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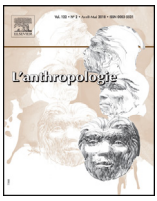

Original article

The rock art of Caraculo, Namibe province, Angola

L'art rupestre de Caraculo, province de Namibe, Angola

Benjamim Fernandes [a,*], Sara Garcês [a,b,c,d], Luiz Oosterbeek [a,b,c,d]

[a] *Instituto Terra e Memória, Mação, Portugal*
[b] *Instituto Politécnico de Tomar, Tomar, Portugal*
[c] *Centro de Geociências, Universidade de Coimbra (u. ID73 – FCT), Coimbra, Portugal*
[d] *Museu de Arte Pré-Histórica e do Sagrado do Vale do Tejo, Mação, Portugal*

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ABSTRACT

The province of Namibe, in south-western Angola, is rich in rock art, which is distributed throughout the region, from the municipality of Camucuio, with its Cipopilo sites, to the Caraculo area, which has the largest number of shelters with rock art. The distribution extends throughout the region, including the municipality of Virei, where the Citundu-Hulu shelter stands out, and the commune of Iona, with the Monte Negro rock art site. To date, the Caraculo region has the largest number of rock art sites identified in Angola. In this paper, we will discuss the general state of rock art studies in Namibe province and, of the various shelters found in the region. We will focus our study on four new sites firstly published in this paper, as they are a good illustration of the diversity of rock art in the region: Muliolila, Múcua II, Kandombolo and Cikotoue. These four shelters were subjected to a digital documentation protocol that is fundamental to the preservation and understanding of these archaeological sites. The methodology involved the application of a digital documentation protocol that included digital photography of the site, panels, figures and surrounding landscape, digital image processing, enhancement of the visualisation and interpretation of the rock art images using DStretch®

* Corresponding author.
E-mail address: ben.fernandes33@gmail.com (B. Fernandes).

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software, and digital tracing using Adobe Photoshop© software. This documentation protocol will be used not only to provide accurate and up-to-date information about the site (thus raising awareness of the cultural and historical importance of these sites), but also to identify hazards and threats that may affect the site, to monitor possible damage and to take measures to protect the site. The motifs represented are very diverse, emphasizing zoomorphic figures such as antelopes, cats and serpentine figures, anthropomorphic forms, geometric forms (simple lines, combined lines, and circular forms) and indeterminate figures. The figures are both monochromatic and bichromatic, with white, black and red being the shades that can be observed (although these vary within each colour). The predominant technique is finger painting. Hunting scenes can be seen, either in isolation or in combination. One suggests that there may be indications that figures were made by at least two culturally distinct groups, even if in this paper the authors do not present any scientific proof for this statement but only different characteristics of the rock art. The rock art sites in the Namibe are of great cultural and historical importance, both for Angola and the world. They provide valuable information about the lives and traditions of the peoples who created them and help to promote awareness and conservation of Angola's cultural heritage. It is essential that intensive documentation and awareness of the importance of this Angolan rock art heritage be promoted and practiced on a large scale.

Mots clés :
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Namibe (Angola)
Holocène

RÉSUMÉ

Située au sud-ouest de l'Angola, la province de Namibe est riche en art rupestre qui se répartit dans toute la région. La majorité des abris ornés se répartissent de la commune de Camucuio, avec les sites de Cipopilo, jusqu'à la zone de Caraculo. La répartition s'étend à toute la région, y compris sur la municipalité de Virei, où se trouve l'abri de Citundu-Hulu, et la municipalité d'Iona, avec le site de Monte Negro. À ce jour, la région de Caraculo abrite la plupart des sites d'art rupestre identifiés en Angola. Cet article a pour but de mettre en évidence l'état général des études sur l'art rupestre dans la province de Namibe. Pour cela, nous nous concentrons sur l'étude de quatre sites d'art rupestre situés dans cette région et qui sont publiés pour la première fois dans cet article: le Muliolila, le Múcua II, le Kandombolo et le Cikotoue. Ces abris ont été soumis à un protocole de documentation qui est fondamental pour la préservation et la compréhension de ces sites archéologiques. Dans un premier temps, la méthodologie comprend l'application d'un protocole de documentation numérique, dont la photographie numérique des sites, des panneaux, des figures et du paysage environnant. Dans un deuxième temps, nous nous consacrons au traitement numérique des images, à l'amélioration deleur visualisation et à l'interprétation des figures d'art rupestre à l'aide du logiciel DStretch®, alors que le relevé numérique lui-même a été élaboré à l'aide du logiciel Adobe Photoshop©. Ce protocole de documentation va permettre de fournir des informations précises et nouvelles sur ces sites d'art rupestre et surtout permettre d'identifier les risques et les menaces susceptibles de les affecter – ce qui permettra à l'avenir de surveiller les éventuels dommages et prendre des mesures appropriées de protection. Les motifs représentés sont très variés, mettant l'accent sur les figures

zoomorphes telles que les antilopes, les félins, les figures serpentines, les anthropomorphes, les formes géométriques (lignes simples, lignes combinées et formes circulaires) et les figures indéterminées. Les figures sont à la fois monochromatiques et dichromatiques, dont le blanc, le noir et le rouge (avec des variations pour chaque couleur). La technique prédominante est la peinture au doigt. On peut observer des scènes de chasse, isolées ou combinées. L'observation des figures permet d'émettre l'hypothèse que ces dernières ont été réalisées par au moins deux groupes culturellement distincts, même si dans cet article les auteurs ne présentent aucune preuve scientifique de cette affirmation mais seulement des caractéristiques différentes des représentations. Les sites d'art rupestre du Namibe sont d'une grande importance culturelle et historique, tant pour l'Angola que pour le reste du monde. Ils fournissent des informations précieuses sur la vie et les traditions des peuples qui les ont créés et contribuent à la sensibilisation et à la conservation du patrimoine culturel de l'Angola et plus globalement de l'Afrique. Il est essentiel que la documentation produite ait des conséquences sur la sensibilisation afin que l'importance de ce patrimoine d'art rupestre angolais soient promue et diffusée à plus grande échelle.

1. Introduction and context

The work presented here is the result of archaeological investigations carried out over the last few years in rock art in the Namibe province, Angola.

The research focused on four shelters in the Caraculo region, an area that currently has the largest number of identified rock art sites in the Namibe province. Surveys were carried out to record and document the rock art sites. During these surveys, archaeological material found on the surface was analyzed, as well as rock art motifs and scenes. Some interpretations are proposed. It is hoped that in the future it will be possible to apply more advanced methods of rock art analysis, including pigment characterization and rock art dating, following the same approach already adopted in other parts of Angola (Rosina et al., 2018) and southern Africa (Prinsloo et al., 2008; Tournié et al., 2011; Mauran et al., 2019; Bonneau et al., 2012, 2017, 2022).

The discovery of these new shelters, however, can inevitably put the province of Namibe on the map of scientific research in terms of understanding the past of human societies in this area. We believe that this will gradually increase the interest in research in the area in question. Therefore, this work represents another contribution that adds to the existing ones (Ervedosa, 1980; Redinha, 1949; França, 1953; Bauman, 1954; Breuil and Almeida, 1964; Clark, 1966; Santos Júnior, 1974; Martins, 2008; Gutierrez, 2009; Fernandes, 2014; Martins, 2015) to the knowledge of the past and human dynamics in the region through rock art studies.

2. The Namibe province: the territory

2.1. The territory

Namibe province (Fig. 1) is in the extreme south of Angola. It covers an area of about 57,091 km^2 and has a population of about 500,000 inhabitants according to official government information (Instituto Nacional de Estatística de Angola, 2018).

The region is characterized by an arid and semi-arid climate, with low rainfall throughout the year. Namibe province is bordered by the Atlantic Ocean to the west, the provinces of Huíla and Cunene to the east, the province of Benguela to the north and Namibia to the south, according to Governo

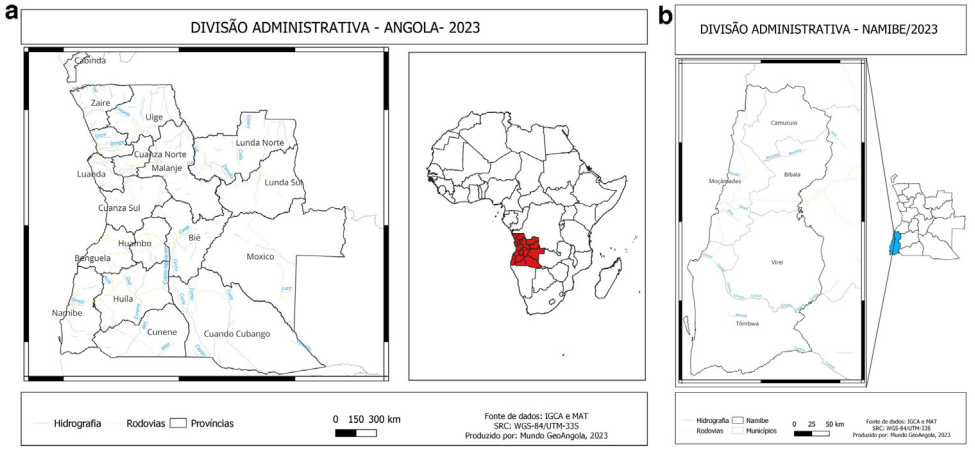

Fig. 1. a: Administrative division of Angola. Source: Mundo Geo Angola 2023; b: Administrative division of Namibe Province. Source: Mundo Geo Angola 2023.
a : Carte administrative de l'Angola. (Source : Mundo Geo Angola 2023); b : Carte administrative de la Province de Namibe. (Source : Mundo Geo Angola 2023).

Provincial do Namibe (GPN) (Governo provincial do Namibe, 2018). Administratively, it is divided into 5 municipalities: Moçâmedes, Tômbua, Virei, Bibala and Camucuio. In terms of topography, the province of Namibe is mainly composed of coastal plains and lowlands, with some mountains, such as the Serra das Neves, located in the municipality of Camucuio, and part of the Serra da Chela, which extends into the province of Huíla, according to GPN. The region also has several seasonal rivers, including the Giraúl, which plays an important role in providing water for irrigation of agricultural crops according to Instituto Nacional de Meteorologia e Geofísica de and Angola, 2021.

From a geomorphological point of view, the Mission of Pedology of Angola (1963) considers the existence of five distinct zones, distributed in the inland-coastal direction:

- the marginal mountain zone, corresponding to the massif of the Serra da Chela,
- the transitional zone between 700 and 1100 m, which is a flat area a few kilometres wide between Bibala and the Curoca River, but well developed north of Bibala and in the southern part of the province, between the Curoca and Cunene rivers;
- the central region, with altitudes between 250 and 700 metres, which covers a large area, mainly of ancient formations, representing about 50–60% of the territory. It is characterized by the presence of what are known as "rock islands", formed by the lowering of the surface because of erosion;
- the coastal plateau area, made up of more recent sedimentary formations, which in some cases extends to the coast.
- and the coastal area, with altitudes of less than 100 metres, where two Quaternary abrasion terraces of varying extent can be distinguished.

The entire area between Chela and the coast is mountainous (Estermann, 1961), rising either in compact ridges or in isolated hills (inselbergs). According to Estermann (1961), the best-known inselberg in the region is Morro Maluco, while the mountain ranges include Serra do Nguendelengo in Bibala and the Mundas (mountains) of Hambo in Camucuio. According to the author, these formations were permanent settlements for the shepherds and small farmers who lived there.

The same mission distinguished the following geological zones in the province of Namibe, extending from west to east. First is the zone of recent sedimentary terrains, whose sedimentary formations, according to the study, extend from the Bay of Lucira to the Cunene River, with Cretaceous formations dominating north of the Bay of Baba, superimposed by Cenozoic formations, mainly Miocene. To the south of Tômbua, there is a large area of dunes; the old lands, an area that occupies

most of the province's territory and which belong to the following formations: Base Complex (mainly of highly metamorphosed eruptive or sedimentary rocks), the Oendolongo system (mainly of quartzites, sandy or clayey schists and amphibolitic rocks), the Bembe system with granitic formations (a large area occupies the entire north-eastern part of the province and extends eastwards to near the coast) and eruptive rocks of the great batholith of central Angola; and post-Permian igneous rocks, including olivine dolerites, dolerites without olivine, volcanic formations of the coastal area north of Moçâmedes, eruptive rocks of the Morro Vermelho region and volcanic porphyry of Moçâmedes.

The southern Namibe Desert zone, from Virei to the sedimentary formations of the rim, is covered by granite of the Chela type (Beetz *apud* Feio, 1981), which can be pink or, in some cases, light grey in colour, with a composition of microcline, oligoclase, quartz, biotite and other accessory minerals. Bettencourt et al. (1962) distinguish two zones in the Namibe Desert. First is the coastal strip of absolute desert, which extends from the south (Cunene River) to the north (Benguela province border) and penetrates the interior of the Namibe in a maximum strip of about 30 km, where sands and dunes predominate. Second is the semi-desert or marginal zone, which immediately follows the previous one and culminates in the foothills of the Serra da Chela, where eruptive rocks also predominate, especially granitic rocks.

From a hydrological point of view, the main rivers in Namibe province (PDIPN "Namibe province Integrated Development Plan", 2007) from south to north are:

- the Cunene, which does not flow within the province but forms its southern border with the Republic of Namibia. It rises in Huambo, crosses Huíla, runs along the southern border of Namibe province and flows into the Atlantic Ocean south of Tômbua;
- the Curoca, which rises on the Huíla plateau. Its upper reaches are known as the Pocolo and its main tributary is the Otchifengo. It flows into the Bay of Pinda, in the municipality of Tômbua;
- the Bero River, which originates in the province of Huíla and flows into the Bay of Moçâmedes;
- the Giraúl River, which originates in the Bibala region and flows near the town of Moçâmedes;
- the Bentiaba River, which originates in the southern mountains of the municipality of Lola and flows into the town of Bentiaba;
- the Inamangandu River, which flows south of Lucira. It is also known as the Chingo along its middle and lower course;
- the Carunjamba River, which rises in Quéria and flows south of the commune of Lucira;
- and the Cangala and Catara Rivers, on the northern edge of the province.

Except for the Cunene, all the other rivers are intermittent and dry for most of the year. Nevertheless, Namibe valley system indicates a more pluvial palaeoclimate than the present one (Carvalho, 1961).

In terms of climate, Angola is in the tropical zone and has an annual regime of two seasons: the hot, rainy season and the cool, dry season. The rainy season usually lasts from August to May, while the dry and cool season only lasts from June to July. Several factors, such as the geographical location in relation to the Southern Hemisphere's intertropical convergence zone, proximity to the sea, relief features and the cold Benguela current, influence the climatic differentiation in Angola (Diniz, 2006). Average annual rainfall in the coastal region decreases from north to south, ranging from 800 mm in Cabinda to 50 mm in Namibe. The province of Namibe, located in the southwest of Angola, has specific climatic characteristics with large thermal amplitudes. The cold Benguela current has a strong influence on the decrease of air temperature, water vapour and rainfall in this region, resulting in increased desertification. With an average height of 300 m, the Namibe Desert extends from the coast to the Serra da Chela.

The data contained in the Development Plan of the Government of Namibe province (PDIPN, 2007) classify the climate of the province as arid along a wide western strip and semi-arid in the rest of the province, except for a narrow strip in the northeast of the province with a dry sub-humid climate, which marks the transition to the inland plateaus with a humid climate. According to the same data, Namibe can be divided into three climate types: dry, desert, hot (DWh) in the coastal strip; dry, desert, very hot (BWh) in the central strip; and dry, steppe, very hot (BSh) in the interior. Average

temperatures range from 18°C to 24°C, and rainfall is less than 200 mm per year (Amaral, 1985). According to the Köppen-Geiger classification, it is a region with a BWh climate, characteristic of hot desert regions of low latitude and altitude. This climate makes it possible to expose the outcrops of the onshore sedimentary margin of the Namib, where rare plant species such as the typical *Welwitschia mirabilis* can be observed.

According to the Missão de Pedologia de Angola (1963), the province of Namibe is almost entirely covered by:

- desert formations: it corresponds to the most coastal and widespread formations, occupying almost the entire area of the province south of the 16th parallel, forming a strip that varies in width from about 50 to 100 km north of this parallel. This area presents several species of herbaceous shrubs and sub-shrubs. The most representative are *Cissus* species and *Welwitschia mirabilis*;
- *Colophospermum mopane* (Hiemilignosa): it follows a coastal-inland direction, with Curoca river as the southern limit where the other species such as *Colophospermum mopane* (Mutiati) is also represented. There are other trees such as *Spirostachys africana* that appear frequently;
- Bush of various elements with several species of the genus *Acacia* widespread (Hiemilignosa). One of them is the Hiemilignosa of the Berlinia-Brachystegia-Combretum type. This species extends from the Mundas do Hambo to Cainde (Virei).

Also, from Cainde to the north are formations dominated by *Adansonia digitata*. Forest galleries are found along some watercourses. According to Bettencourt et al. (1962), the semi-desert or marginal zone was composed of grasses (especially the Semithia and Terminalia species), legumes (plants most desired by livestock) and valuable shrubs that germinated easily after the first rains following seed fall.

The Caraculo region, our study area (Fig. 2), is in the municipality of Bibala on the coastal strip. It is about 60 km from the provincial capital (Namibe). According to Carvalho et al. (1992), the Caraculo region is located on an erosion surface with an altitude between 500 and 600 m, where there are inselbergs that reach heights of up to 2500 m. This area, according to the authors, is the edge of the Angola-Kasai craton (SW of the Congo craton), which is bounded to the southwest by a band of Brazilian rocks associated with the Damara-Katanga belt. This region has rock formations (granites) and is characterized by many caves and rock shelters, many of which would have been used by people of prehistoric culture as dwellings or for painting. It would be interesting in the future to carry out more focused work on the relationship between geomorphology and the choice of certain sites for rock art. Although rock art has not yet been widely studied in this region, the relationship between geomorphology and the choice of certain sites for rock art has already addressed in some non-African contexts (Lenoble et al., 2015; Jouteau et al., 2019).

3. Historical background of the rock art research in Angola

Recently, exceptional work has been carried out to explain the archaeological context of Angola (Matos et al., 2021). Regarding studies specifically of rock art, even though first rock art sites in northern Angola were discovered at the end of the XIXth century, studies of rock art in the Namibe only date back to the 1950s. In 1953, J. Camarate França studied the rock engravings of Citundu-Hulu Mulume and published a work entitled "*The Rock Engravings of Tchitundu-Hulu, Desert of Moçâmedes*". It should be noted that this research was limited to Citundu-Hulu Mulume, since Camarate França had not seen the paintings found in the shelter of the same islet, nor the paintings of Citundu-Hulu Mucai, much less those of Pedra das Zebras and Pedra da Lagoa. In 1954, H. Bauman (Baumann, 1954) published "*Relatório preliminar sobre as novas descobertas de arte rupestre no Sul de Angola*" (Preliminary Report on New Discoveries of Rock Art in Southern Angola), in which he presented photographs of the engravings and paintings of Citundu-Hulu Mucai. In this work, he published for the first time the paintings of the Citundu-Hulu Mucai, which had not been sighted by Camarate França a year earlier.

In 1958, J.D. Clark published "*Schematic Art*", in which he classified the rock art of the eastern region, as well as that of south-western Angola (the Namibe region), as belonging to the group of

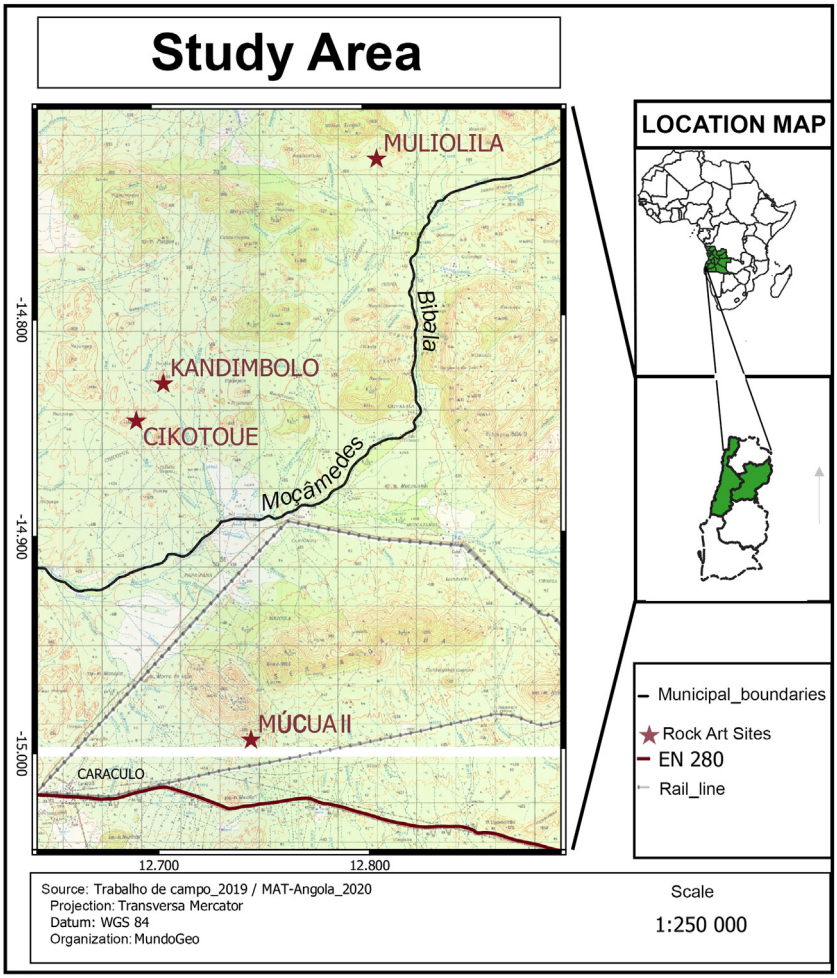

Fig. 2. Map of the study area. Source: Mundo Geo Angola 2020.
Carte de la région d'étude. Source : Mundo Geo Angola 2020.

schematic art of the Central African region. The paintings immediately aroused the author's interest because of the great preponderance of schematic paintings over the naturalistic ones he claims to have found north of the Zambezi. According to the author, most Central African schematic paintings would be painted in reds and browns, and this example from South Africa would not be very different from the "square figures" that the author claims are a common feature of this artistic group (Clark, 1958).

According to M. Gutierrez (2009), this classification by J.D. Clark did not indicate the meaning of the figures painted or engraved on rock faces in Angola. The schematic, summary, ungraded, geometric, and simplified aspect appeared to be a determining factor, but the reality showed a greater diversity.

The Tchitundu-Hulu rock art sites are of paramount importance as the most important repository of Angolan rock art within the Namibe province. Over the years, what began as initial research in this area has developed into one of the most meticulously researched and extensively documented rock art enclaves in all of Angola. The allure of these sites has not been confined to the region, but has attracted renowned scholars and researchers, making it a focal point for archaeological and anthropological investigations spanning several decades. These sites are particularly revered for the sheer wealth of

engravings and paintings they contain, which display a wide range of typologies, intricate techniques, vibrant colours (in the paintings) and an impressive state of preservation.

In 1964 (Breuil and Almeida, 1964), H. Breuil and A. Almeida published a work entitled "*Das gravuras e das pinturas rupestres do deserto de Moçâmedes-Angola*" ("The engravings and cave paintings of the Moçâmedes desert – Angola"), in which they approached the engravings of Cipopilo (municipality of Camucuio) and Brútuei (Citundu-Hulu). In 1974, J.R. dos Santos Júnior published two works on rock art: "Arte Rupestre em Angola" ("Rock Art in Angola") and "*As Gravuras Rupestres de Tchitundu-Hulu" ("The Rock Engavings of Tchitundu-Hulu").* Regarding Citundu-Hulu, he approached the station from different angles, having classified the rock art of the site as being of a schematic or geometric style and difficult to interpret. His work included the documentation of the site with photographic records that identified about 2000 engravings, the description of the technique used to make the engravings, and the characterization of the engravings in terms of their spatial distribution and state of conservation (Santos Júnior, 1974).

In 1980, Carlos Ervedosa published "Arqueologia Angolana", the book that remains today the greatest references of archaeological research in Angola. The author refers to the rock art stations of the province of Namibe, namely Citundu-Hulu and the two shelters of Macahama. More recently, new works have contributed to the understanding of Angola's past (Ball, 2017; Matos et al., 2021).

The 1980s were marked by a virtual stagnation of archaeological research in the country, and in the Namibe region in particular, because of the political and military instability of the post-independence period. In the 1990s, archaeological research in the region resumed thanks to Professor Manuel Gutierrez, who became a major reference in the field. Despite the difficulties posed by the situation in Angola, Gutierrez devoted his time and effort to the study of rock art (Gutierrez, 1996). His work made it possible to disseminate this invaluable heritage and to arouse the interest of new generations of researchers. M. Gutierrez devoted himself mainly to the study of rock art in the province of Namibe and published several works on the subject in which he discussed the results of his research. He was one of the first to carry out ^{14}C dating on rock art sites (both in archaeological contexts and on black figures) and to approach the performance of laboratory tests on the composition of the pigments of the Citundu-Hulu Mucai paintings, without going into detail on this subject (Gutierrez, 1996).

"Art Pariétal de l'Angola" (Gutierrez, 1996) and "Arte Rupestre em Angola, Província do Namibe" (Gutierrez, 2009) were very valuable contributions to the study and understanding of rock art in the Namibe. In the first publication, the archaeological site of Citundu-Hulu is discussed, while in the second Gutierrez presents for the first time 10 new rock art sites in the region of Caraculo, Bibala Municipality. This work confirmed the archaeological potential of the province, especially regarding rock art. As mentioned by the author in 1996, at that time just over 40 rock art sites had been catalogued on the geographical map of Angola, covering an extension from the Zaire River in the north to the Cunene River in the south, and from the eastern border to the Atlantic Ocean.

Although the author acknowledges that the number of sites known at that time was mainly related to mining exploration, thus justifying the existence of unexplored areas, he notes that the knowledge of archaeological remains was partial and did not fully represent the diversity of artistic creation in this region of Africa. However, the author points out that the known sites already showed a wide variety of supports used, forms of expression, techniques, typology of figures, colours used and their combinations (Gutierrez, 2009).

Regarding the ^{14}C dating of the rock art, the author states the following: the dates were obtained from samples taken from the different levels of a survey carried out in the Tchindulu-Hulo Mulume (another writing of Citundu-Hulu) (2596 $\pm$ 53 years BP), which would correspond to the occupation of the cave, and two ^{14}C dates were also obtained in the archaeological levels of Caninguiri (10,000 years) (Guiterrez, 2009). However, to obtain a more reliable and "direct" chronology for the paintings, M. Gutierrez decided to consider three factors: the signs of the presence of Europeans on the site, the presence of iron objects that could be dated to the first millennium (considering the state of knowledge at the time), and the direct ^{14}C dating of the black pigments.

However, the author acknowledged that this method had several drawbacks because knowledge of iron metallurgy was scarce and direct dating of rock art was even scarcer at the time (Gutierrez, 2009). Nevertheless, the results indicated a date of about 2000 years (1980 $\pm$ 100 BP) for the black paintings at the Olepeva site, thus defining a certain continuity between Tchindulu-Hulo Mulume and this site and

considering the absence of iron objects of European origin in the rock art of other sites in the region (Gutierrez, 2009).

In 2008, Cristina Martins presented her master's thesis "*Arte Rupestre de Angola: Um contributo para o seu estudo numa abordagem à Arqueologia do território*" (Rock Art of Angola: A contribution to its study in an approach to the archaeology of the territory), where she makes an approach to several stations of the country, including Citundu-Hulu (Martins, 2008). Nevertheless, the project was rather focused on the Ebo valley (Cuanza Sul) and its plateau, an area that had already been explored decades earlier by Carlos Ervedosa (1980). During fieldwork in 2014, a total of eighteen painted rock shelters were identified, showing the presence of several layers of paintings, including hunter-gatherer depictions of the giant black antelope (*Hippotragus niger*) and a complex ritual context dating from the 18th century AD (Martins, 2015). The study of the Ebo rock art complex became an integral part of an overall project called "The Ebo Project" (Oosterbeek and Martins, 2013). The documentation and analysis of pigments from the Ndalambiri shelter in Ebo was an important step towards a better understanding of Ebo rock art and its meaning to the people who created it.

Despite all the efforts and very valid contributions to the development of an understanding of past dynamics in this region through past artistic manifestations, there is a need to implement more systematic study dynamics in the area.

4. Geographical distribution

The distribution of rock art extends over the entire territory, in a strip that goes from the municipality of Camucuio, with the sites of Cipopilo, down to the region of Caraculo (municipality of Bibala), which is the "epicentre" of rock art in the province, since this is the region with the largest number of painted dwellings. The distribution area extends to the municipality of Virei, the second region with the highest number of identified sites, with the emphasis on Citundu-Hulu, and ends in the south, in the commune of Iona, with the station of Monte Negro. To date, 23 rock art sites have been identified throughout the territory of Namibe province. Of the sites identified, the majority are paintings (Fig. 3). Cipopilo, Pedra das Zebras, Pedra da Lagoa and Mumbe have only engravings. Citundu-Hulu Mulume is the only one that has both engravings and paintings.

5. Methodology

In the 21st century, the accurate, integral, and non-invasive documentation of rock art has become a priority for researchers and heritage managers, given the fragility of this cultural heritage, which is subject to constant environmental and human threats (Domingo Sanz, 2014). Currently, rock art documentation must fulfil several objectives. The documentation of a rock art site can be used as a basis for a series of actions, which may include monitoring the state of conservation and protecting a site; better understanding of the meaning and context of the rock drawings and engravings; better interpretation of the images, which can be improved with detailed information on the location, size, surface type and environmental conditions of the site; and for dissemination actions. Documentation can be used to share information about rock art sites with the public, including local communities, students, and tourists. The availability of accurate and up-to-date information can raise awareness of the cultural and historical importance of these sites.

Although 2D rock art recording methods are currently the most widely used (Domingo et al., 2013; Domingo Sanz and López Montalvo, 2002), the value of 3D models for the study, long-term digital preservation and dissemination of rock art is getting well developed. Various software (Adobe Photoshop, Gimp, Corel Photo Paint, etc.) and specialized plug-ins (DStretch for ImageJ) (Harman, 2005; Le Quellec et al., 2013) for digital enhancement and image processing are used worldwide to facilitate rock art visualization (Clogg et al., 2000; David et al., 2001; Brady & Gunn, 2012). However, rock art documentation continues to be influenced by human skills and the availability of financial and technical resources. The high cost of high-quality reproductions, storage limitations and virtual distribution of models remain problematic and will need to be addressed soon if 3D and 4D methods

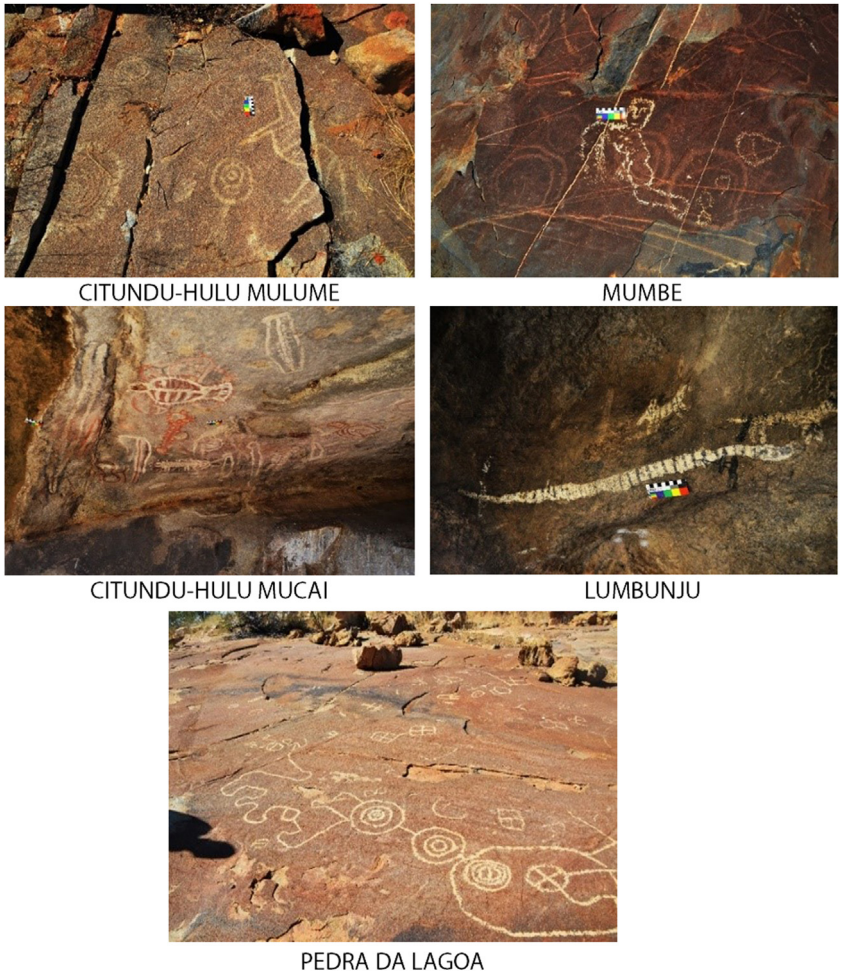

Fig. 3. Photographic record of some rock art sites in Namibe Province. © Benjamin Fernandes, 2014.
Photo de sites d'art rupestre dans la Province de Namibe. © Benjamin Fernandes, 2014.

are to become the standard methods of rock art recording (Domingo Sanz and López Montalvo, 2002; Ruiz López, 2019).

Four areas with sites (Muliolila shelter (I and II), Múcua (I and II), Cikotoue shelter and Kandombolo shelter) located within the survey area were selected for this work and targeted for a digital documentation protocol, which is crucial for taking future actions for their conservation and understanding. The digital documentation protocol included the capture of digital images of the site, panels, figures and surrounding landscape, digital processing of the images, enhancement of the visualization and interpretation of the rock art images using DStretch® software (Harman, 2005) and digital decaling using Adobe Photoshop© software.

The characteristics of the motifs, natural fractures in the supports and the distance between the groups were the criteria used to define the panel. This documentation protocol will not only provide accurate and up-to-date information about the site (raising awareness of the cultural and historical importance of these sites), but it will also help identify possible hazards and threats that may affect the site, monitor potential damage, and we hope soon to take measures to protect the site.

6. Results

6.1. Muliolila shelter 1

Shelter 1 of Muliolila (Fig. 4) is in the locality of Caraculo, municipality of Bibala. It is strategically located in a position that allows a peripheral view of a large part of the valley and thus, from the point of view of the shelter users, it is possible to observe all the movements that take place there. It is a granite rock outcrop, and the interior of the shelter has a rock floor over much of its extension, consisting of a block that appears to have detached from the main block and formed the shelter. The shelter measures 24 metres wide; 3.60 metres high; 7.40 metres deep; an elevation of 611 metres and opens to the south-east. The motifs identified and represented in the shelter can be summarized as zoomorphic, anthropomorphic, geometric, and indeterminate figures. The highest concentration of figures is found in the central area of the shelter (north-east), with about 120 figures dominated by geometric shapes and representations of zoomorphs. There is a high degree of overlapping and many figures are faded. There are also representations of geometric figures along the ceiling (Fig. 5).

Fig. 4. Muliolila shelter. © Benjamim Fernandes, 2017.
Abri de Muliolila. © Benjamim Fernandes, 2017.

Fig. 5. Detail of the ceiling of the Muliolila Shelter. © Benjamim Fernandes, 2017.
Détail du plafond de l'abri de Muliolila. Benjamim Fernandes, 2017.

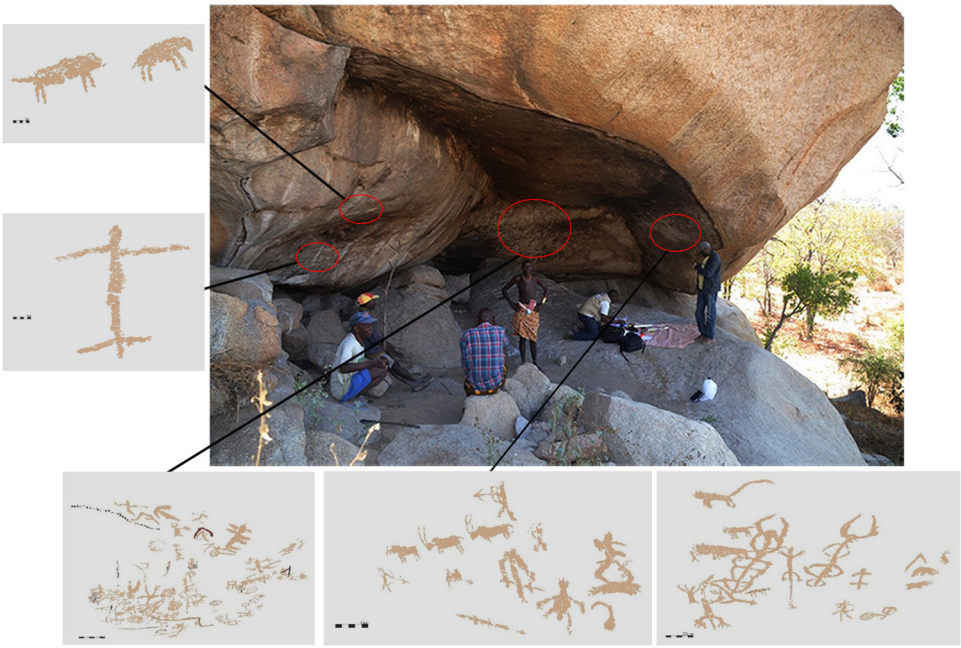

Fig. 6. Location of the main pictorial groupings in the Muliolila shelter. © Benjamim Fernandes, 2017.
Localisation des principaux ensembles picturaux de l'abri de Muliolila. Benjamim Fernandes, 2017.

Approximately 250 figures were counted, distributed over four panels (Fig. 6). This number represents only what we were able to count, given the high degree of degradation of some figures (even using DStretch® software), which are quite faded; the high degree of overlap of the central panel, which makes identification difficult; and the condition of part of the rock support, which has darkened, probably because of fires in the shelter.

At the south-west entrance there is an anthropomorphic figure with an elongated body, about half a metre high, and a set of two zoomorphs. At the south-eastern entrance, there is a group of figures composed mainly of zoomorphs and anthropomorphs, and there are also some geometric representations, although in smaller numbers than the previous ones.

In this shelter, the representation of animals is repeated in all the panels, although they do not constitute most of the motifs. They appear more frequently in the fourth panel, but they are also present in the first and third panels, albeit in very small numbers. The fourth panel is dominated by felines, reptiles, bovids and antelopes. The semi-naturalistic and schematic style of representation makes it difficult to identify the exact species in many cases. In the case of some antelopes, it is possible to identify the species as probably Oryx gazella. However, in the south-eastern part of the shelter, the central figure has twisted horns and a trapezoidal projection characteristic of kudu (*Tragelaphus strepsiceros*). Together with the cats, they make up the majority of the zoomorphs represented throughout the shelter. The serpentine figures are another group of zoomorphs with a large representation in the shelter. The largest serpentine figure is about 1m tall and slender. These figures were identified in the third panel and are not found near holes or crevices. Some of the zoomorphs could be lions or leopards due to their characteristics (shape of the head, slender trunk, and elongated tail). In the first panel, it is possible to observe a group of two zoomorphs that could be interpreted as hyenas, due to the representation of the thick tail and the thick back of the head and jaws.

Human figures appear mainly in the first, third and fourth panels. Although the motif is the same, they are rendered in different techniques and styles, depending on the panel and the scene in which

they are inserted. The largest number ($n = 7$) is in the fourth panel. It is here that the greatest variation in techniques and styles can be seen.

According to the IFRAO Rock Art Glossary, technique is the method of execution, such as painting, incising, direct percussion, while style is a combination of distinctive characteristics of artistic expression or execution specific to a particular person, people, or period (Bednarik et al., 2010).

None of the human figures in this panel has been identified as isolated; they all form groups, suggesting that they are involved in scenes (a group of 3 antelopes, apparently surrounded by 4 or 5 anthropomorphs, with bows and arrows; 2 anthropomorphs are at the back of the antelopes, one at the side and one at the front, apparently closing the enclosure). Only the human figure in the first panel appears to be isolated, as it was not possible to identify the white patches next to it. The figures are rendered in a semi-naturalistic and schematic style. Also noteworthy is the schematic representation of an anthropomorphic figure with an elongated body and open arms. It is one of the largest figures in the shelter, about 40 cm high. One of the most important aspects is its location, in a position that allows a privileged view of both the inside of the shelter and the outside; it is isolated from all the other figures.

Shelter 1 of Muliolila has the numerically dominant representations (more than 100 figures) in geometric forms. Although they are present in all the panels, they appear more frequently in the third (central) panel (Fig. 7) and with a high degree of overlap, making it difficult to read the motifs.

Some of the figures can be interpreted as therianthropes (from the Greek therían [θηρίον], "animal", and anthrāpos [άνθρωποζ], "man", a human being transformed into an animal) or as overlapping zoomorphic and anthropomorphic figures. There is also a figure that resembles a turtle and another that resembles a diplopod (centipede).

The motifs that stand out are circular shapes (circles with dense inner dots; circles with vertical inner lines; striped circles with outer rays), rectangular shapes, simple and combined lines. The motifs are monochrome, white in colour with a light beige tinge. One has the impression that the pigment has gradually darkened to a shade closer to that of the panel's support, probably because of some post-depositional factor.

They show a degree of degradation that is not so pronounced, with the apparent loss of pigment being the most striking element. The largest figure in the panel is at the top right and is a combination

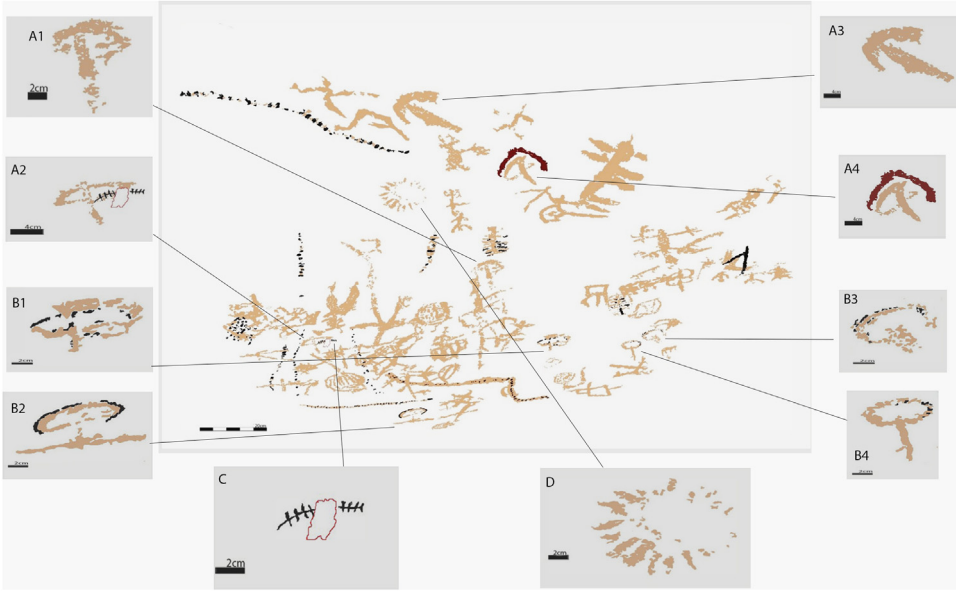

Fig. 7. Decal of the third panel (central panel) from Muliolila. © Benjamim Fernandes, 2017. Scale: 20 cm.
Décalque du troisième panneau (panneau central) de Muliolila. Benjamim Fernandes, 2017. Échelle : 20 cm.

of interlaced lines forming a geometric set of various square or rectangular shapes, some with dense internal dots. The central panel is dominated by geometric figures, although there are some zoomorphs and probably anthropomorphs; it is the panel with the greatest degree of overlap, which makes it difficult to identify, read and count the figures. In general, they are monochromatic, with some bichromatic figures, but in very small numbers.

In the monochrome figures, white dominates, while in the bichrome figures, black is most often combined with white, as in the case of the serpentine figures. There is also a figure that is difficult to interpret, probably a very schematic representation of an anthropomorph, in which white is combined with red. Here, groups of figures stand out for their visibility, in a jumble of overlapping figures and many others already faded, where each one seems to want to "exclude" the other: a quadruped, a group of serpentiforms and a saurian; circular shapes such as a striped circle with external rays, simple and combined lines, rectangular figures, three circular shapes with internal dense dots, four bichromatic circular shapes (black and white) with an external elongated vertical line at the bottom; a probable ramiform of monochromatic black tonality appears next to a probable anthropomorph.

In the fourth panel (south-west panel) the main tonalities of the figures are white and black. This is the most remarkable panel of Muliolila 1, given the richness and variety of motifs and the presence of different scenes. Most of the representations are figurative, but there are also some abstract ones. The motifs represented are mainly anthropomorphic and zoomorphic, mostly in a semi-naturalistic and schematic style. It is also possible to observe geometric representations, mainly circular shapes, simple and combined features, but it is the zoomorphs and anthropomorphs that dominate the panel. Of all the panels in the shelter, this is the one in which it is easiest to identify possible scenes involving anthropomorphs and zoomorphs.

Most of the figures are monochromatic white (Fig. 8 and Fig. 9). Only one bichromatic (black and white) figure, a zoomorph (probably feline), has been identified. The anthropomorphs are mainly represented in a schematic and semi-naturalistic style, but in three different techniques and in three different settings. The zoomorphs represented are mainly antelopes, cats, probably rhinoceroses, saurians and probably bovids. This panel is notable for the tiny representation of some motifs, especially zoomorphs and anthropomorphs, in probable hunting scenes.

At the left end of the left sector of the panel are schematic representations of six anthropomorphs and three zoomorphs (antelopes) in a semi-naturalistic style. Four of these anthropomorphs, armed with bows and arrows, appear to be directly involved in a hunting scene with the zoomorphs; the remaining two anthropomorphs appear to be indirectly involved in the scene. To the right of this sector, there is an isolated anthropomorphic figure which also appears to be involved in a hunting scene involving what is probably a small, incomplete, or amputated antelope. In the lower part of this section, which is already very faded, we can see a schematic representation of a quadruped.

In terms of conservation, the figures are very much worn down. Most of them are very faded, which makes their interpretation difficult even with DStretch®. There are also traces of charcoal graffiti,

Fig. 8. Fourth panel from Muliolila. © Benjamim Fernandes, 2017. Scale: 50 cm.
Quatrième panneau de Muliolila. Benjamim Fernandes, 2017. Échelle : 50 cm.

Fig. 9. Tracing of the fourth panel from Muliolila. © Benjamim Fernandes, 2017. Scale: 50 cm.
Relevé du quatrième panneau de Muliolila. © Benjamim Fernandes, 2017. Échelle : 50 cm.

probably by people living in the area. On the other hand, part of the rock support of the panel is undergoing systematic deterioration, taking on a darker tone, which affects the visibility of the figures. This is a common problem at other rock art sites, and there have been several studies attempting to understand the effects of weathering on rock art panels in southern Africa. It has been suggested that the stability of pigment clay-rock bonds is affected by changes in environmental conditions, particularly moisture and temperature (Hall et al., 2007a; Meiklejohn et al., 2009; Hall et al., 2007b; Mol and Viles, 2010).

6.2. The Muliolila II Shelter

Muliolila Shelter II (Fig. 10) is located on the same lithological environment as Muliolila Shelter I, at the base close to the ground. It has a sandy soil, which would allow excavation, although no materials

Fig. 10. The Muliolila Shelter II. © Benjamim Fernandes, 2017.
Abri de Muliolila II. © Benjamim Fernandes, 2017.

were found on the surface. From the signs it shows, it must have been used as a dwelling, as the traces of a fire are visible, as well as the smoke traces that covered the walls and covers the figures.

The figures identified in Shelter II are mostly zoomorphic figures and geometric shapes. Among the animal figures, the presence of four-legged animals, often in a herd, is noticeable. Among the geometric shapes, circular forms and simple lines stand out. The colours used in the motifs are mainly white and black. It is important to note that the black tone does not seem to be the original colour of the figures, but the result of post-depositional factors.

The state of conservation is poor, mainly due to the presence of smoke over the figures. Another visible element is the wear of the white pigments, which can be seen on many of the figures, some of which are already completely faded, leaving only traces on the walls of the shelter, which are difficult to identify. As Nooter (1986) points out, older and faded white paint tends to leave shadows due to the penetration of the pigment into the rock. We believe that this is one of the reasons for the large number of white spots along the walls of the shelter. However, it is important to note that post-depositional accumulation of minerals such as calcium carbonate or oxalates often forms white deposits on the rock. Bird droppings and insects can also be responsible for the appearance of white spots on the walls (Jopela, 2010).

The action of birds and insects (especially wasps and bees) that nest in the shelters, many of them on the figures, also contributes to their deterioration. Human activity has also had an impact. Among the factors that stand out are bonfires. As the shelter seems to have been used as a temporary dwelling by the people of the region, smoke marks have been left on parts of the walls, particularly in Shelter II, obscuring the figures. Another anthropogenic factor is the graffiti, consisting of numerical inscriptions, probably made by children (according to information provided by locals), which largely overlap the figures of some panels. We do not believe that the intention of the "graffiti artists" was to reproduce the motifs present on the panels, since they present completely different "motifs" to those represented in the rock art.

6.2.1. The Múcua Shelter II

The Múcua II shelter (Fig. 11) is located near the village of Caraculo, in the municipality of Bibala, southeast of a valley near Fundão. It is an isolated block of rock with a granite base, carved by nature, probably under the effect of erosion, to form a shelter. The soil is sandy over most of its extension, which allows for excavations. In the central part of the shelter, there is a fallen block of rock that seems to have separated from the main block and is part of the soil of the area. The presence of vegetation in the area, particularly in the vicinity of the shelter, prevents it from being visible from a long or medium distance, so that it can only be seen from a short distance, which is characteristic of all the shelters in the area, except for the Cikotoué shelter, which can be seen from a medium distance. The view from

Fig. 11. The exterior of Múcua II shelter. © Benjamim Fernandes, 2017.
Extérieur de l'abri de Múcua II. Benjamim Fernandes, 2017.

Fig. 12. The interior of the Múcua II shelter. Benjamim Fernandes, 2017.
Intérieur de l'abri de Múcua II. Benjamim Fernandes, 2017.

the shelter is also short because it is obstructed by the same factor. Nearby is another painted shelter, the Múcua I shelter. The inhabitants of the Fundão region (the community closest to the shelters) call it "Múcua" because of the presence of a baobab (*Adansonia digitata*), a tree that bears fruit called "*múcua*". For this reason, we have named the shelter we are presenting Múcua II. This shelter measures 6.49 metres wide, 3 metres high, 5.35 metres deep, elevation 504 metres and faces north-east (Fig. 12).

The shelter presents a series of figures of a previously unknown typology. It was the first time we had come across this type of figure while studying rock art in the region. Some 34 figures have been identified, most of which are represented by shapes related to a type of stick with a hooked end, which the sites call "*bicheiro*" (Fig. 13). There are also zoomorphic and geometric representations and a schematic representation of an anthropomorphic figure. The motifs identified are all monochromatic (red or white), with red being the color that appears in most representations. The highest concentration of figures is found in the central area and at the beginning of the western sector of the shelter (east/south-east direction), while the eastern end (south/south-east direction) is the area with the least number of representations (only one red spot, already very faded). The paintings start about 70 cm from the ground. The only two paintings in white are in the central area, which is the only part of the shelter where most of the figures are also in white. We must mention the presence of indeterminate figures in the shelter.

Fig. 13. Figure of the "bicheiro". © Benjamim Fernandes, 2017. Scale: 2 cm.
Figure du "bicheiro". Benjamim Fernandes, 2017. Échelle: 2 cm.

The motifs identified in this shelter are mostly zoomorphic, anthropomorphic, and geometric figures. The representation of zoomorphic motifs is numerically very reduced. Four have been identified, all of them probably representations of reptiles. Human representations in the shelter are very rare, with only one schematized human figure identified. However, the geometric shapes identified in the shelter were mostly simple vertical and horizontal lines; interlaced combined lines; dense dots; and cross-shaped figures.

The aspects discussed in the description of the previous shelter also apply to this one. The first element that attracts our attention is the motifs that dominate the rock art of the shelter: we identify as "*bicheiro*" the figures made with a kind of stick that ends in a hook. Out of curiosity, some information has been gathered from the local communities, which, together with the presence of some ethnographic elements, leads us to the hypothesis that the "*bicheiros*" could refer to utensils for hunting certain species of animals. The inhabitants of the Fundão region themselves identified them as instruments similar to those still used today for certain types of hunting. According to the local people, the tool is used to hunt rodents, as well as a type of reptile among which a type of crocodile ("*O'fwa*" or "*Kakala*"). We could not confirm this information. According to the informants, the "*bicheiro*" is used to remove the animal from its hiding place, which is usually a cave, a hole or even a crack in the rock. There is also another instrument in the shape of a "Y" which, according to the inhabitants, is used to immobilize the prey in the neck area; a motif with these characteristics was found in the shelter, but it is very faded.

This tool also refers to the shape of fishing tools: hooks or fishhooks (instruments mainly used in fishing). Despite the absence of motifs suggesting aquatic species (especially fish), we cannot exclude the hypothesis of a reference to fishing activity.

Regarding the state of conservation of the shelter, it can be said that it is reasonable, with some paintings in an acceptable state and others already degraded. The degradation factors appear to have been the same as those affecting the shelters described above. Some figures show a high degree of wear or loss of pigment, which contributes to their fading or total disappearance. This phenomenon is more common in white figures, although it can also be observed in some red figures.

6.3. The Cikotoue shelter

The shelter consists of two blocks of rock, slightly inclined to the south and supported by another smaller block (Fig. 14). The area used by the artists forms a slightly sloping vertical wall, which was used for painting. Along the walls there are rainwater seepage marks which, interestingly, run through the painted panel and therefore the paintings, suggesting that they were deliberately placed there because of a probable connection with water. On one part of the wall there are wide white streaks

Fig. 14. The Cikotoue shelter. © Benjamim Fernandes, 2017.
Abri de Cikotoue. Benjamim Fernandes, 2017.

running from top to bottom, apparently caused by rainwater. This is because the water causes some of the minerals diluted in it to settle on the wall, forming what is known as a crust or veil, and sometimes even some deposits. This phenomenon has been studied in some parts of Australia (Green et al., 2017). The shelter is 4.20 metres long, 2.95 metres high, 8.26 metres deep, 495 metres high and faces south. The distortion observed in some of the figures in this shelter is due to the steep slope of the walls and the lack of internal space for proper documentation.

For the survey of the shelter, only the presence of a single panel was considered (Fig. 15). A panel is defined as a group of rock art motifs that occur in proximity on a rock surface with a reasonably uniform orientation (Bednarik et al., 2010). It measures 2.26 metres high by 2.20 metres wide. The advanced state of deterioration of the panel and consequently of the figures makes their identification very difficult. Those that are visible and can be observed with some certainties are very reduced. The shelter contains a group of figures that is unprecedented compared to those found in other rock art sites.

About nineteen figures identified, only about five are easily identifiable. They are mainly geometric shapes and probably zoomorphic figures, the latter being, as mentioned, very difficult to identify due to the advanced state of deterioration of the panel. The motifs that have been identified are all monochromatic (red or white), with red being the predominant colour in the geometric shapes. The figures are all concentrated in a single area of the shelter (the central part). The upper left part of the panel contains the only easily identifiable figures of the shelter; the lower, central, and right parts contain the figures that are difficult to identify due to the high degree of degradation. It was possible to identify geometric shapes, with simple lines, combined lines, dense dots, cruciform shapes, and a probable schematic representation of a zoomorphic figure being the main motifs identified. All these figures (except the zoomorphic figures) are shown vertically. Of the possible figures that can be identified, there is no overlap, which may indicate that they were made within the same chronology (or not). All the figures in this group are painted in red, except for one which is difficult to interpret.

The motifs identified in this shelter are probably zoomorphic and geometric figures. The geometric representations include a geometric figure consisting of a series of circles formed by the union of five rings; a circle with radiating inner lines, simple lines, geometric figures of difficult interpretation formed by combined lines; dense dots, and a cruciform (cross-shaped) figure. The zoomorphic figures are probably schematic representations of possible diplopods and quadrupeds. The figures interpreted as possible diplopods may, on closer inspection, fall into the category of geometric shapes, depending on the observer's interpretation. However, the choice of this shelter to paint, given its characteristics and especially its exposure to bad weather, such as rainwater infiltration, was an aspect that caught our attention.

Fig. 15. Inclined panel with figures from the Cikotoue shelter. © Benjamim Fernandes, 2017. Scale: 10 cm.
Panneau incliné avec des personnages dans l'abri de Cikotoue. Benjamim Fernandes, 2017. Échelle : 10 cm.

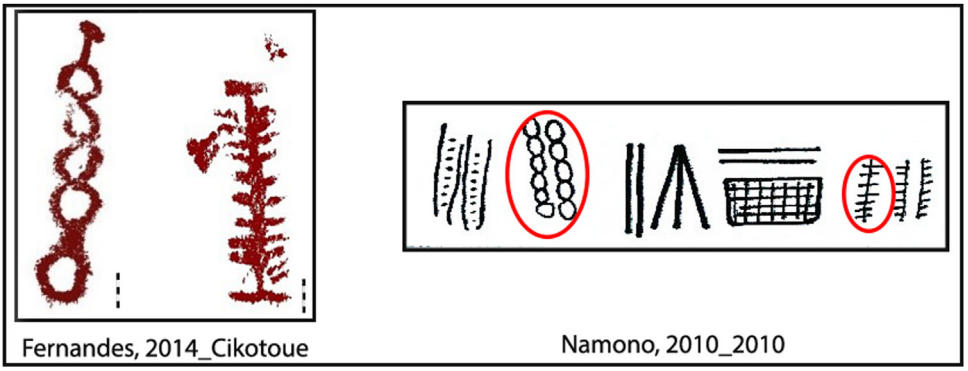

Fig. 16. Some figures are interpreted as being related to water or rain. Adapted from Fernandes, 2014 and Namono, 2010.
Certaines figures sont interprétées comme étant liées à l'eau ou à la pluie. Adapté de Fernandes, 2014 et Namono, 2010.

As described, the water seeps through the upper part of the shelter and runs along the entire wall, forming the panel on which the figures are depicted. It seems clear that the seepage in this shelter preceded the existence of the rock art, but it was still used for painting. It is also interesting to note that there is another panel where almost no effect of seepage can be seen, but this seems to have been completely ignored by the painters. So, what would be the reasons for these artists to use the shelter and this panel, knowing that the figures would be exposed to the rain and consequently to deterioration? Why would they have ignored the panel that did not suffer the effects of infiltration? Was water infiltration the reason for choosing the shelter for painting? Comments on the flow of water over rock art panels have been raised in several contexts (Lewis-Williams and Dowson, 1990; Lewis-Williams and Pearce, 2004; Coles, 2008; Rozwadowski, 2017; Horn et al., 2023).

Another interesting element is the fact that some of the motifs in the shelter resemble motifs that C. Namono (2012) interprets as water-related (Fig. 16). In this shelter there are some motifs that are exposed vertically, slightly inclined. From what we have observed, it seems to us that rainwater infiltration is the main factor in the deterioration of the paintings. We have already mentioned that the panel containing the figures has been infiltrated by water, and the dampness caused by this infiltration has led to the appearance of fungi, which have covered most of the figures, leaving many of them partially or completely deteriorated. The loss of pigment is another aspect that can be observed in some of the figures. Then there are the birds and insects that, as in the other shelters studied, build their nests on the same walls as the rock art, causing the paintings to deteriorate.

6.4. Kandombolo shelter

The paintings in the Kandombolo shelter (Fig. 17) are in an advanced state of deterioration, in this case the shelter in the worst condition of all the shelters surveyed.

It is very difficult to locate the figures, and when they can be located, it is very difficult to make a full reading of them. Due to the advanced state of deterioration, it was not possible to identify groups, so only individual motifs could be identified. The shelter was used as a temporary dwelling, and there is evidence of campfires and even some objects found on the site. Smoke from the fires seems to be the main cause of the deterioration of the figures. Some inscriptions found in the shelter, consisting mainly of charcoal scribbles, are another factor identified as a possible cause of the deterioration of the figures.

Given the location of the shelter, we will only make brief references to it. The motifs represented are grouped into geometric representations such as simple and combined lines, isolated dense points and groups of dense points, zoomorphic representations such as probable reptiles, snake-like figures, and figures of difficult interpretation. It is interesting to note that some of the figures were elaborated on irregularities in the shelter walls, such as cracks. We highlight two figures: a snake-like figure and a figure of difficult interpretation. The group of dense dots is one of the motifs that appear with some

Fig. 17. The paintings in the Kandombolo shelter. © Benjamim Fernandes, 2017.
Peintures de l'abri de Kandombolo. Benjamim Fernandes, 2017.

frequency in the rock art of the region. The technique used here is clearly the use of fingers, and all are in a monochromatic white. C. Namono (2012) and B.W. Smith (2006) interpret this type of motif as probably representing water (rain) or fluids.

7. Discussion

The peculiarities of rock art interpretation, both from a global and a local point of view, constitute one of the greatest challenges in the study of this subject. Rock art is everywhere. Wherever there are rock outcrops, walls, rock shelters or caves, there is a high probability of rock art (Abreu, 2012). The geology and geomorphology of the region, characterized by the existence of inselbergs, rock shelters, walls, rocky outcrops, mostly in granite, may have been one of the factors for the existence of many rock art sites. There are many rock shelters in the region, although not all have been used for painting. There are shelters that, due to their characteristics (shape, dimensions and objects found), seem to have been used as dwellings.

Some of the shelters described here are isolated in the landscape, while others are part of larger units such as inselbergs. They are not visible from a great distance in the landscape but are generally found within a medium or short distance. All the rock art is carved into granite which seems to have been the subject of some kind of choice on the part of the engravers. Despite the abundance of granite in the area, they also had marble. Of the other known sites in the region, only Mumbe (a rock art site in the Virei region) does not have granite as its bedrock but schist.

In some parts of the territory there are natural water reservoirs, consisting mainly of pits dug into granite rocks by erosion, such as the site of "Bwa Inene" (Big Stone) in the Caraculo area, where there are natural reservoirs, some of which are more than three metres deep and five metres in diameter, capable of holding water for long periods. It is probable that the palaeofauna (which was rich, as shown by the paintings) was one of the elements that supported the presence of populations, since it guaranteed the game necessary for the life of hunting communities. On the other hand, there is empirical evidence of the existence of rivers with greater flow in earlier times, as in the case of the

small river stream near the Muliolila shelter. These small watercourses are called "rio seco", i.e. a watercourse that only flows in times of abundant rainfall, known in the local language as "mulola". It is therefore possible to establish links between the environment and human occupation since the choice of regions and sites for painting may be linked to these factors.

Even there is no direct scientific demonstration to assume, one suggests that the rock art represented in the shelters reveals the existence of at least two culturally distinct communities: art associated with hunter-gatherers and art associated with pastoralists. Motifs and scenes related to herding can be seen mainly in the Muliolila shelter, while those related to hunting can be seen in the Muliola and Múkua II shelters.

None of the groups currently claim authorship of the rock art, demonstrating total ignorance of it. This could be a result of cultural discontinuity due to the territorial dynamics and mobility that took place in the region over several centuries (Fernandes, 2014). Another possibility is that some communities of hunter-gatherers and pastoralists lived together and formed a new community, especially when Europeans arrived. They may then have produced rock art as a way of expressing their identity. This is what is known in some parts of southern Africa as creolized rock art (Challis, 2012, 2016, 2017). According to Challis (2012), *creolization* refers to the process of cultural and ethnic mixing that occurred in southern Africa during the 19th century. In the case of the AmaTola "Bushmen", individuals of San, Khoe, Coloured and Nguni descent formed border raiding parties and were able to draw on practices and symbols that had become culturally coherent between their respective societies because of extensive pre-colonial interaction over the preceding centuries.

The result was the formation of a new collective identity born of this union, an example of the process of creolization. There are several studies that attempt to understand the disruption of trade and social communication between indigenous groups and incoming populations, as well as the mixing of cosmologies that occurred because of contact (Challis and Sinclair-Thomson, 2022).

According to B.W. Smith (2006), the most recent rock art in southern Africa is made by Bantu-speaking peoples and is scattered throughout the territory they occupy. They are mostly finger-painted groups and use white as their primary colour, as can be seen in most of the shelters presented here. The rock art of hunter-gatherers and Bantu speakers (Smith, 2006) occurred in the same landscape, sometimes in the same places and on the same panels, and even overlapped.

This reality can be observed in our case. The Muliolila shelter is the best example. There are two hypotheses: the first is the possibility that the figures were made by two culturally different communities; the second is the possibility that they were made by a single community, but at different times, or as an adaptation to factors that caused disturbances. The presence of rock art in the region, and the possibility that they used and shared the same spaces for painting and ritual practice, could show that friendly and cooperative relationships were possible under certain circumstances. There are many oral sources that report the existence of exchanges of favours between culturally different groups in the past and present. However, work carried out elsewhere in southern Africa (mainly during the debate in rock art studies following D. Lewis-Williams' theory on shamanism and trance theory) (Huffman, 1983; Lewis-Williams, 2006; Dawson, 2012) on cultural continuities and discontinuities in rock art should be developed in Angola to better understand this dynamic.

8. Conclusion

Understanding rock art in the Namib region has far-reaching implications, considering the occupation of the area since prehistoric times, the cultural and ethnic interactions that took place in southern Africa during the 19th century, the mixing of cosmologies, trade and social communication between indigenous groups and arriving populations. These are all constantly evolving areas of study. The most recent rock art in the region has been attributed to Bantu-speaking peoples, with the colour white dominating the paintings. Motifs and scenes related to herding can be seen in shelters such as Muliolila, while those related to hunting are present in shelters such as Muliola and Múcua II. It is interesting to note that the rock art of hunter-gatherers and Bantu speakers occurred in the same landscape, often in the same places and even overlapping. In conclusion, the rock art studied in the Namib region was made by at least two culturally distinct communities: hunter-gatherers and pastoralists.

The cultural and historical diversity revealed in the rock art reflects the past interactions and territorial dynamics that have shaped the region. Interestingly, none of the contemporary groups claim authorship of the rock art, suggesting a current ignorance of its existence. This may be a result of cultural discontinuity over the centuries due to territorial dynamics and mobility in the region. These two communities may have shared a common space and some of the paintings may be related to rain harvesting activities.

The study of these sites has made it possible, in a way, to lay the foundations for future research and knowledge of the human dynamics that took place in the area; for example, it has made it possible to obtain more information, albeit in a hypothetical way in most cases, about the interaction (in the production of rock art) between culturally different groups, and that the environment may have been an important factor in the settlement of human communities in the region over time.

However, more detailed studies are needed to contribute to a better understanding of the rock art, its function, and its authors. Dating, pigment analysis, archaeological excavations, and the consequent analysis of artefacts, as well as the use of experimental techniques widely used in archaeology today, could answer many of the questions that arise today.

Disclosure of interest

The authors declare that they have no competing interest.

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