The painted rock shelters of the Zemmur
(Western Sahara)

Joaquim SOLER SUBILS*
Narcís SOLER MASFERRER**
Carles SERRA SALAMÉ**

Introduction

Throughout Western Sahara there are many sites with rock art. Rock paintings especially occur in the Zemmur area. The landscape of this region is known for its low and long sandstone hills, with a great number of small rock-shelters. On the walls of these shelters there are paintings of humans, animals, non-figurative images as well as many handprints. This paper attempts to synthesize the research carried out in the area by the University of Girona and the Ministry of Culture of the Sahrawi Arab and Democratic Republic.

The results of the research were collected during several documentation trips made between 1995 and 2003 to the sites of Rekeiz Lemgasem, Rekeiz Ajahfun, Wadi Kenta, Wadi Ymal and Asako (Fig. 1). However, a few more sites require our attention. Some of them, such as Bou Dheir and Laouianate, have been discovered recently, while others, like Oummat Chegag and Oummat el Lham, are ancient discoveries. Bou Dheir, located near Wadi Kenta, has been recently reported by a team from the University of East Anglia (Brooks et al., 2003). The painted rock-shelter of Laouianate, described in 2001 by Susan Searight and Guy Martinet, although not located in the Zemmur, is also interesting because of the similarity of some depictions with the art of the study area (Searight & Martinet, 2001-2002; Searight, 2002). Finally, Oummat Chegag and Oummat el Lham, described by Théodore Monod in 1951, are located in the Mauritanian Zemmur (Monod, 1951).

In a very general manner, we can describe Western Sahara as a desert flat country with reliefs and stony soils. There are no high mountains and only one wadi of a certain importance, the Saguia-el-Hamra, usually dry. It runs from east to west across the northern rough regions to the Atlantic Ocean, near el Aaiun, the capital city. Only small isolated mountains or very low massifs break the Western Saharan landscape. Vegetation is scarce, typical of the desert and steppe-like environment.

* Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters
Eberhard-Karls Universität Tübingen (Germany)

** Institut del Patrimoni Cultural
Facultat de Lletres
Universitat de Girona
Plaça Ferrater i Mora, 1, CP 17071,
Girona (Catalonia, Spain)
joaquim.soler@gmail.com
The Zemmur is a hilly region in the north-east of Western Sahara. The region is cut by many wadis running towards its northern border, the Saguia-el-Hamra. Thanks to its rich hydrological network, the Zemmur has many wells and a beautiful desert vegetation. The wadis, where water flows only on very exceptional occasions, carved its typical landscape (Fig. 2).

Closely related to the rock art, the most important geographical Zemmur features are its reliefs and geological context. The whole area is in fact part of a larger tectonic area (the Tinduf basin) which was filled with marine sediments during the Ordovician (Palaeozoic). Sandstone, formed as the sediments were deposited deep under the waters of this interior sea, is the most common rock. The painted shelters are carved into the most compact sandstone on the hilltops (Fig. 3) or under isolated blocks at the foot of the hills (Fig. 4). With small and irregular roofs, they appeared as the result of physical erosion, chemical dissolution processes and wind erosion. However, dissolution seems to be the main cause, attacking the horizontal lines of sedimentary deposition that indicate different moments of deposition. The rock along the lines is generally weaker and more vulnerable to the activity of the salts which, after dilatation due to crystallization, cause flaking off of the sandstone walls. Moreover, sandstone is also vulnerable to dilatation and contraction processes, typical of desert-climate areas suffering a high day-to-night temperature differential. Finally, the wind is also responsible for erosion and the shaping of shelters.
Historical background

The archaeological interest does not only lie in the paintings, but also in the abundant lithic and ceramic remains on shelter floors. Grinding hollows deeply carved into the rock (Fig. 5) are also frequent, sometimes with fragments of decorated ostrich eggshells in them. No excavations were carried out, mainly because of lack of time and resources, but some lithic material was collected for comparison with other studied ensembles of the Maghrib. However, as we do not have any stratigraphic data, we can only rely on postdepositional processes and typological studies in order to classify them. At a first exam, two clearly distinct groups of artefacts can be attested. First of all the very eroded Acheulian and Aterian industries and, secondly, less eroded group of artefacts, more similar to the Maghrib Epipalaeolithic industries. The second group consists in blades and bladelets made from cherts, quartzite and effusive rocks. Most of the cores are bipolar and there are a lot of endscrapers on blades and burins on truncation (Fig. 6). Although the microburin technique was also present, no geometric microliths were observed. None of these assemblages can be associated with the paintings, so they cannot be used to date the images.

Up to now, we have studied all the 130 painted shelters known to us in the Zemmur: 26 at Wadi Kenta, 2 at Wadi Ymal, 2 at Reykez Ajaif, 80 at Reykez Lemgasem and 1 at Ask. In total, we recorded and studied 2734 images. All the data were assembled in J. Soler's doctoral thesis (Soler Subils et al., 2005; Soler Subils, 2006; Soler Subils et al., 2006).

Fig. 4. Paintings often occur on the walls of isolated blocks at the foot of the hills. In this example from the Wadi Kenta site a row of gazelles in "Dark Figures style" is preserved.

Fig. 5. Wadi Kenta. Grinding hollows dug out of the rock on the floor of a painted shelter.

Fig. 6. Lithic industry found on the floor of the Wadi Kenta painted rock-shelters.
the group of Herbert Nowak and Dieter Ortner, and Rodrigo de Balbín Behrmann. They were active throughout the early 70s, before the war began. Manuel Pellicer and Pilar Acosta, at that time professors at the University of La Laguna (Canary Islands), focused their attention on the engraved and painted sites of the south and on the megalithic structures (Pellicer & Acosta, 1972, 1991; Pellicer et al., 1973-74). Herbert Nowak and Dieter Ortner worked in the southern part of the country too, but they also studied many northern sites, and published a catalogue of the sites known at that time (Nowak & Ortner, 1975). Finally, in 1975, at the time of his doctoral thesis, Rodrigo de Balbín Behrmann registered all the engraved rock art sites known up to 1975, proposed a stylistic evolution and searched for contacts between Western Sahara and the European Atlantic area (Balbín, 1975). After that, the war interrupted the field research and very little news were published (Balbín, 1977).

In 1995, during the current ceasefire, a team from the University of Girona, in collaboration with the Ministry of Culture of the Sahrawi Arab and Democratic Republic, began a project of surveying, documentation, preservation and diffusion of the country's archaeological remains (Serra et al., 1999; Soler N. et al., 1999a; Soler Masferrer et al., 1999b; Soler Masferrer et al., 2001a; Soler Masferrer et al., 2001b; Soler Subils et al., 2001; Escolà, 2003). The first result of this collaboration was the creation of the Sahrawi People National Museum, located in the «27 de Febrero» refugee camp, in the vicinity of Tinduf. Since then many more sites were discovered and some of the ones described during colonial times were revisited.

Recently, a team from the University of East Anglia, the King's College and the University of La Sapienza, documented the Bou Dheir site and other archaeological places of interest (Brooks et al., 2003). Furthermore, the site of Laouianate, in the south of Morocco but in a similar geographical context, was described by Susan Searight and Guy Martinet (Searight & Martinet, 2001-2002; Searight, 2002).

**Description of the paintings**

Most of the 2734 documented and reproduced images are painted in red but many white and bichrome (red and white) figures also exist. They are of small or medium size; only very few of them reach one metre of length and almost all measure between 10 and 20 centimetres. 60% of the images are figurative (32% human, 28% animal), 24% are handprints and the last 16% are non-figurative images. The remaining 40% are indeterminable stains.

Images of humans are the smallest and in some styles children are also represented. Men and women are depicted, although in many cases sex is indeterminable. These figures usually carry weapons or tools and participate in hunts or processions.

A wide range of animals are depicted: gazelles (*Gazella dama mhorr, Gazella dorcas*), antelopes (*Alcelaphus buselaphus, Damaliscus lunatus, Hippotragus equinus*), elephants (*Loxodonta africana*), giraffes (*Giraffa camelopardalis peralta*), rhinoceros (*Ceratotherium simum*), oxen (most of them apparently domestic, considering their relation with human beings, although there are no other signs of domestication), ostriches (*Struthio camelus camelus*), hyenas, domestic or wild dogs, donkeys (*Equus africanus*) and many other unidentified quadrupeds. These animals indicate a landscape of savannahs or semi-desert steppes, not very different from the current context, only a little wetter. It may be useful to know that some of these animals (antelopes and ostriches) were still present in the 1950s (Ortega, 1962). On the other hand, the absence of camels (*Camelus dromedarius*) is noteworthy.

Handprints occur almost everywhere in the Zemmur. Both left and right hands appear on the walls of many rock shelters, isolated, in series or in semi-circular patterns. Almost all are stamped, therefore «positive» handprints, and only one hand stencil has been discovered. Very few are partly stamped and partly drawn, and they have been found only in a Rekeiz Lemgasem shelter; the fingers are stamped and the palms are drawn and decorated with spirals.

Non-figurative images also appear extensively throughout the Zemmur, although they are very common at the Wadi Kenta site. These mo-
tifs dominate in some rock shelters, where the same signs were painted recurrently in the same place at different moments. They are drawn with linear «geometric» shapes (squares, circles, straight traces, crosses, dots) and wide clear red lines. They may have been painted with finger strokes, as the outlines are not continuous but irregular and faded. Only very few of them suggest highly schematic representations of human beings; almost all are true non-figurative images. They recall, but are not, tifinagh writings, which are also present in the Zemmur rock shelters. Finally, a single Arabic text is also present.

The painting styles of the Zemmur

Although the Zemmur paintings are very diverse, many of them share technical and formal characteristics such as perspective, stroke width, organisation of the scene, general shape of the body, shape of feet, arms, fingers, hips. This recurrent sharing of characters convinced us to study the paintings from a stylistic point of view. However, it was also clear that the traditional sequence of styles from the central Sahara could not be used. The Zemmur images are stylistically very different, and the morphotechnical criteria used in the central Sahara are useless in the Zemmur.

From the beginning, we assumed that more than one style was preserved in the Zemmur’s rock shelters because not all the paintings shared the same morphotechnical elements. Our aim was to identify the styles, order them chronologically and propose an absolute dating. The interpretation and attribution of the images, however, was deliberately dropped at this stage of the research because we could not find ways to accurately and justifiably interpret their meaning.

«Dancers’ style»

One of the most common in the Zemmur, the «Dancers’ style» occurs in several sites: Rekeiz Lemgasem, Wadi Kenta, Asako and, as Theodore Monod’s publications show, in Oummat Chegag and Oummat el Lham (Monod, 1951). Its technical characteristics are the use of frontal-lateral views and flat tint and lines. The morphological characteristics of the depicted humans are the unstable positions and bent legs (always ahead of the body), L-shaped feet and handfingers (Fig. 7, 8 and 9). Although the significance and subjects may not be peculiar, we point out that humans (with children, e.g. Fig. 10) and animals are depicted in this style. Humans hold bows and throwing sticks and wear belts or skirts, hats or fine hairstyles. The «Dancers’ style», although highly diverse, is easy to recognize in humans, but hard to define in animal depictions.
"Shaped style"

The "Shaped style" is technically defined by frontal-lateral views and the preference for flat tints and bichrome (red and white) depictions. The realistic modelling of the figures is the main morphological characteristic. Among humans, the morphological features are triangular feet and the peculiar attitude with one leg behind the body (Fig. 11 and 12). The morphological characteristics of animals are the rectilinear foreheads and rounded muzzles and bellies. Sometimes they appear incomplete due to the natural fading away of the white-painted parts (Fig. 13, 14 and 15). The subjects depicted in the "Shaped style" are always figurative, humans or animals. Humans often hold bows, and among the fauna, clearly dominated by antelopes, a few uncommon animals can be seen, such as the rhinoceros (Fig. 16).

Fig. 11. Rekeiz Lengasem. A pair depicted in "Shaped style". Note the triangular feet and the position of one leg behind the body.

Fig. 12. Rekeiz Lengasem. Scene with humans depicted in "Shaped style", in a very small shelter (the shelter is less than one metre wide).

Fig. 13. Scene in "Shaped style" from Rekeiz Lengasem. The bower's attitude is not aggressive; note the animal's round muzzle and belly.

Fig. 14. Rekeiz Lengasem. Damaliscus lunatus depicted in "Shaped style". The front legs are incomplete because the white paint faded away. The colour of the legs of the real animal is in fact lighter than the colour of its body.

Fig. 15. Rekeiz Lengasem. Animal depicted in "Shaped style". Note the rectilinear forehead, the round muzzle and the white horn.

Fig. 16 a and b. Rekeiz Lengasem. Photo and tracing of scene in the "Shaped style", a rhinoceros surrounded by men.
Among the «Shaped style» art of the Zemmur, a well-defined group of depictions can be isolated, and we defined this subgroup as the «Outlined substyle». The group includes animal figures painted in big size (around 1 metre), obtained by large, widening out lines and seen in a lateral view. The animals’ legs are never complete and no feet can be seen (Fig. 17, 18 and 19). Their morphological features are similar to the characteristics of the «Shaped style».

The stamped hands, often organised in fans, are difficult to classify because there are no morphotechnical characteristics to analyse. They are reproductions rather than representations (Fig. 20). However, considering the superimpositions, we believe them, or most of them, to be associated with the «Shaped style». Nowhere, in the Zemmur shelters, handprints occur over the «Shaped style» figures, but only over other styles. We must, however, also seriously consider the possibility that handprints are images shared by most of the styles.

The «Shaped style» is present in the sites of Rekeiz Lemgaseem, Wadi Kenta, Wadi Ymal and, as it appears in photographs and bibliographical data, in Bou Dheir (Brooks et al., 2003). The «Outlined substyle» is only present in Rekeiz Lemgaseem.

Fig. 17. Rekeiz Lemgaseem. Antelopes in Outlined substyle («Shaped style»).

Fig. 18. Rekeiz Lemgaseem. Ostrich in Outlined substyle («Shaped style»).

Fig. 19. Rekeiz Lemgaseem. Giraffes in Outlined substyle («Shaped style»), painted on the shelter roof.

Fig. 20. Rekeiz Lemgaseem. Tracing and photographs of ‘fans’ of handprints. This motif is now the logo of the National Museum of the Sahrawi People.
The "Stroked style" images are only found at Rekeiz Lemgasem and always represent animals (bovines and giraffes) (Fig. 21 and 22). Technically, the "Stroked style" is characterised by figures depicted in a frontal-lateral view, many of them are bichrome (red and white) and painted with a narrow and solid line combined with flat tint or a soft shade of colour. Morphologically the figures show the whole legs and hoofs and round-shaped muzzles.

The paintings in the "Dark Figures style" are in a very dark red flat tint and they are not very large (between 10 and 20 centimetres). The figures are always depicted in a strict lateral view. Humans are represented with a single leg or arm and quadrupeds never show more than two legs or one horn (Fig. 23 and 24). Only a few female figures, depicted with one breast on top of the other, break this rule.

Morphologically, all the figures are rounded. The humans appear with big buttocks and carry large sticks and bows (Fig. 25). Almost all the images are figurative although not very realistic: no face features, fingers or clothes. An important peculiarity is that the "Dark Figures style" compositions seem to us more organised. Humans and animals are painted in long rows, sometimes heading in different directions (Fig. 23). The repetitive model gives the compositions a clear sense of movement and action. Another consequence of the repeated figures forming rows is a tendency to schematise the representations (Fig. 23 and 26).

This style can be found in the sites of Rekeiz Lemgasem and Wadi Kenta. After consulting the reproductions made by Théodore Monod, we think it is also present in Oummat el Lham and Oummat Chegag (Monod, 1951). Finally, the "Dark Figures style" might have been detected in...
a rock shelter in Laouianate (Searight & Martinet, 2001-02), as we observed on examining the published photographs. The site lies in southeastern Morocco, quite far from the Zemmur, but still in a Saharian context. In our opinion, some images of processions and bowers indicate that many of these paintings belong to the "Dark Figures style" too.

**«Linear style»**

Depictions in the "Linear style" are recognised by their unrealistic frontal and lateral views, their wide, straight lines, light-red colour and schematism. Subjects are figurative and non-figurative, always drawn with the same wide lines.

Non-figurative motifs are simple linear shapes: lines, crosses, circles, circles with internal crosses, anthropomorphic traces, grids and squares. Some more complex patterns are constructed by connecting the initial simple shapes (Fig. 27). A different kind of non-figurative motifs are Libyco-Berber texts, which appear to be written in this style.

Among figurative images in the "Linear style" there are depictions of humans (Fig. 28) and animals. Human figures hold spears and shields but never bows (Fig. 29) and they ride horses but not camels. They are always drawn with straight traces.

The "Linear style" is documented at Rekeiz Lemgasem, Rekeiz Ajahfun, Wadi Kenta (where a lot of non-figurative images were depicted) and Asako. This style also occurs in a vast territory in the southern part of Western Sahara, mainly around Lejudd. The paintings were already known before the discovery of the Zerrrrrrtll. rock shelters (Almagro, 1946; Balbín, 1975; Nowak & Ortner, 1975) and have been related to recent prehistory and protohistory.

**Dating proposal**

From the beginning of the research it was clear that most of the pictures belonged to prehistoric times because of some of the fauna and weapons depicted. Paintings of elephants, giraffes, and rhinoceros mark the pictures as very ancient because most of these animals were extinct in this area many centuries ago - some of them before the Christian era, as we know from the classic and Arabic sources. However, other depicted species (ostriches, gazelles and antelopes) lived in Western Sahara until a few decades ago. This warns us that the use of animal depictions as dating elements should be used with caution.

The paintings were checked by means of Scanning Electronic Microscope (SEM) analysis and no organic material was preserved on them. Therefore, no radiometric methods could be applied to date them, and a relative dating could be inferred only on the basis of an exam of the depictions. We started to build a style sequence based on superimpositions. In the larger and more evident rock shelters images of different styles coexist and superimpositions sometimes occur, and a time sequence could be established. The most ancient paintings are in the "Dancers' style", a style always appearing under paintings of other, therefore more recent, styles (Fig. 30 and 31). After the "Dancers' style", the "Stroked", the "Shaped" and the "Dark Figures" styles. These three styles usually appear in this order (Fig. 32) but in a Rekeiz
Lemgasem shelter a «Dark Figure» painting appears to be under a «Stroked style» one (Fig. 33). For this reason, we must conclude that the «Shaped style», the «Stroked style» and the «Dark Figures style» may be contemporaneous. Finally, superimposed over all these styles is the «Linear style» (Fig. 34), that must be the most recent in the entire Zemmur. There is also a single Arabic text, to be referred to the historic age subsequent to the 15th century AD (García, 2002: 43).

Once the relative sequence was obtained, the paintings were examined for details that could help dating the styles. In the case of the «Dancers' style», the fact that many oxen appear is interesting. It is difficult to decide whether they are domestic or wild, but as most of them accompany human beings we must conclude that they are domestic. Because of this, the «Dancers' style» cannot be older than 7000 BP, when bovines were domesticated (Ferhat, 2003). But the paintings may of course be more recent, especially because in one scene at Rekeiz Lemgasem some humans carry halberds. This suggests they should not date back to before 3800 years ago or be more recent than 3200 years.

Although we must warn that the 3800-3200 dates are taken from the dating of the use of halberds in the southern Iberian Peninsula, and not in Western Sahara, we point out that this is the way some engravings of the High Atlas have been dated (Rodrigue, 1999: 73).

The «Linear style» seems to belong to a period from 2400 to 2000 BP. It cannot be older than 2400 years because of the presence of Libyco-Berber texts, appearing at this time in the entire north African territory (Muzzolini, 1995: 179) and disappearing, in Western Sahara, around the 15th century AD (García, 2002: 43). However, the absence of camels would suggest that they may not be more recent than 2000 years (Wilson, 1984: 7; Muzzolini, 1995: 180; Le Quellec, 1998: 121).

The «Stroked», «Shaped» and «Dark Figures» styles should date to between 3200 and 2400 BP. However, there is no direct evidence allowing a datation, which is only based on superimpositions placing them between the «Dancers'» and the «Linear» styles (Fig. 35).
Linking paintings and engravings

This paper is about paintings in the Zemmur but the majority of the known rock art in Western Sahara are engravings. Thousands of figurative images, mainly animals, are engraved on horizontal stone slabs from the Devonian era in the northern part of the country. This is the case of the sites around the holy city of Smara and the 35-km-long site of Sluguilla Lawash (Fig. 36), also under study by the University of Girona (Soler Masferrer et al., 2001b). A tiny sector of this enormous site is known as the Sidi Mulud site. Our knowledge about the images and the rock-art discoveries in Western Sahara lead us to propose that the Tazina style of engravings could be in some way associated with the "Dancers' style" of the Zemmur paintings.

Although some Tazina figures occur in central Sahara (Muzzolini, 1995), the Tazina style has not been defined in any canonical site of the central Sahara, and it is mainly found in northern Sahara, in the Saharan Atlas of Algeria, the south of Morocco (Wolff, 2002: 43) and the northern region of Western Sahara.

The Tazina engravings generally depict animals, either "ancient" (elephants, rhinoceros, buffalos) or "recent" (giraffes, ostriches, antelopes, gazelles). Many oxen without collars or other "signs of domestication" are also engraved. In the Tazina style engravings of humans...
are very scarce but they are of the greatest importance to support our hypothesis that the «Dancers’ style» can be related to the Tazina style. In fact, many engraved human representations of the Western Sahara closely share morphologic elements with the Zemmur painted human figures. In the examples from Wadi Ben Sacca (Milburn, 1972) and Micateb well (Mateu, 1945-46) the figures have bent legs, always ahead of the body, and unstable positions, with L-shaped feet and visible handfingers (Fig. 37 and 38). Although the following are not strictly stylistic elements, in both styles the humans have elaborate hairstyles or hats, hold bows and throwing sticks and wear belts or skirts. We believe that these morphologic and thematic elements show a relation of the Tazina with the «Dancers’ style».

The dates proposed for the «Dancers’ style» (3800-3200 BP) fall well into Muzzolini's proposed chronological interval for the Tazina style (=4500-3000 BP). In fact, due to the presence in the Tazina engravings of a wide spectrum of animals, but not of chariots and camels, a long chronology is proposed for this style. However, the dates are unclear. In Muzzolini's words, «L'école de Tazina est mal située: elle peut être, dans l'Atlas saharien, le Rio de Oro et le Fezzan, largement contemporaine de la fin du Bubalin Naturaliste, mais elle a une longue durée, se prolongeant jusqu'à une période contemporaine de la Période du Cheval tassilienne, comme l'attestent notamment ses nombreuses figurations d'oryx» (Muzzolini, 1995: 181).

To verify our hypothesis more examples should be collected. The two we present here were published before the definition of the Tazina, so the authors could not relate them to this style. Besides, we have not visited the part of the Western Sahara occupied by Morocco, and therefore we could not study the sites located in that area. We hope that as we advance in the study of the huge Tazinian site of Slugulla Lawash, more examples will be collected. However, the reproductions and photographs published up to the present day seem to us sufficient to provide a basis to our proposal.

Conclusions

During the last decade our knowledge of the prehistoric heritage of Western Sahara certainly improved. Thanks to the continued research many new sites were discovered and an in-depth study of the Zemmur paintings has been completed. Now we know that the prehistoric pareltal art of Western Sahara, especially the paintings, is far richer than our predecessors ever imagined.

In Zemmur, it seems clear that several styles of rock paintings occur, and that they belong to recent prehistoric times, probably between 3800 and 2000 BP. Some of them where contemporaneous, as the superimpositions and thematic elements evidence.

As nowadays we do not have knowledge of a clear and certain sequence of the prehistoric populations that occupied the region, it is difficult to link any of the rock art remains with a prehistoric culture. If we could obtain an absolute radiometric age for any of the styles, it would still be difficult to relate them with any cultural period or other material remains. Thus, two of the major problems concerning the Zemmur paintings - the interpretation and the cultural identity of their authors - remain unsolved.

We can also conclude that most of the prehistoric painting styles of the Western Sahara are different from the central Saharan styles. However, the themes and subjects depicted are similar and the abundance of handprints is the only thematic element very particular to Western Sahara.

Some of these newly defined styles occur only in the Zemmur rock shelters, but as the research continues the study of new findings could go against this statement. At present, we can only claim that the «Linear style», is also present in the Lejuad painted sites of the Tiris region. And we also suggest the presence of the «Dark Figures style» near the Wadi Draa lands, in the Laouianate site.

Despite this apparent fragmentation of the common terminology of the styles, we achieved to place the Zemmur paintings in a more general historical framework through a proposed connection between the
Zemmur's "Dancers' style" and the widely known Tazina engraving style. However, our aim is to prove in more detail and with more assurance these plausible links between the Zemmur "Dancers' style" and the Tazina engravings. The clearly Tazinian site of Sluguilla Lawash should be the best place to continue this line of research.

Also of interest for the archaeology of Western Sahara is that the Zemmur paintings seem to indicate that, at least in Western Sahara, the depiction of "Ethiopic" fauna does not imply old age. Elephants and rhinoceros were present in the most recent prehistory, so in Western Sahara representations of these animals are no reliable chronological indicators.

Finally, we should warn about the conservation problems that face the Zemmur rock paintings. As usual, two main causes of the degradation must be considered. The physical and chemical processes, which formed the rock shelters thousands of years ago, are still active today. In fact, some pictures are disappearing because they fall down when the walls of the shelters are affected by flaking. Other conservation problems are related to visitors. This problem is far more dangerous. The effects of vandalism and robbery are clearly visible in a few rock shelters. Despite this situation, in our opinion, the pictures benefit from the best possible protection: a low rate of visitors and the monitoring of the Sahrawi army. As to physical protection for all the sites, we think that the best way is to continue with the local monitoring of visitors by the responsible governmental forces. In the current context, not much more could be asked for.

Acknowledgements

We would like to thank the Ministry of Culture of the Sahrawi Republic for its collaboration and support. We also thank the University of Girona, especially the private foundation Girona: Universitat i Futur for the financial support and Delegación per la Cooperació i el Desenvolupament de la Universitat de Girona for the institutional support. Finally, the doctoral thesis of Joaquim Soler was possible also because he received a postdoctoral grant from the Departament d’Universitat i Recerca i Societat de la Informació de la Generalitat de Catalunya between 2000 and 2003. His current research and publications are possible thanks to a postdoctoral grant from the Spanish Ministerio de Educación y Ciencia.

Bibliography


MORALES AGACINO E., 1942. Sobre algunos gravados, dibujos e in-
scripcciones rupestres del Sahara español (nota descriptiva), *Mauritania*, 1-XI-1942, Tánger, pp. 373-379, 12 figs.


