KEYWORDS: *Petroglyph - Dating - Style - Microerosion - Palaeolithic - Côa valley - Portugal*

THE AGE OF THE CÔA VALLEY PETROGLYPHS IN PORTUGAL

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Abstract. The antiquity of the Côa valley petroglyphs in Portugal has been the subject of a series of 'blind tests' by several dating scientists in May and June 1995. This paper reports the results of one of these tests, which were arrived at in complete isolation, without any access to the results of the other participants. They are considered within their geomorphological, palaeontological and archaeological setting. The result is a thorough rejection of stylistic dating of rock art, which in this case has misled practically all specialists.

Introduction

The existence of petroglyphs in the Côa valley of north-eastern Portugal has been known to the local population since they were first produced, but, like most other rock art the world over, has remained unknown to the scholarly world until very recently: archaeologists have always been less knowledgeable about rock art than the rest of humanity collectively. In 1989, as part of an environmental impact study commissioned by the Electricidade de Portugal (EDP) to examine the feasibility of constructing a hydroelectric scheme, an archaeological survey was undertaken. It failed to locate any of the petroglyphs even though they were well known to local residents (pers. comm. M. Simões de Abreu, T. J. P. Monteiro, F. J. Barbosa Teixeira). Other archaeological remains were reported, including the ruins of numerous old mill buildings, some Roman villas and a few rock paintings of supposedly Chalcolithic age. It was recommended that, as part of the huge dam construction project and concurrent with it, a team of archaeologists be engaged to record the valley's archaeological resources in detail before they were inundated in the late 1990s. Planning and construction of dam infrastructure began in 1992, and the building of the actual Côa dam in 1994. The archaeological salvage work was undertaken by the government's Instituto Portugûes do Património Arquitectónico e Arqueológico (IPPAR) under the direction of Rebanda (1995), who 'discovered' (in the sense the word is used in scientism) some of the valley's petroglyphs and considered them to be Palaeolithic. He reported this to his superiors, but his claims that the find was significant were ignored and he eventually contacted the Portuguese representative of the International Federation of Rock Art Organisations (IFRAO), M. Simões de Abreu, late in 1994. This led to international announcement (Bednarik 1994a), numerous media reports in Europe and North America, and to controversies about the circumstances surrounding the reporting of the find. A delegation of French conservation specialists was dispatched by Unesco in early 1995 and it recommended that the dam project be deferred (Bouchenaki et al. 1995). Numerous archaeologists and Palaeolithic rock art specialists examined the sites during the first half of 1995. They were completely unanimous that the rock art was mostly of the Upper Palaeolithic, probably Solutrean, from stylistic criteria (Bahn 1995a, 1995b, 1995c; Clottes 1995a; Simões de Abreu 1995a, 1995b). Although most experts favoured an age of approximately 20 000 years BP, at least one scholar confidently pronounced some of them (e.g. the 'horses' at Ribeira dos Piscos) to be 30 000 years old.

The importance of the site complex was seen to be not just in the great age of the art, but in the fact that, at the time, the Côa valley petroglyphs seemed to be the largest corpus of Palaeolithic rock art at any open air site in Europe. Since then it has been suggested that the body of similar rock art at Siega Verde, nearby but in Spain (Balbín et al. 1991; Balbín and Alcolea 1994), is much greater than the one on the Côa, exceeding 540 figures by a considerable margin (Bahn 1995b, and pers. comm.) — several times the number on the Côa. The sites of open air rock art demonstrate collectively that Palaeolithic rock art was not endemic to caves, as has been widely assumed throughout the twentieth century. They suggest instead the validity of my proposition that this art is found mostly in caves because that is where examples of it survived best (Bednarik 1986, 1990-91, 1994b, 1995a). (I mention this to establish that I have a strong motivation in hoping to see the Palaeolithic age of the Côa petroglyphs verified.)

In view of this scientific importance, Portuguese and international scholars demanded that the dam project be abandoned. The ensuing campaign by IFRAO delegates Mila Simões de Abreu and Ludwig Jaffe, backed by the twenty-three other IFRAO-affiliated rock art organisations, succeeded in securing massive public attention and support in Portugal and considerable coverage in the international media. The campaign involved the world's first public demonstration in support of rock art conservation (on 3 February 1995; Bahn 1995b), conducted under the slogan 'The engravings don't know how to swim' (Bednarik 1995b), a public fast, police intervention, and a series of

public rallies, including one held in New York. The alleged ineptness of IPPAR, combined with an indecisive government and the prospect of national elections in October 1995 contributed significantly to the course of events. By May 1995, six months after the first report about the Côa rock art (Bednarik 1994a), there was no official policy on how to resolve the stalemate between the supporters and opponents of the dam, and not one scientific report about the rock art had appeared in the international literature, or was even in preparation. The construction company had been instructed to slow down work on the dam, and Portugal remained faced with the choice of stopping the dam and losing hundreds of millions of dollars, or continuing and drowning the rock art. In addition, the delay in arriving at a decision was costing Portugal many more millions of dollars per week in servicing investment and project costs. Until Bednarik and Watchman (with the support of J. Clottes) proposed to EDP at the end of March 1995 that the rock art should be scientifically dated, no analytical research had been conducted on the rock art itself, and its age was determined in the usual tradition of assigning European rock art ages on purely subjective stylistic attribution. Our proposal led to a program of conducting four blind tests: four dating scientists were requested to perform independent analytical work, the field work of which took place in May and June 1995.

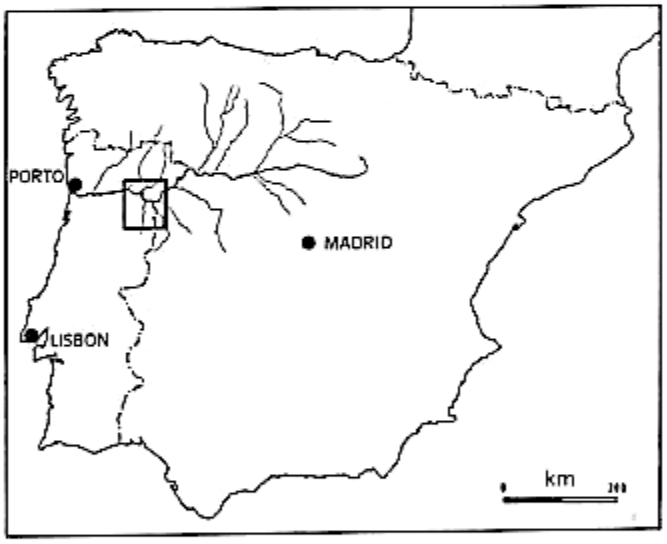

Figure 1. Location of the Côa valley and the Douro Basin on the Iberian peninsula.

The geomorphological, palaeoclimatic, palaeontological and archaeological setting of the Côa valley

The Côa river is a generally north-flowing, southern tributary of the Douro river, and the latter traverses northern Portugal from east to west (Figure 1). Most of the Douro's catchment area is known as the Douro Basin (or Duero Basin, in Spain). This well-defined geological and geomorphological feature is also known as Northern Meseta, a sedimentary basin with an average altitude of about 850 m, surrounded on three sides by mountainous regions (García-Fernández 1968). Its physical isolation and altitude determine its climatic characteristics: Mediterranean summer drought, long and relatively cold winters and low precipitation. The Palaeozoic rocks in the western and central parts of the basin are mostly granite and gneiss, with zones of Silurian quartzites and Cambrian slates elsewhere. The Douro basin's western periphery is formed in part by a rectilinear scarp of about 300 m height which runs in a NNE-SSW direction just west of the Côa's drainage region, and which is responsible for a distinctive hairpin bend a few kilometres downstream from where the Côa joins the Douro, near Vila Nova de Foz Côa. This is the location of the Pocinho dam, completed about twelve years ago and resulting then in the flooding of the lower Côa valley for about 6 km (to between Ribeira dos Piscos and Penascosa).

Three main morphological features form the Beira district of northern Portugal: the western-most portion of the mostly Spanish Northern Meseta, the central *planalto* and the western or coastal mountains (Ferreira 1978). In the Portuguese part of the Meseta, i.e. in the vicinity of the Côa valley, remnants of the planation surfaces are rare (Ferreira 1980). They reflect the Plio-Pleistocene planation surface of Gladfelter (1971), which corresponds to the M1 planation of Schwenzner (1937) and the SII of Lázaro (1977) in the Central Cordillera, generally at an elevation of 950 - 1000 m. Adjacent to the Côa valley, that elevation is reached in the quartzite outcrop ridge to the south-west of Freixeda do Torrao (976 m). Similarly, the dominant planation surfaces near the river's headwaters are at about 1000 m elevation. Near the Douro, however, the planation altitude falls to 400 - 450 m. The polygenetic interfluves of the western Meseta probably correspond to those of the central plateaus of Beira (Ferreira 1980).

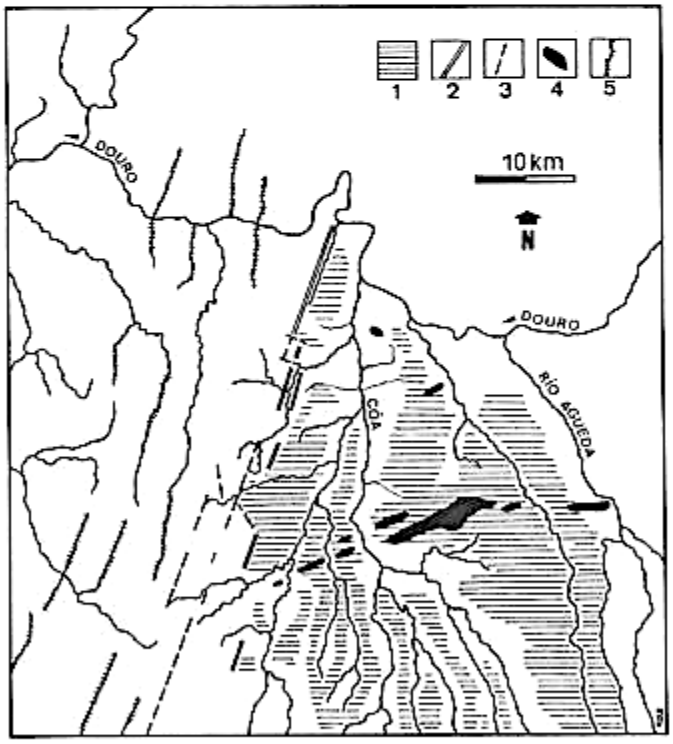

Figure 2. Geomorphological setting of the Côa valley, Portugal, indicating the relationship of stream patterns and tectonic topography (adapted from Ferreira 1978). Key: 1 - fundamental planation surface; 2 - major fault; 3 - tectonic alignment; 4 - quartzitic outcrop; 5 - fracture-controlled valley.

Most stream patterns in the Beira region are adapted to tectonic structure (Figure 2), and differential fluvial

erosion is clearly determined by the different resistance of granites, schists and greywackes (Ribeiro 1949). The upper Côa and most of its tributaries are dominated by granitic plains, while the lower Côa valley is deeply cut into schistose facies of low metamorphism. Thus the upper valleys of the Côa drainage system are relatively shallow, then there is a rapid drop with 300-m canyons west of Algodres, followed by the deep, distinctively V-shaped valleys of the lower Côa and its tributaries. The rock art reported so far is restricted to the system's latter section.

The lower Côa region is morphologically dominated by the schist's inability to maintain steep slopes. Valleys are typically narrow and young, with only small and recent alluvial deposits and a complete lack of Pleistocene alluvials, attributable to a high-energy erosional regime throughout the Quaternary period. This was probably more pronounced during the lower sea levels of Pleistocene periods. The reduced Holocene gradient of the lower Douro probably slowed down river erosion in the Côa valley.

Vertical rock exposures in the lower Côa valley are typically very flat stress fractures or joint planes, usually orientated in a uniform direction, NNE-SSW, which is the same as that of the nearby major fault mentioned above. So they face either ESE or WNW, depending on which side of the river they are located. The identical orientation of rock panels is an important feature, not only because the petroglyphs are easiest to photograph at the same time of day, but because they were all exposed to similar precipitation, insolation and aeolian effects, especially where they are on the same side of the valley.

These near-vertical exposures were in most cases used as the blackboards on which the rock art was executed. Consisting of schistose facies of various compositions, these often perfectly flat exposures bear numerous linear, parallel cleavage fissures that have frequently served as moisture drainage vents. This is evident from the commonly observed accretions from supersaturated solutions, especially of calcium carbonate and silica, which have clearly emanated from these minute spaces. The absence of any gelifraction traces on the panels implies that they have never experienced adequate freezing and regelation or thawing cycles to cause mechanical disintegration — which would have occurred rapidly in this type of rock. This suggests that all presently exposed schist panels did not exist during the Last Glacial Maximum (LGM).

During the LGM, numerous glaciers of the Central Cordillera overlooked the Douro Basin (Vidal-Box 1948; Solé-Sabarís and Llopis 1952), as they did in a previous Würm glacial. Among them were those of the Sierra de Guadarrama (Franzle 1959; Sanz-Donaire 1978) and the sixteen glaciers in the Sierra de Gredos in Spain (Huguet del Villar 1915; Obermaier and Carandell 1916; Vidal-Box 1932; Hernández-Pacheco 1933; Martinez de Pisón and Muñoz 1972). More relevant in the present context is the glaciation of the Portuguese sector of the Cordillera, the Serra da Estrela, close to the headwaters of the principal Côa tributaries (Lautensach 1949; Daveau 1971). Although only rising to 1991 m above present sea level, this granite massif bore continuous perennial ice down to 1620 m during the glacial maximum. The Zêzere valley glacier, one of several fed from this, was 13 km long. It extended to Manteigas, at only 600 m elevation, being 300 m thick. Thus glaciers extended to within a few kilometres of the Côa sources. It is to be assumed that the valley, nestled between the high planation surfaces, would have experienced quite severe periglacial conditions during the LGM.

Periglacial conditions were not restricted to the mountainous inland areas such as the Cordillera itself (Franzle 1959; Stäblein 1973; Bullón 1978; Sanz-Herraiz 1978), they are evident even at low elevations in northern Portugal, for instance at Cabo Mondego. There, frost-shattered clasts appear interstratified with fossil dune sand on the footslopes, adjacent to the present coastal fringe. It is thought that, during the glacial maxima, a vast littoral platform was exposed to gelifluction and aeolian erosion (Daveau 1973). Breuil and Zbyszewski (1945) even reported a breccia of limestone clasts with shell fragments on the littoral side of Serra da Arrábida, just 10 m above present sea level. The angular clasts of the hanging valleys of the Serra de Sintra, a low coastal ridge terminating in Cabo da Roca near Lisbon, are also thought to be of periglacial origin. Elsewhere in the low ranges of the Estremadura, Daveau (1973) has reported several periglacial deposits, such as typical *grèzes litées* in the form of *versants reglés* observed in the Serra de Candeiros. These phenomena confirm the observations on the Atlantic coast further north, of climatic oscillations between dry and humid periods.

The distinctive temperature gradient between Portugal's north and south of 5°C to 10°C is thought to have extended into the past (Turner and Hannon 1988; Straus 1991), which would seem to render the claims of placing the Côa petroglyphs into the Solutrean quite untenable (cf. McIntyre and Kipp 1976; Ruddiman and McIntyre 1981). It has been claimed that these animal figures depict several species: ibex, aurochs, horse and perhaps red deer (Bahn 1995a; Bednarik 1994a; Clottes 1995a). The severe, periglacial climate one would have to postulate for the Côa valley during the Solutrean, a technological tradition of the LGM, would seem to exclude the latter three species from being able to survive in the region. The northern mountains of Portugal and the Douro Basin presented essentially tundra conditions during the polar incursion of about 20 000 BP (Daveau 1973, 1980, 1986). At Portugal's northernmost known Palaeolithic occupation site, Caldeirão Cave, the main faunal components of the Solutrean deposit are ibex and chamois, two typical cold-adapted species (Zilhão 1990). With the waning of the LGM at perhaps 17 000 BP, they were replaced by red deer, horse, wild boar and similar species of temperate woodlands (Póvoas et al. 1992). A similar pattern can be observed at palaeontological sites, such as Algar de Cascais and Algar João Ramos (Antunes et al. 1989), and it is confirmed by vegetation changes as implied from wood charcoal at Cabeço do Porto Marinho and pollen elsewhere. The aurochs seems to become common towards the end of the Pleistocene, e.g. at Casal Papagaio Cave. During the cold Dryas III pollen zone, just over 10 000 years ago, there is a brief return of the chamois to Bocas (Bicho 1993) and Caldeirão (Póvoas et al. 1992). It is thought that both ibex and chamois expanded briefly to central Portugal (Bicho 1994), presumably from the mountains in the north they had retreated to. In the Mesolithic of southern and central Portugal, aurochs, horse and deer continue, but ibex and chamois seem now absent in this part of the country (Arnaud 1993; Morales and Arnaud 1990; Zilhão 1991). There is no distinctive change at the end of the Pleistocene, either in faunal remains or in

human subsistence strategies or technology. Portuguese archaeologists assume that the Palaeolithic style of economy continued to about 8000 BP, and they use the concept of an Epipalaeolithic to describe the period from 10 500 to 8000 BP (Bednarik 1995c), which in other parts of western Europe is occupied by Mesolithic technological traditions.

What emerges from these considerations is that a combination of the four animal species archaeologists claim to have identified in the Côa petroglyphs is highly unlikely to date from the LGM, or from the Solutrean period. Three of the perceived species — and I emphasise that there is no proof whatsoever that aurochs, ibex and *Equus przewalskii* were in fact depicted — are very unlikely to have lived on the planation surfaces of the western periphery of the Douro Basin. Its tundra would have been quite unsuitable for these species. Subsequent to the LGM, horse and aurochs did appear further south, but continued through to the end of the Mesolithic and are therefore no proof of Pleistocene age. However, they seem to exclude a Solutrean age.

Moreover, there is not even any evidence that the Côa region was occupied by humans of that period. Indeed, there is no evidence at all of an Upper Palaeolithic occupation in northern Portugal, with the northernmost sites being in the Estremadura: Caldeirão Cave, the nearest Portuguese Palaeolithic site, is about 175 km from the Côa art sites. Similarly, there is no Epipalaeolithic occupation site known in Portugal that is closer than Casal Papagaio Cave, even further away, and the nearest Portuguese Mesolithic sites are over 200 km from the Côa sites: Fonte Pinheiro, Forno da Telha, Bocas rockshelter (all Estremadura), and a series of sites in the lower Ribeira de Muge valley (south of Santarém). It is reasonable to state that the Côa site complex is entirely without any pre-Neolithic archaeological context: no occupation site older than the Neolithic has ever been found in northern Portugal. On the Spanish side, the open-air Solutrean site Fuente de las Pocillas is also about 200 km away.

The Côa valley petroglyph sites

It is therefore clear that the answers to the important questions concerning the Côa petroglyphs are to be found in the art itself, in features related to it directly, and in the sites of its occurrence. Of particular importance are the petrology of the support panels, the accretionary patinae found on them, the weathering patterns on rock and petroglyph surfaces, and the empirical information to be gained about the production of this art. These are scientific data, in contrast to archaeological speculation about the meaning of the figures, what they depict, why they were made, and to what stylistic tradition they belong. Scientific data can result in repeatable observations, they are falsifiable and they can in most cases be checked by any researcher using the same method and equipment. They do not depend on subjective variables, such as how an individual observer's nervous system identifies iconic information in ancient graphic systems.

In studying rock art we must obviously begin with the rock: it supports the art, influences its survival and often provides the means of its dating. The Côa petroglyphs occur mostly on near-vertical exposures of schist. This term describes a particular group of foliate rocks in the range of the metamorphic stages, corresponding to conditions of low to medium metamorphism. In the lower Côa region, phyllites and schists of variable compositions and recrystallisation stages occur. At Canada do Inferno (Hell's Gully), the principal art site, the schist is well developed, with discrete zones of single minerals including silica, although most of its crystals measure only in the order of 5 - 20 µ (microns). Muscovite flakes form frequent nodular structures, whereas feldspar (albite?) and especially quartz concentrations are still rare. However, hydrous minerals are less prominent than at other localities in the valley. Foliation fissures may contain precipitates — silicas, often containing silt, some iron oxides and especially carbonates. Where they are wide enough, well-rounded quartz grains of mostly 0.2 - 0.3 mm diameter can be found caked into the precipitates. They are probably the residue of a former inundation of the site by river sediment, bearing witness to the turbulent fluvial history of the valley. Locally, the thalli of two distinctive species of lichen occur as colonies in fissures. The site is on an unusually steep and thus presumably young slope, inclined at an angle well above the rock's typical topographic equilibrium slope angle.

The *canada* itself is immediately upstream of the art site, containing a series of old water mill buildings. These continue below the water level of the Pocinho reservoir, which was about 12 m above the river at this site when I saw it. Similarly, most of the nineteen recorded petroglyph panels were under water in 1995. The main concentration is on panel 1, a few metres above the water, bearing a dense tangle of animal figures. Just above the Pocinho level is a horizontal rock with numerous historical inscriptions (panel 7), bearing also two engraved dates of the 1700s. Some 10 m downstream and at the same elevation as panel 1 is panel 3, featuring numerous shallow incisions. On the steep slope above, between 40 and 50 m above the original river bed, are three more panels. No. 13 bears only a few scratches, No. 14 the outlines of two horses, and No. 15 features two bovid figures.

Canada do Inferno is about 750 m upstream of the upper coffer dam (there are coffer dams just above and below the Côa dam site, and the two reservoirs are connected by a tunnel), and on the left (western) bank of the river (Figure 3). Some 2.5 km further upstream, near the end of the artificial lake formed by the Pocinho dam, a small intermittently flowing creek named Ribeira dos Piscos joins the Côa from the left. A short distance into this side valley, barely above the creek bed, is a prominent rock panel bearing two horse figures, one incomplete. This is panel 1 of Ribeira dos Piscos, and a few metres downstream from it lies a low, elongate panel, No. 2, which bears numerous incised marks.

Here, the schist is somewhat less crystalline than at Canada do Inferno and has less distinctive mineral recrystallisation. The dominant mica is muscovite, often occurring in lumps of randomly oriented leaves. The less common biotite also tends to appear as nodes, of metallic sheen when fractured, while quartz and staureolite crystals are not visible at low magnifications. Of interest is the pattern of weathering in section, reflecting reversal of metamorphosis, including hydration, followed by degradation and case hardening. Alteration is visually distinctive to 4 mm depth, indicated by a faint darkening of the micaceous components. On the surface, a brown patina of Munsell 6.5R-4/3 has developed to a thickness of only 10

or 20 µ on the main panel. It consists primarily of silica and silt. Locally (e.g. just to the right of panel 1), extensive growths of reprecipitated carbonate in the form of coral-like formations of 10 to 20 mm are evident and indicate the significant effects of vadose water.

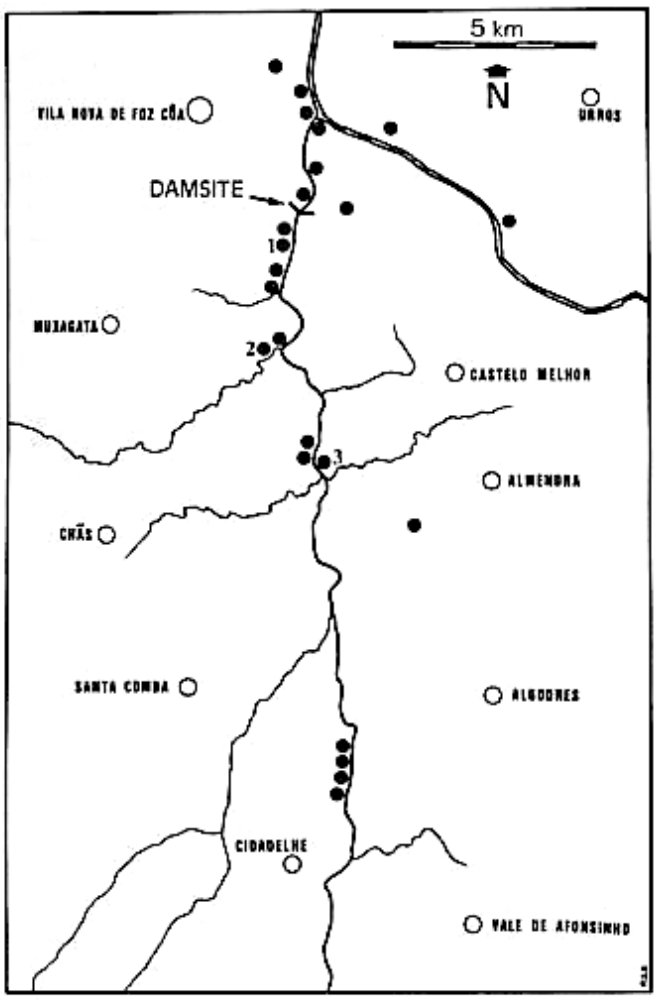

Figure 3. Villages and known rock art sites in the lower Côa region, Portugal. The three numbered art sites are Canada do Inferno (1), Ribeira dos Piscos (2) and Penascosa (3).

Another 3 km further upstream, but on the right river bank and well above the end of the Pocinho reservoir, is Penascosa (Figure 3). There is a long alluvial bank, and the petroglyphs begin right at its edge, the top of the recent sand bank just covering a few markings. There are eight panels recorded at this site, scattered over a small area of the slope on various vertical rock panels. Fluvial wear of the rock is prominent at the lower elevations, and there are significant differences in the intensity of kinetic damage evident on angular boulder edges, depending on whether they are on the upstream or downstream end. The schist is of lower metamorphosis grade than at the previous two sites, with hydrous minerals (chlorite, micas, amphiboles) being prominent, pyroxenes probably absent, and quartz and feldspar showing no signs of recrystallisation. This facies is best described as a chlorite schist, containing almandite inclusions locally, and is significantly softer than the previously described types. The main site is panel 3, at the northern end of the site and a few metres above the gravel terrace. It bears a dense arrangement of incised, pecked and abraded animal figures similar to that at Canada do Inferno panel 1. There is a rough stone wall at the southern end of the site, which includes two engraved fragments of a panel higher up on the slope. Above it, perhaps 10 m above the river, is panel 6, bearing a prominent quartz vein.

Penascosa can be accessed via a steep vehicular track from the village of Castelo Melhor on the edge of the planation surface above. Just opposite Penascosa, on the other bank of the Côa, are the two Quinta de Barca sites, totalling some five panels (Figure 3). There are a few other minor sites between here and the Côa dam (Quinta Rego da Vide, Vale da Figueira and Foz Ribeira dos Piscos), and some more below the dam site (Foz do Côa M.E. and M.D., Broeira and Ribeiro Moinhos). Two petroglyph sites have been reported from high up near the scarp of the plateau to the west (Machapão, which overlooks the present dam construction site, and Ribeira Ribeirinha, which is reached from the village Almendra). Another 8 km upstream from Penascosa along the Côa lies a group of small art sites (Faia A-D, totalling six panels, one of which bears some very faded red paintings). Finally, there are a few more petroglyph sites in the Douro valley, close to where it is joined by the Côa, including Vale de José Esteves, Ribeira de Urros, Vale do João Esquerdo, Vale Cabrões and, further downstream, Vale da Casa. The latter site is of interest in the next chapter.

The stylistic dating of rock art

Rock art acquires archaeological significance only when its age becomes known, at least its approximate age. For this it is necessary to provide independent, non-archaeological evidence in the case of the Côa sites, otherwise we have no more than a circular argument: we believe we know the antiquity by archaeological, stylistically based determination, hence we have evidence of archaeological human activity in the valley, hence the dating is justified. Similarly, the stylistic/archaeological dating of the Côa rock art derives no scientifically acceptable support whatsoever from the claims about other sites in the general region — Mazouco on the Douro and Siega Verde on the Río Agueda, a tributary parallel to the Côa and upstream along the Douro, on the other side of the Spanish border. The 'horse' figure at Mazouco (Jorge et al. 1981; 1982, 1987) is stylistically similar not only to some of those on the Côa, but also to a horse figure at Vale da Casa, which Baptista (1983) describes as being in a clear Iron Age context. Indeed, Baptista explicitly challenges the Palaeolithic attribution of the Mazouco horse, and warns against the use of stylistic concepts in dating these figures:

> Um estilo, portanto, muito semelhante ao do cavalo de Mazouco, localizado um pouco a montante do Vale da Casa, também junto ao Río Douro. Pertencendo este cavalo da rocha 15 a um contexto claramente da Idade do Ferro, parece-nos assim, que sem outro contexto ou paralelo local, muito dificilmente se poderá continuar a manter a cronologia paleolítica que foi sugerida para aquele. Aliás, nao fossem as armas, as sobreposiçoes e certos pormenores da gravaçao dos inúmeros cavalos do Vale da Casa e suas associaçoes, e seria estilisticamente defensável para alguns deles essa cronologia Paleolítica ou Epipaleolítica. ... De qualquer forma, um alerta para o enganoso de atribuiçoes cronológicas ou culturais baseadas em meros conceitos estilísticos e mais uma prova de que ainda estamos muito longe de uma sistematizaçao da nossa arte pré-histórica. (Baptista 1983: 63)

Vale da Casa lies between the Pocinho dam and the

confluence of the Douro and Côa, i.e. only a few kilometres from the Côa petroglyph sites. The Mazouco site is upstream along the Douro, but still within easy walking distance. At the very least we have to concede that the Mazouco horse (Bahn and Vertut 1988: Fig. 74) is undated, at worst we may accept Baptista's (1983, 1984) attribution to the Iron Age.

Similarly, the Siega Verde site with its many hundreds of animal figures remains undated (Balbín et al. 1991; Balbín and Alcolea 1994). It occurs just above river level, hence the probability of the art being Palaeolithic, as has been unanimously claimed, is in fact quite remote. As on the Côa, there are no clear depictions of animal species that did not exist on the Iberian peninsula during Holocene times. The same applies at the various other open air sites attributed to the Pleistocene, in Spain, Portugal and the French Pyrenees (Bednarik 1994a, 1995d). Portuguese rock art is inadequately explored, there is comparatively little published about it (Anati 1968; Baptista 1981; Baptista et al. 1978; Santos 1940, 1963; Sayans 1956) and modern methodology has generally not been applied to it (cf. Angeles et al. 1975).

These difficulties raise the general question of stylistic dating in archaeology. It applies not only to rock art, but also to a great many other taxonomic systems in use in archaeology, ranging from stone tools to pottery to architecture. The principle seems to be derived from art history, in which certain parameters of historical art traditions are recognised and then used to designate the periods, eras or specific schools specimens of unknown age belong to. Archaeology has extended this principle to art periods for which we have very poor chronological resolution, to very early periods, and to purely utilitarian object types such as tools. In the text-free context of pre-Historic archaeology, styles are no longer conceived on the basis of historical sources, but as free-standing constructs of archaeologists themselves. To illustrate by example: there is no proof that the 'stylistic' perceptions archaeologists favour of Magdalenian end scrapers match those of Magdalenians themselves. In fact there is not even proof that there was an ethnic group or culturally distinctive society that corresponds to the technological traditions we define as the Magdalenian. Our concepts of these traditions are largely based on artefact types, especially tool types, and they reflect the taxonomies invented by the specialists of an alien society, us. They may have very little validity in the historical reality of what really happened in the past. In a scientific sense they ought to be able to tell the scientist about the way modern archaeologists perceive reality; they tell us nothing reliable about the way pre-Historic people perceived the world, or their tools, or their artistic styles. Not surprisingly, archaeologists disagree fundamentally about what style is (Conkey and Hastorf 1990), where it resides, what its role is in archaeological taxonomies, or how we could come to terms with it in a quantifiable, falsifiable, repeatable or objective fashion. Style is not accessible to scientific definition, it is a subjective dimension that does not exist until it is perceived to exist. Its perception by archaeologists may tell us much about the perception, cognition and intellectual conditioning of archaeologists, but we can never be sure what it might be capable of telling us about the past.

In the specific area of Pleistocene rock art research, a century of creating stylistically based chronological frameworks about Palaeolithic rock art in Europe has led to a level of certainty about such pronouncements that is unparalleled in the rest of the world. For many decades now, such rock art has been placed into the stylistic pigeonholes created by inductive dating information, location, superimposition, inferred relationships and speculation, but most of all, by stylistic correlation. Specialists of Europe's Pleistocene rock art, called the Franco-Cantabrian tradition, have developed great confidence not only in recognising 'Palaeolithicity' in rock art, but also in placing individual images into precise sub-phases or stages of perceived, *theoretical* technological traditions of the Upper Palaeolithic period of western Europe. The precise criteria for such stylistic dating are usually stated in only the vaguest terms, but on close examination they are inconsistent, self-contradictory and sometimes downright false. Criteria such as twisted perspective (cf. Deregowski 1995 for excellent discussion), under- or over-emphasised aspects or body parts, *fil de fer* execution, aspects of art production and other variables are used in a random and often apparently subjective fashion in these procedures, which are notoriously lacking in clarity and refutability. The general impression is that, in the final analysis, these stylistic decisions are made on the basis of individual 'experience' (whatever that may mean) and iconographically guided intuition, i.e. on an entirely untestable basis of subjective perception.

This explains not only the frequent inconsistencies and endless disagreements in this area, but also the initial apprehension in archaeology when scientific dating methods were first introduced for rock art (Bednarik 1991a). This apprehension still continues in some peripheral regions, for instance in Portugal, where it has led to most emotive opposition from a few individuals. Continuing rejection of scientific and 'direct' dating of rock art helps to explain the significant discrepancies that have appeared between the traditional stylistically derived ages and the scientific dating information at most of the sites where the latter has so far been secured. The traditional dating of the Cougnac paintings, for instance (e.g. Lorblanchet 1984), has been completely rejected by Lorblanchet (1994). The paintings in Zubialde Cave in the Alava province of Spain, 'discovered' in 1990 and pronounced to be Palaeolithic, were found to be modern fakes (Bednarik 1992a). The art in Cosquer Cave near Marseille, reported a year later, was pronounced to be a fake or at least seriously questioned by many leading Palaeolithic rock art specialists, but was subsequently demonstrated to be of Palaeolithic age by Clottes and his colleagues. However, its stylistic dating, even though supplemented by limited direct dating (of charcoal pigment), suggested that the art was produced in two phases, one at 17000 to 19000 years ago, the other perhaps 22000 ago (Clottes et al. 1992a). Soon after, still in the same year and after analysing another eleven samples, Clottes and colleagues conceded that their stylistic assumptions were wrong, and that the older art phase dates from about 27000 BP (Clottes et al. 1992b). More serious was the discrepancy for the Chauvet cave art, found only in December 1994 and attributed to the Solutrean, at 17000 to 21000 BP. This is one of the most beautiful and impressive galleries of European rock art (Clottes 1995b), comprising hundreds of animal figures of great detail that would surely suffice to elicit a stylistic consensus. Following the traditional stylistic perception

that Palaeolithic art developed from the simplest to the most complex, the Chauvet art would be of the late Magdalenian. Within a few months, after the results of fourteen radiocarbon analyses became available, even the stylistic dating to the Solutrean was rescinded, having to be revised by more than 50% to well over 30 000 years (Clottes et al. 1995). No art of such utter sophistication had ever been expected possible for the early phases of the Aurignacian, and this result alone should suffice to show how tenuous all stylistic pronouncements are.

Not that this is particularly surprising. When we look at other rock art corpora around the world, there is a wealth of stylistic mis-pronouncements evident wherever these have been subjected to more rigorous study. Recent examples include the Levantine rockshelter paintings, originally regarded as Palaeolithic, then widely published as Mesolithic. They are now thought to be Neolithic (Hernández et al. 1988), but they have still not been properly dated. Many mistakes occurred simply because it was assumed that a sedentary life style of its makers would inevitably be reflected in a rock art tradition. Precisely this mistake led not only to the stylistic dating of the Levantine art, but also of the Bubaline School rock art of the Sahara first to the Pleistocene (Mori 1965), later to the early Holocene, until Muzzolini (1990) argued convincingly that the tradition must be of a pastoral people and cannot be earlier than 6000 BP. Another rock art body that was attributed to the Pleistocene on purely stylistic grounds are a few rock paintings among the thousands of petroglyphs of two Siberian sites, Shishkino and Tal'ma, north of Irkutsk (Okladnikov 1959, 1977; Okladnikov and Saporoshskaya 1959; Kšica 1972, 1984, 1992). This dating, too, has had to be rejected (Bednarik and Devlet 1992, 1993). The stylistic dating of Chinese petroglyphs is most precarious and often lacks any scientific evidence (Bednarik and Li 1991; Bednarik 1993a). Precisely the same applies to the entire rock art of India (Bednarik 1991b, 1993b, 1994c). Rock art dating in South America had to be rejected (Bednarik 1989), and this has also been necessary in North America (Bednarik 1987a). In Australia, too, there are several unfounded claims for rock art antiquities, although here at least the stylistic arguments do not loom as large as in Eurasia.

In short, the futility of stylistic dating of rock art has been demonstrated throughout the world and on numerous occasions (Figure 4), and yet we have not been able to eradicate this century-old archaeological campaign of disseminating whimsical claims and false chronologies. During the last decade, concerned rock art specialists have begun to challenge this established system (e.g. at the Second AURA Congress; Lorblanchet and Bahn 1993) but with only limited success. In the case of the Côa petroglyphs, all specialists who examined the sites or commented on the art agreed unanimously that it was clearly of the Palaeolithic, and probably of the Solutrean. This was in itself a contradiction: the stylistically supposedly identical Mazouco horse had been attributed to the Magdalenian (Jorge et al. 1981), and the apparently also similar site of Siega Verde to the final Solutrean or early Magdalenian (Balbín and Alcolea 1994). The stylistically similar horse from Vale da Casa was found to be of the Iron Age. These contradictory and notional attributions illustrate the limitations of stylistic arguments.

I found myself in the unenviable position of being the only commentator who questioned the Palaeolithic attribution of the Côa petroglyphs (Bednarik 1994a, 1995b, 1995c); unenviable especially because my theory of taphonomic selection of rock art (Bednarik 1986, 1993c, 1994b) would derive massive support from the open air Palaeolithic rock art sites. Instead of believing what I wanted to believe because it supported my own pet theory, I preferred to *test* assumptions that would confirm my views on 'cave art', because my epistemological commitment does not permit me to resort to confirmationism. My doubts concerned a series of features of the Côa art that seemed to render a Pleistocene age improbable (Bednarik 1995c), and my insistence led to scientific inquiries into the antiquity of the Côa rock art.

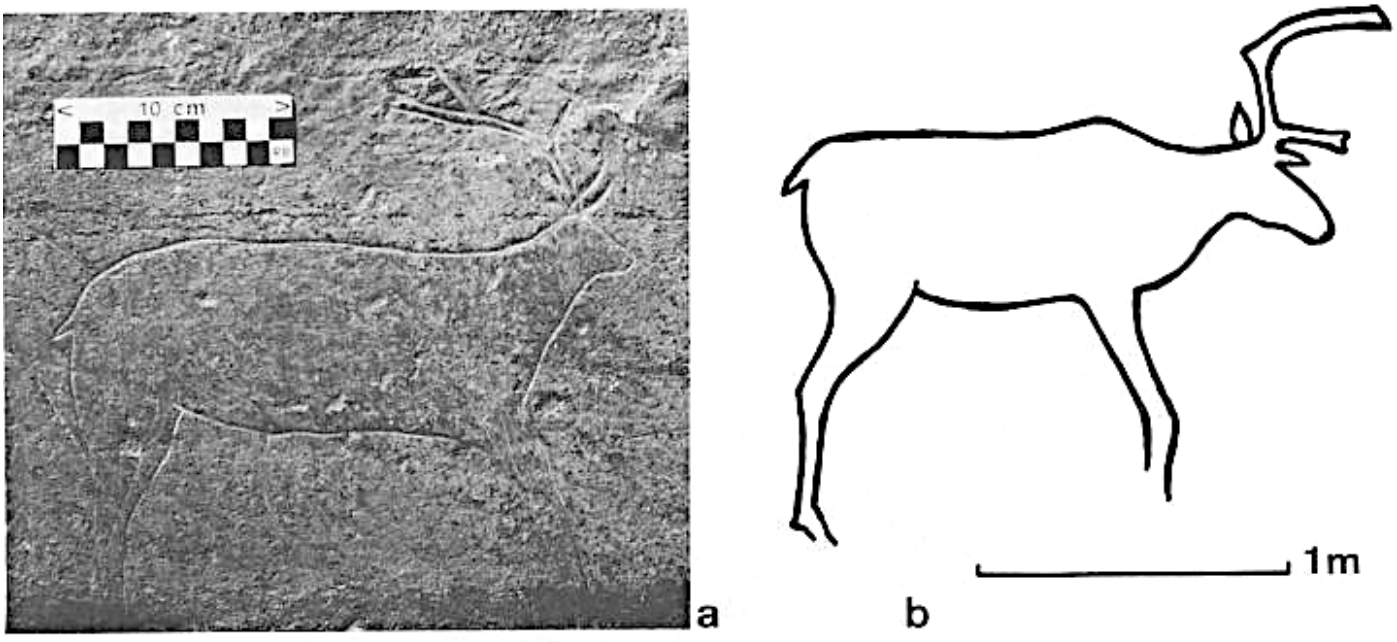

Figure 4. *Two examples of stylistically 'naturalistic' animal outline figures of the Holocene: (a) Shishkino, central Siberia, made with metal tools; (b) Böla near Stod, central Norway.*