



a arte da conservação técnicas e métodos de conservação em arte rupestre

O objectivo do presente volume é o de apresentar e avaliar as experiências de conservação levadas a cabo nos últimos dois anos no Vale do Côa, bem como as soluções propostas pelas empresas de conservação de pedra que participaram neste projecto para mitigar as dinâmicas erosivas em acção nos afloramentos com arte rupestre. Inclui pareceres de peritos internacionais em conservação de arte rupestre, e levanta questões sobre as várias intervenções propostas. Integra ainda as conclusões mais relevantes de um projecto de monitorização sísmica do território do Parque Arqueológico do Vale do Côa.

02

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arte rupestre

**III congresso
de arqueologia**
trás-os-montes,
alto douro
e beira interior

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Alexandra Cerveira Lima, António Martinho Baptista, António Sá Coixão

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António Pedro Batarda Fernandes

Autores

António Pedro Batarda Fernandes, Carlos Catita, Emilio António Pessoa Mesquita, Fátima de Llera, Fernando Carrera Ramirez, François Soleilhavoup, Idalina Veludo, J. Delgado Rodrigues, Luís Machado, Luís Matias, Madalena Rodrigues, Marco Marques, Marta Raposo, Nuno Proença, Paula Teves Costa, Valerie Magar

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Comments on treatment proposals for rock art at Foz Côa

Valerie Magar

(International Centre for the Study of the Preservation and Restauration of Cultural Studies, vm@iccrom.org)

Preliminary considerations

In May 2006, the Archaeological Park of Foz Côa (PAVC) organised a three-day visit to three areas within the Park, inviting three conservation professionals (Fernando Carrera Ramírez, an archaeological conservator from the ESCRBCG [School of conservation of Galicia], Francois Soleilhavoup, an independent naturalist with a long experience in the conservation of rock art in Northern Africa, and Valerie Magar, conservation specialist from ICCROM). The aim was to assess conservation proposals for the rock art engravings, developed by three different Portuguese conservation firms, and helping with an open discussion on the topic.

This text offers my own comments, based on that initial visit, and on the reading of the texts submitted for this publication by the three firms. The analysis is necessarily limited in scope, given the high complexity of a site such as Foz Côa. One needs to keep in mind the coexistence of a multilayered layered landscape, in order to safeguard its qualities and values, altogether protecting its material substance and ensuring its integrity. The area of Foz Côa and surrounding region encompasses two world heritage nominations: the Prehistoric Rock-Art Sites in the Côa Valley, inscribed for their exceptional qualities representing the “most outstanding example of early human artistic activity in this form anywhere in the world” and the Alto Douro cultural landscape, associated with winemaking production.

One should highly praise the initiatives taken so far by the PAVC, in keeping in mind the fragility of the site, and the fine balance that is required to maintain this extraordinary heritage integrated within a landscape still in use.

The PAVC has dealt by parts with the overall conservation of the site. They first developed a management system and plan for the area, dealing mostly with tourism impact. Selected areas in the Park can be visited through conducted tours with groups of maximum eight persons in four-wheel-drive park vehicles. The system is active, and has proven its worth in the past years, although there are some concerns with the financial sustainability of the model. This topic, however, is beyond the scope of this text.

In a second moment, the Park has been investigating possibilities for more direct conservation treatments, to face the most threatening alteration and decay phenomena. Clearly understanding the existing challenges of the application of direct treatments in rock art sites, the Park undertook an extremely careful and commendable initiative.

In 2004, the PAVC set a tender for conservation for the rock engravings, located on schist outcrops throughout the Park. Three private conservation firms were selected, and each was allocated an area, focusing on specific outcrops within the three main sites of the PAVC, to carry out an analysis of the conservation status, and prepare conservation proposals; each of the teams was also required to carry out tests of their treatment proposals, on boulders located in the vicinity of their case-studies, with similar conservation problems, but with no engravings. Finally, a last requisite was that each firm would work in isolation, without sharing information on the results of their analysis or proposals with the other firms.

The visit in May 2006 was the first time the three teams met to expose the results of their work to the PAVC, to the other firms and to the three guests. Each team had half a day to present their activities. At the end of the second day, the three guests were asked to prepare a presentation with preliminary thoughts on the firm’s proposals, which would be presented and discussed the following day at a special session on conservation within the Congresso

de Arqueologia de Trás-os-Montes, Alto Douro e Beira Interior. Debates no Vale do Côa. The results from the discussion were taken in consideration by the three firms, who then reviewed their proposals.

The approach was quite unusual for the conservation sector, and has provided very interesting results. While tendering is a common process, it does not necessarily imply this level of research and testing to be carried out, and usually does not include an open confrontation with the authors, or the testing and evaluation of preliminary results, as it was the case here.

1. Canada do Inferno

a. The site

This site is located at the intersection of the Côa River and a small tributary, in a deep canyon. The construction of the dam, whose remains are clearly visible, was planned some 400 metres downstream from the site. The building of an earlier dam (the Pocinho dam), built in 1983, had already caused the flooding of one part of this area, submerging a significant number of engravings from the Canada do Inferno.

The escarpment visited, on the left bank of the Côa River, offers a series of schist outcrops, facing east. The engravings in that part were mostly located on the vertical faces of the rocks, with smooth surfaces ideal for the engravings. These mainly represent animal figures, mostly aurochs, ibex, horse and goat.

This is probably the most heavily affected of the three sites. Besides the partial flooding of engravings and the very visible remains of the dam building nearby, there is also a quarry on the upper part of the canyon, whose explosions were heard at intervals during the visit.

b. Conservation analysis and proposal

The conservation proposal for Canada do Inferno was in charge of the firm Composito, and presented by Luís Machado. The analysis was carried out on one rock outcrop, and the main problem identified was the fracture and movement of blocks, in a manner known as toppling, mainly a mechanical movement and sliding of the upper stone fragments, caused by their own weight and the effect of a steep slope.

The “type-rock” for testing was therefore chosen on the basis of this main concern. A rock outcrop was selected some 100 meters downstream from the analysed outcrop, on a steeper area of the canyon.

The test treatments were of two main types. On one hand, looking for a way to diminish the water filtrations into the cracks and micro-cracks, and spot consolidation tests were carried out with Ethyl silicate. On the other hand, the team tested the movement of a large unstable rock fragment in the upper part of the “type-rock”, with the aim of replacing it in its original position, understanding the complexity of the operation, and evaluating its possible application on outcrops elsewhere.

Visits to the test sites

2. Penascosa

a. The site

Penascosa is located in an open valley, on the right bank of a small river. The lower part of this valley can get flooded, whenever there are heavy rains. The panels we focused on were located in the lower part of the valley, on the sandy soil.

The engravings in this area depict mainly animal figures, with horses, ibex, aurochs, goats, and also fish.

b. Conservation analysis and proposal

The conservation proposal for Penascosa was in charge of the firm In situ, composed by an interdisciplinary team composed of conservators, geologists, engineers and surveyors. The head of the team, Fátima Llera, led the discussions, although all members presented a part of the proposal.

As in Canada do Inferno, the main risk they identified for the site is the movement of blocks by toppling, and they therefore focused their attention on both testing measures to diminish the possibility of block movements on a “type rock” and in designing a method to monitor the movement of blocks, using georeferenced reference points on one of the blocks with engravings.

In terms of the “type rock” their proposal also involved the use of lime-based mortars to be applied on the upper parts of the fractures, in order to avoid the accumulation of material inside the cracks and fractures, which is presumed to enhance the problem of toppling. The lower part of the cracks and fractures was left open to allow rainwater to flow out of the system. Very few mentions were made regarding the surface of the rocks, in spite of apparent losses on several of the engraved rocks.

3. Ribeira de Piscos

a. The site

Ribeira de Piscos is located on a small, narrow valley. The panels we visited, on the left bank of a small stream, depict again various animal figures, including horses and aurochs, and there is also a finely incised human figure.

b. Conservation analysis and proposal

The conservation proposal for Ribeira de Piscos was in charge of Nova Conservação, and was presented by Nuno Proença. He offered what was at first sight the most comprehensive approach and description of all aspects of alteration and decay. The result was nevertheless similar in terms of the conclusions, i.e. with the movement of blocks, or toppling, identified as the main threat for the site.

The test treatments were carried out on a “type rock” located above the studied panel, which offers a similar position in terms of slope, but is not subject to flooding when the dam and river levels change.

The treatment consisted on the sealing of cracks, both on the upper part of the type rock, using a series of superposed layers, including a lime based mortar, and then other materials to render this cover impermeable. The fine cracks on the surface of the type rock were also infilled using a lime based mortar.

This group also tested the use of adhesives to replace broken fragments of the stone in position.

1. Diagnosis of the sites

As an initial observation, it was interesting to find out that the analysis and proposals by the three firms were quite similar. With slightly different methods for the analysis of the state of conservation of the selected outcrops, they all came to similar conclusions regarding the main threats to the site. They all focused their attention to the phenomenon of toppling of the outcrops, considering the natural tendency of schist to split or break along vertical and horizontal cleavage plans, creating a series of blocks as the principle threat. The main fear, visibly shared by the park managers (and consultants) and the three firms, is that the blocks in every outcrop seem to tend to move outwards, with an eventual risk of collapse of the upper blocks. This theme therefore concentrated most of the firms' efforts and proposals, with very little or no attention given at this point to the rock surfaces where the rock art is located.

While the stabilisation of larger rock fragments seems important in this case, both for the safeguard of the rock art and for the security of visitors, there would still seem to be a need for a better understanding of the micro-morphological features of the parent rock, and its behaviour in the areas with rock art. A combination of petrographic, microbiological, chemical and physical analyses would provide further insight into the mechanisms of alteration and decay affecting the surface, and particularly trying to understand if these are active mechanisms, and if so, the rate at which they are happening.

2. Treatment proposals

All teams very conscientiously considered the importance of ethical behaviour in a site such as Foz Côa, and emphasised the need to respect the premise of minimal intervention, while at the same time tailoring any intervention to each specific case.

The review of the proposed treatments was taking place after one year, which was a very good initiative, but this should still be considered insufficient for a real evaluation of their effects, given the long-term phenomena often affecting rock art sites.

a. Cleaning

None of the teams considered the theme of cleaning, as this is an activity undertaken by the Park on a regular basis. Particularly for the sites of Penascosa and Ribeira de Piscos, where flooding occurs periodically, the Park carries out cleanings to remove the excess mud deposited on the surface of the rock outcrops, to allow the visibility of the engravings. It would be important to link these deposits and cleanings to the analysis of the overall situation at the three sites, and understand its consequences both on the surface of the rocks, and on potential movements of the larger blocks.

b. Stabilisation of blocks

All three firms proposed treatments involving the total or partial closing of cracks between the blocks. In most cases, they proposed to close the upper part of the fractures, using mortars or a mixture of mortars and stone slabs, depending on the crack size. This would avoid the cracks from being filled with earth and other organic matter, and would also divert water from filtering into the cracks.

Two of the proposals (at Canada do Inferno and Penascosa), the idea was also to leave the sides of the cracks open, in order to allow for an easy water circulation. The other team (Ribeira do Piscos), preferred instead to fill in the cracks, using an expanded clay, in order to avoid any further accumulation of materials in them.

Discussion of the proposals

All three firms also proposed the use of lime based mortars (using and testing a variety of hydraulic limes and inert fillers) both to fill in the smaller cracks, and to create the protective layers.

Two of the teams also explored ways of rendering the upper areas of the stone, and particularly the infilled areas, impermeable to water infiltration. The team working in Canada do Inferno proposed the use of *Paraloid B-72*, while the team working at Ribeira de Piscos proposed a more complex system, and potentially very interesting, combining the use of various layers in the upper part of the outcrops, with the aim of creating inert stable layer, covered with vegetation.

The choice of the materials to be tested, and particularly the mortars, seems to respond to materials that are well known and tested in the conservation of built structures. Their use in these open-air sites will still have to be monitored for a longer period of time before really understanding their behaviour and ageing processes.

The use of *Paraloid B-72* in particular should be monitored, as its behaviour in other rock art sites has not always provided the desired results.

Two of the teams (Canada do Inferno and Ribeira do Piscos) also tested the movement and re-attachment of blocks. At Canada do Inferno, a large block was moved back to a more stable position, as a test to evaluate the feasibility of such an operation. The ethical aspects of carrying out such an intervention were also analysed.

The other type of intervention tested at both sites was the use of adhesives combined with rods for the reattachment of loose fragments. After one year, the fragments seemed to be behaving in a good manner.

c. Consolidation

The team working at Canada do Inferno carried out consolidation tests on a schist fragment, using Ethyl silicate, with apparent good results, but no lab tests were carried out to evaluate the depth of the consolidation or the reaction with the schist.

Such testing and analysis could prove extremely interesting and important for the understanding of the behaviour of conservation materials in open-air sites, and it would be desirable to continue with the monitoring and evaluation of the treated fragment in the future, possibly linked to a periodic sampling and analysis of treated and untreated areas.

3. Monitoring

All three team emphasised the need for adequate documentation for the monitoring of the rock outcrops, but only the team working at Penascosa developed specific proposal for the monitoring of possible movements caused by toppling.

This is a fundamental topic, given that the rate of alteration and decay at the site is still unknown. Since the Park was created in 1998, no visible movements of the blocks have been detected, and there have also been no apparent changes in the rock surfaces.

Final considerations

The initiative taken by the PAVC to deal with conservation problems of the rock art can only be commended, as it has acted with all the precaution required when dealing with a complex natural site. Any action undertaken will have to be carefully analysed, tested and approved, taking into consideration the protection of the rock art and its environment.

The proposals from the three firms provide good initial insight into some of the factors affecting the rock outcrops at Foz Côa, but they still reflect the need for specific training in rock art conservation. Rock art sites are always extremely complex, with numerous parameters influencing simultaneously its state of conservation. Open-air sites have the additional challenge of not having a known 'zero' state, as in buildings for example. The rock outcrops have been exposed to a changing environment for a long time, and rock art was made on these sometimes old surfaces later in time. It is important to accept some natural evolution in these types of sites, and intervene, as the three teams correctly mentioned, only if necessary, and if follow-up and maintenance can be ensured.

During the meeting in May 2006, all proposals made to the PAVC coincided in the need to monitor closer the proposed treatments before deciding on actions, even if these are technically possible. More knowledge is still required on micro-environmental conditions in the area, especially thermal and humidity changes at the surface and subsurface of the rock, before any major decision can be taken. These would usefully complement the data gathered from a weather station installed at Penascosa since 2003, which has offered some information on the microclimate in that part of the Park.

Attention should also be placed on how the engraved surfaces are evolving (petrographic analysis could give insight on current or potential problems). Mineral depositions are visible on some of the outcrops, and have been reported in previously published articles on Foz Côa, but little is still known on their composition and deposition mechanisms, and there is no current knowledge to understand if this is a past phenomenon or a currently active one.

Also, in a parallel manner, there should be an open possibility to test other materials that may be more compatible with a schist rock (possibly silicate-based treatments), and monitor in the medium and long-term the compatibility, durability, effectivity, alteration and decay and possibility for re-treatability of the rock once these materials have been applied. The data gathered by this sort of testing would be extremely valid in the future.

Another aspect to consider, when (and if) envisaging a conservation treatment at the PAVC is its scale. At the moment, there are 28 known sites, with 400 engraved surfaces, and over 2000 motifs. The feasibility of any intervention needs to be considered in terms of cost and effectiveness, and it will be important to define a way to prioritize any possible conservation activity.

For all of the above, a good documentation strategy for conservation purposes is required. The levels of accuracy will need to be defined, in order to have enough information to allow decision-making possible, but in manageable numbers.

The monitoring will need to be able to detect slow changes on the outcrops, both alteration and decay, and potential catastrophic events (collapse caused by periodic floods, earthquake, quarrying explosions...).

The results from what has already been achieved, in combination many other potential activities such as those mentioned in this text would offer invaluable information not only for Foz Côa, but for other sites with similar problems, and in instances, may also enable the extrapolation of results to other types of sites too. The test rocks at Foz Côa, if adequately planned and used (and funded), could become an extremely useful open-air laboratory for the understanding of potential direct treatments at rock art sites.