), and in one case the movement of the tail (Fr01-76 and 78). Finally, within the split-action category there are two examples of juxtaposition, where three (CI30-01 to 03) and four (Fr01-48, 52, 80 and 82) male ibexes were represented in a line, presenting such stylistic unity, that can be interpreted as different moments of the movement of the same animal.

There are only three representations that can be interpreted as presenting action lines, with two of them also presenting frozen motion features. Both of them present lines coming from its mouths, one with its head turned to the side, facing the viewer (QB01-41), and the other with stretched asymmetrical legs (Pn05-01). The third one is a horse, which presents one pecked line touching its neck (QB12-01).

Other than the ones located in the Côa valley, figures integrated in one of the clusters that conform phase 2 are found in Siega Verde, La Griega, Domingo García and Poço do Caldeirão (Santos, 2019, p. 174)

Pecking is less frequent in the making of phase 2 figures. Contrariwise, abrasion and incision – both in its simple form and especially in its repeated form – are more

recurrent. Scrapping is also attested. In terms of morphology, animal bodies become less massive; inner details of the head become more common and their form less simple (e.g. nostrils of the horses become round); the representation of two legs per pair is still rare but more hoofs are now represented, especially in a round or olive shape (**Fig. 8**); some inner delimitations of the body are identified in several animals of this phase, sometimes filled with incised lines (partial striated animals) and others with pecking. Compositions with high density of superimpositions between figures become scarcer.

Animals with this type of morphology were identified in several other sites of France and Iberia, especially from its northern half (**Fig. 11**). In fact, in the southern half of Iberia only 5 sites have some vague parallels to our figures of this phase. The remaining examples are found in 4 caves of the northern limit of southern Meseta, in 17 caves of the cantabrian region and in 8 French caves, namely Lascaux (Santos, 2019, pp. 174-185). These parallels are poorly dated and are not of much use to precise the chronology of our phase 2. The majority of the parallels are attributed to the Late Solutrean/ Early Magdalenian, but some of them are attributed to earlier or later chronocultures. This is compatible with the Chlorine-36 date we have for the exposure of rock 14 of Canada do Inferno, that although it has the majority of its time interval located in the Middle Magdalenian, still has around 700 years within the Early Magdalenian time span. As such, phase 2, should be attributed to a period between the Upper Solutrean and the Early Magdalenian, but its absence of both Middle Solutrean and Middle Magdalenian contexts should not be completely discarded. Another fact should be retained: the decrease of the number of southern sites with parallels to this phase, a tendency that will reach its paroxysm during phase 3.

The sites with figures integrated by our analysis in clusters conforming phase 3 are, besides the Côa sites, Siega Verde, Domingo García and Penches (Santos, 2019, p. 195).

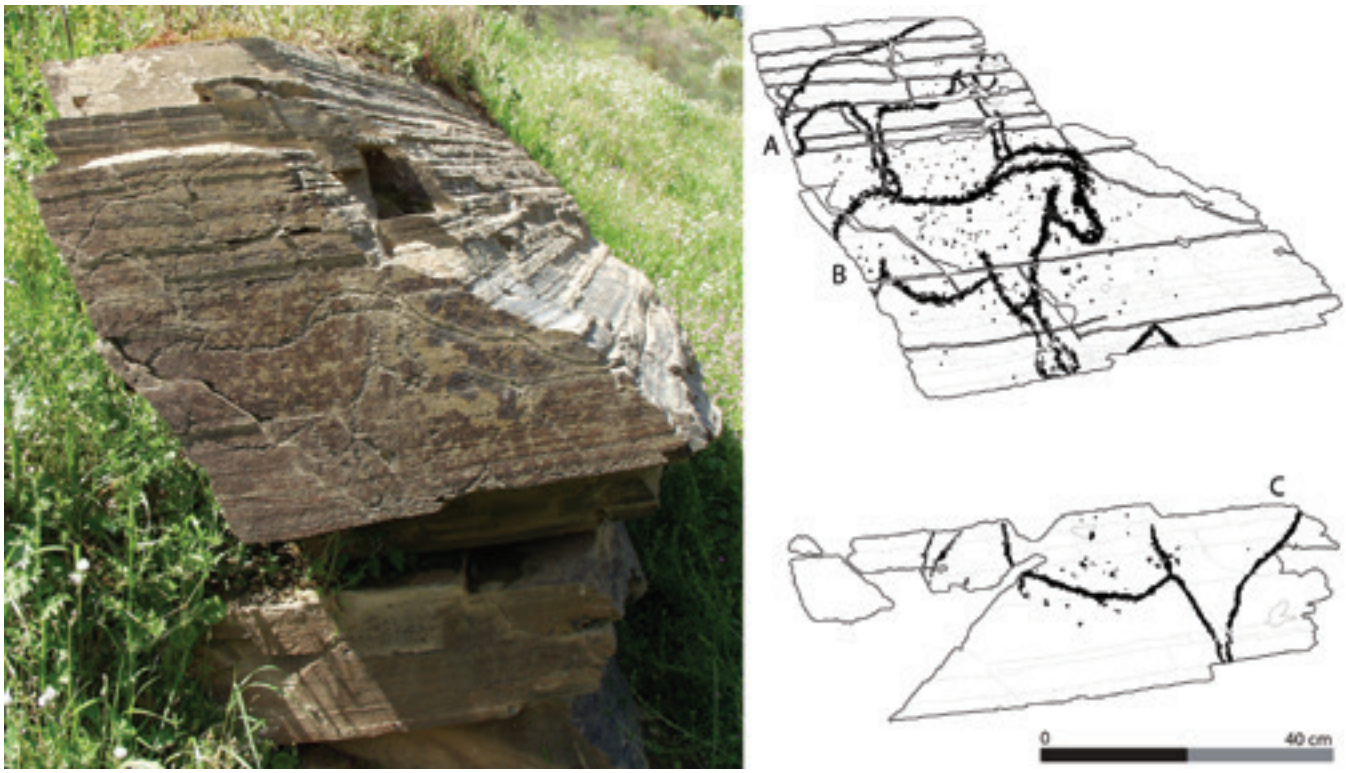


Figure 8: Rock 3 of Fariseu, an example of a phase 2 composition. The three animals are examples of frozen motion. **A** – segmental; **B** – symmetrical; **C** – assymetrical.

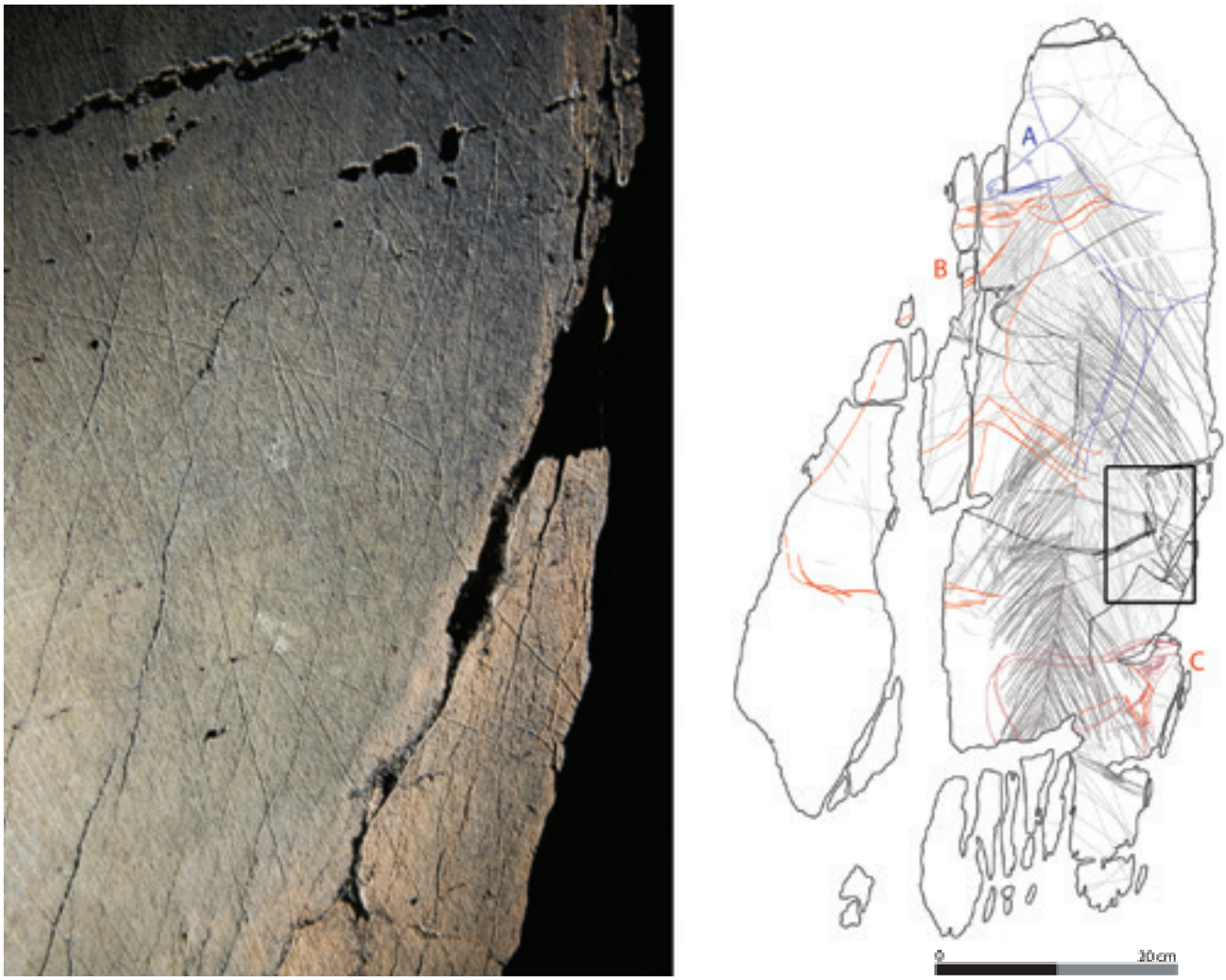


Figure 9: Panel A of rock 4 of Vale de José Esteves, an example of a phase 3 composition. The animals with colour are animated. **A** – Symmetrical frozen motion (front legs); **B** – complex coordinated frozen motion (open mouth and lower head); **C** – Split-action in the head movement by segmental superposition. The area of the photo is indicated in the tracing by the rectangle.

Phase 3 figures are characterized by their naturalism (**Fig. 9**). Their bodies become more proportionated; inner details of the heads become usual and even more naturalistic, especially the eyes; the representation of two legs per pair in an uniangular profile is now usual, as it is the representation of the hoofs and the inner delimitations of the body. Incision, especially in its repeated and simple forms, is the most common technique.

No parallels for the figures of this phase can be found in the South of Iberia. Contrariwise, they are found in 14 caves of the cantabrian region and in at least 17 French sites (Santos, 2019, pp. 185-191) (**Fig. 11**). The majority of these parallels are better dated, all of them being attributed to Middle and Late Magdalenian. As such, in this case, the comparative analysis can refine a chronocultural attribution based solely in archaeological and geoarchaeological evidences and permit us to attribute phase 3 to Middle and Upper Magdalenian.

The great frequency of panels in the Côa Valley in which phase 2 and phase 3 engravings are found together, the rarity of panels where one of these phases appear on its own, as well as the difficulty of ascribing ibexes and red deer to one of these phases, oblige us to merge these two phases when it comes the time of analysing the thematic distribution of their figures. Between these two phases, 488 figurative units

were inventoried, distributed by 111 parietal spaces of 21 sites. Horse becomes the most represented theme (25%). Aurochs (20.29%), red deer (18.03%), ibex (14.14%), antropomorph (5.12%), chamois (1%), bison (0.4%) and feline (0.4%) are the other identified themes. Isolated representations of fishes and birds are also known. But, as we previously said, when phases 2 and 3 engravings were being made, the figures of phase 1 were still visible. As such, if we take into account the pre-existing figures, the thematic distribution is as follows: aurochs (24.3%), horses (22.7%), ibexes (17%), red deer (14.7%), anthropomorphs (2.6%) and chamois (1.14%). Nonetheless, unidentifiable figures are still 16.4%. During these two phases non-figurative repertoire continues to be essentially engraved by incision. The proportion of this repertoire augments as augments the diversity of its forms (Santos, 2019, tab. 6.17).

There are less animated representations in phases 2 and 3 than in phase 1. Frozen motion and action lines are relatively more important in detriment of split-action. Segmental animation (**Fig. 8**) continues to be the major frozen motion category, now followed by complex coordinated, symmetrical, asymmetrical, and finally simple coordinated, that reaches its highest value. Split-action is reduced to eight cases, five of them of segmental superposition, mostly of the heads (upwards and backwards) (**Fig. 9**), and two with duplication of the legs. One of these examples (QB03-01) is particularly exceptional, where the head of a male ibex is duplicated in a particularly ingenious way. The animal seems to have looked backwards, where a female ibex was represented (QB03-02). Upwards, to the left, there are the hindquarters of another ibex (QB03-03), stylistically similar to the first male, also portrayed with "barbed-wire" contour, the sole difference being that it presents its tail up. The position of the legs of the male ibex is compatible with its interpretation as a seated animal (Lorblanchet, 1995, p. 35) that looks in sequence backward to the female and forward to another male. But the reading of the two front legs as the representation of movement allows the interpretation that we can be in the presence of a split-action by juxtaposition, where the male ibex, driven by the motion of its legs, moved left upwards, where it was portrayed in a second frame (Luís, 2019). This phase also presents two representations with multiple contours of the legs, suggesting locomotion (Pi24-099 and 113), one of them also included in the frozen motion category. Together, phases 2 and 3 present the highest number of action lines (8). Most of them are located around the heads (Pi24-003), notably in the case of human figures, which also present lines associated with the mouth (Pi24-114) and penis (Pi02-08). An ibex (Fr08-08) and two aurochs (Pi24-114 and VC05-02) – both of them also with frozen motion features – also present action lines surrounding the mouth and another aurochs features several lines and signs in the flank (VC32-01).

Figures included by our analyses in clusters conforming phase 4 are found in the Côa Vallley, in Siega Verde, in Domingo García, in the cave of Ojo Guareña, and in the portable art of La Peña de Estebanvela and Fariseu (Santos, 2019, p. 191). Although not integrated in our analyses, some figures of La Griega should have been made during this phase.

Geometric shapes, either trapezoidal or oval, characterize the majority of phase 4 animal bodies (**Fig. 10**). They are generally filled inside, usually by fine line incisions, but also by pecking. No details are found inside their heads. The four legs are usually represented, in oblique or straight biangular profile. Incision is the most common technique, but pecking and scraping are also identified. Red painting was used in Faia and in the portable art of Fariseu (Aubry *& alii*, 2017; Santos *& alii*, 2018).

Outside of the studied region, similar figures are found in other sites of Iberia, France and Italy (Santos *& alii*, 2018, pp. 58-66). A lot of these figures are very well dated and their chronocultural attribution is unproblematic. In the Côa Valley, they

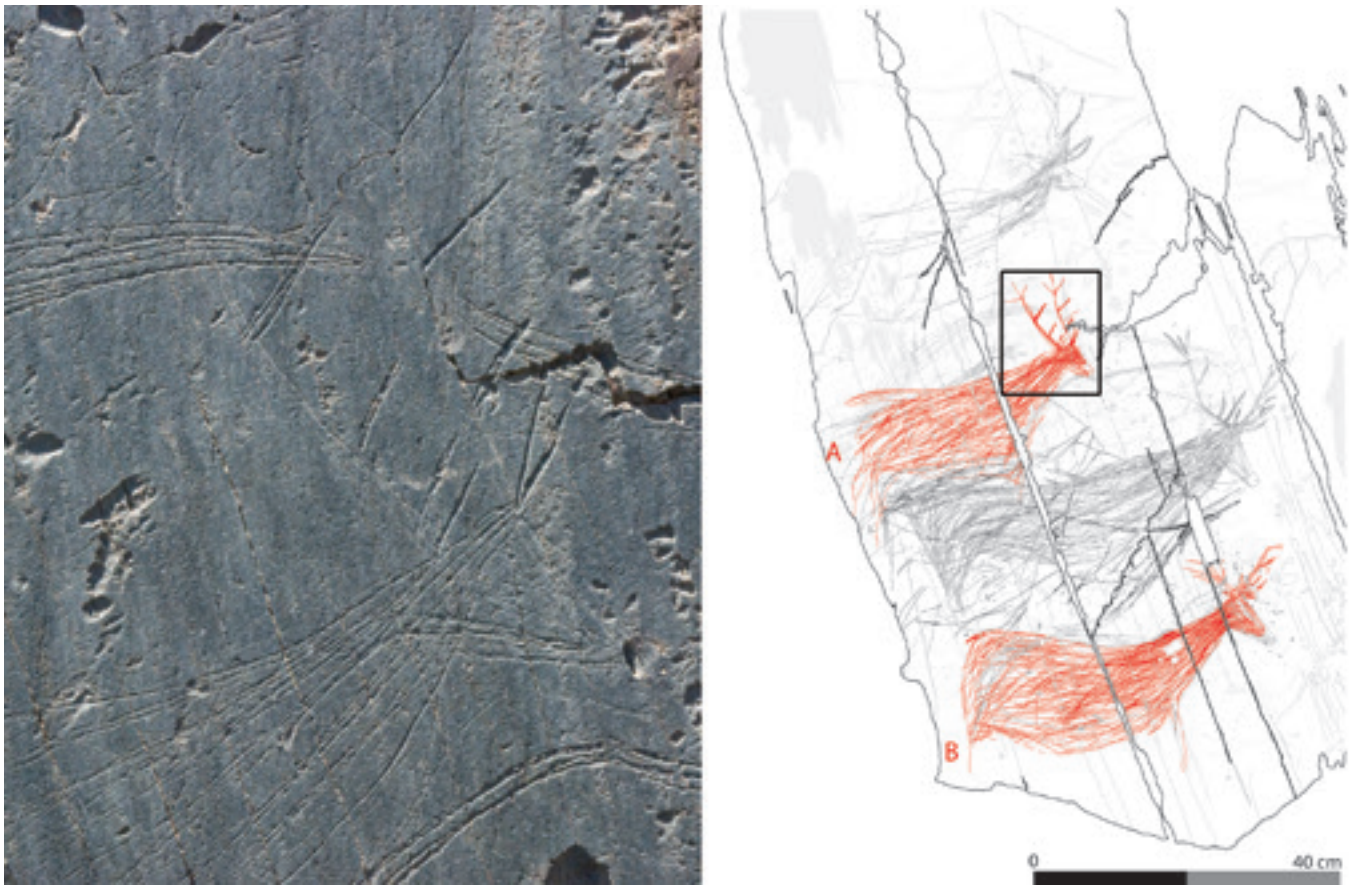


Figure 10: The upper right sector of rock 23 of Quinta da Barca, an example of a phase 4 composition. The figures in lighter grey are part of a phase 2 composition. The area of the photo is indicated in the tracing by the rectangle. The animals with colour are examples of frozen motion in the panel. **A** – assymetrical; **B** – symmetrical.

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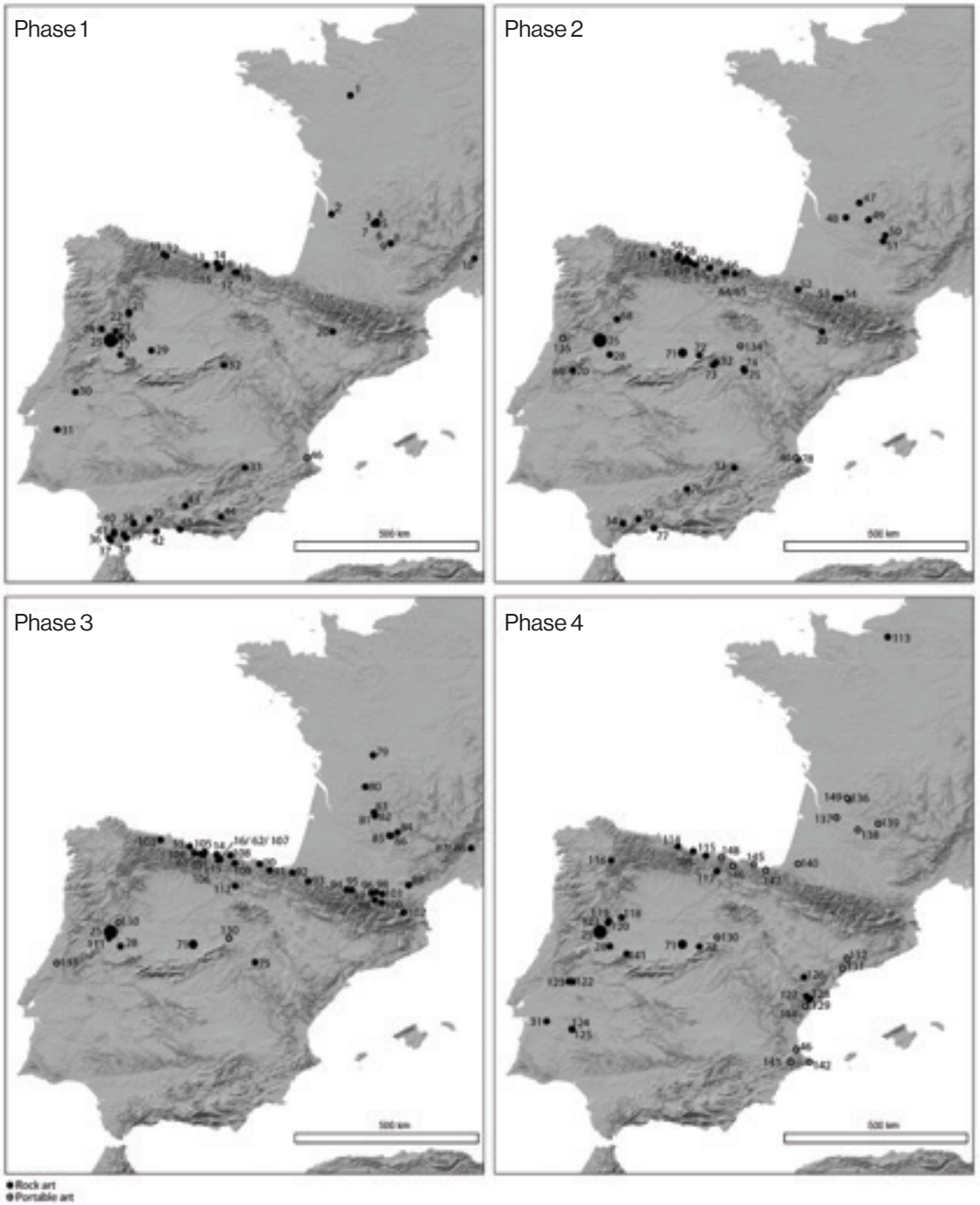
Figure 11: The dispersal of parallels in Southwestern Europe for each of the phases of the Côa Valley's Palaeolithic rock art cycle.

are dated from the Late Dryas (Greenland Stadial 1), but in other sites they can be about a millennium earlier or later. They are part of a graphic tradition named in different ways by different authors: epipalaeolithic art, style V, post-Magdalenian art, or figurative azilian art (e.g. Beltrán, 1989; Lorblanchet, 1989; Roussot, 1990; Guy, 1993, 1997; D'Errico, 1994; Bueno, Balbín and Alcolea, 2007).

According to what we know now, about two thirds of the rocks of the Côa Valley with Palaeolithic rock art were engraved during this phase, but only 46 panels were studied. The inventory that resorts from that study shows that rock art thematic distribution of this phase is very similar to the one identified in the portable art of Fariseu (Santos & *alii*, 2018). In fact, if we eliminate the 84 unidentified animals of the rock art *corpus* of this phase, red deer is the dominant species (86 figures, 46 of them being hinds, 6 brockets and 1 fawn, totalizing 38.9% of the figures). Ibex (50 figures, 22.6%), horse (41 figures, 18.6%), fish (18 figures, 8.1%), aurochs (14 figures, 6.3%) and anthropomorphs (5 figures, 2.3%) are the remaining represented themes. In Fariseu's portable art, if we eliminate the unidentifiable animals (27 figures), red deer remains the most represented species (with 34 figures, 19 of them being hinds, 3 brockets and 2 fawns , totalizing 56.7% of the figures), being likewise followed by the ibex (10 figures, 16.7%). In this series aurochs is the third most represented species (8 figures, 13.3%), being followed by anthropomorh and horse (both with 4 figures each, 6.7%). Linear forms are the most represented ones in the non-figurative repertoire.

Animals in phase 4 are the least animated in absolute numbers (122), even if animation features are higher than phases 2 and 3, relative to their absolute number (42%). Split-action is completely absent from this phase´s animation. There is an



The only sites with portable art indicated on the map are those with figurative units of the region of lithic sourcing of the Côa Valley, the site of Parpalló (46) and the sites with parallels to our phase 4. The sites of Côa (25) and Domingo García (71) are grouped in larger circles. 1: Mayennes-Sciences; 2: Pair-non-Pair; 3: Fongal; 4: Labattut; 5: Laussel; 6: La Croze à Gontran; 7: Oreille d'Enfer; 8: Marcenac; 9: Pech-Merle; 10: La Tête-du-Lion; 11: La Lluera 1; 12: La Viña; 13: Micolón; 14: Altamira; 15: Hornos de la Peña; 16: El Castillo; 17: La Luz; 18: El Rincón; 19: Venta Laperra; 20: Fuente del Trucho; 21: Pousadouro; 22: Sampaio; 23: Ribeira da Sardinha; 24: Foz Tua; 26: Mazouco; 27: Redor do Porco; 28: Siega Verde; 29: La Salud; 30: Ocreza; 31: Escoural; 32: El Reno; 33: El Niño; 24: La Pileta; 35: Ardales; 36: Atlanterra; 37: Vencejo Moro; 38: Cueva Horadada; 39: Ciervo; 40: Jara 1; 42: El Toro; 43: Malalmuerzo; 44: Piedras Blancas; 45: Nerja; 46: Parpalló; 47: Villars; 48: Gabillou; 49: Lascaux; 50: Escabasses; 51: Le Cuzoul des Brasconies; 52: Etxeberri; 53: Labastide; 54: Gargas; 55: Tito Bustillo; 56: La Lloseta; 57: El Buxu; 58: El Covarón; 59: Llonin; 60: Chufín; 61: El Bosque; 62: La Pasiega; 63: Las Chimeneas; 64: La Haza; 65: Covalanas; 66: Arco A; 67: Arenaza; 68: Fraga Escrevida; 69: Poço do Caldeirão; 70: Costalta; 71: Domingo García; 72: La Griega; 73: El Turismo; 74: La Hoz; 75: Los Casares; 76: Morron; 77: Cueva Navarro; 78: Les Meravelles; 79: Réseau Guy Martin; 80: Teyjat; 81: Font-de-Gaume; 82: Les Combarelles 1; 83: Rouffignac; 84: Sainte Eulalie; 85: Pergouset; 86: Grotte Christian; 87: Grotte du Colombier; 88: Abri du Colombier; 89: Gazel; 90: Santimamiñe; 91: Ekain; 92: Alkerdi; 93: Sinhikole-ko-Karbia; 94: Labastide; 95: Tibiran; 96: Les Trois Frères; 97: Le Tuc d'Audoubert; 98: Le Mas d'Azil; 99: Le Ker de Massat; 100: Niaux; 101: Le Portel; 102: Fornols-Haut; 103: Peña de Candamo; 104: Covaciella; 105: Pindal; 106: La Loja; 107: Las Monedas; 108: La Garma; 109: Cullalvera; 110: Medal; 111: Quinta da Moreirola; 112: Penches; 113: Gouy; 114: Los Pedroses; 115: La Clotilde; 116: Cova Eirós; 117: Ojo Guareña; 118: Passadeiro; 119: Pedra de Asma 7; 120: Cabeço do Aguilhão; 121: Parada; 122: Cachão do Algarve; 123: Fratel; 124: Moinhola; 125: Molino Manzánez; 126: Barranco Hondo; 127: Cova del Bovalar; 128: Cingle del Barranc de l'Espigolar; 129: Abric d'en Melià; 130: La Peña de Estebanvella; 131: Sant Gregori; 132: Molí del Salt; 133: Buraca Grande; 134: Villalba; 135: Vau; 136: Pont d'Ambon; 137: Abri Morin; 138: La Borie del Rey; 139: Abri Murat; 140: Abri Dufaure; 141: abrigo del Castillo; 142: Les Cendres; 143: Tossal de la Roca; 144: Cova Matutano; 145: Lumentxa; 146: Arenaza; 147: Urtiaga; 148: Chora; 149: Rochereil. The base map is a shaded relief based on the SRTM 90 DEM (Jarvis & alii, 2008).

overwhelmingly dominance of frozen motion (98%) (**Fig. 10**), with also some examples of action lines. Within frozen motion, asymmetrical subcategory dominates, followed by symmetrical, segmental, which was the prevalent subcategory in the previous phases, and complex coordinated. There are still two examples of simple coordinated frozen motion. Action lines are equally related to the mouth (JE16-02 and 03) and belly (VC01-01).

Periodization is not an end in itself. It permits us, however, to make inferences otherwise impossible to make. For instance, only periodization made visible the dramatic thematic change that happens between phases 3 and 4. In fact, red deer is only the 4th represented species between phases 1 and 3 at the same time that bovines and horses are the better represented ones. During phase 4 red deer becomes the most represented species, horses are less represented than ibexes and aurochs are even less represented than fishes. This diachronic analysis also permits us to identify phases of contraction and phases of expansion of contacts between the Côa Valley and the remaining regions of Southwest Europe. In fact, the area of dispersion of parallels to the images of the Côa Valley is larger during phases 1 and 4 than during phase 2 and, especially, phase 3, which seems to confirm the hypothesis of Zilhão (2003) that during cooler periods, contacts at long distance tend to augment. But the diachronic partition of a cycle is also the precondition to the synchronic analyses of each of its phases. Only that permits us to contrast the thematic differences between the sites of the Côa valley and the other sites of the region and to reinforce the hypothesis that the first is an aggregation site (e.g. Santos, 2019; Aubry, Luís & Santos, 2020).

These inferences are among the ones that are only possible if we do not avoid the difficult task of phasing and dating a rock art cycle. Although a difficult one, this task can be approached by other methods besides stylistic analysis *per se*, even if it should not be discarded. This paper only hints at some of those lesser-used methods, hoping that the achieved results would encourage other researchers not to give up of such an important task.

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