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ROCK-ART OF TOCA DO PARAGUAIO (Piauí, Brazil)

A MORPHO-TECHNIQUE APPROACH

THALISON DOS SANTOS

Volume 1

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You cannot expect the Form before the Idea,
for they will come into being together.

Arnold Schoenberg

ABSTRACT

This work approaches the rock-art of Toca do Paraguaio (Piauí, Brazil) as the result of compositions between universal morpho-technique features. These features emerge according to the interacted morpho-technique axes (morphology and technique), during the process of materialization of ideas, conducted by the authors. This thesis looked for the morpho-technique history of 939 paintings of Toca do Paraguaio with the objective of identifying identities, from the particularities of the morpho-technique history the paintings showed. Through the application of this model it was possible to suggest a minimum of identities that could have painted the site. In the interpretation of the paintings, it was identified a possible depiction of a hut (the only one in Capivara), as well as paintings carrying objects that could be interpreted as pottery or basketry. Considering these interpretations, it was possible to establish a chronological marker according to the estimated ages that these technologies appeared in the region. This work also contextualized stratigraphically and chronologically the other types of materials found in the site, like the lithic tools, the ceramic fragments, the human, faunal and vegetal remains.

Key words: Rock-art; morpho-technique; morpho-technique features; identity; toca do Paraguaio.

RESUMÉ

Cet ouvrage aborde le rock-art de Toca do Paraguaio (Piauí, Brésil) à la suite de compositions entre éléments morpho-techniques universelles. Ces caractéristiques se dégagent selon les interactive axes morpho-technique (morphologie et technique), au cours du processus de matérialisation des idées, menée par les auteurs. Cette thèse a cherché l'histoire morpho-technique de 939 peintures de Toca do Paraguaio avec l'objectif d'identifier des identités, à partir des particularités de l'histoire morpho-technique qui les peintures ont montré. Grâce à l'application de ce modèle, il est possible de proposer un minimum d'identités qui aurait peint le site. Dans l'interprétation des peintures, il a été identifié une représentation possible d'une cabane (la seule dans Capivara), ainsi que des peintures en train de transporter des objets qui pourraient être interprétés comme la poterie ou la vannerie. Compte tenu de cette interprétation, il était possible d'établir un marqueur chronologique à partir de datations par ces types des technologies dans la région. Ce travail a également mis en contexte chrono-stratigraphicque les autres types de matériaux trouvés dans le site, comme les outils lithiques, les fragments de céramique, les restes humains, fauniques et végétaux.

Mots-clés: art rupestre; morpho-techniques; éléments morpho-techniques ; identité ; toca do Paraguaio.

RESUMO

Este trabalho aborda a arte rupestre da Toca do Paraguaio (Piauí, Brasil) como o resultado de composições entre características morfo-técnicas universais. Estas características surgem de acordo com eixos morfo-técnicos interativos (morfologia e técnica), durante o processo de materialização das idéias, conduzido pelos autores. Esta tese buscou pela história morfo-técnica de 939 pinturas da Toca do Paraguaio, com o objetivo de identificar identidades, a partir das particularidades da história morfo-técnica que as pinturas demonstraram. Por meio da aplicação deste modelo, foi possível sugerir um mínimo de identidades que poderiam ter pintado o sítio. Na parte interpretativa das pinturas, foi identificada uma possível representação de cabana (a única em Capivara), bem como, pinturas que aparecem transportando objetos que poderiam ser interpretados como cerâmica ou cestaria. Considerando estas interpretações, foi possível sugerir um marcador cronológica para esses tipos de pinturas, de acordo com as idades estimadas para o surgimento dessas tecnologias na região. Este trabalho também contextualizou cronoestratigraficamente, os outros tipos de materiais encontrados no sítio, como as ferramentas líticas, os fragmentos cerâmicos, restos humanos, faunísticos e vegetais.

Palavras-chave: Arte rupestre; morfo-técnica; elementos morfo-técnicos; identidade; toca do Paraguaio.

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INTRODUCTION[1]

As a human phenomenon, the rock-art can be studied from different disciplines and from several perspectives. Maybe this is one of the reasons that push some prehistorians to criticize the information achieved through the study of rock-art. The status of what is reliable and not reliable, is a common critic, rock-art investigators receive. But, interpretative uncertainty is not only in charge of interpretive subdisciplines, such as rock-art. In some cases, other interpretations achieved through the analysis of other types of material culture are also criticized.

Actually, the degree of reliability of some rock-art works depends most of the type of approach. In some cases, the interpretations are very reliable. For example, the fact that rock-art is found at a given place, confirms, undoubtedly human presence, even though it may be difficult to point out the exact period of time in which the site was painted. Once the difficulty of dating this human phenomenon is assumed, the challenge of organizing a given type of rock-art in a period of time, is the biggest task of several investigations.

In Brazil, attempts to identify the periods in which certain types of rock-art were produced, have taken place since the decade of 1970, with the researches in the region of Piauí and Minas Gerais (Prous, 1991: 13). These works have provided a lot of information about rock-art and its context. In Piauí, some ages have been estimated. In any case, many of the basic assumptions in rock-art research can be easily criticized. One of them, and probably the most common, is the practice of considering the rock-art presented on the walls of any given site, as the result of the same pictorial moment, very little importance has been given to the superimpositions. Another common tendency in the rock-art investigation in Brazil is to consider the entire corpus as a unity, and, consequently relating this to a group identity.

For the development of this thesis, all these questions have been considered, firstly, because its main motivation is to identify, between the pictures of a given site, the ones that could be result of the same knowledge of execution, being consequently painted by the same identity.

This information would only be possible with the development of a model of analysis designed to achieve these objectives, privileging each painting of the site, as one unity of analysis. Thus, emerged the development of the morpho-technique model that considered each painting, as a singular structure and the context (the site), as a source of information.

[1] The image used in the cover page (the star catcher) is found in the panel 7A number 688 in Toca do Paraguaio.

In this work, special attention has been given to the paintings, searching patterns materialized within them that could be result of the same protocol of morpho-technique execution. The concept of morpho-technique has been proposed in this work, as the main structural axis of paintings, in which information about the identity of the authors could be achieved. Other concepts that considered the materialization of paintings have been sought in the Arts, to support the morpho-technique model. With the development of the morpho-technique model, it was possible to identify the structural elements (referred in the text as universal morpho-technique features) that are born with the materialization of the paintings.

To apply and test the morpho-technique model, rock-art from the archaeological site Toca do Paraguaio, in Southeastern Piauí (Brazil) was selected. Toca do Paraguaio is a rock-shelter located in the archaeological area of São Raimundo Nonato[2] in southeastern Piauí (Brazil), close to the municipality of Coronel José Dias, inside the area of Serra da Capivara National Park (Capivara). The site has around 70 meters length oriented in the sense north/south and opened to the east. In this work, the entire corpus, composed by 939 paintings has been analyzed.

As a result of this work, 33 (99 paintings) identity tendencies have been identified from 939 figures, suggesting that, at least 28 individuals could have made 28 of these identities, and 5 of them could have been done by different persons sharing the same identity. Also, specific morpho-technique histories were identified, which confirm the efficiency of the method and also the plausibility of the universal morpho-technique features.

This thesis was organized in two volumes and a cd. The first volume presents the objectives of the research (Introduction), archaeological context (chapter 1), brief history of research (chapter 2), the building of the morpho-technique model and the operational procedures (chapter 3), the application of the morpho-technique model (chapter 4), the conclusions and the consulted references. The second volume will present the tracings of 939 prehistoric paintings from Toca do Paraguaio and the panel divisions. This volume is for consultation, in which the paintings referred to the first volume can be checked. It is organized in A3 paper; otherwise the smallest paintings would not be seen. In the cd there are the morpho-technique database, the tracings of the paintings and the photos of the paintings.

[2] In this text the Archaeological area of São Raimundo Nonato will be referred sometimes, as Capivara, or São Raimundo, or Southeastern Piauí. All these denominations correspond to the same region.

1 – THE ARCHAEOLOGICAL SITE OF TOCA DO PARAGUAIO

This chapter is addressed to the presentation of Paraguaio's archaeological context, as well as the surrounding environment in a small scale.

1.1 LOCATION AND CHARACTERISTICS OF THE SITE

The Toca do Paraguaio is a rock-shelter (Fig. 2) located in the archaeological area of São Raimundo Nonato[3] in South Eastern Piauí (Brazil), closer to the municipality of Coronel José Dias, inside the area of Serra da Capivara National Park (Fig. 1).

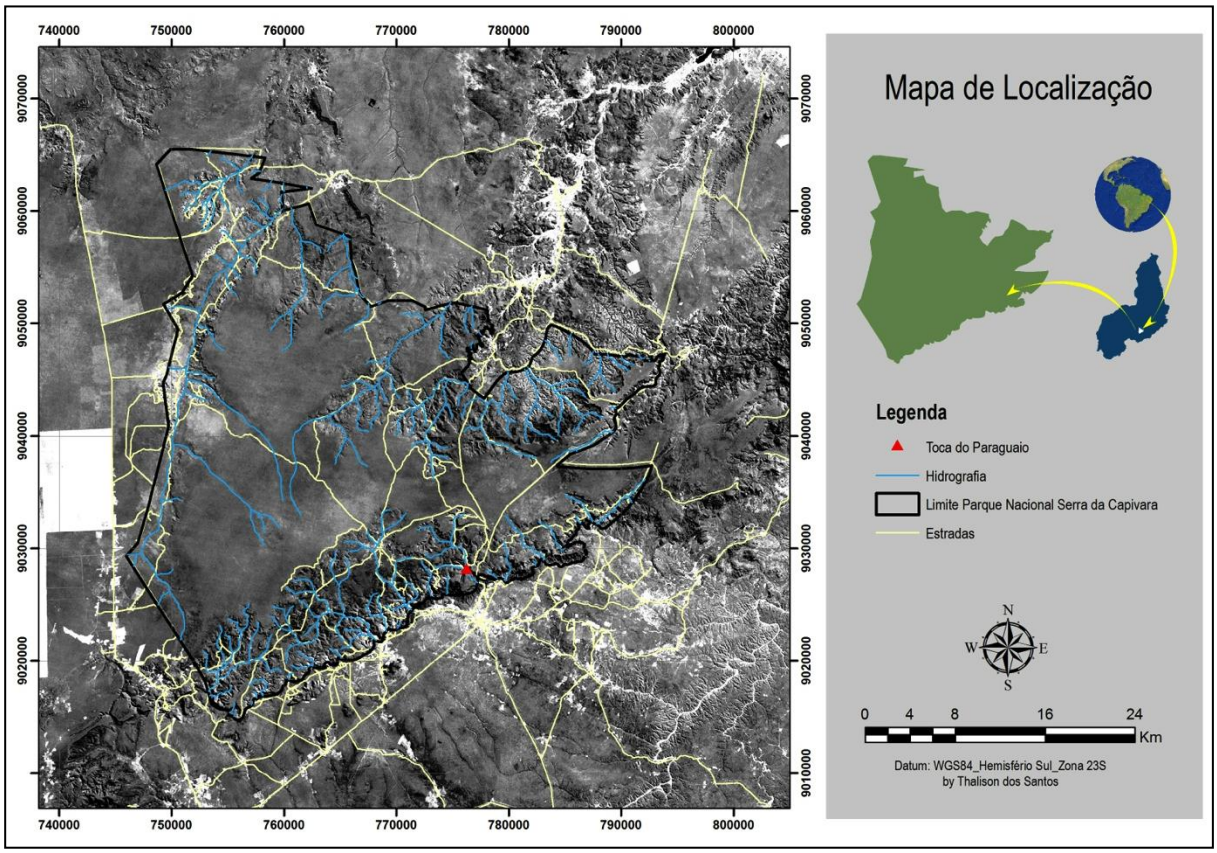


Figure 1 - Toca do Paraguaio located inside the boundaries of Serra da Capivara National Park. Red=Site point, Blue=Hydrography, yellow=roads. Design: Thalison dos Santos. Source: Database of FUMDHAM.

Specifically it is placed in a deep and narrow valley (Arnaud *et al*. 1984-35) on the top of the plateau[4], which can reach between 400 to 600 meters height above sea level. The

[3] In this text, sometimes São Raimundo will refer the name São Raimundo Nonato, and Paraguaio will refer the name Toca do Paraguaio (rock-shelter). The area of São Raimundo Nonato is also known as Capivara, especially on the international literature.

eroded sediments from the top of the plateau are deposited along the slopes. Currently, they are dragged out from the top of the plateau and mostly deposited on foot of the plateau's cliff, composing high talus and also the pediment on the Precambrian plains.

The narrow valley where the Toca do Paraguaio is placed present some ephemeral water sources, such as a narrow stream and a water reservoir naturally sculpted on the rocky surface on the foot of the escarpments. Throughout this valley other rock-shelters can be found.

The vegetation along this valley is considered as midsize woody *caatinga*[5], it is very similar to the gallery forests, which can be found in the ravines of the escarpments and in the valleys on the top of the plateau.

The site has around 70 meters in length oriented from north to south and opened to the east. It is 420 meters above sea level (Guidon, 1975: 66).

In the Northern portion of the site, the rock is composed of a layer of sandstone deposited under a layer of conglomerate (Guidon, 1975: 66). Its surface presents a rocky level that follows the orientation of the walls (N-S). This level also divides the Upper Sector (North) from the Lower Sector (South).

The Upper Sector is 30 meters in length. It has around 10 meters of sheltered surface. Counting from the surface, the ceiling height is variable. In the deepest part of the shelter; the ceiling reaches 50 cm from the ground, while in the entrance, it can reach about 7 meters. In this area, the rock-art is drawn upon the ceilings, the walls and the pebbles from the conglomerate. Essentially, the rock-art is oriented vertically (when they are drawn on the walls) and horizontally (when they are drawn on the ceiling).

The Lower Sector is about 40 meters in length. Its surface is less sheltered than the Upper Sector. Most of the time, this portion is exposed to the sun, especially during the morning. Generally, the rock-art in this sector is drawn in a vertical pattern (upon the walls). This sector has the largest paintings on the site, which could be seen from the center of the valley, if the vegetation did not block the vision.

[4] This plateau (Fig. 1) is referred in the Brazilian maps, as part of the Serra Geral (General Mountains) do Bom Jesus do Gurguéia, which is the southeastern edge of the sedimentary basin of Parnaíba river. The Serra do Bom Jesus do Gurguéia is an important massif, that starts 200 km far west from São Raimundo Nonato, extending itself around 280 km to the East and West (Arnaud *et al*. 1984: 29).

[5] Caatinga is an Amerindian word that means Mata Branca (White forest). From the Tupi (native South-American language) Caa means Mata (forest) and Tinga means Branca (white color) (Buco, 2012: 43).

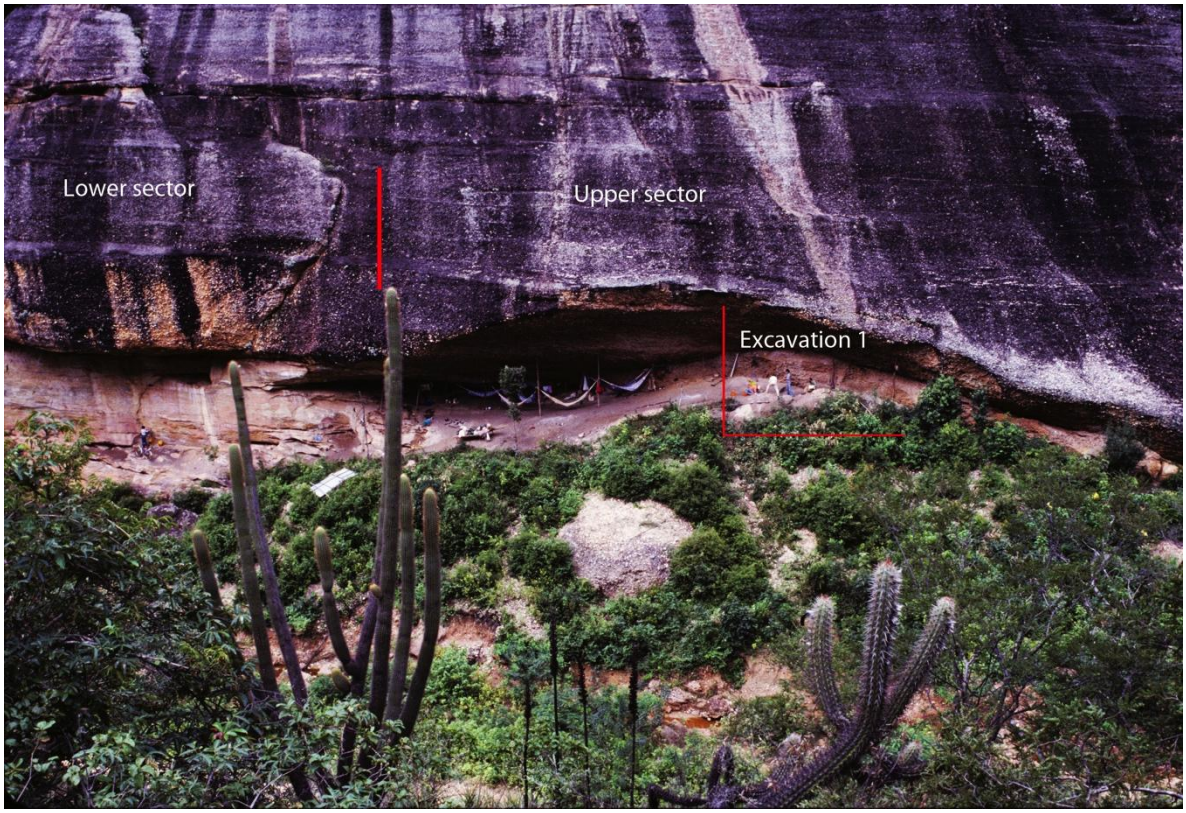


Figure 2 - Toca do Paraguaio during the archaeological interventions of 1978. View from the sandstone massif in the opposite side of the valley. Source: Archives of FUMDHAM.

1.2 THE EXCAVATIONS

The excavations happened during two main archaeological campaigns, the first one in 1978 (Fig. 2) and the second in 2007. Both were concentrated in the upper sector, which is the only part presents potential soil to be excavated.

Most of the main results were achieved upon analysis of materials found in 1978. The results from the excavation 2 of 2007 were not yet published.

The main area of excavation from 1978 was 5 meters in length and 4 meters in width covering an area of 20 meters squared. This area was named as Excavation 1, and was dug up according to the methodology of Wheeler, determining squares across an alphanumeric axis. The excavation was dug up by *decapages* following the natural layers. Apart the excavation 1, there was also three *sondages* of verifications, where very few materials have been found[6].

The area that was excavated in 2007 and covered a surface of 72 meters squared (Fig. 3). It was established on the best-preserved part of the surface. This surface was conserved

[6] All the information about the excavation, stratigraphy, and description of the found materials, was consulted in the excavation's camp diaries from 1978 (specifically from the notebooks of Niéde Guidon, Jean Paul Gaborit, Susan Monzón, Laurence Ogel-ros and Marie-Bernadette) and from 2007 (the notes taken by Aurélio Paes Landim).

due the proximity between the ceiling and the ground, the shallow condition of the soil that presented bedrock around 30 cm below the surface. This area of excavation was established along a large and wide surface, and dug up by artificial layers about 10 cm thick.

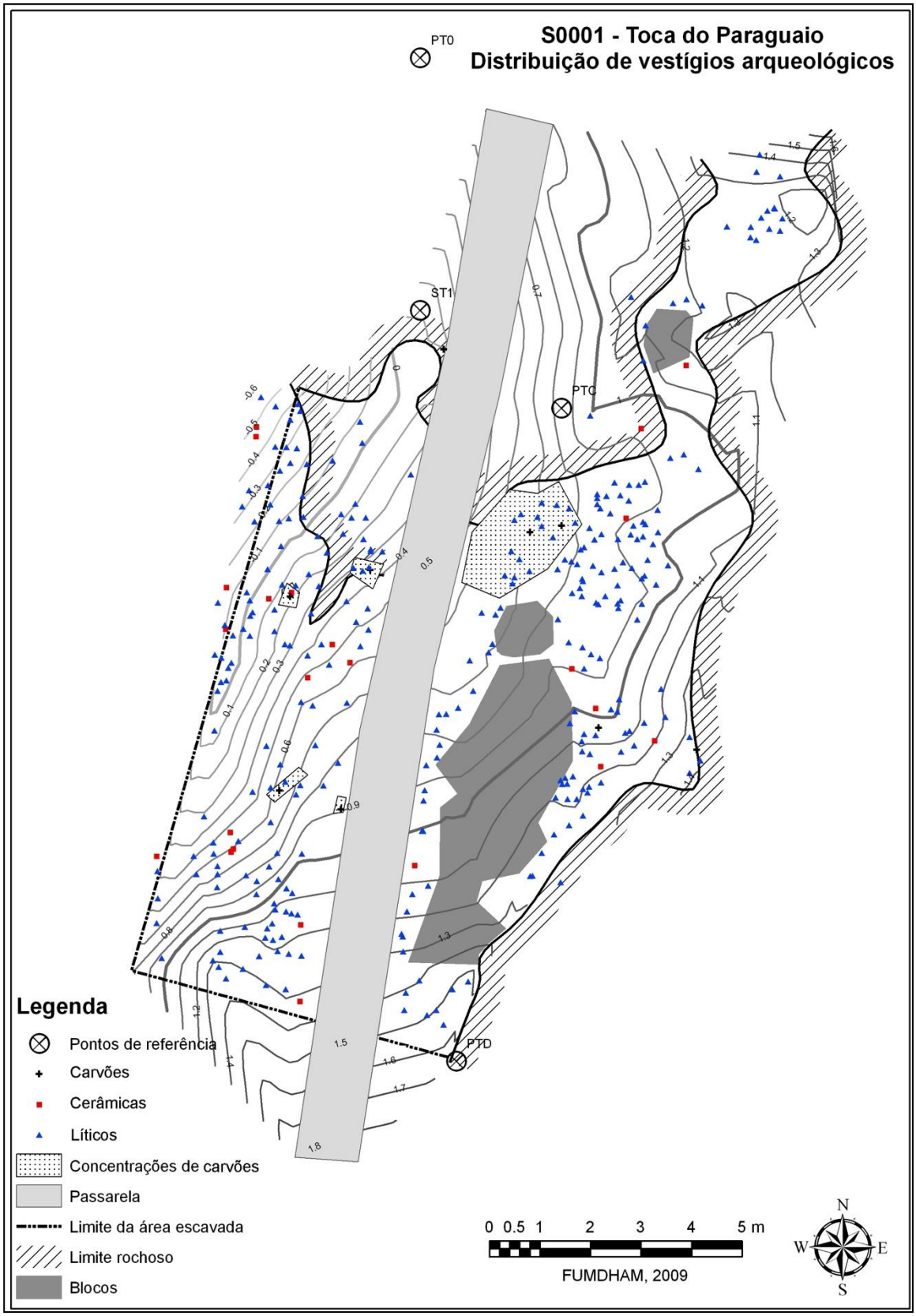


Figure 3 - Plan of the excavation 2 from 2007, presenting the distribution of materials. Source: Archives of FUMDHAM

1.3 STRATIGRAPHY

In this work the stratigraphy is divided in two cultural horizons, P1 and P2 (Fig. 4). The P1 horizon corresponds to the first four layers (layer A, B1, B2 and C) related to the earliest forms of human activity. These layers had been dug up into ten *decapages* or levels of work (*decapage* XVII until VII). These four layers have been considered a cultural horizon, because of the relationships identified between them, attested by its remnants. Sometimes this horizon can reach, around 87 cm of thickness, depending of the place or square. It presented lithic tools, vegetal and animal remains, charcoal, fires, ochers and human burials that seem to have been undisturbed by recent human activity.

The A layer from the P1 Horizon is the first layer upon the conglomerate bedrock. It presents rough yellow sands and pebbles that vary in dimensions. Recent human activity on this layer was not identified.

The layers B1 and B2 have anthropogenic origins, as they correspond to the burials number 1 and number 2 and other associated cavities. These layers correspond to the second and third moment of the stratigraphy, and have interfered on the A layer and the bedrock. The involving material found in B1 layer was composed of; friable grey-brown sandy sediment, vegetal remains (*Manihot* nutshells), charcoal, remains of calcined animals, lithic tools, natural pebbles and a human skeleton (individual 1). The involving material found in B2 layer was composed of; friable grey-brown sandy sediment, lithic tools (anvil), natural pebbles, sandstones, charcoal, ocher and a human skeleton (individual 2). Recent human activity in this layer was not strong, but had been more intense in the B1 layer reaching and displacing the feet of individual number 1.

The C layer corresponds to the fourth moment of the stratigraphic deposits. It is composed by grey-brown sandy clay sediment, very friable, with charcoal from large fires, vegetal remains, lithic tools and natural pebbles. In comparison with layers B1 and B2, recent human activity was more present in this layer.

The P2 horizon can be about 64 cm of thickness, depending on the place or the square. It is comprised by the latest set of levels (from VI to the surface), in which, recent human perturbations have been attested. These human perturbations are mostly due to the practice of sticking stakes in the ground to arrange hammocks. Because of this, charcoal and other recent materials were displaced from their original positions and deposited in the P1 horizon.

The P2 horizon corresponds to the D-surface layer, which is characterized by the presence of very friable dark-grey sediment. In this layer, the presence of lithic tools, ceramics, plastics (food package), animal remains, stakes, remains of fires, wires, glasses etc. was attested. Apparently, it is possible that some lithic tools and ceramics fragments have been displaced to the interface between the surface and the top of the C layer. In any case, this whole area was disturbed by recent human activity, making it impossible to place the remnants in their correct stratigraphic position.

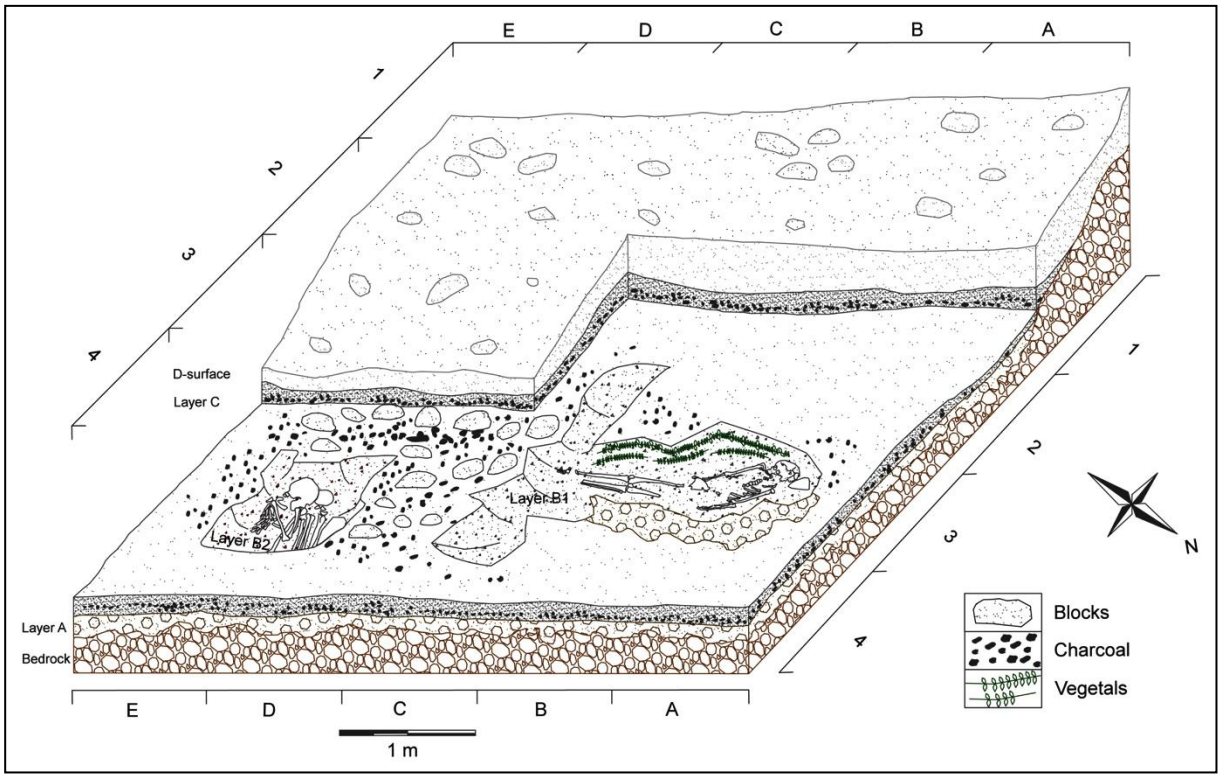


Figure 4 – Stratigraphic diagram of excavation 1 from 1978[7]. Source: Thalison dos Santos

The Excavation 1 from 1978 has five Radiocarbon dates distributed throughout its stratigraphic sequence. Three ages were provided to the B1 and B2 layers, one age has been estimated for the C layer and other one to the D-Surface layer. Excavation 2 from 2007 has only one date for the level 3 (30 cm below the surface).

[7] This stratigraphic block presented in this thesis in a reproduction of the original stratigraphy of Paraguaio based in information written in 1978 the camp diaries. To reconstruct this stratigraphic block, were considered the principles of archaeological stratigraphy proposed by Harris (1991: 51). Therefore, the stratigraphy presented in this work is a reproduction of the original stratigraphy of excavation 1 from Paraguaio. The excavation 1 in Paraguaio, was one of the first excavations in the area of São Raimundo and a lot of information about that time has been lost.

Table 1 - List of radiocarbon ages related to the layers. Source: Database of FUMDHAM.

Area of excavation	Layer	Radiocarbon ages estimates	Laboratory reference	Date
Excavation 1	B1	8600 +/- 100 BP	MC-2510	1978
Excavation 1	B2	8670 +/- 120 BP	MC-2480	1978
Excavation 1	B2	8780 +/- 120 BP	MC-2511	1978
Excavation 1	C	7000 +/- 100 BP	MC-2509	1978
Excavation 1	D-surface	0,123 +/-0.6	BETA-136203	1999
Excavation 2	Level 3	7040 +/- 50BP	BETA-232672	2007

1.4 THE HISTORICAL OCCUPATIONS

When the Toca do Paraguaio was scientifically discovered in 1970, the historical occupation was sharply identified on its surface, but the intensity of this occupation was detailed during the excavations in 1978. During this time, archaeologists found contemporary materials interfering the natural layers disturbing the context and the original position of the remnants inside them.

Most of the interferences were made by wooden stakes stuck into the soil to organize hammocks, but also, by digging holes to make fires and rubbish containers. Remains of food packaging and consumed animal bones were found intensively throughout the surface.

The Archaeologists found that the site was used as a camping area and probably was still being randomly occupied. It was also found that, in front of the site, in the middle of the narrow valley, was a section of the road BR-020 that binds the Federal District (Brasilia), in the center of the country to the city of Fortaleza, to the North East.

The profile of the occupants was established as track divers and hunters that used the site as a camping area during trips and hunting periods (Guidon, 1985: 117). This explained the presence of fires, the stakes stuck in the soil, the small parking area, the food packagings and animal remains upon the surface.

1.5 THE CERAMIC INDUSTRY

The ceramic industry is exclusively from the Excavation 2 (2007). Its remnants are fragmented and distributed between the surface and the levels 1 and 2. Even though these fragments were found in the shallowest levels, the procedures of ceramic production in Paraguaio can be summarized in the following steps: The manufacturing technique is basically cording, the clay treatment is mostly by the insertion of sand, and the finishing technique is essentially smoothed (Table 2).

Table 2 - Relation of ceramic fragments from excavation 2 (2007). Source: Adapted from the preliminary ceramic classification made by Ceramics team from FUMDHAM.

Label	Digit	Sector	Levels	Manufacturing Techniques	Added Materials	Finishing techniques	Thickness (mm)	Observations
138517	0	Excavation 2	3	Cording	Sand+ball clay	Polished	5	Edge
138518	0	Excavation 2	3	Cording	Sand+Mica+ ball clay	Smoothing	7	
138519	0	Excavation 2	3	Cording	Sand	Smoothing	5	Edge
138520	0	Excavation 2	3	Modeled	Sand	Polished	8	
138521	1	Excavation 2	3	Cording	Sand	Smoothing	4	
138521	2	Excavation 2	3	Cording	Sand	Incision	4	
138522	0	Excavation 2	3	Cording	Sand+Mica+ ball clay	Smoothing	6	Apliqué
138563	0	Excavation 2	3	Cording	Sand	Smoothing	7	
138602	1	Excavation 2	Surf.	X	X	X	6	Residual
138602	3	Excavation 2	Surf.	X	X	X	7	Residual
138602	4	Excavation 2	Surf.	X	X	X	7	Residual
138602	5	Excavation 2	Surf.	Cording	Sand	Smoothing	6	Edge
138602	6	Excavation 2	Surf.	Cording	Sand	Smoothing	6	
138602	7	Excavation 2	Surf.	Cording	Sand	Smoothing	7	
138602	8	Excavation 2	Surf.	Cording	Sand	Smoothing	7	Edge
138602	9	Excavation 2	Surf.	Cording	Sand	Smoothing	7	
138602	10	Excavation 2	Surf.	Cording	Sand	Smoothing	8	
138602	11	Excavation 2	Surf.	Cording	Sand	Smoothing	7	It matches with the digit-13.
138602	12	Excavation 2	Surf.	Cording	Sand	Smoothing	6	
138602	13	Excavation 2	Surf.	Cording	Sand	Smoothing	7	

138602	14	Excavation 2	Surf.	Cording	Sand	Smoothing	8	
138671	1	Excavation 2	Surf.	Cording	Sand	Smoothing	8	It matches with the digit-2.
138671	2	Excavation 2	Surf.	Cording	Sand	Smoothing	9	
138673	0	Excavation 2	Surf.	Cording	Sand+ball clay	Polished	7	Edge
138701	0	Excavation 2	1	X	X	X	5	Residual
138702	0	Excavation 2	1	X	X	X	7	Residual
138703	1	Excavation 2	1	X	X	X	6	Residual
138703	2	Excavation 2	1	Cording	Sand	Polished	7	
138704	0	Excavation 2	1	Cording	Sand+ball clay	Polished	7	
138705	0	Excavation 2	1	Cording	Sand+Mica+ ball clay	Smoothing	8	Edge
138706	0	Excavation 2	1	Cording	Sand	Smoothing	6	
138766	1	Excavation 2	1	Cording	Sand	Smoothing	7	It matches with the digits -4 e -5, labels 138602-7 e -8.
138766	2	Excavation 2	1	Cording	Sand	Smoothing	7	
138766	3	Excavation 2	1	Cording	Sand	Smoothing	5	
138766	4	Excavation 2	1	Cording	Sand	Smoothing	7	Edge
138766	5	Excavation 2	1	Cording	Sand	Smoothing	7	
138767	0	Excavation 2	1	Cording	Sand	Polished	7	Edge
138768	1	Excavation 2	1	Cording	Sand	Polished	5	It matches with the digit-2.
138768	2	Excavation 2	1	Cording	Sand	Polished	5	
138769	0	Excavation 2	1	Cording	Sand	Polished	5	Edge
138770	1	Excavation 2	1	Cording	Sand	Smoothing	8	It matches with the digit-2.
138770	2	Excavation 2	1	Cording	Sand	Smoothing	8	
138770	3	Excavation 2	1	X	X	X	5	Residual
138771	1	Excavation 2	1	Cording	Sand	Polished	4	Edge
138771	2	Excavation 2	1	Cording	Sand	Incision	8	
138810	10	Excavation 2	2	X	X	X	7	Residual
138812	1	Excavation 2	2	X	X	X	5	Residual
138812	2	Excavation 2	2	Cording	Sand	Polished	3	Edge

138813	1	Excavation 2	2	X	X	X	10	Residual
138813	2	Excavation 2	2	Modeled	Sand	Smoothing	11	
138853	0	Excavation 2	2	Modeled	Sand	Polished	10	Apliqué

1.6 THE LITHIC INDUSTRY

The lithic industry is essentially made up of pebbles. It seems that the clasts from the wall of the Upper Sector were used for making the tools. It is also interesting to note that miniaturized rock-art is placed on the pebbles of the conglomerate (Fig. 5), along the walls and ceilings from the Upper Sector. This allows to question if was there any relationship between the lithic industries and rock-art.

In September, during the fieldwork the lithic industry has been observed, this raised a suspicion that some cortical flakes (five) presented micro-points of ocher pigment. In any case, this evidence is not consistent enough to establish a relationship between the lithic industry and the paintings. However, the utilization of the same support seems to have been linked with both types of behavior.

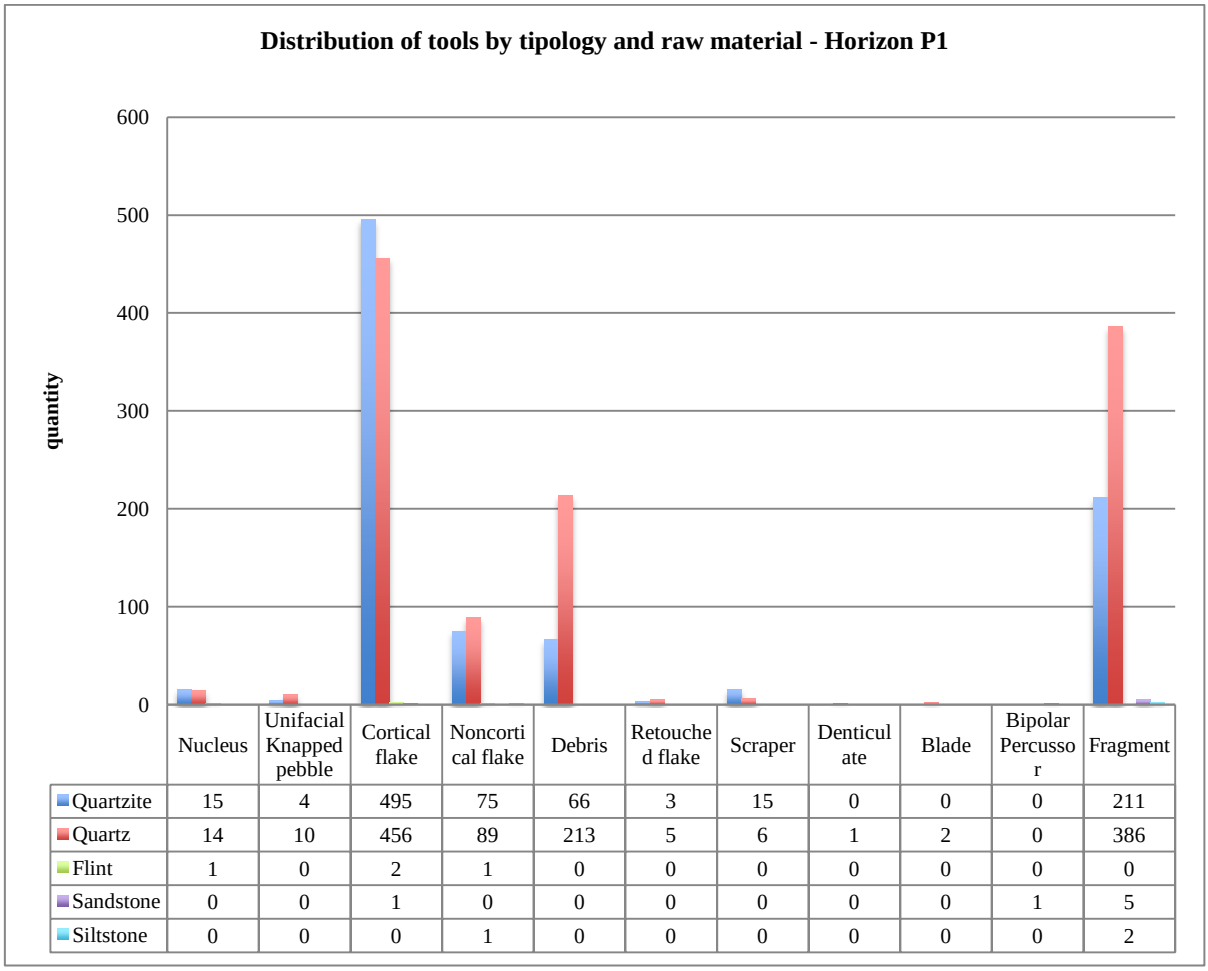
Figure 5 – Rock-art support and probably source of raw material. Photo: Thalison dos Santos

The main characteristics of lithic industry found in the excavations in 1978 were published by Guidon in 1985[8]. On this occasion, she gathered data from the excavations of other sites and tried to organize the occupations into cultural unities of Nordeste tradition. This was a clear attempt to relate the material culture with the rock-art, considering the classification of rock-art along the area of São Raimundo Nonato.

In any case, according to the preliminary analysis it is assumed that the preferential raw material was quartzite and quartz (Fig. 6), a persistent pattern in all the layers and horizons. This type of raw material is abundant in the Upper Sector. Some other types of raw materials, such as flint and siltstones were identified in an inferior amount.

Considering the lithic industry according to the horizons it is possible to identify that in the layers A, B1, B2 and C, most of the tools were made using the methods of *débitage*, *façonnage* and bipolar percussion. The same methods were undertaken to produce the lithic tools from the D-surface layer. A small difference was identified between the raw material from the P1 and P2 horizons. In the P1 horizon the number of flint tools is lower, while in the P2 horizon, where there was an increase of the number of tools made up of this raw material.

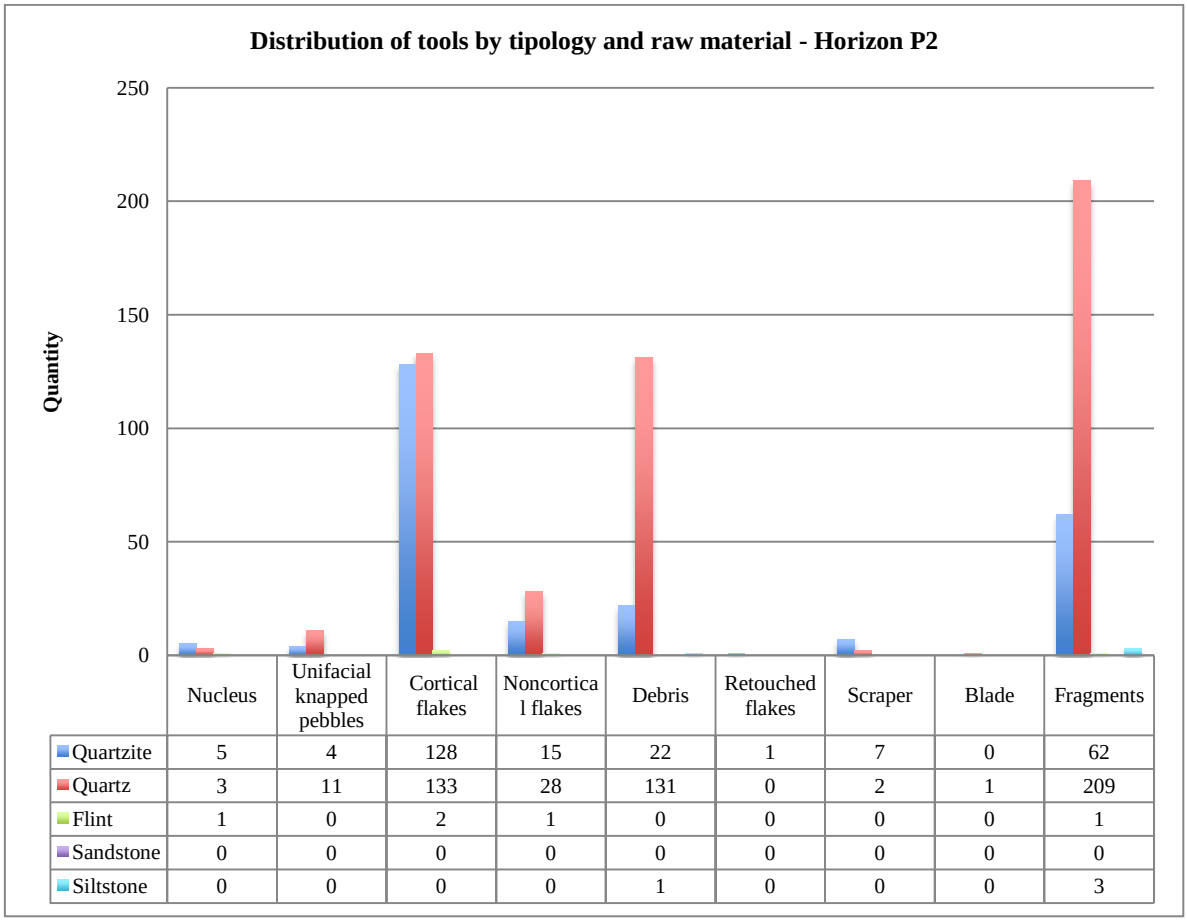
[8] Article named "Unidades culturais da Tradição Nordeste na área arqueológica de São Raimundo Nonato"



	Nucleus	Unifacial Knapped pebble	Cortical flake	Noncortical flake	Debris	Retouched flake	Scraper	Denticulate	Blade	Bipolar Percussor	Fragment
Quartzite	15	4	495	75	66	3	15	0	0	0	211
Quartz	14	10	456	89	213	5	6	1	2	0	386
Flint	1	0	2	1	0	0	0	0	0	0	0
Sandstone	0	0	1	0	0	0	0	0	0	1	5
Siltstone	0	0	0	1	0	0	0	0	0	0	2

Figure 6 - Quantities of raw materials related with lithic tools from Horizon P1. Source: Adapted from the preliminary lithic tools classification made by FUMDHAM's lithic team.

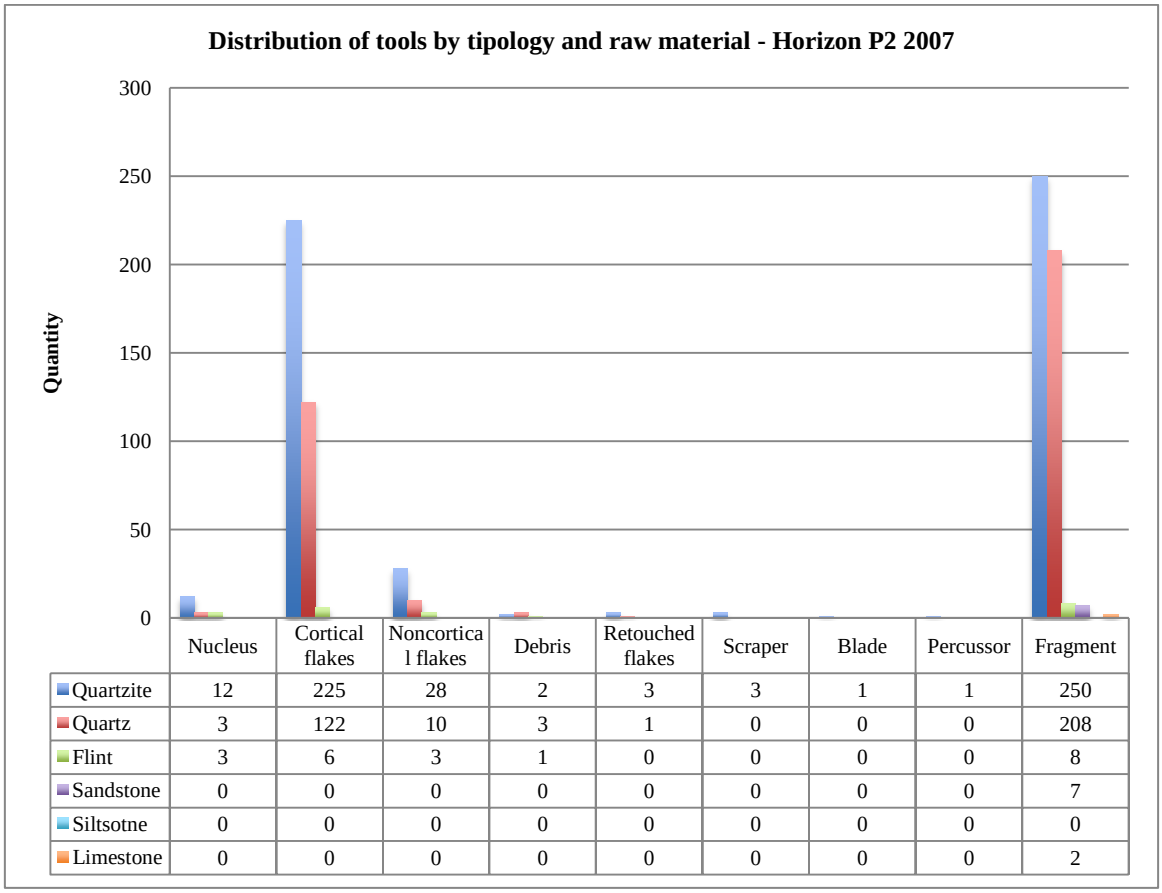
In any case, for the P1 horizon, it is possible to note that the biggest pebbles were knapped with an intention to search a sharp edge. This justifies the quantity of cortical flakes. But, as long as quartz and quartzite are not the best raw material to be knapped, the quantity of fragments is quite high in comparison with the quantity of cores, as well as other and other tools (Fig. 7). In general terms, it seems that they knapped many times in order to achieve a small amount of successful cases. In addition, among the successful cases, it seems that the most sought shape was the side scraper (Fig. 10, drawing C).



	Nucleus	Unifacial knapped pebbles	Cortical flakes	Noncortical flakes	Debris	Retouched flakes	Scraper	Blade	Fragments
Quartzite	5	4	128	15	22	1	7	0	62
Quartz	3	11	133	28	131	0	2	1	209
Flint	1	0	2	1	0	0	0	0	1
Sandstone	0	0	0	0	0	0	0	0	0
Siltstone	0	0	0	0	1	0	0	0	3

Figure 7 – Quantity of raw materials related with lithic tools from Horizon P2. Source: Adapted from the preliminary lithic tools classification made by FUMDHAM's lithic team.

For the P2 horizon, the pattern identified in the horizon P1 continues, with very few differences. For instance, in this horizon, the quantity of successful cases is slightly lower, but without further additions or exceptions, the same kind of behavior was repeated. The preferential raw material continued to be the quartz and the quartzite and the quantity of successful cases was still low (Fig. 8).



	Nucleus	Cortical flakes	Noncortical flakes	Debris	Retouched flakes	Scraper	Blade	Percussor	Fragment
Quartzite	12	225	28	2	3	3	1	1	250
Quartz	3	122	10	3	1	0	0	0	208
Flint	3	6	3	1	0	0	0	0	8
Sandstone	0	0	0	0	0	0	0	0	7
Siltsotne	0	0	0	0	0	0	0	0	0
Limestone	0	0	0	0	0	0	0	0	2

Figure 8 – Quantities of raw materials related with for lithic tools from Horizon P2, excavation 2. Source: Adapted from the preliminary lithic tools classification made by FUMDHAM's lithic team.

Comparing the lithic industry between the excavations from 1978 and 2007, it is possible to see that the same behavior continues. In this case, there was detected the presence of the limestone as a raw material, and flints are used more. These small differences have something to do with the localization (a well preserved part of the upper sector) where the excavation of 2007 was established.

Considering a regional context, the industry from Paraguaio shows similarities with the industry from other sites, like Pedra Furada, Sítio do Meio and Antonião. Among them, Pedra Furada has the oldest industry, dated back to the Pleistocene (Parenti, 1998: 329). This industry is characterized by the presence of knapped pebbles in quartz and quartzite, used fragments, cortical flakes, scrapers, drills, denticulates and natural flakes (Guidon *et al*. 1996, Parenti 1998: 329).

The industry from Sítio do Meio was found in a sandstone context and is characterized by the presence of tools of pebbles (Fig. 9 and 10). The same pattern is present in the industry

from Antonião that was found mixed with faunal remains in a limestone context. In both sites the pebbles are exogenous raw material (Parenti, 1998: 331).

The industry from Sítio do Meio is dated back to the Pleistocene and the industry from Antonião dated back to the early Holocene.

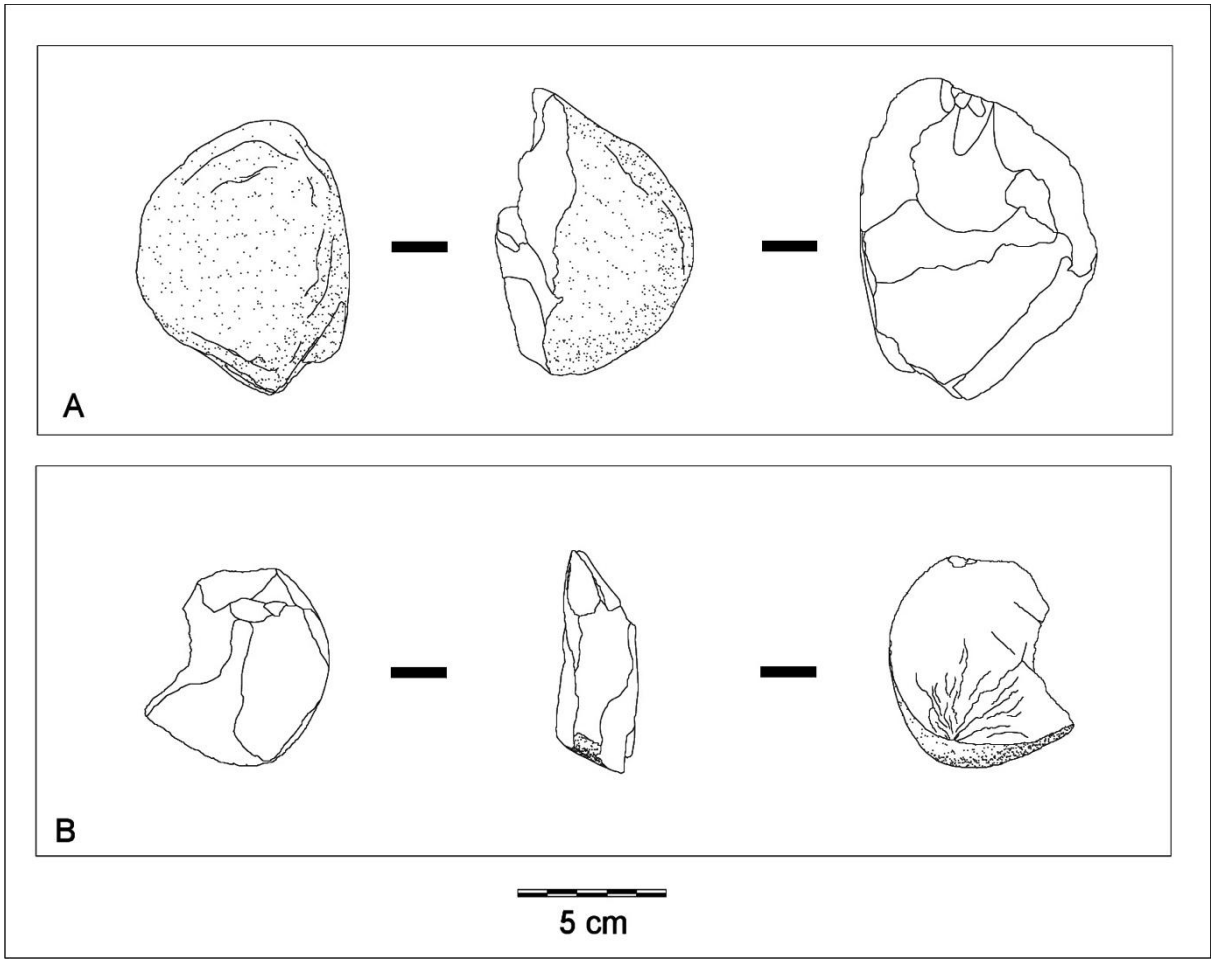


Figure 9 - Illustrations of lithic tools from the excavation 1 in 1978. A=Nucleus from layer B1 (label 2310). B=Cortical flake from layer B2 (label 2323). Design: Thalison dos Santos.

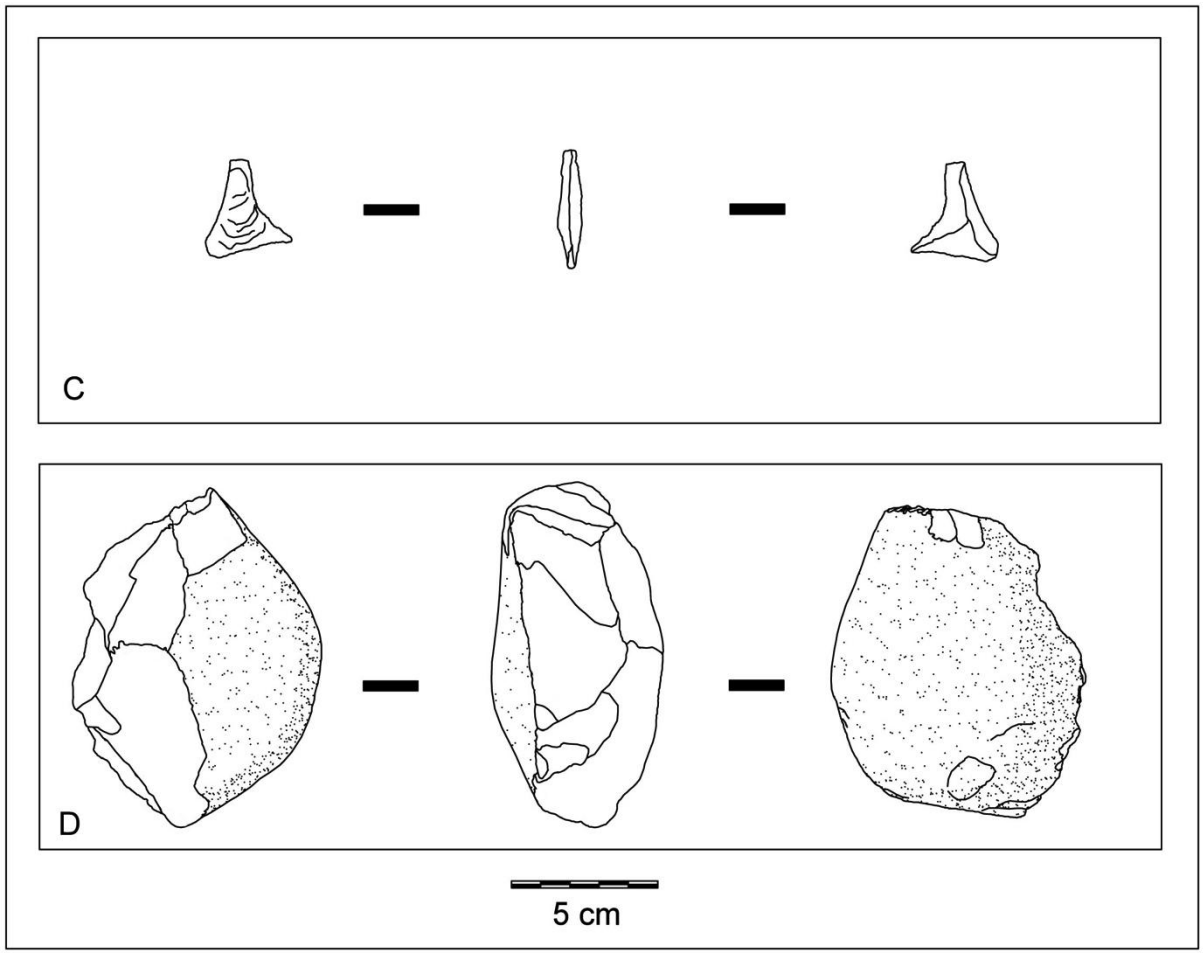


Figure 10 - Illustrations of lithic tools from the excavation 1 in 1978. C=Noncortical flake from layer B2 (label 2368). D= Side scraper from layer B1 (label 2242). Design: Thalison dos Santos.

1.7 THE PALEOANTHROPOLOGICAL REMNANTS

In 1975 when Guidon published the description of the paintings, she gave news of a human skeleton found by hunters in Toca do Paraguaio. This skeleton was well conserved, still having hair. The hunters who discovered the skeleton called the police thinking that it could be a homicide.

In 1978 during the excavations, two other human skeletons were exhumed. A paleoanthropological analysis was carried out by Mello e Alvim & Ferreira (1985). Later Bernardo & Neves (2009) also analyzed the cranial morphology of the specimens.

The skeletons were named as individual number 1 and individual number 2, both were found in two different burials, the burial number 1 (individual number 1) and burial number 2

(individual number 2). The individual number 1 was a male with an average stature[9] about 159 cm, whereas individual number 2 was a female with an average stature about 156 cm (Mello e Alvim & Ferreira, 1985: 246-250).

The metric analysis for individual number 1 revealed that: the cranium was low, the frontal, parietals and occipital were convex, the face was narrow and mesognathous with an angle of profile of 84º, the orbits were high, the nose was broad, the cranial capacity was estimated in 1308 cm3, the jaw was long and fairly robust, as well as the postcranial skeleton (Mello e Alvim & Ferreira, 1985: 250).

The metric analysis for individual number 2 revealed that: the jaw was narrow with an opened angle and fairly robust; the postcranial skeleton was little robust, with bones slightly short and narrow (Mello e Alvim & Ferreira, 1985: 250).

In the analysis of cranial morphology, Bernardo & Neves (2009: 97-98) compared metric data from skulls number 1 and 2 with metric data from 1267 skulls (male and female) from other regions around the world. Other skulls from Capivara were also included in the analysis; such as skulls found in the sites Toca dos Coqueiros (1 individual, 9,9+/-50 kyr BP), Toca do Gongo 1 (1 individual, 2,0 kyr BP), Toca da Baixa dos Caboclos (1 individual, 0,23+/-0,05 (Beta 115612) and 0,45+/-0,04 kyr BP (Beta 113114)) and Toca do Serrote do Tenente (1 individual, 0,92+/-0,04 kyr BP (UA-23386) and 0,94+/-0,04 kyr BP (UA- 22776)).

This study shows the main differences between individuals according to the morphology of their skulls. They divided the six individuals in two groups. One group with specimens gathered in Caboclo, Gongo and Paraguaio 2 showed morpho-cranial affinities with populations from Asia or Paleoamericans. The other group gathered the specimens Paraguaio 1 and Coqueiros that showed morpho-cranial affinities with populations from Australia and Africa (Bernardo & Neves, 2009: 103-104). In addition, they realized that the skulls from the first group were short, broad with high faces, whereas the skulls from the second group were long, narrow with low faces.

Finally, they concluded that the difference found on those individuals from Capivara is favorable to the hypothesis that two populations, morphologically diverse occupied the Americas. One of these two populations had morphological similarities with the populations found in Australia and Africa, whereas the other, had similarities with the Asiatic and Native Americans (Neves *et al.* 2007; Bernardo & Neves, 2009: 104). In addition, according to the model of two migrations, the arrival of the mongoloid morphology might have been between

[9] The average stature of the individuals was identified according to the table of Genovés, 1966 (Mello e Alvim and Ferreira, 1985-250).

8,0 and 9,0 Kyr (Bernardo & Neves, 2009: 104). The authors assume that the case of Toca do Paraguaio seems to confirm this hypothesis, and also raises an important question about the origins of mongoloid morphology.

Bernardo & Neves (2009: 104) assume that, according to the literature, the mongoloid morphology would have emerged in Northeastern Asia between the end of the Pleistocene and the beginning of the Holocene. Therefore, the earliest typical mongoloid morphology was found in Asia with an estimated age of 7,5 Kyr BP (Brown, 1999 *apud* Bernardo & Neves, 2009: 104). On the other hand, mongoloid populations were already present in the Northeast of Brazil around 8,5 Kyr BP (Bernardo & Neves, 2009: 104).

In any case, the fact that in Toca do Paraguaio, individuals 1 and 2 are morphologically diverse is remarkable. These differences upon the individuals become stronger when we analyze the context of their burials.

The burial number 1 corresponds to the B1 layer where the individual number 1 was deposited. This burial presented the following characteristics: the funerary fossa interfered the A layer and parts of the bedrock. The shape of the funerary fossa was oblong and presented vegetal remains (branches and leaves) (Mello e Alvim & Ferreira, 1985: 244) deposited all over the skeleton. Lithic tools, calcined animal remains, heated pebbles and charcoal were found accompanying the individual.

This individual was found almost complete and most of his bones were in anatomical connection. He was oriented in the sense North-South, extended in dorsal decubitus; his skull was slightly curved to the left resting upon a stone; his pelvis was 25 cm lower than his head and feet (Mello e Alvim & Ferreira, 1985: 244). Some of the bones were well conserved but others, like the mandibular body, the left calcaneus, the right ribs, the cervical vertebras, the left side of the pelvis, the coccyx and the hand bones were weathered by the action of termites (Mello e Alvim & Ferreira, 1985: 244). Strands of hair were found upon the skull and next to it, the parietal bone was slightly cracked, the right hand was resting under the pelvis, arms touching the body, the legs were crossed, and the feet bones were unconnected because a wooden stake displaced them (Mello e Alvim & Ferreira, 1985: 244).

The burial number 2 corresponds to the B2 layer, where individual number 2 was found. This burial presented the following characteristics: the fossa deeply interfered the A layer and the Bedrock. Its diameter was around 50 cm wide and 55 cm deep. This burial presented remnants of fires that were observed at the top of the funerary fossa, as well as three rocks, two pebbles with 35 cm and 20 cm and a sandstone with 40 cm. Upon these rocks,

were also found two pebbles with 10 cm of length (Mello & Alvim & Ferreira, 1985: 245). Remains of fires were also identified under the skeleton, indicating that fires were held before and after the skeleton's accommodation.

The involving sediment of the fossa was mixed with coal ashes and contained natural pebbles, other pebbles with marks of use, possibly a grinder or a polisher, quartz flakes, charcoal, a few vegetal remains and pieces of armadillo shells (Mello e Alvim & Ferreira, 1985: 245).

Individual number 2 was found in anatomical connection in a flexed position. The right hand was closed against the left humerus, the kneecaps were found at the level of the orbits, the feet were purposely inclined upwards against a sandstone piece with red burn marks. The phalanges were resting upon a sandstone block and the calcaneus was underneath this stone (Mello e Alvim & Ferreira, 1985: 245).

In a general way, the skeleton was well conserved, although there was a termite's mound inside the fossa that probably weathered a part of the sacrum. Scalp remains were found on the left parietal (Mello e Alvim & Ferreira, 1985: 245).

1.8 THE VEGETAL REMAINS

The vegetal remains were not studied yet, but they have potential to yield important information about the paleo-environment. These vegetal remains were found along the recent layers, as well as inside the burial fossa and in the layers that buried them. They are part of the funerary assemblages that joined the dead individuals and their burial ritual. The layer B1 (burial number 1) has an estimated age of 8,6 Kyr BP, while the B2 layer (burial number 2) has an estimated age of 8,780 Kyr BP and the C layer has an estimated age of 7,0 Kyr BP. This allows to assume that the vegetal remnants found inside these layers have an age between 8,7 and 7,0 Kyr BP.

The vegetal remains can be summarized in to branches, leaves, charcoal and nutshells. Throughout the digging, Guidon wrote in her diary that the B1 layer presented Maniçoba nutshells. However, as the layers were anthropogenic and recent human activity had disturbed them, it was difficult to identify from which layer they came from. In any case, the term Maniçoba is locally used to refer to specific type of plants from the gender *Manihot.*

The gender *Manihot* comes from the family *Euphorbiaceae*, which the most known specie is *M. Esculenta Crants*, which produces cassava flour, very consumed in the Northern

and Northeastern Brazil (Wisniewski, 1983: 7). Cassava flour is also consumed by remaining indigenous groups.

The gender *Manihot* is very rich and can be divided in two groups of species; one represented by the tuberous plants (*M. Esculenta Crants*) and other represented by laticifer plants or rubber plants, with poorly developed roots (Wisniewski, 1983: 7). The laticifer species are natural from the Northeastern Brazil and can be found between the Southern latitude parallels 5º and 15º (Labroy, 1913 *apud* Wisniewski, 1983: 7). Outside the Northeastern regions they can be found rarely in the North of Goiás and sometimes in the Northeastern area of Mato Grosso (Wisniewski, 1983: 8).

The gender *Manihot* has 21 species in which 5 of them can produce rubber (Correa 1974 *apud* Wisniewski, 1983: 8); only the species that can provide rubber are named as maniçobas or maniçobeiras. Between these species, the most typical in the state of Piauí is the *Manihot Piauiensis Ule* (Wisniewski, 1983: 8). Generally, those trees are midsize and sometimes can be shrubby. Naturally, they are found on the slopes of plateaus reaching around one thousand meters above sea level. They are part of a downsized and dense floristic composition with trees that rarely exceed ten meters in height (Labroy, 1913, Zehntner, 1914 *apud* Wisniewski, 1983: 8).

The Maniçobas are trees adapted to semi-arid climate with very drought seasons followed by other season characterized by ephemeral pluvial regime (Wisniewski, 1983: 8).

The presence of these types of trees allows concluding that between 8,7 and 7,0 Kyr BP, *Manihot* trees were already established on the landscape. Most probably, the climate might have been hot, favoring their development. Another important point is, the exploitation of *Manihot* by prehistoric groups for funerary practices. This raises an important question; would the presence of *Manihot* nuts be the result of an incipient agricultural practice? Or would they be the result of a hunting-gathering behavior of a group?[10] In any case, it is known that people have exploited these trees to compose funerary assemblages with their nutshells.

The *Manihot* nutshells or coquinhos de maniçoba, as they are commonly referred, are very small measuring 1 or 2 cm of dimension. They have a woody shell, that when opened reveals a nutritious mass that can be eaten. This kind of nut is still consumed in Southeastern Piauí, normally mixed with sugar.

For now, apart from the *Manihot* nut shells, it is only possible to assume other information about the paleo-environment will be achieved through the analysis of these

[10] This is an important theme to be studied in Capivara. Very few information is known about the sedentarization and the establishment of agriculture in this region.

vegetal remains. Many studies can be undertaken with those materials, such as the analysis of charcoal, the wood, the identification of the trees according to their leaves and also the flotation of pollen that could exist inside the collected sediments from the burials.

1.9 THE ZOOLOGICAL REMAINS

There is nothing published about the faunal remains from Toca do Paraguaio. Actually, a detailed paper conducted by Fátima Barbosa (*in press*) is taking place for Phd research in Archeozoology in the area of Capivara. In any case, it is just possible to assume that most of the faunal remains were found in the recent layers, as seen in excavated area from 2007 (Table 3).

Table 3 - List of animal remains from the excavation 2. Adapted from the preliminary classification made by the team of organic vestiges from FUMDHAM.

Label	Sector	Level	Vestige
138775	Excavation 2	1	Bone
138513	Excavation 2	3	Bone
138851	Excavation 2	2	Bone
138765	Excavation 2	1	Bone
138809	Excavation 2	2	Bone
138514	Excavation 2	3	Bone
138550	Excavation 2	3	Bone
138716	Excavation 2	1	Bone
138615	Excavation 2	surface	Bone
138774	Excavation 2	1	Carapace
138524	Excavation 2	3	Carapace

2 – BRIEF HISTORY OF RESEARCH IN SOUTHEASTERN PIAUÍ

This chapter is dedicated to the presentation of a brief history of rock-art research in the archaeological area of São Raimundo Nonato.

2.1 THE CLASSIFICATION[11]

André Prous (1991: 14) considers the period from 1965 until today, as the recent period of archaeological researches in Brazil. He highlights the establishment of specialized radiocarbon dating labs, as well as the National Program of Archaeological Researches (the Portuguese acronym is PRONAPA). The PRONAPA was associated with institutions from North America, such as the Smithsonian Institution and its main objectives were the formation of researchers in Brazil, as well as the study of human occupations through the analysis of ceramic materials.

On the other hand, in 1970 the famous Archaeological Franco-Brazilian Mission took place in the states of Minas Gerais and Piauí (Prous, 1991: 17). These Missions were sponsored by the Centre National de la Recherche Scientifique (CNRS) from France, the Ministère des Affaires Étrangères and institutions from Brazil, such as the National Museum, Ipiranga Museum from São Paulo University, the Federal University of Piauí (Guidon, 1978: 114), as well as Federal University of Minas Gerais (Prous, 1991: 17).

These Franco-Brazilian Missions were interested on the study of rock-art, aiming specifically to discover the ages of the parietal art and their cultural contexts (Prous, 1991: 17). With these orientations Niéde Guidon started the archaeological Mission in Southeastern Piauí, visiting the place for the first time in 1970 (Guidon, 1978: 13). The first work started in the Várzea Grande region, with registration and documentation of the first sites (in which Toca do Paraguaio has the code number 1). After that, other work took place, such as the first direct tracings of rock-art and primary excavations.

The work of Guidon in the Várzea Grande region, were widely published between the decades of 1970 until 1980. Her Phd thesis that is dedicated to a morphological analysis of rock-art in the area of Várzea Grande (Guidon, 1975: 39) was published by École des Hautes Études en Sciences Sociales, in a review named Cahiers d'Archéologie d'Amérique du Sud.

[11] This subsection describes the classification as an interpretation made by the author considering the main publications about rock-art from Capivara published by Niéde Guidon, Anne-Marie Pessis, Gabriela Martín, Laurence Ogel-ros, Susana Monzón and others.

This work was one of the first dedicated to the study of rock-art in Brazil covering an entire zone with many sites. As every first work, it established the bases for further researches in this region. Guidon divided the area of study in to zones, keeping the local names, they are: Serra da Capivara, Serra Branca, Gongo, Serra Nova, Pitombeira, Serra do Bojo, Serrote da Casa Nova and Caracol.

The analysis of the *corpus* was based on the direct tracings of 50 sites identified in the epoch, in which the methodology of tracing was suggested by Lorblanchet himself (Guidon, 1975: 5). Six sites were considered as an eponym for the proposed definitions. They were: Toca do Paraguaio, Toca da Entrada do Pajaú, Toca da Entrada do Baixão da Vaca, Toca do Pajaú, Toca Grande da Areia and Toca Pequena da Areia.

Guidon (1975) has contributed to the study of rock-art through the description of shapes of the figures. With these descriptions, she organized morphological groups in which their criteria of division were presented in detail. For the zoomorphic figures, these criteria were part of an interpretation, through comparisons between the morphology of paintings and the morphology of living animals.

Guidon (1975) also compared the rock-art *corpus* according to the geographic position of the sites (their zones), which made her to discover morphological differences between three principal zones. Until that moment, she referred to these differences, as Local Traditions. These local traditions were defined according to morphological elements that were considered as typical. These elements were related to specific zones where they occurred most, being these zones considered as their local of origins.

As long as typical elements from one zone were found in another zone, Guidon (1975) assumed that, the occurrence of typical elements far from their zone of origins could be the result of mobility or a migratory movement. Consequently, with this idea of mobility, came the notion that the morphology of rock-art from Várzea Grande was constantly changed as different groups crossed the territory. Thus, this could be interpreted as cultural differences within the rock-art.

With the advance of the researches and the discovery of new sites with rock-art, during the decade of 1980, raised the necessity to divide systematically the rock-art *corpus*, relating it to the intensity of occupation throughout the area, as well as the contexts. In this decade the amount of sites were already around 200, presenting 139 with rock-art.

With the contributions of Niéde Guidon, Ogel-Ross, Susana Monzon, and later Gabriela Martín and Anne-Marie Pessis, a system of analysis was developed resulting in a

preliminary classification of rock-art. This preliminary division encompassed the possibility of several cultural identities (groups), chronologies and migration. All hypotheses proposed by these authors between 1980 and part of 1990 emerged according to these three main axes.

Between 1980 and 1990, the research developed a really dense theoretic-methodological background, in which Pessis (1983; 1987; 1989; 1991; 1992) gave principal contributions, taking influences from the Visual Anthropology. At this point, other variables of analysis were incorporated to the approach, in addition to the morphology, chronology and geography. During this period, concepts coming from the theory of systems are reflected in the publications (see Pessis, 1992).

There was a tendency to consider the rock-art from Southeastern Piauí, as result of an interaction of different variables, including the different identities that could have penetrated the territory, introducing their own pictorial systems or set of rules. Thus, the rock-art of the region would be result of interactions between these variables. The ways, in which these interactions would be shown in the rock-art, would be reflected in the preliminary classification. Variables in micro levels were also considered, like the way the paintings showed themselves on the panels, the paintings composing scenes and the activities they depicted.

With these assumptions, emerged also the refinement of conceptual and methodological language. This was reflected in general researches, and a development of a common terminology was established for the whole territory. The development of this terminology was not a part of single researches conducted randomly, but was the result of general effort to understand the rock-art on the territory. Actually, because of this preliminary classification, rock-art investigation in Brazil has greatly developed. Not because the classification was absolutely correct, but because it unveiled an entire theoretical and methodological background (as the development of a conceptual terminology).

These ideas resulted in the systematization of rock-art investigation, as methodological protocol. This model considered that, as a whole rock-art was a depiction of the sensitive world, of prehistoric groups. It demonstrated that investigators should not look at rock-art, as a phenomenon coming apart from the human nature. Thus, as long as rock-art was considered a human phenomenon, the investigator could access the sensitive world identifying the recognizable figures using the correct methods (Pessis, 1987: 133).

These ideas were justified by the fact that, all rock-art ever produced in the world was made by the same Homo sapiens species. According to these assumptions, looking at rock-art,

one would be able to find points of relationships between the pictures that endured until today (being part of the present sensitive world), and those from the sensitive world of prehistoric groups. This part of analysis resulted in the first division of rock-art in *grafismos*[12] *reconhecíveis*, meaning recognizable and *grafismos não reconhecíveis*, meaning unrecognizable figures (Pessis, 1983: 19-20).

Another point that this analysis has considered, was measuring the degree of recognition a figure could have. This mensuration would be possible because of the *traços de identificação* (traits of recognition), meaning the traits that conduct the investigators toward an interpretation that is limited by the nature of what is shown by the figures (Pessis, 1983: 16).

In practice, as more traits of recognition were shown by the figures, more recognizable they would be, and vice-versa. It was interpreted that this variable could be the result of using different cultural rules, a pattern related to the identity of groups. Other assumption consisted on the reliability of identifiable paintings, considering that the more recognizable the figures were, farther from the conjectural plan, the interpretations would be. This should make the classification more objective.

The pictures that had higher amounts of traits of recognition were known as, "*figuras de reconhecimento imediato*" (Pessis, 1983: 16), and meaning figures of immediate recognition. These kinds of pictures could have their messages (but not the signification) accessed instantaneously. On contrary, the figures carrying less traits of identification were called as *grafismos puros* (Pessis, 1983: 16), which literally translating in English would be pure graphics. At this point the *corpus* was divided in to figures of immediate recognition, anthropomorphic and zoomorphic figures, and figures without immediate recognition, like pigment spots and other random forms called as *grafismos puros*.

Another part of the analysis considered the levels of interpretation, specifically, it looked at the figures composing scenes and interpreted their depicted actions. In other words, it interpreted the theme of the scenes. Thus, the term *grafismos de ação* (graphics in action) was introduced, referring to the figures depicting actions (Pessis, 1983: 19), like the ones found in the scenes of sexual nature, hunting, dancing scenes etc. However, sometimes the scenes showed *grafismos puros* related with the recognizable figures, thus, it was considered that their messages could be, as well accessed.

[12] The term Grafismo was used because the authors considered rock-art from Southeastern Piauí as a graphic art. Being very narrative, playful, detailed pictured etc. (this term can be translated in English as Graphic). Hence the figures, which these characteristics were not perceptible in the first moment, they were called as Grafismos puros (literally translating this term would be Pure Graphic).

The term "*Grafismo de composição*" (graphic of composition) was used to refer to the paintings that showed enough traits of identification to allow recognition (Pessis, 1983: 19). Other variables, like the themes and the techniques, were also very important to provide parameters for the classification. From these variables, came the divisions like sub-tradition and styles.

At the end of the analysis, two groups of paintings were identified. The first group corresponded to a set of figurative and unnaturalistic paintings, in which characteristics like scenes compositions, dynamism and narrative were frequent. The second group, reunited the set of paintings, in which, characteristics like the absence of dynamism and narrative were frequent. The first group was interpreted as depictions of everyday life; the second group was not studied as much.

Another important aspect of this analysis consisted, in the consideration of rock-art as a communication system composed by specific codes of the prehistoric groups. Therefore, the paintings would have meanings that could not be understood, on the other hand; the messages they transmitted could be identified.

One of the problems of classification consisted of the occurrence of compositions reuniting recognizable figures associated with unrecognizable figures. For example, compositions in which anthropomorphic figures and *grafismos puros* appeared together. The assumption that, both figures were made at the same time presented a problem for the classification, that had to include the presence of two types of images inside the same class.

The identification of morphological particularities was also considered as parameters of division, according to the zones where the paintings were found. It was assumed that the differences identified in the themes, scenery and techniques could be used through a hierarchy of data to divide the rock-art following a territorial logic.

In methodological terms, the tradition means the presence of types of paintings, the relative proportions found between the different types, and, the relations that are established between figures composing a panel (Pessis & Guidon, 1992: 21). These types of paintings are figurative but not very naturalistic, they tend to compose scenes, in which figures performing actions are frequently depicted. In these scenes, sometimes, unrecognizable figures could appear. Subdivisions, like sub-tradition and style have been proposed inside a tradition.

The term sub-tradition is used to refer to paintings of a given tradition, that show vartiations according to the geographical and ecological environment (Martín, 2008: 235). In this case, the sub-tradition is more contextual, because it changes more on the level of

thematic and techniques. For instance, there are changes between the themes depicted in the region of Várzea Grande in Piauí and the ones from Seridó in the state of Rio Grande do Norte.

The styles[13] were considered as an evolution inside the sub-tradition, the result of micro variations of technique, morphology and thematic. These innovations reflected the creative manifestations of each community (Martín, 2008: 235).

In 2010 Gabriela Martín and Niéde Guidon published an article where they discuss the necessity of an actualization of the present classification of rock-art in Brazil (2010: 11). They proved the main theoretical and practical problems that justified a refusal of this classification. It was also shown that this classification has always been a preliminary proposal, and, its acceptance and reproduction had been widespread as a paradigm. In any case, they highlighted the quantity of data produced throughout the years of research that can be profited for further definitions.

2.1.1 Nordeste Tradition

The concept of Nordeste Tradition found in the literature of rock-art from Brazil, is widely discussed and used to refer to visual depictions or pictures distributed throughout the Northeastern of Brazil, as well as other areas of the country. Essentially, these pictures are figurative and little naturalistic. They can compose scenes depicting actions that could be associated to unrecognizable figures. These types of depictions are commonly interpreted as scenes from everyday life.

This tradition encompasses large periods of time and space (Martín & Asón, 2000: 67). They are not direct estimated ages, nor even a coherent evolution throughout the time. It seems that, images from this tradition vary morphologically, technically and iconographically, according to the geography, and most likely to the author's cultures.

There is no consistent information about the emergence of rock-art in the area of São Raimundo. It is only known that, around 12,0 Kyr BP rock-art was already present in the region (Guidon, 1989: 8), and around 9,0 Kyr BP it was already widespread in other parts of the country, like the state of Rio Grande do Norte (Martín, 1988). This information is supported by findings of pieces of ochers, plaquettes and buried panels that have been dated (Guidon, 1989: 8). In any case, it is noteworthy that there are other evidences that deserve

[13] Martín (2008:235) considers this term as very problematic.

special attention. For example, the existence of rocky pieces, on which ocher lines was identified. These plaquettes have been found during the excavations of Pedra Furada inside layers that provided an estimated age of 32,0 Kyr BP and 17,0 Kyr BP (Guidon, 1989: 8). Guidon (1989) points out, that these plaquettes are not consistent evidence to affirm that rock-art already existed in the region around these periods.

2.1.1.1 Várzea Grande Sub-tradition

The concept of Várzea Grande[14] sub-tradition has evolved from the concept of style. It was born from Guidon's first publications that described the rock-art of Várzea Grande in 1975. On this occasion, she considered the sets of characteristics identified on the rock-art of Várzea Grande, as a style naming it after this region where the sites were found.

With the development of the research, the concept of sub-tradition was introduced to justify the presence of thematic compositions that appeared recurrently inside a region. These thematic compositions showed little differences in terms of technique. With the discovery of Nordeste paintings in other states of Brazil (like in Seridó, Rio Grande do Norte), it became clear that the thematics were strictly linked to the geographical particularities, and perhaps chronological (Guidon, 1985: 16).

2.1.1.1.1 The Serra da Capivara Style

The Serra da Capivara style is named after the mountain where the main sites of this style are located (Guidon, 1985: 18). The paintings of this style are basically made by the use of lines of contour more or less thick, varying according to the figure's size (Fig. 11). Sometimes, these lines are not continuous; in this case they are known as *Contorno aberto* (Guidon, 1985: 19), meaning broken line in English.

In most cases, the filling pigment overlaps the lines of contour, rendering impossible to identify if the paintings were first made by lines of contour or not. However, considering observations coming from other types of figures, it is possible to affirm that the paintings from the sub-tradition Várzea Grande were made by the use of outlines to design shapes that after were filled up with inks (Guidon, 1985: 19).

The most common treatment of the figures was made up of smooth paint, and more rarely, figures filled up with traits or other geometric shapes that could appear (Guidon, 1985:

[14] Várzea Grande was the name used to refer to the actual municipality of Coronel José Dias.

19).

The red color is strongly dominant, however some figures could be yellow, black or brown. The last two appeared only in two cases. Bi-chromatic figures are rare, and when appear they are yellow and red (Guidon, 1985: 19).

It was verified that, some figures, have been made by using the finger as tools, while paint brushes were used to produce the finest figures. The biggest figures filled by smooth paint were made with the hands or using large brushes to apply the pigment (Guidon, 1985: 19).

In terms of composition, it is thought that the human figures are mostly smaller than the animals. The panels seem not to be organized in a standardized fashion (Guidon, 1985: 20).

Thoughout the Serra da Capivara style, the dominant figures are the animals, especially due to their large size and their position on the panels. For some rock-shelters, only deer figures are dominant, in other cases the rheas and armadillos can be dominant (Guidon, 1985: 21).

The human figures are always smaller than the animal figures. This pattern occurs in other styles, except in some cases of Serra Branca style. Large panels are also one of the characteristics of Serra da Capivara style. The smallest panels are constituted by the paintings upon pebbles (Guidon, 1985: 21).

Figure 11 - Example of paintings of Nordeste Tradition and Serra da Capivara Style. A, Toca da Entrada do Pajaú; B and C, Toca da Entrada do Baixão da Vaca. Source: Pessis & Guidon (1992: 25-26-28).

2.1.1.1.2 The Serra Talhada Stylistic Complex

According to Guidon (1985: 24) the use of the Complex concept is due to the plurality of styles that appeared sometimes mixed inside the same site. This can be seen on the panels from some sites in Serra Talhada belonging to other styles, like Serra Branca and Serra da Capivara (Fig. 12) (Guidon, 1985: 25).

The division of this complex can be justified by the following characteristics: 1) the figures depicting actions are miniaturized; 2) the technique of coloring in the shapes is characterized by smooth paint, as well as by geometric traits; 3) many figures are filled with both techniques. Sometimes, a single figure can be half filled by smooth paint and the other half leaked. In other cases, some sites display figures entirely filled with smooth paint (Guidon, 1985: 25).

Other characteristics of separation are the color and shape, as well as miniaturization. Other colors like grey, white, yellow, brown and beige were introduced in the complex. In any case, the red paintings are majority. Bi-chromate figures are common and very rarely polychrome (Guidon, 1985: 26).

The zoomorphic figures are fewer in comparison to the anthropomorphic ones, but they dominate the panels because of their size and treatment. The pure graphics are minimum, and the frequency of superposition between figures of the same style is more common in this Complex. In addiction, there is a systematic of selection of natural niches using them as small size panels (Guidon, 1985: 26).

These sets of information give the main characteristics of the Serra Talhada Complex. These features are common for the sites found in the area of Serra Talhada, a part of mountain which rock-shelters are placed on the foot of the *falaises* or in the front of cuesta.

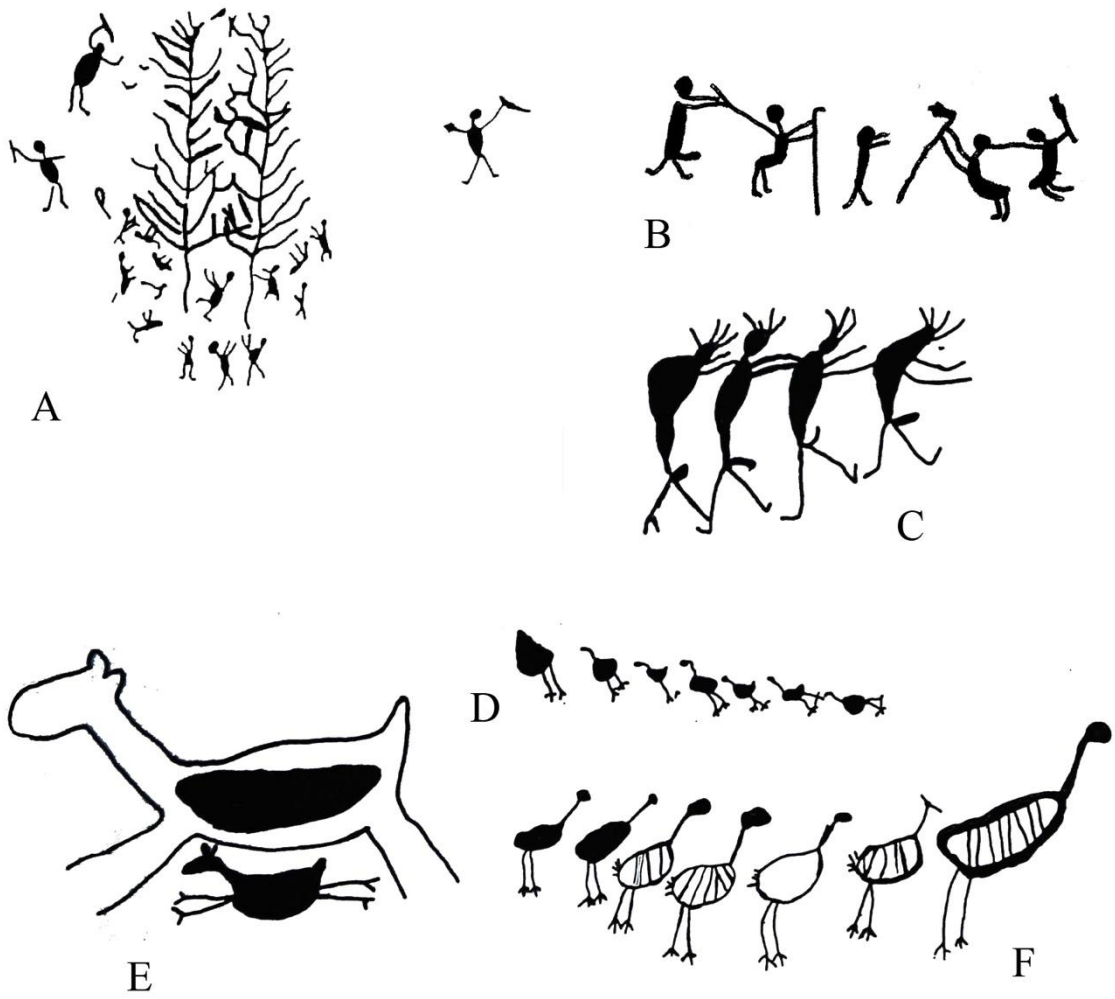


Figure 12 – Examples of figures of Nordeste Tradition that belong to the Complex Stylistic Serra Talhada. A, Toca da Baixa Verde; B, Toca do Caldeirão dos Rodrigues; C and E, Toca do Boqueirão da Pedra Furada; D, Toca do Baisão Depois da Subida da Serrinha I; F, Toca do Baixão das Mulheres. Source: Pessis & Guidon (1992: 25-26-27).

2.1.1.1.3 The Serra Branca Style

The paintings from the Serra Branca style depict the same thematics found in the sub-tradition Várzea Grande, and their technical characteristics are diverse from those found in Serra da Capivara style (Fig. 13) (Guidon, 1985: 21).

The body shapes of anthropomorphic figures are very typical, but human figures similar to those ones depicted in the Serra da Capivara style also occur, as well as other styles. Actually there are common shapes to all the styles from the same sub-tradition, but the

proportions vary according to their styles, and sometimes, can be a typical characteristic of a single style (Guidon, 1985: 22).

Beyond the body shapes, the technical characteristics of Serra Branca style can be summarized as: a) body filled by smooth paint and geometrical traits, in whichthe geometric traits prevail; b) utilization of other colors, suck as yellow, white and brown; red is common, as well as polychrome figures (Guidon, 1985: 22).

The sequences of execution seem to have been done by the use of lines of contour, varying in thickness, according to the size of the figures. For the cases in which the figures have been filled up with smooth paint, it was very difficult to assume if lines of contour were used. This happens mostly in figures from Serra da Capivara style (Guidon, 1985: 23).

The number of paintings made by broken lines is predominant in the Serra Branca style than the Serra da Capivara, as well as the use of fine brushes, fingers and hands to apply the paint (Guidon, 1985: 23).

In the sites of Serra Branca style it is common to find engravings depicting typical motifs from sub-tradition Várzea Grande, on the caved blocks found in front of the panels (Guidon, 1985: 23).

In composition, the Serra Branca style is characterized by the presence of large panels covering the ceilings and walls of rock-shelters. The superimpositions are very marked, but generally the overlapped figures are not from the same style. In sites where superimpositions happen most, normally the overlapped figures are from different traditions (Guidon, 1985: 23).

Between the objects, the most depicted is the propellant and the javelin (spear). The dominant paintings are commonly animals, such as jaguars and deers. Other characteristics are found on the human figures, specifically the ones represented by the compositions of anthropomorphs placed side-by-side with the arms raised and opened, in a hierarchical and solemn attitude. This can be called as *Orantes* (prayerful figures) (Guidon, 1985: 24), though it does not mean that the artist had the intent to depict people in a prayerful attitude.

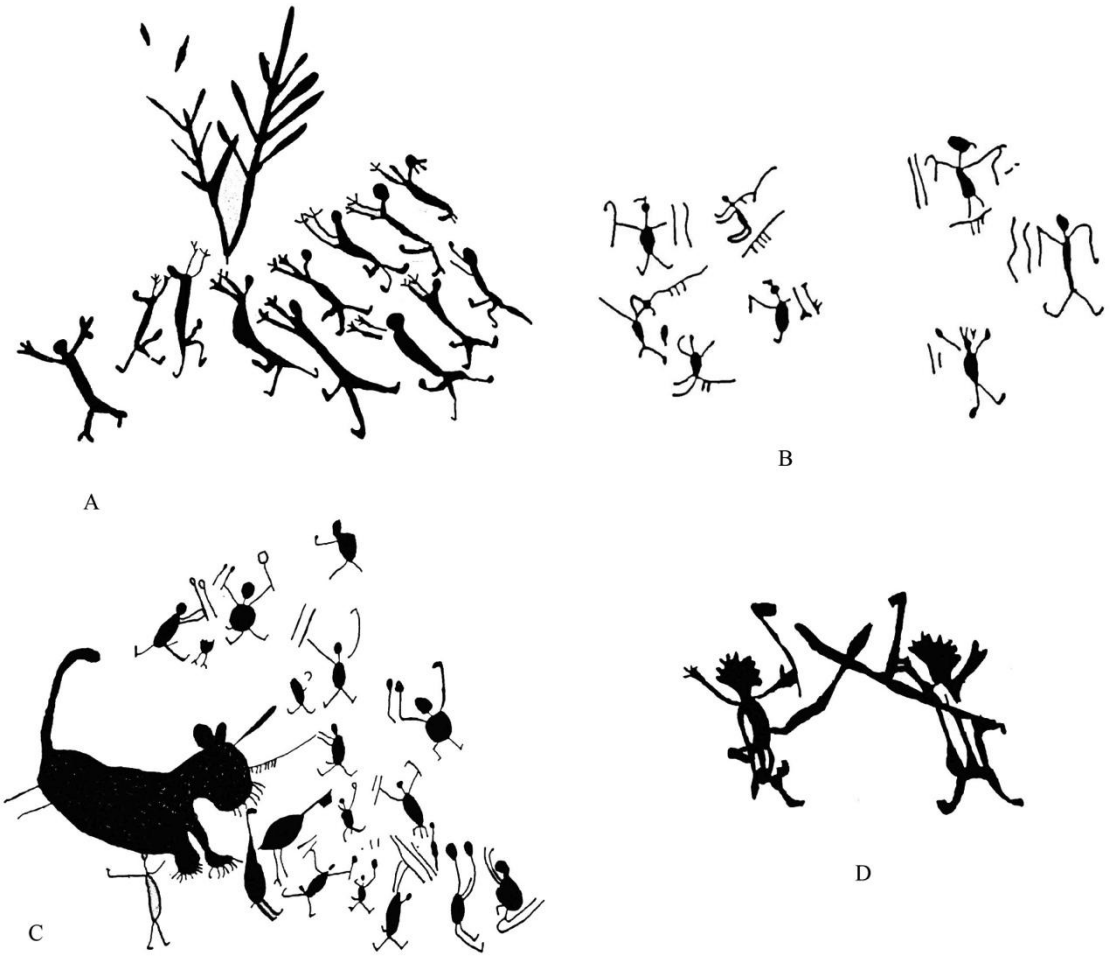


Figure 13 – Examples of figures of Nordeste Tradition and Serra Branca Style. A, Toca da Extrema II; B, Toca do Arapoá do Gongo; C, Toca do Baixão Depois da Subida da Serrinha I; D, Toca do Vento. Source: Pessis & Guidon (1992: 26).

2.1.1.1.4 The Angelim Style

In 2002, Reinaldo Morales Jr. proposes the creation of Angelim style, named after its eponym site the Toca do Angelim. The Angelim style is defined as the meaning of all those expressions that characterize this unique conception and representation of form (Morales, 2002, 111).

According to Morales (2002), the following characteristics define the Angelim style. A) The presence of paintings frequently polychrome, where sometimes interior filling of the figures are executed in yellow or white with finger-width lines. B) Most of the times, the figures are outlined in red or orange, with the colored material having been painted with brush strokes about 3-4 mm wide. C) Outlines conforming to the interior shapes, indicating that they

were painted after the interiors. D) The unique feature of this style is the presence of broken outlined figures. E) The cervid is the most depicted figure, with legs suggested by the lines of contour, sometimes suggesting movements by their curves. F) Polychromatic figures are more common than the monochromatic ones, but sometimes the monochrome types occur. In any case, the integrity of shape is maintained. G) The selection of natural niches is common. H) The zoomorphic figures, such as rheas, monkeys, *cutia*[15], *mocó*[16] and fish (Fig. 14) are less depicted.

The author also revealed features considered as variations of the Angelim style. These variation features are: a) when human figures are depicted, they tend to be a rectilinear shape. B) Sometimes the anthropomorphic figures have their heads and contours executed as part of a continuous line. C) The anthropomorphs are normally depicted in a static position, sometimes having their bodies leaked or presenting rectangles, zigzags and, most of all, vertical lines.

The chronological clues were considered from overlappings. In relation to, Morales (2002: 113) considers that some Angelim style figures were painted before some Serra da Capivara's figures. In any case, he also attested that several figures from Serra da Capivara were painted over the Angelim style figures. As depicted on is the *Onça Branca* (White Jaguar) in Estevo's rock-shelter.

[15] Cutia is a rodent from the gender *Dasyprocta.*
[16] Mocó or *Kerodon rupestres* is a rodent typical from the rocky areas in eastern Brazil. It is very common in Piauí.

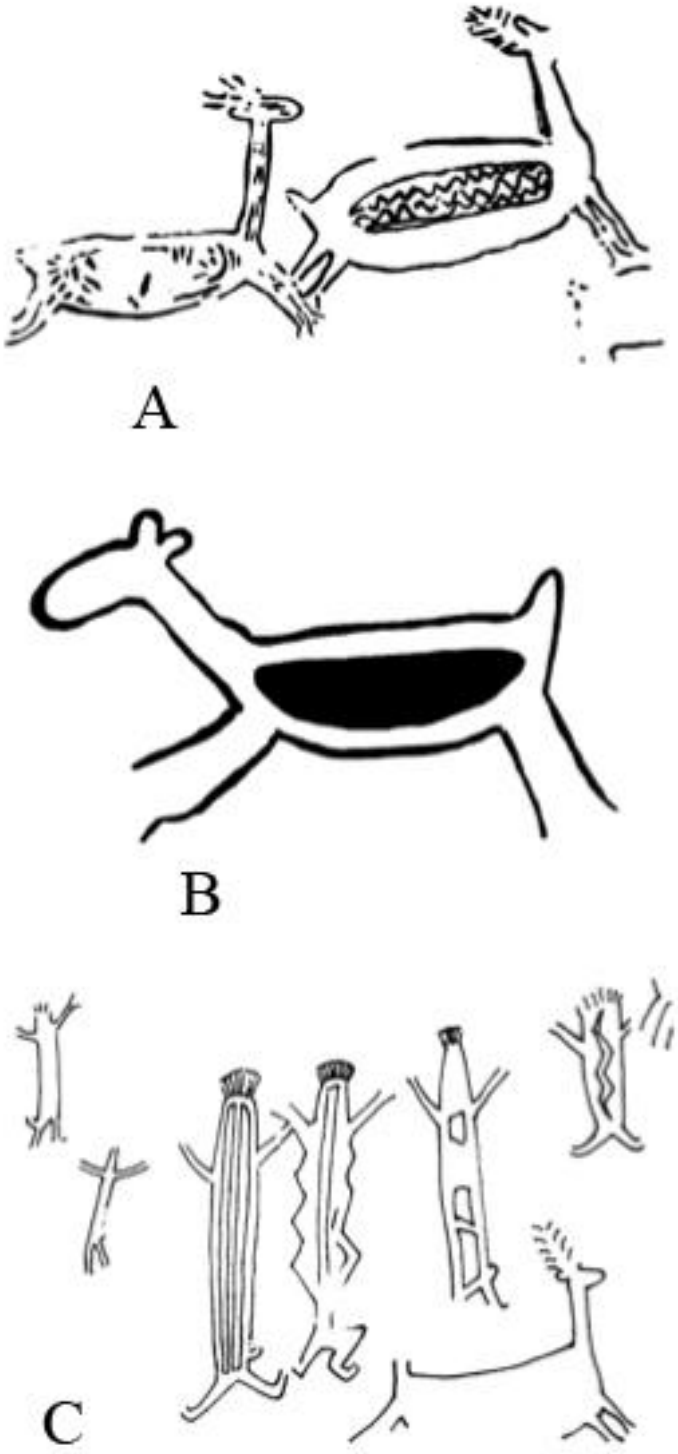


Figure 14 – Examples of figures classified as Angelim Style. A, Toca da Invenção; B, Toca do Boqueirão do Sítio da Pedra Furada; C, Angelim do Barreirinho. Source: Morales (2002; 101).

2.1.2 Agreste Tradition

The Agreste Tradition is characterized by the presence of recognizable figures, especially anthropomorphic, though the zoomorphic figures are quite rare. Objects and phytomorphic figures never appear (Guidon, 1989: 8).

Figures performing actions are rare and depict only hunting scenes. All the figures are depicted in a static way. Dynamism and movement never appear (Fig. 15) (Guidon, 1989: 8).

The morphology of Agreste's *grafismos puros* is different from those found in the Nordeste Tradition. Sometimes, Agreste figures are made inside Nordeste panels, difficulting the separation. In any case, Agreste's figures can appear overlapping figures from other traditions. This indicates, a criterion of choice of the pictorial space (Guidon, 1989: 8).
The techniques of drawing and paintings are of poor quality and it is difficult to identify the depicted species of the zoomorphic figures (Guidon, 1989: 9).

In the area of São Raimundo, the Agreste tradition is peripheral and limited between 10,5 Kyr BP and 6,0 Kyr BP. As the Nordeste's people were disappearing, there occurs an Agreste domination that seems to last until 3,0 Kyr BP (Guidon, 1989: 9).

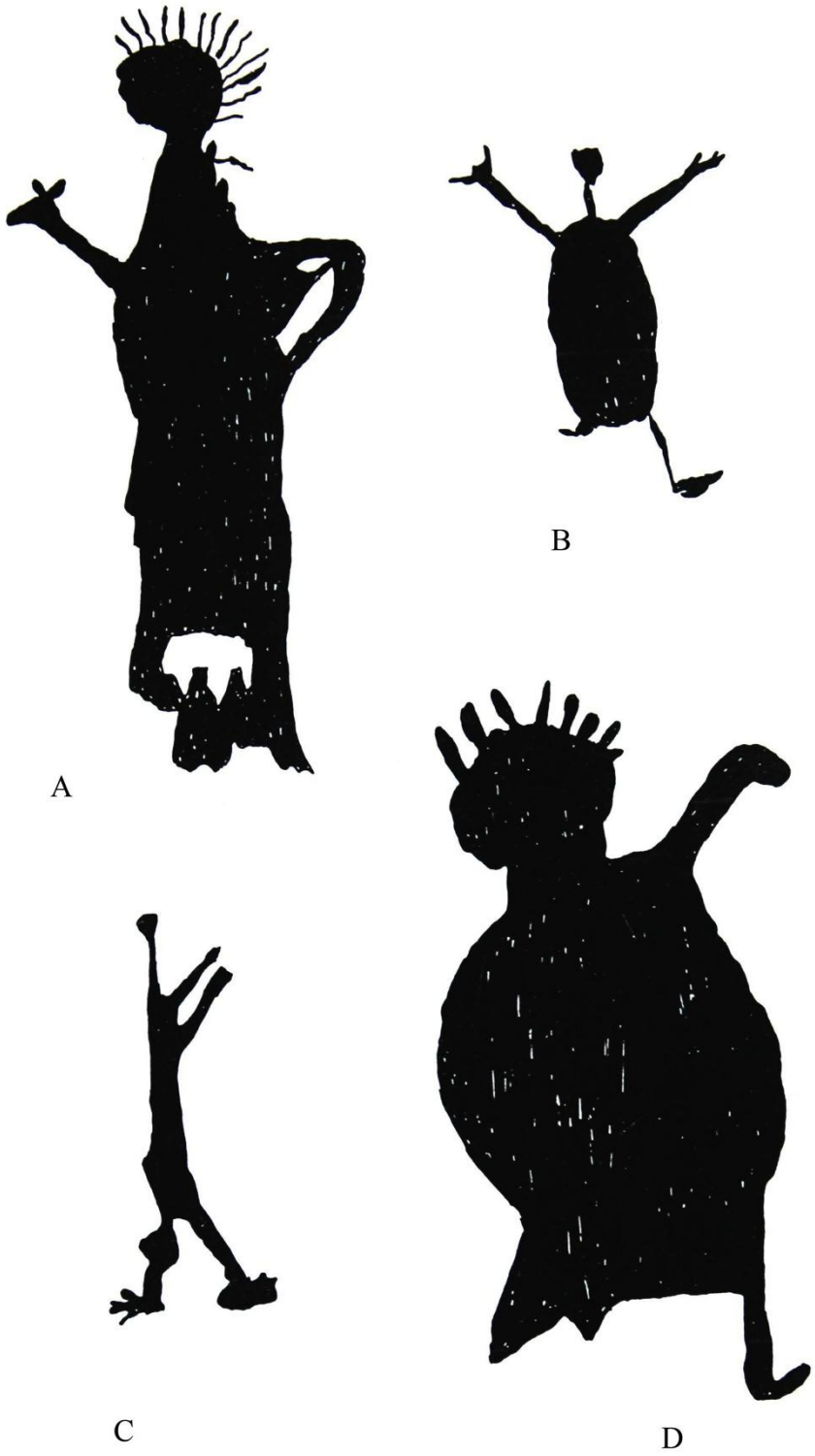


Figure 15 - Examples of figures classified as Agreste Tradition. A, Toca da Entrada do Baixão da Vaca; B, Toca da Extrema II; C and D, Toca da Chapada dos Cruz. Source: Pessis & Guidon (1992: 29).

2.1.3 The Geometric Tradition

The Geometric tradition, is characterized by paintings that mainly depict, unrecognizable figures, hand marks, footmarks, human figures and reptiles in an extremely simple or schematic fashion (Fig. 16) (Guidon, 1989: 9)

This tradition appears isolated being restricted to a single site from the pre-Cambrian plains. However this tradition can appear in sites with Nordeste or Agreste rock-art (Guidon, 1989: 9).

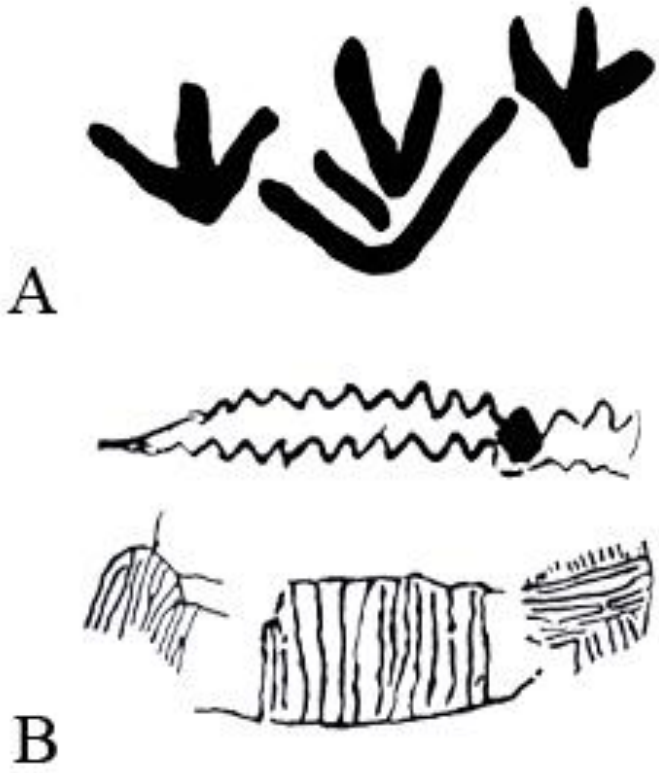


Figure 16 - Examples of figures classified as Geometric Tradition. A, Toca das Letras; B, Toca do Salitre. Pessis & Guidon (1992: 30-31).

2.1.4 Itacoatiara traditions

Based on the observations of rock-art from São Raimundo, Guidon (1989) proposed a division of three traditions for engravings, refering them as Itacoatiara de leste, Itacoatiara de Oeste and Gongo. This division was based on the differences identified in few sites.

Defining Itacoatiara de leste, Guidon (1989: 10) wrote that, it was a typical tradition from Northeastern Brazil. Its panels decorate the margins and rocky riverbeds of streams from the *sertão*[17], being persistent by the proximity of waterfalls even during the dry season (Fig. 17). Results of surveys have shown that Itacoatiara de leste was associated with groups of hunter-gatherers (Guidon, 1989: 10).

For Itacoatiaras de oeste, Guidon (1989,10) wrote that, this tradition depicted only unrecognizable figures, being widespread from the boundaries of Bolivia until the western limit of São Raimundo Nonato, heading itself to the south where appears also in northern of Minas Gerais (Fig. 17). She proposed also, that the so called Pisadas tradition that appear in southern Brazil, Uruguay and Argentina could have been developed from Itacoatiaras de Oeste.

The chronology of Itacoatiara de oeste is thought to be of 12,0 Kyr BP, having been dated in the state of Mato Grosso, associated with a beautiful lithic industry of flint. Apparently, the panels of this tradition decorate rocky walls near to waterfalls, lakes, ponds, and natural water reservoirs in general (Guidon, 1989: 10).

About the Gongo tradition, Guidon (1989: 10) wrote that, it could be uncertain, especially because this supposed tradition has been defined based on engravings of a single site. She considered it, as an isolated phenomenon that deserved to be studied in detail.

The panels of this tradition are composed by unrecognizable figures, as well as some zoomorphic and anthropomorphic figures, depicted very schematically.

[17] Sertão is a denomination for all interiors of Brazilian territory. This denomination also brings an idea of mysterious and not occupied territory.

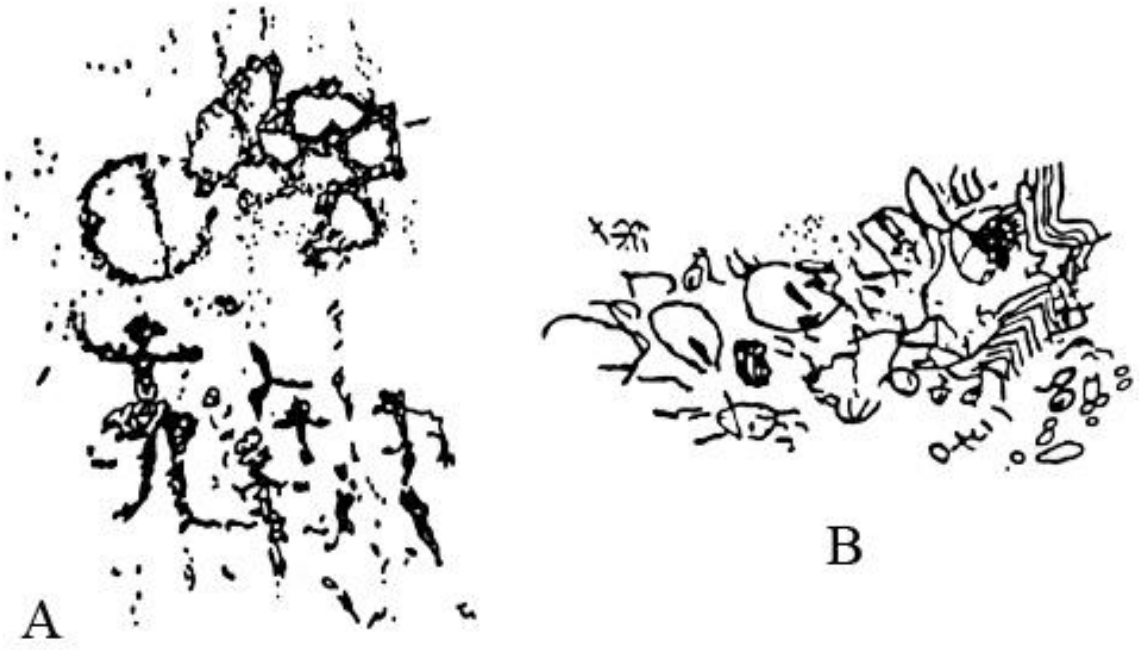


Figure 17 - Examples of figures classified as Itacoatiaras de Leste and Itacoatiaras de Oeste. A, Cachoeira do Riacho Santana; B, Toca do Buraco do Pajéu. Source: Pessis & Guidon (1992: 32).

2.2 OTHER STUDIES OF ROCK-ART IN THIS REGION

Other researches have also been carried out in southeastern Piauí, approaching rock-art in a different ways, further than the preliminary classifications. These works have shown important information to the reconstitution of prehistoric contexts. Perhaps, Maria Conceição Soares Meneses Lage did the first work that began to open the horizons of rock-art studies in Capivara, during the decade of 1990. She approached rock-art, specifically rock-paintings, in the area of São Raimundo Nonato, according to the archeometry. Her Phd thesis was submitted in Paris under the title of "Étude Archéométrique de l'art rupestre du sud-est du Piauí", having as a primordial objective to establish a general frame of physicochemical and mineralogical of pigments used to do rock-art.

On this occasion she analyzed pigment samples coming from five sites (Pedra Furada, Baixão do Perna I and II, Entrada do Baixão da Vaca, Extrema II and Vento), identifying the relationships between pigments from these different sites and also those within the same site. Beyond the identification of elementary chemical of pigments, Lage also conducted, analysis of pictorial stratigraphy, operatory sequences of execution, know-how of preparation,

applications, stylistic relationships, sources of coloring raw materials, relations between the archaeological levels and rock-art, dating of paintings, as well as questions of conservation.

With this objective, physicochemical information about rock-art in southeastern Piauí was achieved. For instance, it was discovered that quartz grains found in ochers and clays, withdrawn around the sites, presented bigger grains than those ones found in the paintings that provided pigment samples. This suggested that these coloring materials were subject of special treatments, like crushing and filtering to remove the grains of quartz. The deposits source of grey pigments was identified in the area of Zabelê (Lage, 1992: 365-366).

Relating the analysis of samples coming from group I, framing figures from Nordeste tradition, Serra Talhada stylistic complex and Serra da Capivara style, with the samples coming from group II, framing figures from Agreste tradition. Lage (1992: 353-366) identified that; in both cases the general pictorial stratigraphy is simple. Sometimes, over a layer of mineral salt deposits, there was no alteration of the support, not having any particular preparation, not even coating application, or rock scraping, or friction. In any case, she also added that the pigments of paintings from different traditions (Nordeste and Agreste) might be identical. The paintings of these traditions are made with ochers from the same origins and probably prepared in a similar way.

Looking at differences of color tones upon a single figure, Lage (1990) concluded that the hue differences in the red colors are not homogeneous. In reality it is possible to make red pigments mixing red ochers, orange, yellow and brown ones. Actually the variation of red tones, is linked with the intensity of coloring matter applied on the rock-surface, in greater or lesser amount (Lage, 1990: 366)

Specifically for the black pigments that came from Extrema II, the analysis was conducted through the use of an optical microscope. This allowed to hypothesize that the black pigments were made of finely crushed coal, being perhaps a result of crushed or calcinated bones (Lage, 1992: 335-366). In any case the nature of the used coals could not be established.

Examining the sequence of execution and pictorial stratigraphy, Lage (1992: 350) identified that for some paintings in Extrema II, the yellow was applied first, and then repainted with red. These cases were interpreted as repaint practice. This same behavior was identified upon samples coming from paintings from Baixão da Vaca. In this case the yellow pigment was applied in a liquid state before the red pigments.

In Pedra Furada, the sequence of execution and pictorial stratigraphy revealed that, generally the white pigments were applied after red pigments. In some cases, white figures were repainted after the red figures, maintaining the same previous existing shape. Other Bi-chromatic figures (red-white) were executed at the same moment. Also in Pedra Furada, evidence of repainting has been identified, based on the analysis of pigments with different tonalities coming from the same figures. Lage (1992) concluded that, the samples BPF 88.12 (painting) and BPF 88.13 (retouching) correspond to the same pigment. It is likely that the same person applied the dark red retouches (Lage, 1992: 345).

In Arapoá do Perna, two types of white pigments have been identified. One type was based on kaolin and other type was based on carbonates (Lage, 1992: 349).

For the red pigments, Lage (1992) has identified groups of recipes, based on the presence of chemical elements in greater or lesser quantities. Generally, according to the elementary chemical composition, the red pigments could be divided in three main groups; one based on silicon and iron; other containing potassium and iron; and the last one, composed by sulfur and iron. However, some samples presented these elements in lesser amount. Other group was identified in Extrema II containing calcium and iron (Lage, 1992: 329-334).

It is worth mentioning other important researches, like the MSc thesis of Cristiane Buco, submitted in Federal University of Pernambuco in 1999. This thesis was dedicated to the identification of music in the prehistory of Northeastern of Brazil. This work gave important clues to the comprehension of the life and the artistic expression of prehistoric groups. Buco (1999) identified music in two different types of images, the dancing scenes, which normally appear composed by rows of human figures, and also in figures that appear holding musical instruments. Thus, Buco (1999), considered that the societies that painted these scenes, should already have musical knowledge and probably were ceramist groups. This interpretation has been improved by ethnographic data, especially based on observations of the Krahô indigenous group.

Considering the years of research in this region, it is possible to note that rock-paintings were more studie than the engravings. For some reason, a preference for paintings dominated most part of the studies. In any case, an important researche work has been carried out by Ana Clélia Correia Nascimento, as a Phd thesis, submitted in Newcastle University, under the title “Engraved world: a contextual analysis of figures and markings on the rocks of southeastern Piauí”.

Nascimento (2009) gives important information based on observations of engraved rock-art. She interpreted some motifs according to the pictorial context, concluding that kite shaped (in Portuguese tridígito) forms might refer to bird footprints, mostly because these shapes appear associated to other animal and human footprints.

Based on the discovery of an anthropomorphic figure with a vulva depiction, Nascimento (2009) has interpreted similar shapes found isolated as vulva depictions. Between the engravings she analyzed, it was found that similar shapes were widespread in the region. This raised the hypothesis that the depicted vulvas could be related to fertility rituals (Nascimento, 2009, 236).

Comparing the *corpus* between engravings and paintings, Nascimento (2009: 238) has found that, paintings depict more human and animal figures. Generally, they occur in a narrative way, depicting scenes of hunting, sex, dance etc. While engravings tend to make reference to physical body parts, including female sexual organs and footprints.

Also in 2009 Elaine Ignácio submitted her MSc thesis in the University of Trás-os-Montes e Alto Douro and the Polytechnic Institution of Tomar, under the title "A representação do cervídeo no complex rupestre do Parque Nacional Serra da Capivara". In this approach, she identifies important relationships between cervid depictions and the context. She also demonstrated how the notion of perspective was already present in these depictions.

Considering the most naturalistic figures of cervids, Ignácio (2009) identified different morphologies, specifically based on the cervid's antlers. She also made morphological comparisons between cervids depicted in a rock-art site, and those still alive. Through these comparisons, she came to propose the biological taxon, in which the depicted cervids could be part of.

Assuming that the depicted cervids, did in fact exist in local prehistory, made environmental inferences. Ignácio (2009) proposed that the presence of *Blastocerus dichotomus* would be associated with a wetter paleo-environment (Ignácio, 2009: 155). She considered this data as a temporal marker, especially because the evidences of wetter climate of the area of São Raimundo are attested during the Pleistocene/Holocene transition.

Recently in 2012 Cristiane Buco presented a large work, in which she approaches 200 sites with rock-art, placed along the Serra Branca valley. This work was presented as Phd thesis, under the title of "Arqueologia do Movimento", submitted in the University of Trás-os-Montes e Alto Douro in Portugal.

This work is especially important for the understanding of local prehistory for many reasons. First, it encompasses an entire rock-art *corpus* inside a geomorphological feature. Second, it considers the rock-art as result of dynamic cultures entering and leaving this valley. Third, the idea of movement as migration has in consequence variations on the rock-art and the pictorial stratigraphy that could be verified.

Buco (2012: 519) has characterized the rock-art from Serra Branca, as a type of rock-art represented essentially by human figures (the predominant), followed by animal figures, especially cervids. In terms of quantity, the monochrome figures with their bodies filled are predominat, followed by midsize and short size polychrome figures. Human and animal depictions compose the visual predominance of Serra Branca's Valley. Normally, these figures have their bodies filled geometrically, being midsize or large size.

Considering the pictorial corpus according to the idea of movement in a given time-space, Buco (2012) has constructed an explicative frame, in which prehistoric universes, like the nature of subsistence and the symbolic-imaginary were presented. Buco (2012) has assumed, that the rock-art from the valley of Serra Branca, was the result of these principal universes (Buco, 2012: 519).

About the preliminary classification, Buco (2012: 519) wrote that, in the valley of Serra Branca there is not a single site, exclusively presenting Agreste rock-art, the same is also true for the Nordeste tradition.

Perhaps the greatest contribution of Buco's work is the establishment of a periodization, based on the presence of superimpositions, morphology and techniques of paintings. Buco (2002: 493) has proposed, what she called, four movements of occupation that crossed the valley of Serra Branca. Thus relating paintings to mobility and avoiding the "traditions" approach.

The first one was related to the presence of big animals found in the rock-art, possibly reflecting cultures of hunter-gatherers, corresponding to the first inhabitants of the valley. A hypothetical chronology is thought to be during the transition between the Pleistocene and the Holocene.

The second movement was referred as transitional people, also cultures of hunter-gatherers, in which the rock-art they have produced in the valley could be linked with their mythic everyday lives. A hypothetical chronology is assumed to the Earliest Holocene.

The third movement was referred as "passing people", represented by painted and engraved motifs. These passing people could have introduced new technical and thematic

elements. This was based on the identification of changes in rock-art, as well as in the lithic industry. This movement was divided in three phases named 3A, 3B and 3C, in which, a hypothetical chronology is assumed to the Middle Holocene. It is also thought that, these passing people could have lived during hotter periods of the Middle Holocene, when changes between the types of vegetation was ongoing to the establishment of the *Caatinga.*

The fourth movement was associated to the rock-art made by historical people. This type of rock-art was very different from the other. Normally they use predominantly black color. While the engravings, were made basically by making grooves and polishing surfaces. The thematics depicted in the paintings, reflect evidently recent periods. Names and ages, and sometimes, entire phrases were made by painting or engraving. The chronology of this movement is based on ages depicted on the rocks, being 1950 its temporal marker.

Approaching the drawings made by historical groups, as real rock-art, Buco (2012) has broken away from the idea that the historical drawings should be seen as vandalism. Buco's work shows that, historical rock-art can work as chronological marker, but principally can be seen as a significant period of rock-art for their authors.

2.3 GENERAL REMARKS

As seen, the study of rock-art in southeastern Piauí is very developed compared to other parts of the country. In any case, rock-art researches in other states, like Minas Gerais, Pernambuco, Rio Grande do Norte and Bahia have also provided important data to the comprehension of Brazilian rock-art.

Specifically in the region of São Raimundo, apart from the problematic around the preliminary classification, it is worthy to note that a great quantity of consistent information has been produced during these years of research. For instance, today it is known that certain types of rock-art were related to cultures of hunter-gatherers. There are also clues of temporal markers related to these kinds of images. For example, the first *ante quem* ages, estimated for layers that buried a panel attached to the rock, in Toca do Baixão do Perna I. This age proves that, anthropomorphic figures composing scenes were already made before 9,5 Kyr BP (Guidon, 1991; Pessis, 1992).

Other data is related to the layout of figures revealing that there are clear morphological differences. There is not doubt that, the authors of some figures have depicted forms that recall anthropomorphs, zoomorphs, phytomorphs, ornithomorphs, etc. On the other

hand, other figures can recall several things, even anything else than their painted shapes. In any case, the relationships between these types of figures remain uncertain, justifying further researches.

Nowadays, it is known that the first attempt to separate these figures was necessary for the comprehension of Brazilian prehistory. It is worthy to note that, this separation played an important role to approach the totality of prehistoric rock-art present in the epoch. It culminated in the first general distribution of rock-art along the country. Furthermore, it has shown itself as an effort to follow the evolution of rock-art throughout the time and space, always looking for the identification of group identities.

Nowadays the rock-art corpus has increased significantly, even inside southeastern Piauí. Frequently, discoveries of new rock-art sites are diffused on the internet web, especially the ones found in Maranhão, Ceará, Bahia, Amazonas, Pará, Mato Grosso, Tocantins, Goiás, and Santa Catarina. These new rock-art clusters reinforce the idea of establishing a general classification, in which, the evolution, the territorial distribution and chronologies can be considered. This challenge is still far from being finished.

3 – THE MORPHO-TECHNIQUE MODEL

This chapter is addressed to the construction of a model of analysis model named as the Morpho-technique model. The objective of this analysis model is to recognize tendencies of identity, looking through structural axes of rock-art (paintings), referred in this work as morpho-technique axes, and their "substances" of integrity, referred in this thesis as universal morpho-technique features. This analysis will be strictly intra-site.

This chapter is divided in to three parts, the first being the construction of the model of analysis and the presentation of criteria of bases, like the morphology and technique. The second part is dedicated to the presentation of the operational procedures.

3.1 CONSIDERING ROCK-ART

In general terms, the presence of rock-art at a given site undoubtedly confirms the human presence. This rock-art can be related to any chronological period. Once the difficulty of dating this human phenomenon is assumed, the challenge of organizing a given type of rock-art in a period of time, will be the biggest task of several investigations. However, there are differences in the way investigators define this human phenomenon.

For the purposes of this work, all types of rock-art will be considered as compositions[18]. Throughout the study of rock-art it is possible to identify compositions in all senses. First, rock-art is the result of an interaction between technique and morphology, resulting in composition of shapes related to their specific movements of execution according to the ideas that the authors wanted to materialize. Second, rock-art is the result of a superimposition of actions involving theoretic and practical exercises between the artist and his artwork. Third, even in terms of colors, it is also quite clear that rock-art is the result of a physicochemical composition of elements.

Considering rock-art as a composition, it makes sense to look into its structure in a way to extract information about their authors. The structure is the result of interactions between morphology and technique. In this work, the result of this interaction between morphology and technique arrange the paintings structure according to a morpho-technique axis.

[18] Leroi- Gourhan (1965: 203) considers that the compositions are simultaneously related to the sense of the figures and their balance in space.

3.2 THE MORPHO-TECHNIQUE AXES

Anati (2002a: 13) has already pointed out that, the prehistoric rock-art and other types of art have elemental ingredients, in which all images are structured. In this work it is assumed that all rock-art images has two principal axes of structure, the morphological and the technique. Specifically for rock-art, it was considered that these axes are related to a very complex creative process that is referred here as materialization process. This process corresponds to the act of bringing immaterial or mental images to their material or physical existence.

It is also argued that, the morphology and the technique are interacted axes of images structure, mainly because they are born at the same time. Since this birth is related to the cognitive capacity of the authors, these axes are seen as part of the same action of materialization.

It is the technique related to the morphology that confers a given image the status of matter, because images that exist mentally do exist, even though they are not materialized.

As a rule, it was considered that rock-art images without these main axes does not exist on the physical plan. Thus, the individualization of technique from the morphology would only result in unconnected movements. On the contrary, the individualization of morphology from the technique would result in mental or immaterial images.

These structural interacting axes were called as morpho-technique structure and have been considered a source of important information about the identity of the authors of prehistoric artworks. These axes have elements that have been considered as the basic substance of the figures integrity. In this work, they are referred to as universal morpho-technique features. These features can be individualized in a way to understand how the figures were made, according to the compositions between morpho-technique features. This allows identifying a tendency of painting knowledge that is linked to the identity of the authors.

3.2.1 Universal morpho-technique features

The universal morpho-technique features referred in this thesis were identified through the Arts, under the name of elements of the visual language[19]. They are referred to as bases of the theory of design and painting, constituting the integrity of all images ever made. As Ostrower (2003: 53) points out, "with these very few elements, and not always combined together, all works of art are formulated with their immense variety of techniques and styles".

For the purposes of this thesis, the term visual language has been altered to universal morpho-technique features. Firstly because they are in fact structural elements of images; secondly, this term avoids any comparison between images and language[20]. And third, this approach has clear objectives of achieving information about the identity of the authors of prehistoric rock-art.

Before defining these morpho-technique features, is important to note that "they do not have pre-established meanings, they do not mean anything until be arranged in a formal context. In any case, something can be extracted from them towards a recognition of expressive identities" (Ostrower, 2003: 53). These features are part of the integrity of images supported by their morpho-technique axes. They represent a way of execution, and do not have to do with the meanings per se, only a final arrangement between these features represent the idea and the meaning in which it was meant to be. The way they have been arranged to configure a given image, and the repetition of these manipulations upon other images, leads to the recognition of the author's identity.

According to Ostrower (2003: 53) these elements can be summarized in five categories, such as line, shape, mass, value and color. Other authors consider eight elements, point, line, shape, mass[21], space, value[22], color and texture.

Given the fact that in this paper, only prehistoric rock paintings of a single site will be analyzed, only five types of mopho-technique features will be considered; the point, line,

[19] Wassily Kandisnky was the first person that began to discuss the constituent elements of images between 1910 and 1914. Kandinsky started studies of shapes and colors influenced by the dodecaphonic musical movement created by Arnold Schönberg. In the epoch he had clear intentions to relate paintings with music. He took as assumption, that paintings had expressive elements that could work to exteriorize or speak directly to the feelings, as a musical arrangements do (Salun, 2012: 1-2). Kankinsky saw the paintings as a composition or an arrangement of elements, such as musical notes on a musical score.

[20] Some rock-art investigators, like Anati (2002a), sometimes approach the rock-art as a visual language or a real text, in which is possible to understand the grammar, syntax, ideograms etc. For the purposes of this work, despite being focused in the structure of paintings, it was preferred do not approach the rock-art as a text.

[21] Mass corresponds to three-dimensional shape or volume, that gives the illusion of weight, density or bulk. This feature was not considered in the analysis of prehistoric imageries.

[22] Value corresponds to the utilization of lightness and darkness upon shapes. This feature was not considered in the analysis of prehistoric imageries.

shape, space and color. However, it is known that other features like mass can be used in analysis of other types of prehistoric images, such as engravings.

When combinations between morpho-technique features are arranged according to their morpho-technique axes, such as musical notes do along of a pentagram, the result will be images, figures, paintings, or engravings. These images are strictly linked to the cognitive load of the authors, and consequently, they have specific meanings that are not possible to access. Because of this, rock-art can be considered as morpho-technique compositions. The way they were constructed is a reflection of means of execution, according to a painting expertise linked with the identity of the authors in every level.

As more features are arranged together, more weight the compositions will have. The weight scale is considered according to the degree of spatial changes that the features can do. For instance, a single point on the space does not change much, thus, it is lighter than the lines. However, the degree of special changes implied by lines is lighter than the spatial changes implied by shapes. This gives us clues about how complexes images were thought and can work, as well as, an indicator of identity.

As other types of features are not being considered, like the value and mass, the scale of weight is only possible for points, lines and shapes.

3.2.1.1 the points or dots

In this thesis, a point is a morpho-technique feature. It can be defined as a pinpoint on the space, in this case, a pinpoint on a rocky surface. Musso (2008: 2) indicates; “A point is a small stain of color put on the canvas. It can be alone and isolated or put in resonance with other points or lines. The point is essentially a static element”.

When this feature appears alone, its weight is the lightest one among the other features. This universal morpho-technique feature can be used in a way to arrange a determined shape, by the juxtaposition or superimposition of them. Depending of the type of prehistoric image, the points can be a predominant morpho-technique feature. This happens for instance, with some engravings, specifically the ones made by pecking techniques.

3.2.1.2 the lines or traits

Basically, this morpho-technique feature arises when several dots are queued. Kandinsky (1968) has defined the line, as "the trajectory of the point in movement". All the lines are longer than wide, and can be dynamic or static (Fig. 18). Ostrower (2003: 54) indicates that lines can characterize the space in several ways. This morpho-technique feature is heavier than a single dot, and is used to catch a shape, by different combinations of lines. It can bring a lot of information depending of how it was arranged.

Different arrangements can bring a lot of information depending of how the lines are (static or dynamic). With the use of lines the relationship between shape (morphology) and movement (technique) is revealed. Lines allow arriving to the directional orientations that consequently, were the same ones chosen when they were created (Santos, 2010: 36). Most important, is the fact that the movement transforms the space and allows understanding the notion of time, and then casual connections between precedence and posterity (Oosterbeek, 2011) Two main types of lines are considered, straight lines and expressive lines.

3.2.1.2.1 Straight lines

These lines are static (Ostrower, 2003: 55) essentially straight and can be oriented in a horizontal, vertical or diagonal sense. Considering prehistoric context, straight horizontal lines will be those oriented in a sense closer to an axis 270º/90º. The vertical will be the ones oriented to a sense closer to an axis 0º/180º. The diagonal lines will be the ones oriented in a sense closer to the axes 315º/135º and 45º/225º. These lines are inherently stable and give a sense of direction to the compositions.

3.2.1.2.2 expressive lines

They are essentially dynamics (Ostrower, 2003: 55). The expressive lines are curved, sinuous, or zigzaged applying dynamism to the compositions. These features, present the same type of information as the straight lines, they are only curved.

3.2.1.3 the shapes

This morph-technique feature is defined as areas configured in two dimensions, as Ostrower (2003: 59) points out; they always delimitate an area. Naturally, shapes are always flat. They exist in several ways, the simplest of all being the one, which encloses an area with an outline (Fig. 18).

Naturally, shapes are more complex than lines or points. First, they configure the space differently, by height and width (Ostrower, 2003: 59). Second, even when they are made up of combinations between points, lines, or colors, they are still part of other type of pictorial manipulation. Thus, the points and the lines, become the integral part of shapes, sometimes combined with colors. The shapes are heavier and naturally more complex than single lines.

For prehistoric paintings, the shapes correspond to any painted surface, or enclosed areas of colors that were not made linearly even if it has lines of contour. They are essentially flat or implied.

Figure 18 - Shapes and lines used to make the experimental rock-art in Instituto Terra e Memória (Mação, Portugal).

3.2.1.4 the spaces

The spaces are the natural shapes of the rocks (Anati, 2002a: 15), they also correspond to the areas surrounding the compositions, or the rock surfaces around the paintings. The selection of a certain part of the painted space, and not the other, gives clues about the choices the authors made. They are linked with the compositions right from the moment they were ideas within the author's mind. The spaces are built through a sensitive relationship with the reality (Oosterbeek, 2012: 19).

Associated to an identity tendency, the spaces suggest areas of activity along the site, meaning that the compositions could have been made at the same moment.

3.2.1.6 the colors

Actually this morpho-technique feature is quite complex, due to its variations. To use this feature in the analysis of rock paintings, the concept of hue will be considered, because it is agreed that even a single monochromatic painting has significant differences on the same color. These differences can be mentioned using the term hue. In this case this feature will be identified by the indication of a single color hue, for example, hue of red or white.

The hue is related to the quality of colors but other factors are also part of this morpho-technique feature, for example the physicochemical elements of their coloring materials. The physicochemical elements correspond to how colors were used or produced.

The theory of colors began to be developed since sir Isaac Newton made the discovery of the color spectrum in the white light. This contributed to the understanding that colors are perceived because they are reflected off of objects. In any case, the physicochemical elements are considered as fundamental parts of this feature.[23].

3.3 ARTISTIC CHOICES

Considering each figure as a single painting that has its own morpho-technique and symbolic history, the artistic choices will be recognized by the way the universal features were arranged in their morpho-technique axis to compose the images.

[23] From Paraguaio, four samples of painting pigments have been withdrawn to identify their elementary chemical composition. These samples are under investigation and the results will improve the information about this morpho-technic feature. They also should be published in article format.

The repetition of the same choices on the same site will reflect in the same layout or painting template. These templates do not necessarily have to be 100% similar, but they have to be similar enough to identify an identity. In any case, their appearance in other parts of the site will demonstrate a relationship between figures with the same morpho-technique history.

The choices and the configuration of paintings are united to a painting expertise, which in turn, is the reflection of individual and social identity of the authors. This know-how is considered part of identity because it is part of a knowledge[24] that can be traditionally transmitted.

3.4 IDENTITY TENDENCIES AND CHRONOLOGY

It was considered that the identity tendency would be defined by the recurrence of paintings in which the morpho-technique history is the same or closely similar, resulting in specific paintings templates or layouts. Figures from the same tendency may have the same chronological indicators, because they have been done under the same artistic choices.

This tendency of identity will be considered as material evidence of an identity. The challenge is to identify whether this identity is part of a personal or collective style. This could be subject of further researches.

The identity sought in this thesis, is the personal identity and is defined through the knowledge of expertise in the action of painting, which is exclusive of an individual. This knowledge of expertise is printed in the morpho-technique history of paintings. According to Sanz *et al.* (2007: 17) artists leave marks of authorship in the work of art and those marks of authorship are attributable to specific times, places, and identities.

Taking to assumption that every painting is a unity, consequently brings the idea that each painting is the result of a single individual. Thus, only counting figures would provide the number of painters that visited the site, however, this is not exactly true. It is possible that a single person could have painted vast amount of figures on a single site or even in other places, the morpho-technique analysis helps to identify the individuals and separate them according to their morpho-technique specificities of execution. Therefore, it is a model directed to the identification of personal identities or personal painting styles. In any case, this does not preclude the identification of individuals that share the same collective identity.

[24] Knowledge in non-literate societies needs to be strictly codified and transmitted (Oosterbeek, 2012b: 69).

Sanz *et al.* (2007: 25) points out that the concept of identity (individual or group) is a social reality that can be shaped only attending to a specific time and place and in opposition to others. This justifies the choice of Paraguaio to apply the intra site morpho-technique model looking for individual identities.

3.5 SELF- IDENTITY X SOCIAL IDENTITY

The issue of identity is widely discussed with different statements according to archaeology, anthropology, psychology and other disciplines. In any case, there is an understanding that the identity works as a defining argument. The great issue of identity is to understand under which facet of society it works best. Is it more cultural than mental? Or is it more collective than individual? What can be said about the identity reflected upon material culture?

About this, Gamble (2007: 117) suggested that; "what we find in the gap between the psychological and social is corporal and material culture". Gamble, built a model for identity linking psychology and social aspects. Some of Gamble's contributions were used to support our concept of identity tendencies.

In general terms, Gamble (2007) believes that all the aspects of identity on their different levels are related to the body, the material culture being the result of body's action. In this way he created a model in which the body and consequently, material culture worked as an interlocutor between the levels of identity, the individual and the social.

A relationship has been suggested between the individual identity and the social identity. "Material culture conveniently focuses attention on the construction of our internal state, my own individual, psychological understanding of the world. But, that internal state is influenced by my relationship with and contribution to a wider social world" (Gamble, 2007: 123-124). "In logical terminology, persons are physical particulars but psychological relata" (Collins, 1985: 73).

However, Gamble (2007) has discreetly suggested that every individual identity is more psychological and the collective identity is more social. "It is the sociologists, in the guise of anthropologists, who gain the upper hand as we move from an internal to external standpoint" (Gamble, 2007: 124).

Basically, psychological issues that Gamble (2007: 112) called as "the darkness of the body" are more internal than collective. These questions are, for example, the notions of

emotion and performance and the self-interest, etc. Supported by psychological issues, developed by Damasio (2000), Gamble (2007:119) demonstrated how the internal, or individual identity works. This system was discribed as the three kinds of self (Fig. 19).

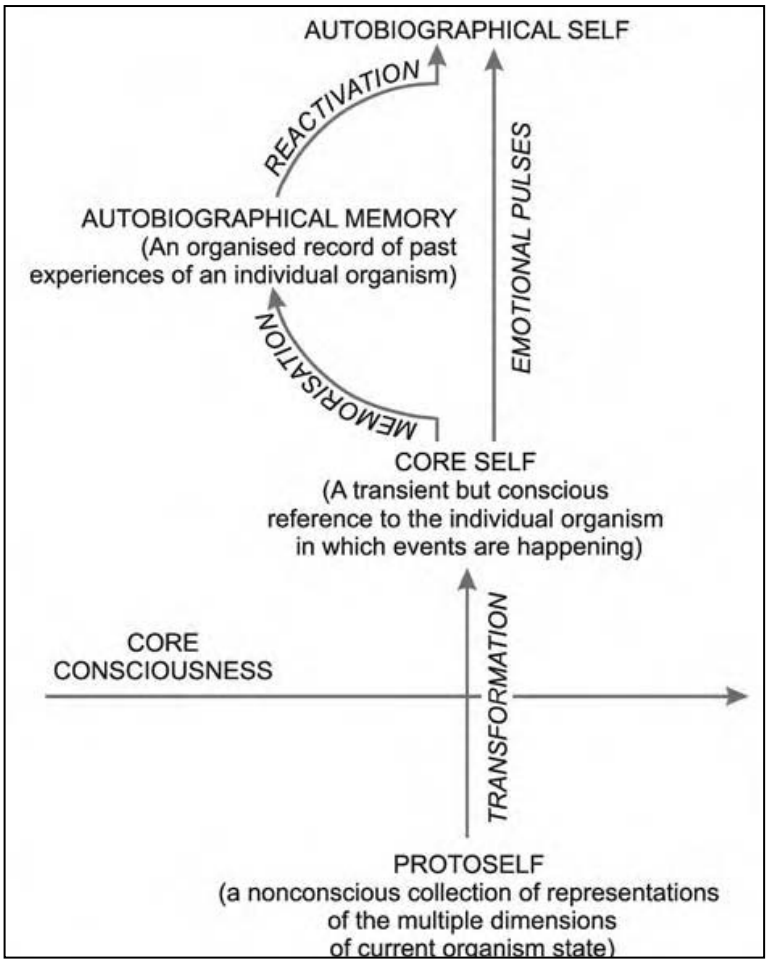


Figure 19 - Three kinds of self as was described by Damasio (2000: Table 7.1). The two arrows leading towards the autobiographical self signify its dual dependency on emotional pulses from the experiences of core consciousness and the continuous revisiting of autobiographical memories (After Damasio, 2000 and Gamble, 2007: 119).

On the other hand, he developed the concepts of accumulation and enchainment, to explain how our identity is developed on both individual and social levels. He considered our body as a container in which diverse aspects of identity were deposited and cemented. "Instruments and containers (bodies) are the visible material proxies for embodiment (accumulation) and it is around, and within them, that identities are accumulated" (Table 4) (Gamble, 2007:117).

> (…) Accumulation and enchainment are social practices that result from bodily activity as well as providing metaphors for identity. They are social practices because human beings are always implicated in networks of materiality (Gell 1998; Knappett 2006). It is through the inter-linked practices of accumulation and enchainment that relationships are enacted (Gamble, 2007: 116).

He argued also, that some rules could exist referring to the construction of identity. He considered that these rules "emerge by a familiar Cartesian dualism in order to understand how we create ourselves, and how this act is implicated with the material world of objects and things" (Gamble, 2007: 114).

Table 4 - grounded rules of identity rules construction or hybrid networks: After Toren, 1999:4 *apud* Gamble, 2007:114).

1	We are individually social and socially individual
2	We are biologically cultural and culturally biological
3	Mind is embodied and the body manifests mind
4	Our understanding of what is material is always mediated by our relations with others and likewise
5	Our subjective and objective perspectives guarantee each other
6	Structure and process are aspects of one another

Our concept of identity tendencies will be linked to the model of identity proposed by Gamble, in which the interior identity (individual) comes towards to the exterior identity (social) at the same time that the exterior identity (social) polishes the interior identity (individual). Thus, it would be unnecessary to make a separation between collective identity and individual identity, because they are both printed upon rock-art.

3.6 INTERPRETATIONS

Interpretation, in this work, was considered as the process of recognition upon a morphological appearance of the paintings, relating them to the symbolic universe of the authors. However, it was considered that the interpretation of figures should work according to the morpho-technique of the paintings, with the objective of gathering additional information that contribute to the recognition of identity tendencies.

3.6.1 Thematic or motifs

It is assumed that the compositions were ideas or themes inside the author's mind, however they provide very few clues for the recognition of identity tendencies. Firstly, they are not a way of doing (an action), but a personal immaterial view of someone's mind, that was possibly originated from the cognitive load (social and individual) available in his period. The themes vary according to the periods and region, in which they were depicted (Anati, 2002a: 25). Secondly, action is printed upon the materialized idea, but what this idea was before being materialized and what it meant, is lost. And third, globally the themes are repetitive (Anati, 2002b: 102). For instance, the glimpse of human figures will be always present, all over the prehistory, as well as the glimpse of cervids and other animals. However, the means that the authors used to paint these themes can be discovered and can give more consistent information about their cultures.

To recognize a figure, a representation of a human or a cervid, is consequently to suggest that the painters had a cervid or human image, or something similar to a human or a cervid form, in their minds. This could or could not have been true, and probably they had other objectives in mind, under the guise of pure morphological similarity. Considering these questions, it was suggested not to do a profound discussion about the themes depicted in Paraguaio. In any case, the themes will be identified and independent of their morpho-technique. However, particular attention was given to the possibility of identifying a relation between the morpho-technique and the themes.

3.7 OPERATIONAL PROCEDURES

The operational procedures of this thesis were divided in two parts, fieldwork and laboratorial work. The first part is dedicated to the description of the process of images acquisition, and the second part is dedicated to the treatment of images and application of the model of analysis.

3.7.1 Images acquisition

The acquisition of images analyzed in this work came from a photographic survey conducted between October and November 2012. This photographic survey was part of short fieldwork and had the objective of taking detailed pictures of the paintings. This has considered framing the paintings from very close distances.

The photographic survey was made up by taking detailed pictures, because the objective of this thesis was to look up at the figures considering them as a single unity, with their own morpho-technique history.

Other factors contributed to the choice of this photographic system, like the fact that the site does not have enough space to conduct a systematic linear photographic survey. The surface in the lower sector is not spacious, remaining passable upon a level of around five meters high; any attempt of doing a linear photographic survey would be difficult to frame the panels. Also the fact that the paintings from the upper sector are on the ceiling, in the deepest sheltered part of the site, where the panels are closer to the ground, making it very difficult to set up a tripod.

3.7.2 Treatments with Photoshop CS5 and ImageJ

After the photographic survey, the treatment of some images was carried out, principally, considering the ones with difficult visualization, where doubts were raised about the authenticity of the paintings, when they seemed to be the result of natural deposits upon of the rocky surface. To identify if they were paintings or not, Photoshop and the ImageJ were used to work on the pictures.

Through Photoshop, tools like brightness/contrast, color balance, hue/saturation and sometimes the equalizer have been used to improve the visualization of the pictures. With ImageJ a plug-in named as Dstretch has been used to improve the quality of colors. In both

cases the goal was to make the color spots clear, and prove if they were in fact paintings or not (Fig. 20).

Figure 20 - Demonstrative image of the manipulations of photos in the Photoshop. In the left, there is the original picture, and in the right there is the same picture manipulated in Photoshop.

3.7.3 the tracings

Generally it is assumed that the photographs are documentation and the tracings are interpretations. For this study, the tracings were carried out without previous interpretations about what the paintings depicted, because of this, the tracings were conducted simply following the color spots of the compositions. The exercise of identifying the motifs depicted was conducted after the tracing of the color spots.

The tracing was used directly upon the pictures acquired during the photographic survey (Fig. 21). To make the tracings, Photoshop CS5 was used, as well as a graphic pad known as Bamboo. This digital board makes a connection with the computer serving as a touch-screen mouse. By using freehand movements with the touch screen pen, the color spots presented in the rock-art photos were colored, with the objective of catching the technical and morphological differences between them.

Using Photoshop, the photographs were replicated in three images and separated by layers, being one layer to save the original picture, that remained closed and untouchable; other picture as background and the last as a changeable picture, upon which saturation, contrast, brightness etc. could be modified to better show their shapes.

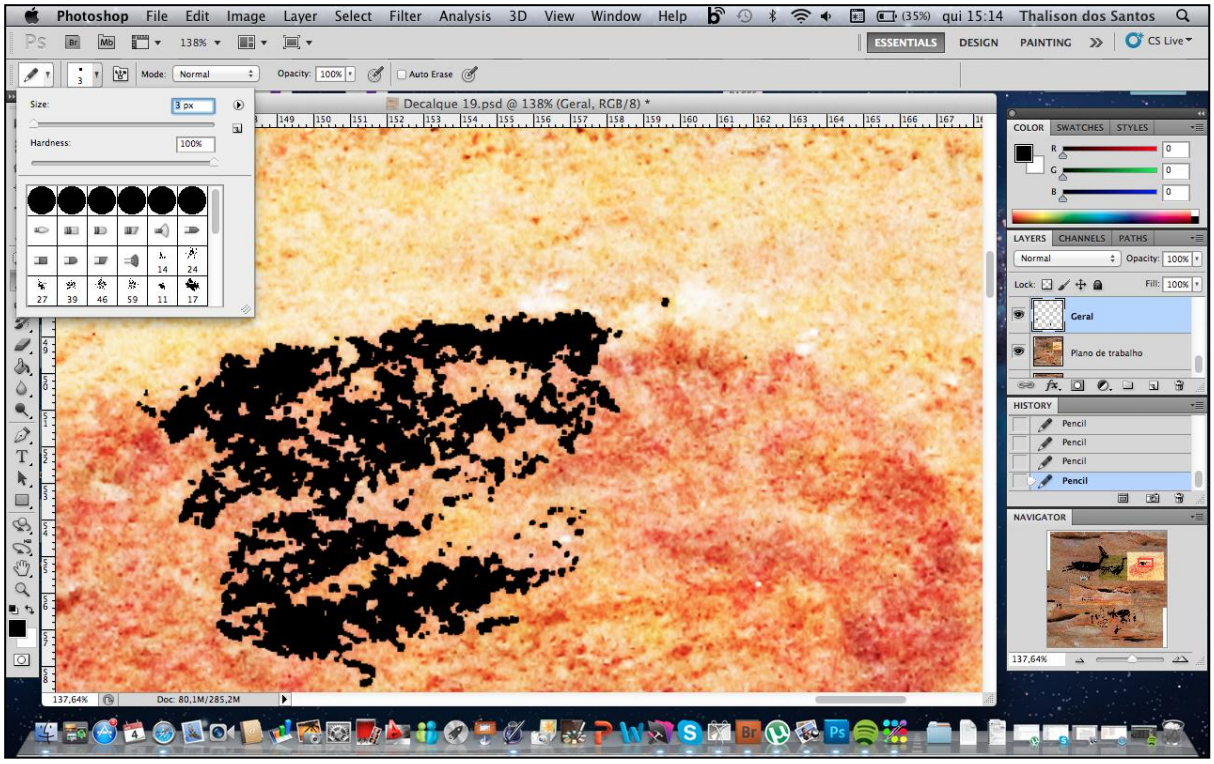


Figure 21 – Picture showing the process of tracing.

The system of tracing colored the compositions in black using the pencil tool, with head size between 2 and 8 pixels. The superimpositions were individualized in different layers and the areas of connection were marked by a linear space between both compositions. To highlight the compositions that were overlapped, the tonality of color of the oldest paintings were maintained, while the latest paintings remained in black. The cracks of the rock were drawn in hues of grey and individualized on a different layer. This system of tracing did not present many problems, because in Paraguaio there is a predominance of monochrome paintings (Fig. 22).

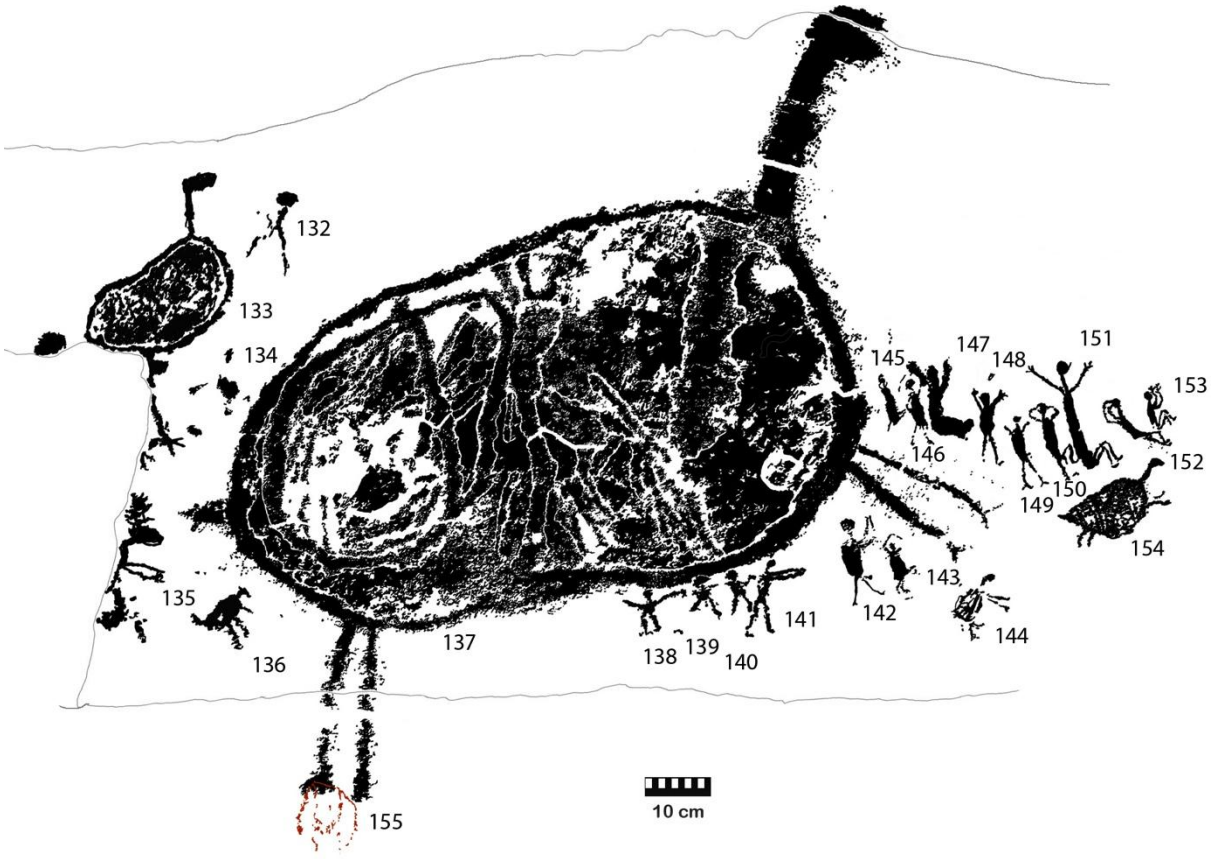


Figure 22 - Tracing of paintings from the Panel 4D.

There was an attention to maintain the original position of paintings on the walls. This was solved by the superimpositions of tracings made 1978 and 2013. Specifically between those that have been produced for this thesis, and those produced by Guidon and her team during the decade of 1970. Maintaining the original position of the traced figures along de rocky walls was one of Guidon's preoccupations in 1978. The position of figures that were traced in 1978 using direct methods helped to project the new tracings, maintaining their original positions on the panels.

For the purposes of this thesis, it was necessary to make another tracing survey, considering the morpho-technique particularities of each painting. Actually, for this thesis, the tracing were part of the process of analysis while the oldest tracings were made as documentation of the site.

The task of tracing the paintings allowed the identification of the universal morpho-technique features, and consequently forced the exhaustive observation of the corpus.

3.7.4 The database

The database was considered to gather information about the arrangements of morpho-technique features. In this way, it was recorded how, and which features were used to compose the paintings. With this information summarized in an excel workbook, it would be easier to identify the compositions that share the same painting procedures and consequently, the same identity.

The database also gathers information about the state of conservation of the paintings and their panels, as well as other relevant information.

4 – ANALYSIS OF ROCK-ART[25]

This chapter is addressed to the analysis of rock paintings through the morpho-technique model.

4.1 NOTES ON CONSERVATION

The state of conservation of the site was considered on two levels; the first is the integrity of panels and the second is the integrity of paintings. To make this diagnostic, information regarding each painting has been gathered in the database. It is noteworthy that this analysis of the state of conservation has only considered the places with figures around segments of rock walls.

4.1.1 the panels (spaces)

Observing the conservation according to the actual amount of images on the site, Paraguaio has been damaged in 12%. This percentage only represents the places where incomplete figures were identified, most of them because of broken panels. On the other hand, most of the panels are complete (88%) presenting only some lines of fracture.

To show this visually, the tracings made for this thesis were overlapped on the tracings made by Guidon and her team in 1978. This allowed the visualization of panels that have been fractured since 1978 until today, especially in the lower sector.

4.1.2 the paintings

The integrity of the paintings has been considered to complement the diagnostic of conservation. The statistics made according to the database have shown that 36% of the corpus is still composed of complete figures. However, the number of incomplete figures is superior, at 39%.

The cases in which, the degree of integrity was uncertain has been identified in 25% of paintings of the corpus.

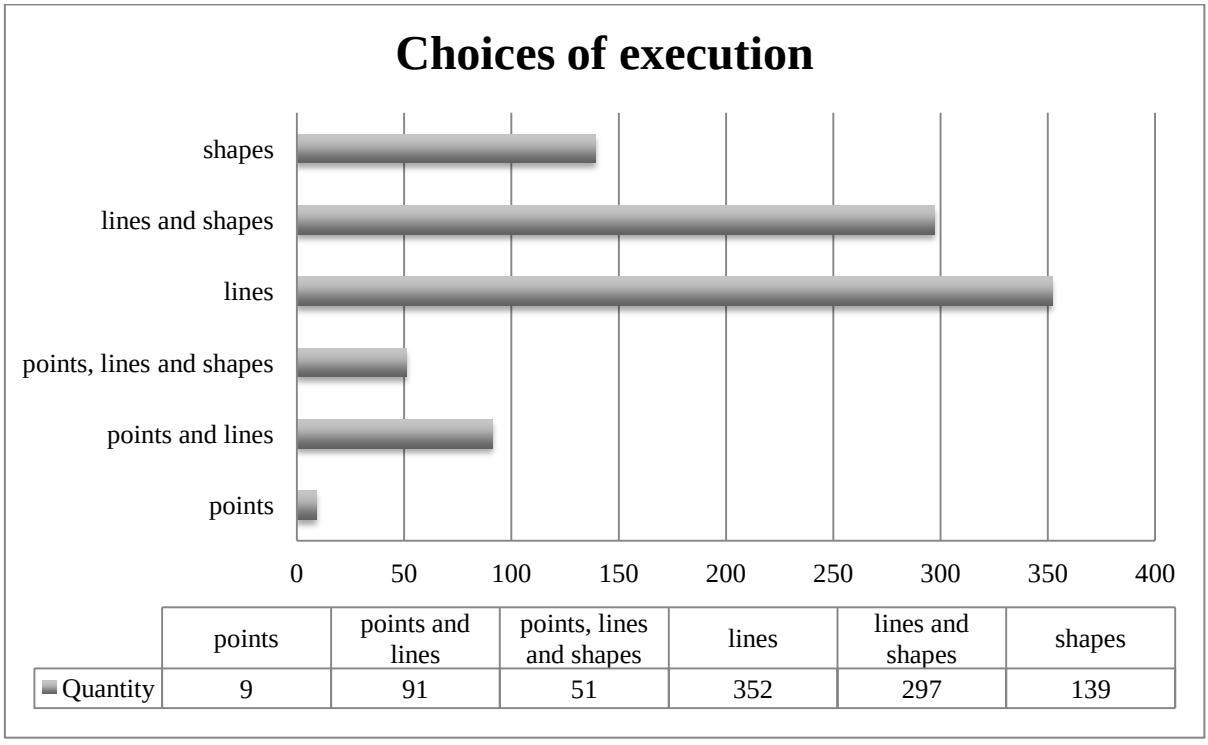
[25] The paintings referred in the analysis can be checked in the volume 2 of this thesis. Each painting of the site has been numbered and located in panels.

In the group of unidentified figures, it was difficult to define, if the paintings were actually made up the way they were meant to appear, if they were result of damage or even both. In any case, the weathering of paintings is happening rapidly.

4.2 FORMULAS OF ARRANGEMENTS

The analysis of the 939 figures from Toca do Paraguaio has revealed the choices of execution and their respective quantities through the selection and preference of the morpho-technique feature. The combinations between the morpho-technique features can be thought as formulas of the figure compositions.

In terms of numbers, it is possible to resume that the preferential morpho-technique feature is the line. 37% of the paintings were made purely through the use of this morpho-technique feature. The second most used is the combination between lines and shapes, 32% of the paintings made by this combination. In third place, appear paintings in which only shapes have been identified, making up 15% of the corpus. In any case, this morpho-technique feature is sometimes, the remains of damaged figures or even random forms. The combinations between lines, points and flat shapes represent 5% of the corpus. The combinations between points and lines represent 10% and the figures made only by using points represent 1% of the corpus (Fig. 23).



	points	points and lines	points, lines and shapes	lines	lines and shapes	shapes
Quantity	9	91	51	352	297	139

Figure 23 - Demonstrative chart choices of execution made by the authors of the rock-art of Paraguaio.

The analysis revealed that, in Paraguaio the preferential way of applying pigment on the walls, was through the use of painting brushes (94 % of the corpus). Several different thicknesses of the stroke has been identified, the less thick being 0,1 cm and the thickest 5 cm. Other ways of adding pigment on the walls have also been equally used, such as the application of pigments through the use of hands (3% of the corpus), or using crude raw material as crayons (3 % of the corpus). This permits assuming that, most of the rock-art in Paraguaio has been done by the use of pigments that have been manipulated or treated.

4.2.1 the use of points

During the analysis it was possible to establish that there were two different uses of points. One of these uses is inwardly related to points making part of anthropomorphic or zoomorphic bodies like head points (Fig. 24, numbers 157, 159 and 189). The other use is related to points spatially closer to each other, composing some clusters. In this case, it was possible to identify that the tip of the fingers were used to apply pigment to shape the points (Fig. 24, numbers 648, 760 and 762).

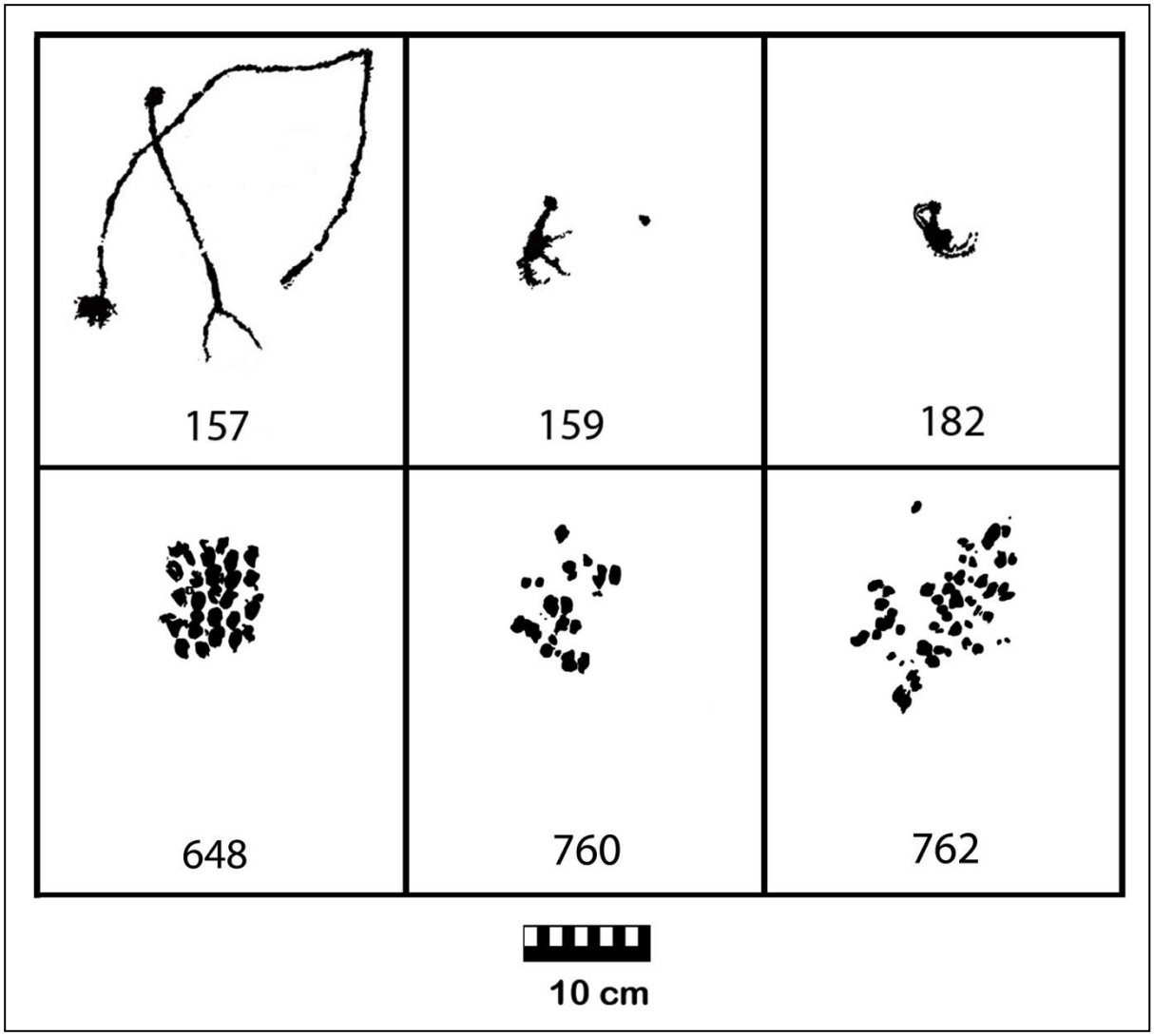


Figure 24 - Examples of points used to arrange figures.

4.2.2 the use of lines

With regard to the lines, it was possible to identify the use of dynamic and straight lines, disposed in 9 types; vertical (Fig. 25, composition number 80, the digital lines of 632, the crayon lines of 631 and the body of 595), horizontal (Fig. 25, the arms of 108 and the body of 600), diagonal (Fig. 25, 199 and 654), sinuous (Fig. 25, 755), zigzag (Fig. 25, 683 and 643), curved up (Fig. 25, the arms of 153, 440, the legs of 452 and the rhea's neck of 424), curved down (Fig. 25 the arm of 451 and the legs of 153), curved left (Fig. 25, the tails of 506, 507, 508, 509, 510, 511 and 512) and curved right (Fig. 25, 552).

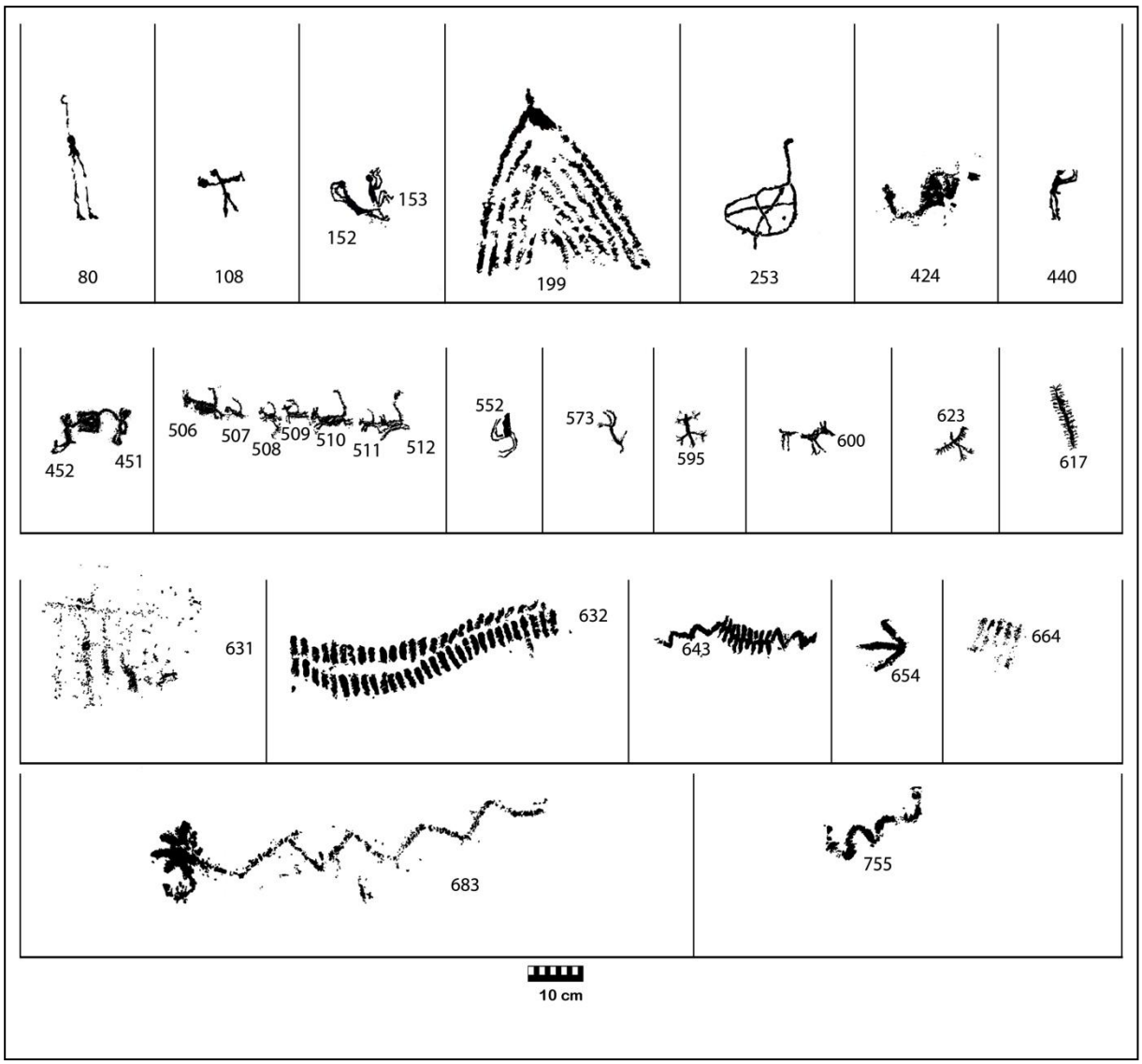


Figure 25 - Examples of lines used to arrange figures.

In Paraguaio, most of the linear figures are combined with some of these 9 types of lines shown bellow, and sometimes a single picture can present 4 different types of lines (Table 5)[26].

Table 5 - Variations of lines used to compose figures in Paraguaio.

Lines and their combinations	Quantity	Observation
continuous line	1	
curved down	1	
curved left	2	
curved up	4	

[26] The general database of this thesis can be checked in the CD.

diagonal	35	with 9 crayon lines
diagonal - curved down	1	
diagonal - curved left	3	
diagonal - curved left - curved right	1	
diagonal - curved right - sinuous	1	
diagonal - horizontal	32	
diagonal - horizontal - curved right	1	
diagonal - horizontal - sinuous	1	
diagonal - sinuous	4	
horizontal	9	
horizontal - curved left	4	
horizontal - curved up	1	
horizontal - sinuous	3	
vertical	70	with 6 crayon lines and 3 digital lines
vertical - curved down	1	
vertical - curved right	1	
vertical - curved right - curved up	1	
vertical - curved up	4	
vertical - diagonal	63	with 1 crayon line
vertical - diagonal - curved left - sinuous	1	
vertical - diagonal - curved right	1	
vertical - diagonal - curved up	1	
vertical - diagonal - horizontal	31	with 1 crayon line
vertical - diagonal - horizontal - curved left	2	
vertical - diagonal - horizontal - curved up	2	
vertical - diagonal - horizontal - zigzag	1	
vertical - horizontal	43	with 2 crayon lines
vertical - horizontal - curved down	1	
vertical - horizontal - curved left	1	
vertical - horizontal - curved up	1	
vertical - horizontal - sinuous	2	
vertical - sinuous	3	
vertical - zigzag	1	
sinuous	18	with 1 crayon line
TOTAL	**353**	

4.2.3 the use of shapes

The analysis of rock-paintings from Paraguaio has revealed that, at least 10 types of shapes, such as oval, circular, rectangular, triangular, concave, concave plan, biconvex, trapezoidal, square and hands (hand print), have been used to compose the figures (Fig. 26).

Variations of these shapes, in terms of coloration and position, have been also identified. The use and the choice of these shapes vary according to the themes represented.

The cases in which the shapes appear isolated, incomplete or with difficult description, were included in a category designated as flat shape. For some cases, it was possible to describe the main characteristics of the flat shapes that appear isolated. For instance, it was possible to identify, if they were rectangles or circles and how they configured the space. This happened for the flat shape 630 (Fig. 26), that has been identified as an oval colored diagonal, while the flat shape 692 (Fig. 26), has been identified as a colored triangular shape, or even 752 (Fig. 26), that has been identified as a rectangular flat shape filled in with vertical lines.

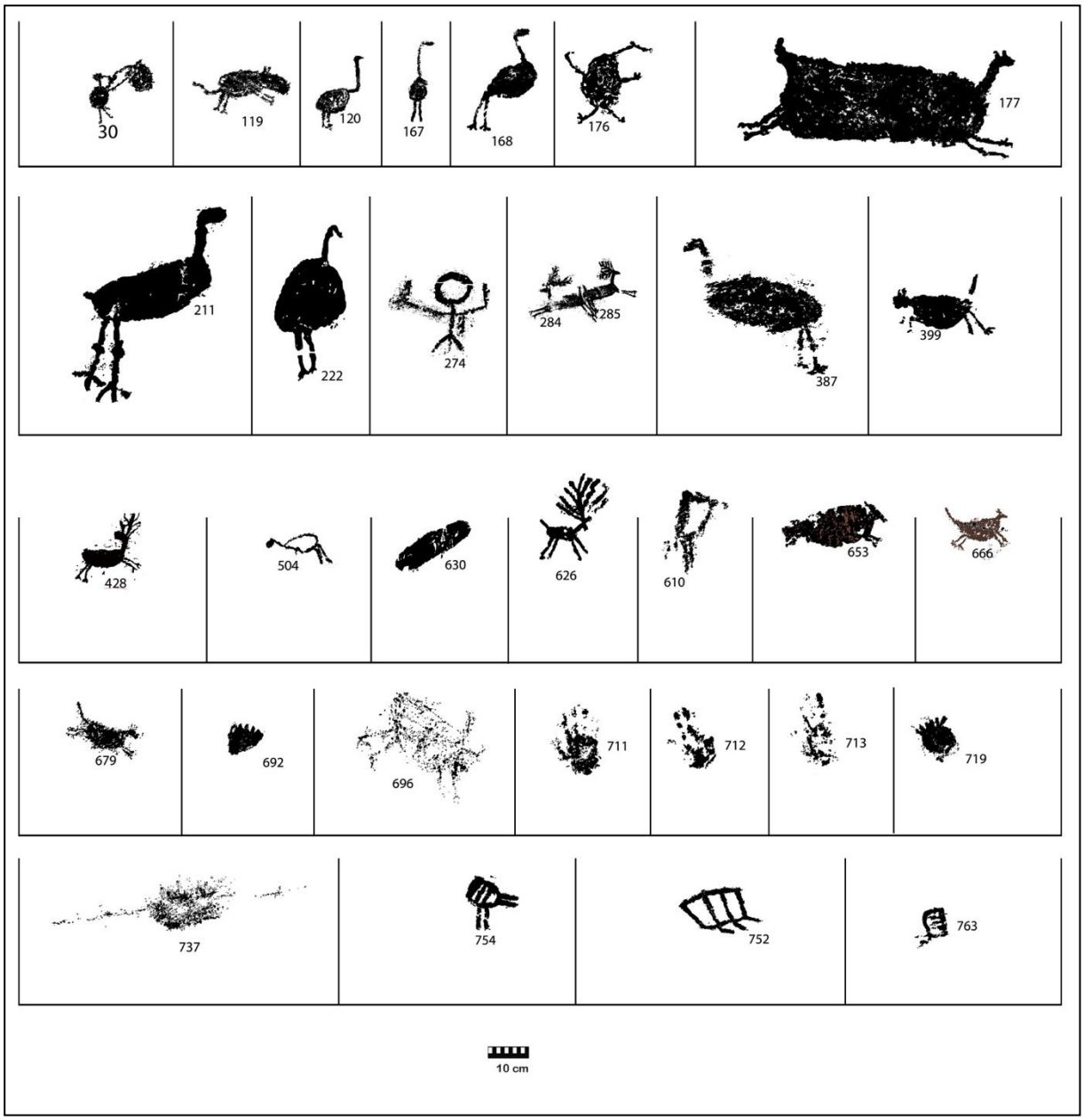


Figure 26 - Types of shapes used to arrange figures in Paraguaio.

In Paraguaio the shapes were mostly used to define the bodies of the painted figures. This means that during the process of materialization of the idea, a specific type of shape was used to define its body (Table 6).

Table 6 - Types of shapes used isolated to compose figures in Paraguaio.

Shapes	Quantity	Observations
flat shape	62	with 5 case filled up with crayon
biconvex vertical filled with a vertical line	1	
circular filled	32	
circular leaked	2	
concave plan filled	2	
hand print	6	
oval diagonal filled	5	
oval diagonal leaked	2	
oval horizontal filled	3	with 1 case filled up with crayon
oval vertical filled	6	
rectangular diagonal filled	2	
rectangular diagonal filled with vertical lines	1	
rectangular filled with vertical lines	1	
rectangular horizontal filled	3	with 1 case filled up with crayon
rectangular sinuous filled	1	
rectangular vertical filled	3	
rectangular vertical filled with vertical line	1	
square half filled and half leaked	1	
triangular filled	3	
triangular leaked	2	
TOTAL	**139**	

4.2.4 Combinations between morpho-technique features

Combinations between the morpho-technique features were identified in 438 figures, in which lines and shapes represent 68% (297 figures), points and lines represent 20% (90 figures) and combinations between points, lines and shapes represent 12% (51 figures). Variations between points and lines, shapes and lines, points, lines and shapes have been identified (Table 7).

For the combinations between points and lines it was possible to identify, at least, four variations of lines associated to a point that could compose a single figure. When lines and

points compose a figure, normally, the lines tend to arrange the bodies and the points arrange the heads (for example, paintings number 157 and 108).

Table 7 - Combinations between variations of points and lines used to compose paintings in Paraguaio.

Points	Lines	Quantity
point	curved left	1
point (head)	curved left - curved right	1
point (head)	curved right	1
point	diagonal	1
point (head)	diagonal - curved left	2
point (head)	diagonal - curved up	1
point (head)	diagonal - horizontal	3
point (head)	diagonal - horizontal - curved right	1
point (head)	diagonal - sinuous	1
point	horizontal	1
point (head)	sinuous	4
point	vertical	1
point (head)	vertical	2
point (head)	vertical - curved down	1
point (head)	vertical - curved down - curved up	8
point (head)	vertical - curved down - sinuous	2
point (head)	vertical - curved up	2
point (head)	vertical - curved up - sinuous	1
point (head)	vertical - diagonal	28
point	vertical - diagonal	1
point (head)	vertical - diagonal - curved down - curved left	1
point (head)	vertical - diagonal - curved left	1
point (head)	vertical - diagonal - curved right	1
point (head)	vertical - diagonal - curved up	2
point (head)	vertical - diagonal - horizontal	5
point (head)	vertical - diagonal - horizontal - sinuous	1
point (head)	vertical - diagonal - sinuous	3
point (head)	vertical - horizontal	9
point (head)	vertical - horizontal - curved down	1
point	vertical - horizontal - sinuous	1
point	vertical - sinuous	1
point (head)	vertical - sinuous	1
TOTAL		**90**

In Paraguaio, very little paintings composed by combinations between lines and shapes could not be described or identified. In any case, it is known that these flat shapes were associated with lines (Table 8).

Table 8 - Variations of lines and shapes not identified.

Types of lines	Types of shapes	Quantity	Observations
curved down	flat shape	2	
curved up	flat shape	1	
diagonal	flat shape	4	
diagonal and curved down	flat shape	1	
diagonal and horizontal	flat shape	2	
horizontal	flat shape	1	
vertical	flat shape	9	with 2 crayon lines
vertical and diagonal	flat shape	3	
vertical and horizontal	flat shape	4	with 1 crayon line
sinuous	flat shape	1	
	TOTAL	**28**	

Figures composed by lines associated with circular flat shapes occur very often. Figures with these arrangements do not show more than three variations of lines associated with a circular shape. However, some paintings showed three variations of lines associated with two variations of shapes, although, this rarely happens. Variations of these templates, specifically of the circular shapes have been attested, for example, with circular shapes not filled in or filled in with other shapes or lines (Table 9).

Table 9 - Combinations between variations of lines and circular shapes used to arrange paintings in Paraguaio.

Types of lines	Types of shape	Quantity	Observation
curved up	circular filled	2	
diagonal	circular filled	10	with 1 crayon line
diagonal and curved right	circular filled	1	
diagonal, curved up and curved right	circular filled	1	
diagonal and horizontal	circular filled	3	
diagonal, horizontal and curved right	circular filled	1	
diagonal and sinuous	circular filled	3	
horizontal	circular filled	1	
sinuous	circular filled	4	
vertical	circular filled	11	

vertical and diagonal	circular filled	17	
vertical, diagonal and horizontal	circular filled	3	
vertical, diagonal and sinuous	circular filled	2	
vertical and horizontal	circular filled	11	
vertical and sinuous	circular filled	2	
zigzag	circular filled	1	
curved left - curved right	circular filled and circular leaked around the head	1	
vertical - diagonal - horizontal	circular leaked and circular filled	1	
vertical - curved left - curved right	circular filled and oval vertical filled	1	
vertical - diagonal - zigzag	circular filled with another circle and radial lines	1	
diagonal	circular leaked	1	
vertical	circular leaked	4	
vertical and curved down	circular leaked	1	
vertical, diagonal and horizontal	circular leaked	2	
diagonal	circular leaked around the head	1	
horizontal	circular leaked around the head	1	
vertical - diagonal	circular leaked around the head oval vertical filled	1	
vertical - diagonal	circular leaked around the head and oval vertical an horizontal	1	
TOTAL		**89**	

Among the shapes, it was identified that, the concave-plan type was used exclusively to compose zoomorphic depictions. This type of shape normally appears associated with lines. Once more, variations on the combination of morpho-technique features have not exceeded more than four combinations (Except for one case, in which a composition was arranged by vertical lines, diagonal, curved left and curved right, associated with a concave-plan shape filled in) (Table 10).

Other variations of concave shapes have been identified, such as, figures arranged with concave shapes (two of them composing an anthropomorphic figure). Also convex and biconvex types have been identified, exclusively composing, zoomorphic depictions.

Table 10 - Combinations between variations of lines, concave and convex shapes used to arrange paintings in Paraguaio.

Types of lines	Types of shape	Quantity	Observation
diagonal	biconvex horizontal filled	3	
vertical - diagonal	convex horizontal filled	1	
vertical	concave horizontal filled	1	
vertical and diagonal	concave horizontal filled	2	
diagonal	concave plan filled	8	with 2 crayon
vertical	concave plan filled	1	
vertical and diagonal	concave plan filled	6	with 1 crayon
vertical, diagonal and horizontal	concave plan filled	1	
vertical and horizontal	concave plan filled	2	
diagonal and horizontal	concave plan filled with vertical line	2	
vertical, diagonal, curved left and curved right	concave plan filled with vertical line	1	
diagonal	concave plan leaked	2	
vertical and diagonal	concave vertical filled	1	
vertical, diagonal and sinuous	concave vertical leaked	1	
TOTAL		**32**	

The oval shapes are also utilized often and most are used to compose zoomorphic and anthropomorphic figures. Variations also have been identified, especially in terms of fillings and positions (Table 11). In any matter, they do not exceed four variations of combinations of morpho-technique features to compose a single picture.

Table 11 - Combinations between variations of lines and oval shapes used to arrange paintings in Paraguaio.

Types of lines	Types of shape	Quantity	Observation
diagonal	oval diagonal filled	4	
diagonal and horizontal	oval diagonal filled	1	
vertical	oval diagonal filled	4	
vertical and diagonal	oval diagonal filled	11	
vertical, diagonal and horizontal	oval diagonal filled	6	
vertical and horizontal	oval diagonal filled	1	
vertical and horizontal	oval diagonal filled with diagonal lines	1	
vertical and diagonal	oval diagonal leaked	2	
diagonal	oval horizontal filled	1	

diagonal and horizontal	oval horizontal filled	1	
diagonal and sinuous	oval horizontal filled	1	
horizontal	oval horizontal filled	2	with 1 crayon line
vertical	oval horizontal filled	3	
vertical and diagonal	oval horizontal filled	7	
vertical and horizontal	oval horizontal filled	1	
vertical and horizontal	oval horizontal filled with horizontal bands	2	
diagonal	oval horizontal leaked	1	
curved up and sinuous	oval sinuous filled	1	
diagonal and curved up	oval sinuous filled	1	
vertical	oval sinuous filled	5	
vertical and diagonal	oval sinuous filled	4	with 2 crayon lines
vertical, diagonal and horizontal	oval sinuous filled	1	
diagonal	oval sinuous leaked	1	
diagonal	oval vertical filled	2	with 1 crayon line
diagonal and horizontal	oval vertical filled	1	
horizontal	oval vertical filled	1	
vertical	oval vertical filled	7	
vertical - diagonal	oval vertical filled	1	
vertical, diagonal and curved left	oval vertical filled	2	
vertical, diagonal and horizontal	oval vertical filled	3	with 1 crayon line
vertical and sinuous	oval vertical filled	1	
diagonal	oval vertical filled with a vertical line	1	
sinuous and curved right	oval vertical filled and circular filled	1	
vertical	oval vertical leaked	1	
vertical and curved down	oval vertical leaked	1	
vertical and diagonal	oval vertical leaked	1	
vertical, diagonal and horizontal	oval vertical leaked	1	
TOTAL		**86**	

The rectangular shapes have been used to compose anthropomorphic and zoomorphic figures. The variations are in terms of position and fillings, and as a rule, they do not exceed

four variations of combinations of morpho-technique features to compose a single picture (Table 12).

Table 12 - Combinations between variations of lines and rectangular shapes used to arrange paintings in Paraguaio.

Types of lines	Types of shape	Quantity	Observation
curved up and sinuous	rectangular diagonal filled	1	
diagonal	rectangular diagonal filled	1	
vertical and curved up	rectangular diagonal filled	1	
vertical and diagonal	rectangular diagonal filled	2	
vertical, diagonal and horizontal	rectangular diagonal filled	1	
vertical and diagonal	rectangular diagonal filled by diagonal lines	2	
diagonal	rectangular horizontal filled	5	
diagonal and horizontal	rectangular horizontal filled	1	
diagonal and horizontal	rectangular horizontal filled with horizontal lines	1	
horizontal	rectangular horizontal filled	1	
vertical	rectangular horizontal filled	3	
vertical and diagonal	rectangular horizontal filled	8	with 1 crayon
vertical, diagonal and curved left	rectangular horizontal filled	1	
vertical and horizontal	rectangular horizontal filled	1	
vertical	rectangular sinuous filled	1	
vertical, diagonal and sinuous	rectangular sinuous filled	1	
diagonal and horizontal	rectangular vertical filled	2	
horizontal	rectangular vertical filled	3	
horizontal and curved up	rectangular vertical filled	1	
sinuous	rectangular vertical filled	1	
vertical	rectangular vertical filled	3	
vertical and diagonal	rectangular vertical filled	2	
vertical, diagonal and curved up	rectangular vertical filled	3	
vertical, horizontal and curved up	rectangular vertical filled	2	
vertical, diagonal and horizontal	rectangular vertical filled and circular filled	1	
vertical, sinuous and zigzag	rectangular vertical filled and circular filled	1	
diagonal	rectangular vertical filled and square filled	1	

diagonal	rectangular vertical filled with horizontal lines	1	
curved up	rectangular vertical leaked	1	
	TOTAL	**53**	

Other types of shapes have been identified in very low quantities, like squares, trapezoids and triangles (Table 13).

Table 13 - Combinations between variation of lines and square, trapezoidal and triangular shapes, used to arrange paintings in Paraguaio.

Types of lines	Other types of shape	Quantity
vertical	square	1
diagonal	trapezoidal diagonal filled	1
diagonal and horizontal	trapezoidal diagonal filled with vertical lines	1
diagonal	trapezoidal horizontal filled	1
vertical	triangular filled	2
vertical and diagonal	triangular filled	1
vertical, diagonal, curved down, curved left and curved right	triangular filled	1
vertical and horizontal	triangular filled	1
TOTAL		**9**

In Paraguaio, other types of paintings were composed by the use of three different morpho-technique features, like points, lines and shapes (Table 14). Most of the pictures composed by these combinations are anthropomorphs.

The use of points was restricting to draw the head of the anthropomorphs. The lines were used to compose their limbs and the shapes to compose their bodies. In all the cases only three variations of lines were used combined with the shapes. The shapes varied in terms in position and filling-

Table 14 - Combinations between points, variation of lines, convex and circular shapes, used to arrange paintings in Paraguaio.

Points	Types of lines	Types of shape	Quantity
head point	vertical and horizontal	biconvex diagonal filled	1
head point	diagonal	circular filled	3
head point	diagonal and sinuous	circular filled	2
head point	sinuous	circular filled	1
head point	vertical	circular filled	1

head point	vertical and diagonal	circular filled	2
head point	vertical, diagonal and curved left	circular filled	1
head point	vertical, diagonal and curved up	circular filled	1
head point	vertical, diagonal and horizontal	circular filled	1
head point	vertical, diagonal, horizontal and curved up	circular filled	1
head point	vertical, diagonal and sinuous	circular filled	2
head point	vertical and sinuous	circular filled	1
head point	sinuous	circular leaked	1
head point	vertical	circular leaked around the head	1
head point	vertical and diagonal	circular leaked around the head	6
head point	vertical and horizontal	circular leaked around the head	1
head point	vertical, diagonal and sinuous	circular leaked around the head	1
head point	vertical, horizontal and curved down	concave plan filled	1
head point	vertical and diagonal	oval diagonal filled	2
head point	sinuous	oval diagonal filled	2
head point	diagonal, horizontal and sinuous	oval horizontal filled	1
head point	horizontal	oval horizontal filled	1
head point	vertical, diagonal and sinuous	oval horizontal filled	1
head point	vertical and diagonal	oval horizontal filled with vertical lines	1
head point	vertical and diagonal	oval horizontal leaked	1
head point	curved left and curved right	oval vertical filled	1
head point	diagonal	oval vertical filled	1
head point	vertical	oval vertical filled	1
point	vertical	oval vertical filled	1
head point	vertical and diagonal	oval vertical filled	4
head point	vertical and diagonal	oval vertical leaked	3
head point	vertical, diagonal and horizontal	oval vertical leaked	1
head point	sinuous	oval vertical filled and circular leaked around the head	1

head point	vertical and horizontal	rectangular sinuous filled	1
		TOTAL	**51**

4.2.5 the use of spaces

During the analysis three different uses of spaces were identified, vertically is predominant in the lower sector, while horizontally is predominant in the upper sector, as also the use of pebbles as canvas. The vertical use refers to the choice of vertical walls, on which the panels were set. The horizontal use of spaces refers to the choice of horizontal ceilings, where some panels were made. The use of pebbles refers to the pebbles composing the conglomerate as panels. The order of use shows that the vertical space is the most frequent, at 64%, while the horizontal space is 25%, and the use of pebbles is 11%.

4.2.6 the use of colors

In terms of colors, it was identified that 930 figures were painted in red color, 5 figures are bichromatic, utilizing red and black, 3 figures are grey and 1 figure is purely black. In terms of percentage, the red represents 99%, the red and black represent 1% and the others do not reach 1%.

Pigment samples have been withdrawn from the site to identify their physicochemical compounds and the results are being awaited.

4.3 IDENTITY TENDENCIES

Considering the use of the morpho-technique features, their similarities, their arrangements and templates, it was possible to identify, 99 compositions that have their morpho-technique histories shared between 33 different sets of painting expertise. This 33 expertise knowledge could be result of different identities that painted the site, likely meaning that at least 28 different individuals executed 86 figures (Table 15 and Fig. 27, 28 and 29). It was also possible to identify that 13 figures comprised in 5 identities (5, 7, 14, 16 and 28) presented few differences in their morpho-technique. This allowed assuming that these paintings from identity tendency 5, 7, 14 and 16 could have been done by different persons that shared the same rules of painting, likely they could be members of the same group.

The compositions number 19, 116, 228 and 347 comprise the identity tendency number 5. The compositions 27 and 70 comprise the identity tendency number 7. The compositions 143, 146, 150, 188, 190 and 218 comprise the identity tendency number 14. The compositions number 211 and 213 comprise the identity tendency number 16 and the compositions 702 and 810 comprise the identity tendency number 28.

Those compositions show the same templates with some differences related to the morpho-technique, which can be explained by the use of an individual style of persons that shared the same painting knowledge. The identity tendencies 5, 14 and 28, present paintings on different panels around the site. In any case, the tendencies 5, 7, 14 and 16 are in the lower sector, while the tendency 28 is in the upper sector.

All the other identity tendencies are composed by figures that showed morpho-technique similarity, resulting in very similar templates. This suggests that there was consistence on following the rules of painting.

The tendency number 15 (composed by figures number 210, 212 and 214) was the only case identified in which, a zoomorph and an anthropomorph shared a similar morpho-technique, with very few variations in the template. In any case, both compositions are placed on the same panel. The tendency 16, composed by two zoomorphic figures (the number 211 and 213) also showed some difference in their templates. In any case, they share a similar morpho-technique.

Table 15 - Description of 33 identity tendencies identified in Paraguaio, through the analysis of rock-art.

sector	panel	composition	tendencies	tendency number	figure's integrity	interpretation	type of spaces	colors
lower sector	1	2	vertical and horizontal	1	incomplete (cracked panel)	zoomorph - cervid	vertical	red
lower sector	1	4	vertical and horizontal	1	incomplete (cracked panel)	zoomorph - cervid	vertical	red
lower sector	1	13	vertical and oval sinuous filled	2	complete	zoomorph	vertical	red
lower sector	1	14	vertical and oval sinuous filled	2	complete	zoomorph	vertical	red

lower sector	1	15	head point, vertical and diagonal	3	incomplete	anthropomorph	vertical	red
lower sector	1	17	head point, vertical and diagonal	3	incomplete	anthropomorph	vertical	red
lower sector	1	16	diagonal - horizontal - curved right	4	incomplete	anthropomorph	vertical	red
lower sector	1	18	diagonal - curved left	4	incomplete	anthropomorph	vertical	red
lower sector	1	19	broken lines	5	incomplete (cracken panel)	not identified	vertical	red
lower sector	3B	116	broken lines	5	complete	zoomorph	vertical	red
lower sector	3F	228	continuous lines	5	incomplete	zoomorph - cervid	vertical	red
lower sector	5B	347	broken lines	5	complete	zoomorph - rhea	vertical	red
lower sector	2	21	vertical, diagonal and rectangular horizontal filled	6	complete	zoomorph	vertical	red
lower sector	2	22	vertical, diagonal and rectangular horizontal filled	6	complete	zoomorph	vertical	red
lower sector	2	27	vertical, diagonal and oval horizontal filled	7	complete	zoomorph	vertical	red
lower sector	2	70	diagonal and rectangular horizontal filled	7	incomplete	zoomorph	vertical	red
lower sector	2	57	vertical and oval vertical filled	8	complete	zoomorph - rhea	vertical	red
lower sector	2	58	vertical and oval vertical filled	8	complete	zoomorph - rhea	vertical	red

lower sector	2	59	vertical and oval vertical filled	8	complete	zoomorph - rhea	vertical	red
lower sector	2	60	vertical and oval diagonal filled	9	complete	zoomorph - rhea	vertical	red
lower sector	2	61	vertical and oval diagonal filled	9	complete	zoomorph - rhea	vertical	red
lower sector	2	62	vertical and oval diagonal filled	9	complete	zoomorph - rhea	vertical	red
lower sector	2	63	vertical and oval diagonal filled	9	incomplete	zoomorph - rhea	vertical	red
lower sector	3A	76	diagonal and biconvex horizontal filled	10	incomplete	zoomorph - cervid	vertical	red
lower sector	3A	79	diagonal and biconvex horizontal filled	10	incomplete	zoomorph - cervid	vertical	red
lower sector	3B	81	vertical - diagonal	11	incomplete	anthropomorph	vertical	red
lower sector	3B	82	vertical - diagonal	11	incomplete	anthropomorph	vertical	red
lower sector	3B	83	vertical	11	incomplete	anthropomorph	vertical	red
lower sector	3B	84	vertical - diagonal	11	incomplete	anthropomorph	vertical	red
lower sector	3B	85	head point and vertical - diagonal	11	incomplete	anthropomorph	vertical	red
lower sector	3B	86	head point and vertical - diagonal	11	incomplete	anthropomorph	vertical	red
lower sector	3B	97	vertical and oval horizontal filled	12	complete	zoomorph	vertical	red
lower sector	3B	98	vertical, diagonal and oval horizontal filled	12	complete	zoomorph	vertical	red

lower sector	3B	105	vertical and circular filled	13	complete	zoomorph	vertical	red
lower sector	3B	106	vertical and circular filled	13	complete	zoomorph	vertical	red
lower sector	3C	143	head point, sinuous and oval vertical filled and circular leaked around the head	14	complete	anthropomorph - male	vertical	red
lower sector	3C	146	head point, vertical and diagonal circular leaked around the head	14	complete	anthropomorph	vertical	red
lower sector	3C	150	vertical, diagonal, sinuous and circular leaked around the head	14	complete	anthropomorph - male	vertical	red
lower sector	3E	188	head point, vertical, diagonal and oval vertical filled and circular leaked around the head	14	complete	anthropomorph	vertical	red
lower sector	3E	190	head point, vertical, diagonal and oval vertical filled and circular leaked around the head	14	complete	anthropomorph	vertical	red

lower sector	3F	218	head point, vertical diagonal and circular leaked around the head	14	complete	anthropomorph	vertical	red
lower sector	3F	210	head point, vertical, diagonal and oval vertical leaked	15	complete	anthropomorph	vertical	red
lower sector	3F	212	head point, vertical, diagonal and oval vertical leaked	15	complete	anthropomorph	vertical	red
		214	vertical, diagonal and oval diagonal leaked	15	complete	zoomorph - rhea	vertical	red
lower sector	3F	211	vertical, diagonal and oval diagonal filled	16	complete	zoomorph - rhea	vertical	red
lower sector	3F	213	vertical, diagonal and oval diagonal filled	16	complete	zoomorph - rhea	vertical	red
lower sector	3F	216	vertical, horizontal, diagonal and oval diagonal filled	17	complete	zoomorph - cervid	vertical	red
lower sector	3F	227	vertical, horizontal, diagonal and oval diagonal filled	17	complete	zoomorph - cervid	vertical	red
lower sector	3F	220	vertical and circular filled	18	complete	zoomorph - rhea	vertical	red
lower sector	3F	222	vertical and circular filled	18	complete	zoomorph - rhea	vertical	red
lower sector	3F	223	vertical and circular filled	18	complete	zoomorph - rhea	vertical	red

lower sector	3F	224	vertical and circular filled	18	complete	zoomorph - rhea	vertical	red
lower sector	3F	225	vertical and circular filled	18	complete	zoomorph - rhea	vertical	red
lower sector	4D	284	vertical, diagonal and rectangular diagonal filled by diagonal lines	19	complete	zoomorph - cervid	vertical	red
lower sector	4D	285	vertical, diagonal and rectangular diagonal filled by diagonal lines	19	complete	zoomorph - cervid	vertical	red
lower sector	4E	308	vertical, diagonal, horizontal and oval diagonal filled	20	complete	zoomorph - cervid	vertical	red
lower sector	4E	309	vertical, diagonal, horizontal and oval diagonal filled	20	complete	zoomorph - cervid	vertical	red
lower sector	4E	310	vertical, diagonal, horizontal and concave plan filled	20	complete	zoomorph - cervid	vertical	red
lower sector	5A	327	vertical, curved down and sinuous	21	complete	anthropomorph	vertical	red
lower sector	5A	328	vertical, curved down and sinuous	21	complete	anthropomorph	vertical	red
lower sector	5B	345	diagonal, horizontal oval horizontal filled with horizontal bands	22	complete	zoomorph - cervid	vertical	red

lower sector	5B	346	diagonal, horizontal oval horizontal filled with horizontal bands	22	complete	zoomorph - cervid	vertical	red
upper sector	6A	541	vertical, curved down and curved up	23	incomplete	anthropomorph	horizontal - ceiling	red
upper sector	6A	542	vertical, curved down and curved up	23	incomplete	anthropomorph	horizontal - ceiling	red
upper sector	6A	543	vertical, curved down and curved up	23	incomplete	anthropomorph	horizontal - ceiling	red
upper sector	6A	544	vertical, curved down and curved up	23	incomplete	anthropomorph	horizontal - ceiling	red
upper sector	6A	545	vertical, curved down and curved up	23	incomplete	anthropomorph	horizontal - ceiling	red
upper sector	6A	546	vertical, curved down and curved up	23	incomplete	anthropomorph	horizontal - ceiling	red
upper sector	6A	547	vertical, curved down and curved up	23	incomplete	anthropomorph	horizontal - ceiling	red
upper sector	6A	556	diagonal and horizontal	24	complete	zoomorph - cervid	horizontal - ceiling	red
upper sector	6A	557	diagonal and horizontal	24	complete	zoomorph - cervid	horizontal - ceiling	red
upper sector	6A	563	diagonal and horizontal	24	complete	zoomorph - cervid	horizontal - ceiling	red
upper sector	6B	592	vertical, diagonal and horizontal	25	complete	zoomorph - lizard	horizontal - ceiling	red
upper sector	6B	595	vertical, diagonal and horizontal	25	complete	zoomorph - lizard	horizontal - ceiling	red
upper sector	7A	640	vertical, diagonal and horizontal	25	complete	zoomorph - lizard	horizontal - ceiling	red

upper sector	6B	598	vertical, diagonal and horizontal	26	complete	zoomorph - bird	horizontal - ceiling	red
upper sector	6B	599	vertical, diagonal and horizontal	26	complete	zoomorph - bird	horizontal - ceiling	red
upper sector	6B	622	vertical, diagonal and horizontal	26	incomplete	zoomorph - bird	horizontal - ceiling	red
upper sector	6B	623	vertical, diagonal and horizontal	26	incomplete	zoomorph - bird	horizontal - ceiling	red
upper sector	7A	666	diagonal	27	complete	zoomorph	horizontal - ceiling	red
upper sector	7A	679	diagonal and horizontal	27	complete	zoomorph	horizontal - ceiling	red
upper sector	7A	682	diagonal	27	complete	zoomorph	horizontal - ceiling	red
upper sector	7A	702	vertical, horizontal and circular filled	28	complete	not identified	horizontal - ceiling	red
upper sector	7F	810	vertical, horizontal and circular filled	28	complete	not identified	horizontal - ceiling	red
upper sector	7B	710	hand print	29	incomplete	hand print	vertical - ceiling	red
upper sector	7B	711	hand print	29	complete	hand print	vertical - ceiling	red
upper sector	7B	712	hand print	29	incomplete	hand print	vertical - ceiling	red
upper sector	7B	713	hand print	29	incomplete	hand print	vertical - ceiling	red
upper sector	7D	754	vertical, horizontal and oval diagonal filled with diagonal lines	30	complete	not identified	vertical	red

upper sector	7D	763	diagonal, horizontal and rectangular vertical filled with horizontal lines	30	complete	not identified	vertical	red
upper sector	8B	876	diagonal and rectangular horizontal filled	31	complete	zoomorph - cervid	pebbles support	red
upper sector	8B	877	diagonal and rectangular horizontal filled	31	complete	zoomorph - cervid	pebbles support	red
upper sector	8C	899	vertical and circular leaked around the head	32	complete	anthropomorph	pebbles support	red
upper sector	8C	900	vertical, diagonal and circular leaked around the head	32	incomplete	anthropomorph	pebbles support	red
upper sector	8C	901	vertical, diagonal and circular leaked around the head	32	complete	anthropomorph	pebbles support	red
upper sector	8F	934	vertical, diagonal, curved up and flat shape - rectangular vertical filled	33	complete	anthropomorph - male	pebbles support	red
upper sector	8F	935	vertical, diagonal, curved up and flat shape - rectangular vertical filled	33	complete	anthropomorph - male	pebbles support	red

upper sector	8F	936	vertical, diagonal, curved up and flat shape - rectangular vertical filled	33	incomplete	anthropomorph - male	pebbles support	red

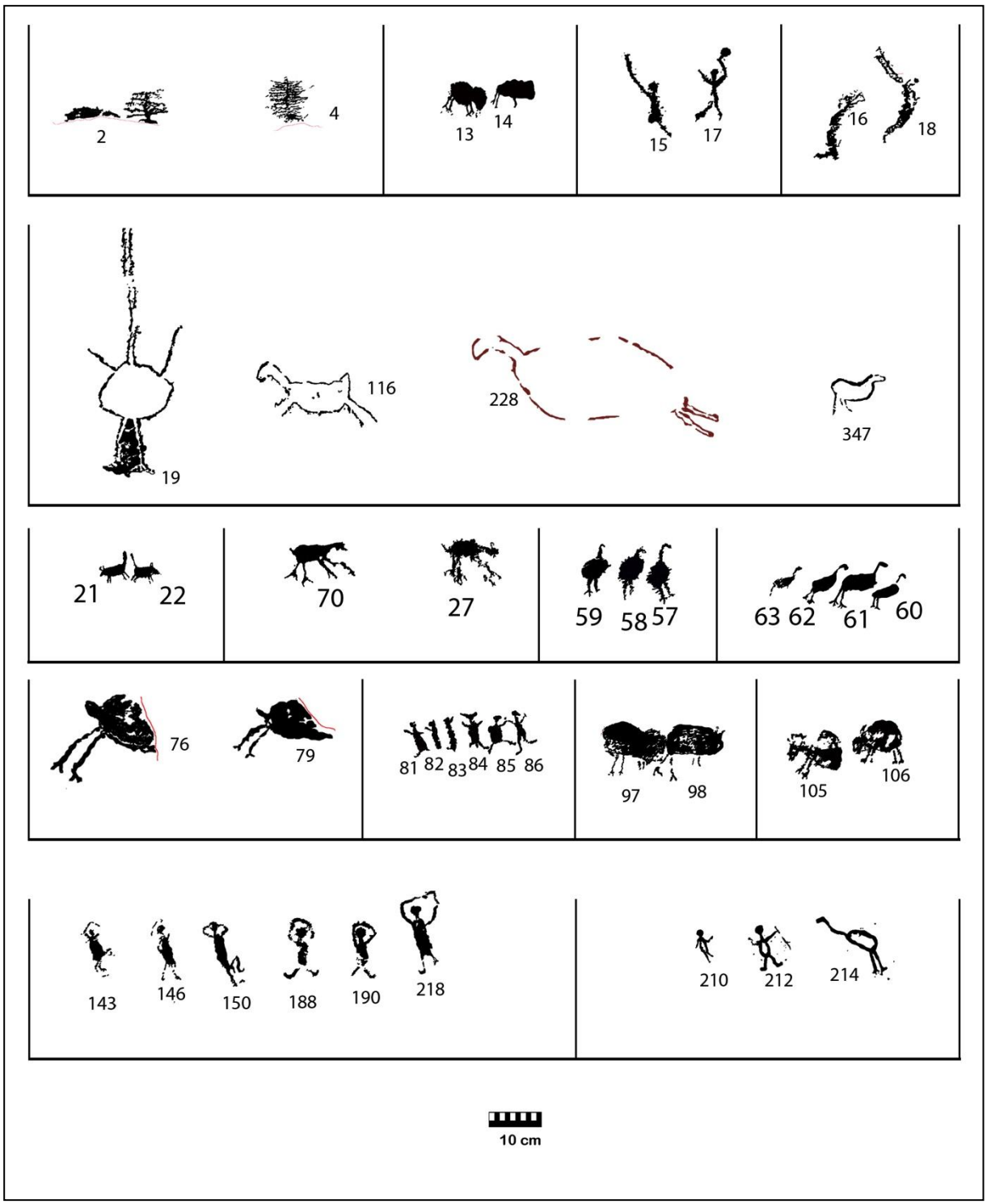


Figure 27 - Identity tendencies found in Paraguaio through the analysis of rock-art (lower sector).

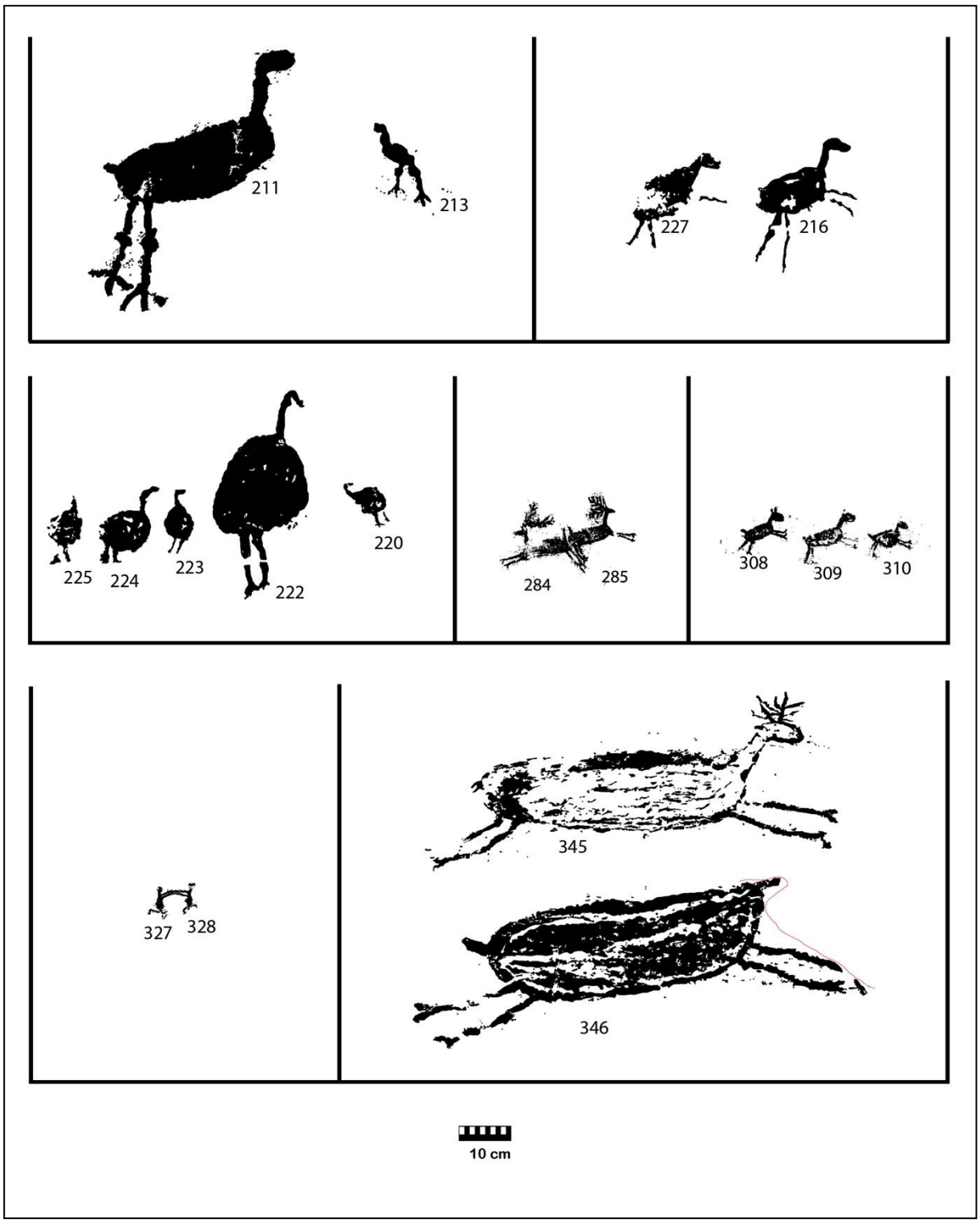


Figure 28 - Identity tendencies found in Paraguaio through the analysis of rock-art (lower sector).

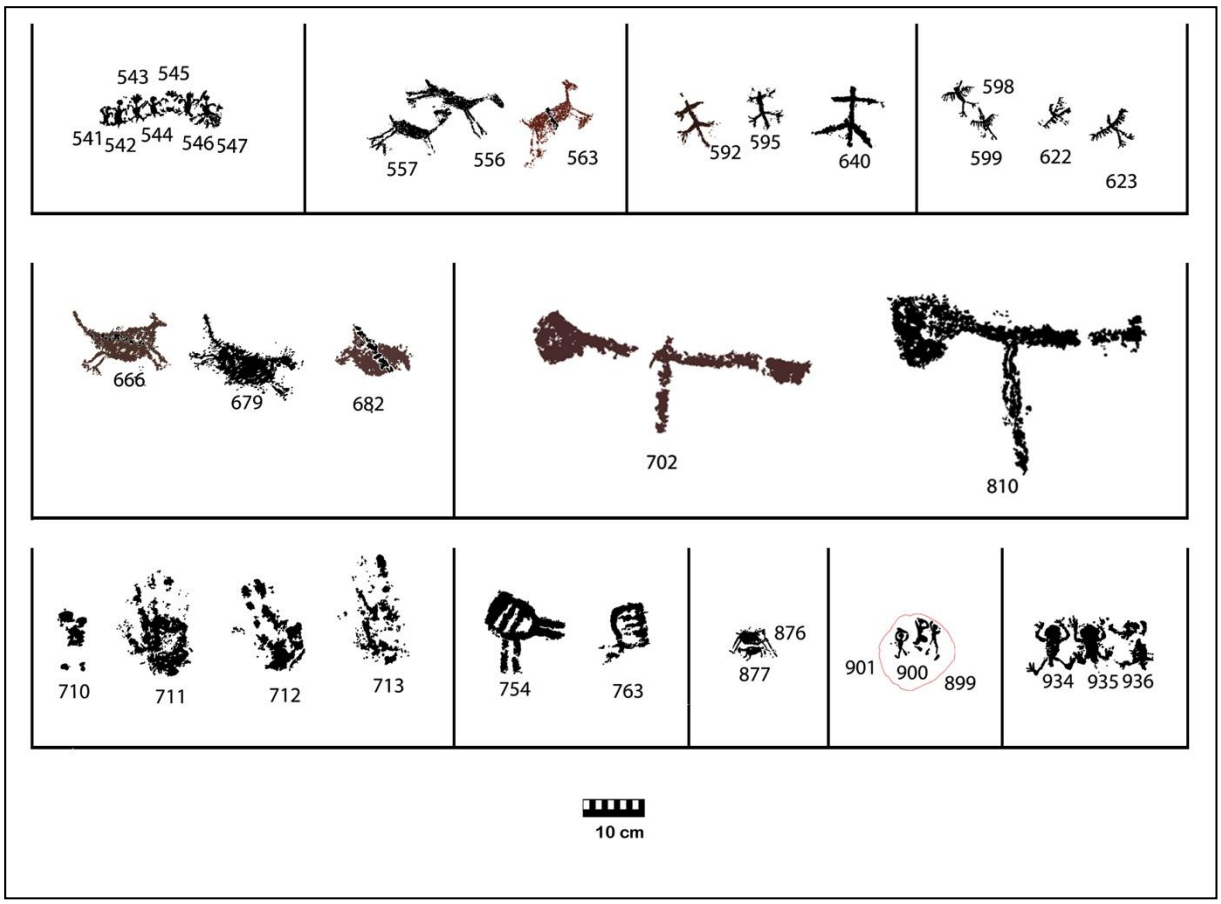


Figure 29 - Identity tendencies found in Paraguaio through the analysis of rock-art (upper sector).

The clearer identity tendencies are shown below (Fig. 30, 31, 32 and 33) in a picture that demonstrates their morphologies and their techniques of execution through the combinations between the universal morpho-technique features.

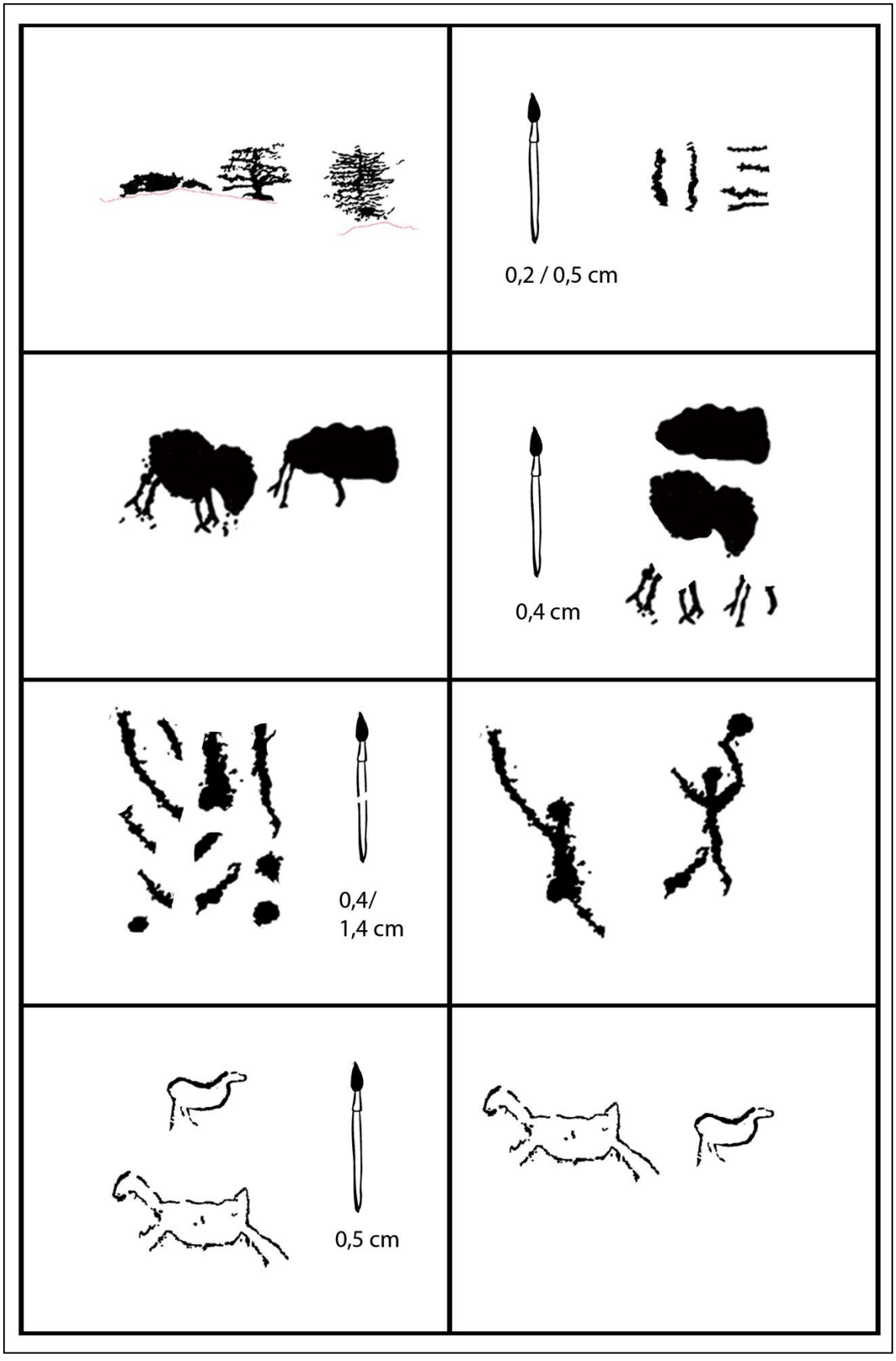


Figure 30 - Presentation morpho-technique of the identity tendencies found in Paraguaio through the analysis of rock-art (lower sector).

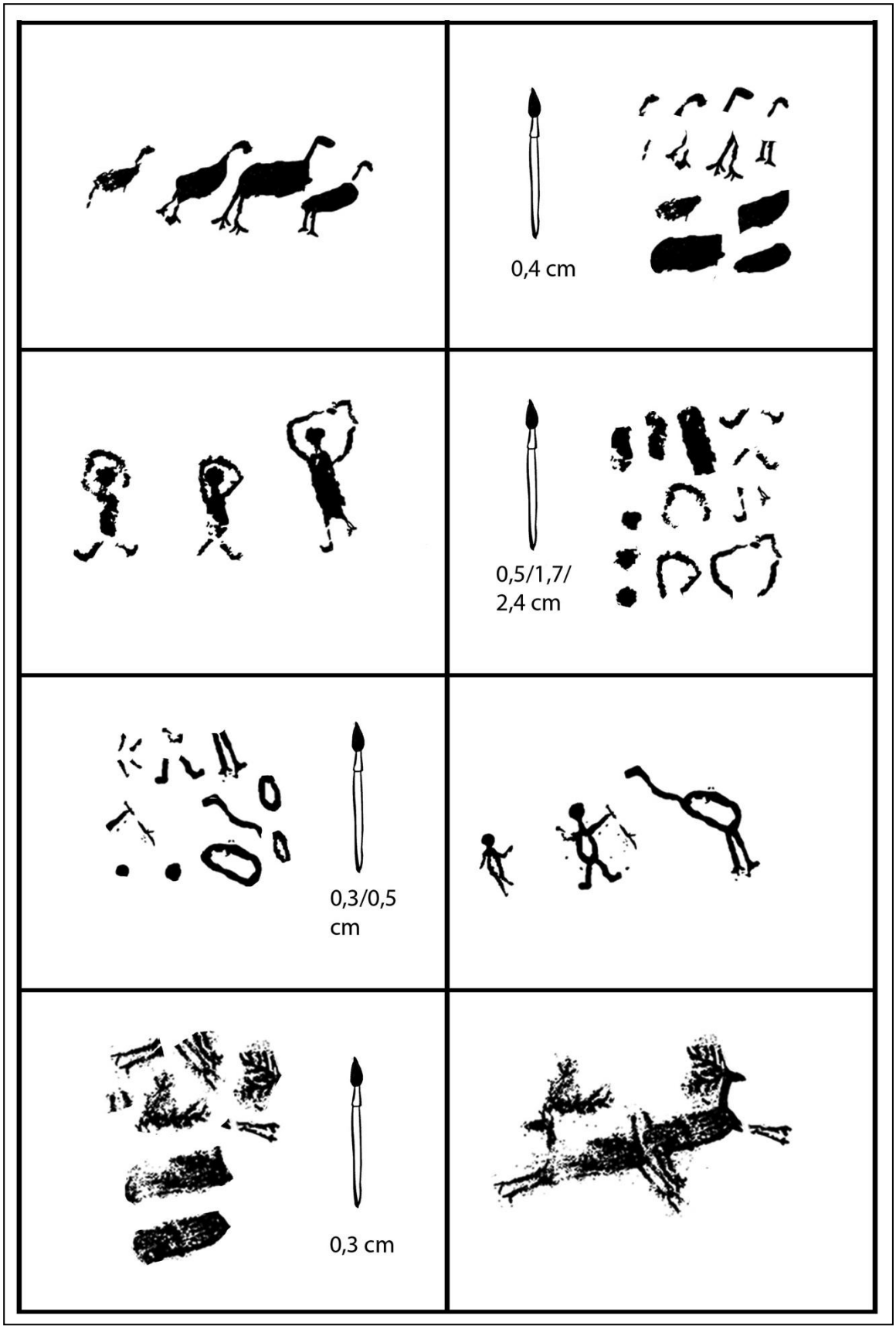


Figure 31 - Presentation morpho-technique of the identity tendencies found in Paraguaio through the analysis of rock-art (lower sector).

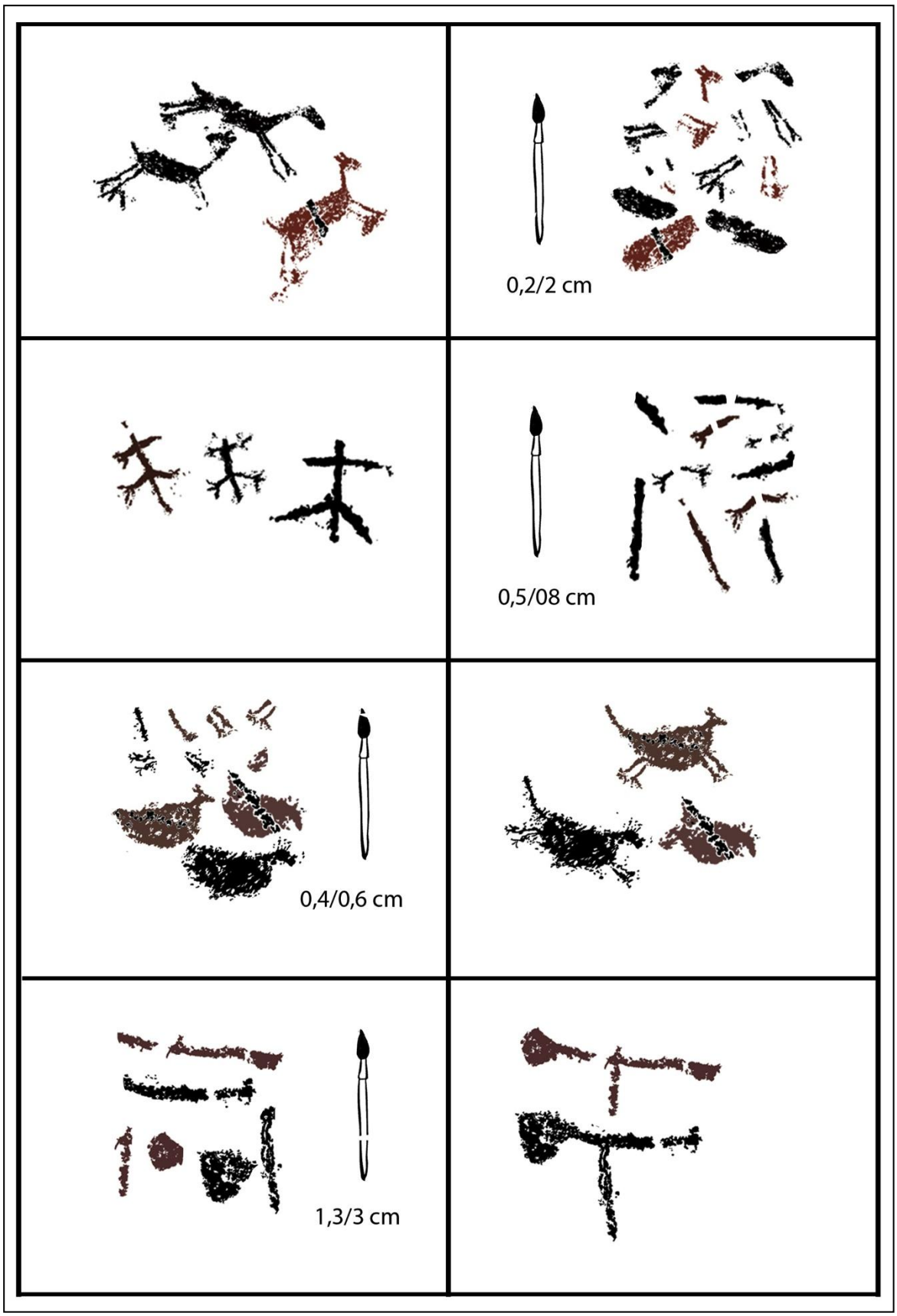


Figure 32 - Presentation morpho-technique of the identity tendencies found in Paraguaio through the analysis of rock-art (upper sector).

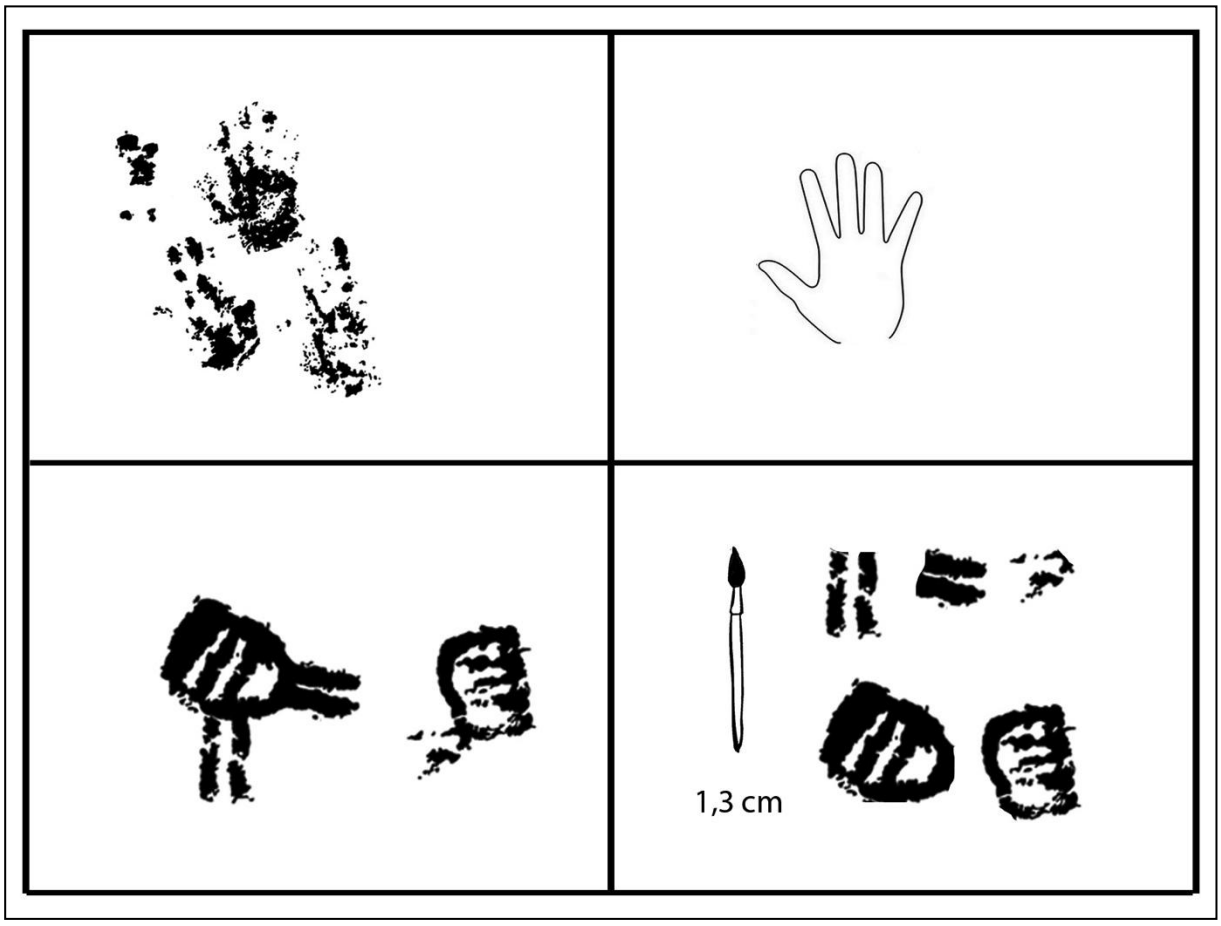


Figure 33 - Presentation morpho-technique of the identity tendencies found in Paraguaio through the analysis of rock-art (upper sector).

It is important to note that some other paintings, especially those that appear together being interpreted as the result of the same group, sometimes did not show similarity in their morpho-technique. Two possibilities can be considered; a) in fact, the same group was not the author of these paintings; b) the model of analysis needs to be improved. It is most probably, the model of analysis that needs to be improved.

4.4 THE SUPERIMPOSITIONS AND PICTORIC STRATIGRAPHY

During the analysis of the corpus, it was identified that throughout the painted walls 28 places presented superimpositions (Fig. 34 and 35). Most of them consist of two separated painting moments, like other paintings overlapping the previous ones. Only in one case, three painting moments were identified on a superimposition. It corresponds to the compositions

number 602 (the earliest one), then, overlapped by the composition 601, finally being overlapped by the composition 597.

These overlappings can be thought as pictorial layers that follow the same rules of superimposition of layers verified in stratigraphy of sediments. Using this principle, it is possible to determine the oldest pictorial layers and the recent ones. In any case, the temporality between these layers remains unknown.

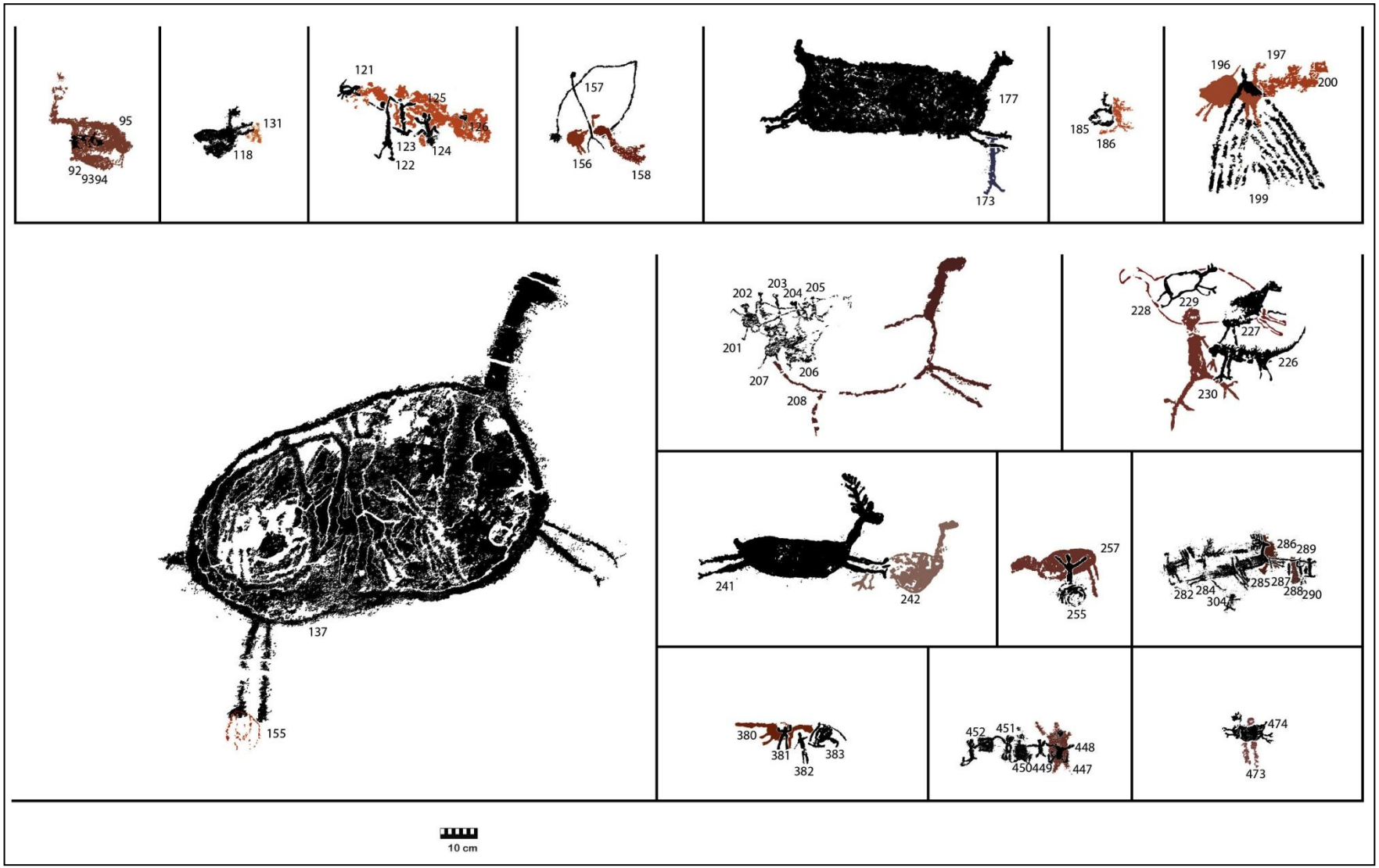


Figure 34 - Superimpositions found in Paraguaio through the analysis of rock-art (lower sector).

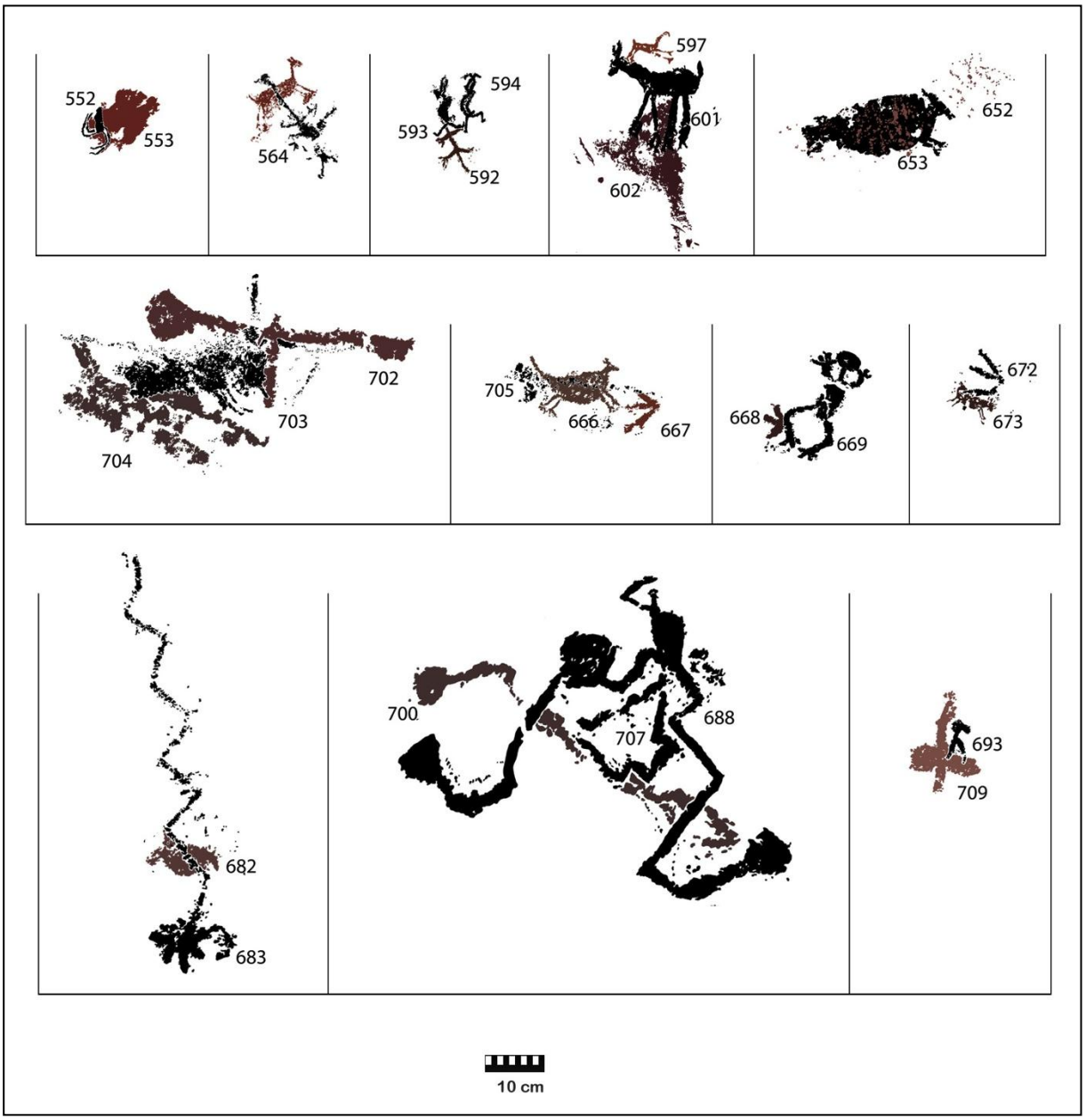


Figure 35 - Superimpositions found in Paraguaio through the analysis of rock-art (upper sector)

4.5 INTERPRETATIONS

The analysis of paintings from Paraguaio reveals that the anthropomorphic figures are the most depicted on the site, representing 31% of the corpus. The zoomorphic figures represent 26% and figures made with the hands represent 2%. The paintings that have not been identified represent 41% of the corpus. In any case, this category is composed mostly by damaged figures that once could have once been complete and comprehensible figures.

4.5.1 the anthropomorphs

Among the anthropomorphs (272 figures), at least one is a representation of a baby (panel 5G, composition 497) in the context of a sexual scene performed between two adults. The main interpretation of this scene is that the anthropomorphs were performing sexual intercourse for reproduction. The representation of a baby is the first observed in the rock-art from southeastern Piauí. In spite of this case, it was discovered that sexual scenes were not a common theme to be depicted, because from 939 paintings only two unique cases of sexual scenes have been reported in the site (panel 5G, compositions 496 and 498 associated with the baby representation, and panel 7F, compositions 809 and 808).

At least 26 anthropomorphs were depicted carrying or sharing objects with the others. Most of these objects could represent basketry or pottery (examples are the figures panel 2, figure 30; panel 5E, compositions 452 and 451). Other anthropomorphic figures were depicted with objects, especially carrying objects upon their heads (panel 2, compositions 32 and 33; panel 4E, 312; panel 6A, 569, 570 and 571; panel 6B, 616; panel 7A, 695 and panel 8E, 926). Another important carrying scene is one in which an anthropomorph carries a zoomorph (panel 2, composition 26).

In Paraguaio, 16 anthropomorphic compositions are true depictions of men proved by the presence of the phallus (panel 2, 67; panel 3C, 142, 143, 150; panel 5E, 439, 440 and 453; panel 6A, 573; panel 6B, 593 and 594; panel 8F, 932, 933, 934, 935, 936, 937).

Other types of compositions could be closely linked to the cultural and mythological universe of the authors. For instance, specific kinds of composition, in which it is not possible to identify exactly what the painting is depicting, allowing only the recognition of a cervid and a rhea, or a human and tree at the same time. These types of compositions were described as symbiosis figures (panel 3C, composition 137, panel 5F, composition 472 and 476).

4.5.2 the zoomorphs

Among the zoomorphs it was possible to identify that 10 of them as representations of other birds-like the rheas (example, panel 5D, 391, 393; 6A, 550 and 568; 6B, 598, 599, 618, 619, 622 and 623); 2 of them depict canine animals (panel 6A, 581 and 6B, 600); 3 of them resemble capybaras (panel 3B, 100; 4B 257 and 5E, 427); 48 of them depict cervids (panel 2, 37; 4B, 241; 4D, 284 and 285; 5B, 345 and 346; 5E, 428; 5J, 540; 6B, 626); 4 of them depict

felines (example, panel 3B, 109; 5E, 431); 1 depicts a fish (panel 4A, 233); 5 of them depict lizards (panel 3B, 226; 5D, 409; 6B, 592 and 595 and 8C, 891); 1 depicts a millipede (panel 6B, 617); 1 depicts a raccoon (panel 3B, 119); 2 of them depict razorbacks (panel 1, 13 and 14); 80 of them depict rheas (example panel 3E, 185, 195; 3B, 120; 3D, 168; 3E, 185, 195; 4B, 242, 253; 4E, 313, 320, 323; 5D, 387; 5F; 475) 3 of them depict a symbiosis[27] between a rhea and cervid, man and tree (panel 3C, 137 and 5F, 472 and 476).

In 67 figures, it was not possible recognize what animal they depicted, but it is definitely an animal depiction, like the case of the composition 317 from the panel 4E.

As Guidon (1975: 133) had already noticed, the predominant imagery in Paraguaio is the cervid then the rheas. It seems that these animals were very important for the authors of the paintings, perhaps for economic questions, it also seems that some of the paintings were related to their mythological universe. In any case, the relationship between rhea-cervid is an important characteristic of the rock-art from Paraguaio.

This relationship was already noticed and published by Guidon during the decade of 1970. During this time, Guidon designated these figures, in French as "*cernandou*", meaning that the image of a cervid and the image of a rhea have been mixed to compose a *cernandou* figure. It is not possible to find out if these paintings have really been made out as a cervid-rhea or if it was the result of overlappings. Beyond the symbiosis between cervid and rhea, Paraguaio has the only hatching event, depicting a rhea, ever found in the area of São Raimundo (panel 5F, 475).

Lesser quantity, other types of animals depicted in Paraguaio suggest that they were not a fashionable type of theme to be represented. One example of this is the figure of what resembles a fish (panel 4A, 233).

Important information about the paintings from Paraguaio is that fact that most of the animas are represented horizontally, especially the cervids. The rheas are depicted on a vertical profile, but also happen to be depicted in a frontal pattern. The same rule can be attributed to the human depictions.

[27] Santos *et al.* (2010: 819) also reported the existence of a symbiotic painting involving capybara and jaguar. This figure is located on the rock-shelter of Pau Dóia.

4.5.3 A proposed chronology for some paintings

Based on the interpretations of the paintings, a chronological proposal was made for specific types of figures. It is argued that some of the cervids and rheas were actually depicted by hunter-gatherers groups, because they seem to have had been very important for the authors. Actually, these representations are very recurrent in Capivara. The presence of symbiotic paintings (panel 3C, 137 and 5F, 476) between rhea and cervid raises an important aspect of the mythological universe of their authors. Because this symbiosis generates a fantastic animal that did not exist in the reality. The other case of symbiosis in Paraguaio is given between tree and man, this reinforces the idea that some of the paintings found in Paraguaio were made by hunter-gatherers. In terms of symbolism, the tree means gathering and the cervids and rheas means hunting. The symbiosis between these beings suggests the existence of a group economically based on hunter gathering. Remains of cervids and rheas are rarely found in the area of São Raimundo, although, a tooth of a *Blastocerus dichotomus* (cervid) was found in the site Toca das Moendas and was dated by ESR providing the estimated age of 22,0 Kyr and 23,0 Kyr (Faure *et al.* 2010: 4).

It is also argued that other paintings that appear carrying or sharing objects, (panel 2, 30, 32, 33 and 69; 4E, 312; 5C, 357 and 358; 5E, 451 and 452 and 7A, 695) could have been produced by the ceramists or basketry cultures. In addition, it is worth to mentioning that two anthropomorphic paintings (panel 1, 17 and panel 3D, 163) that appear carrying objects, which were interpreted as polished axes.

Making a comparison between these interpreted figures, and the general archaeological background in southeastern Piauí, it is possible to suggest a timeframe in which the types of materials depicted in rock-art would already exist in the area. For instance, in the area of São Raimundo there are 119 archaeological sintes in which ceramic remains were found, they have provided a set of 37 estimated ages between 9,1 Kyr BP (Beta 133792) and 0,23 Kyr BP (Beta 115612) (Guidon & Pessis; Melo, 2004; Buco, 2012). This data suggests that pottery depictions could really exist in the rock-art; therefore, they would have to be compatible with these timeframes when the ceramic technology appears. The same kind of approach can be thought for the supposed polished axes depictions (panel 1, 17 and 3D, 163). These polished axes only appear in southeastern Piauí around 9,2 Kyr BP (BETA65856) (Guidon & Pessis, 1993; Buco, 2012).

This hypothesis is also based on the existence of a painting that might be the representation of a hut (panel 3E, 199) that could have been painted by sedentary groups, possibly ceramists, the only one ever found in southeastern Piauí. Actually, this supposed hut overlaps depictions of rheas (3E, 196 and 197).

These interpretations allows the hypothesis that, hunter-gatherer groups were the authors of some paintings from Paraguaio, while ceramists or sedentary groups could have produced some other figures. This data is very compatible with the ages of the individual number 1 and 2 found in Paraguaio.

CONCLUSIONS

Considering the data presented in this thesis, it is possible to conclude that, 84% of Paraguaio's rock-art was executed using lines. This can be proved by the sum of the number of figures presenting lines (be they isolated or associated with the other morph-technique features, like the points and shapes), a total of 791 from 939 figures. Taking this information into consideration, it is possible to conclude that the use of lines was a strong rule of drawing for the groups that painted the Paraguaio's rock-art.

The other features, such as the shapes and points mostly appear associated with the lines, as a complement for the linear drawings. Only in very few cases the shapes and the points seemed to have been solely used to represent themes. This data, gives place to the assumption that the rock-art from Paraguaio is mostly linear.

Given the fact that, the groups that have painted Paraguaio's rock-art used most the lines to depict their ideas, it justifies the appearance of variations in this type of morpho-technique feature. In this site, both types of lines, straight and dynamic have been used with 9 types of lines variations (vertical, diagonal, horizontal, sinuous, zigzag, curved up, curved down, curved left and curved right).

Regarding only to linear figures, it was identified that, a single painting can display up to 4 variations of lines. This corresponds to the maximum number of line combinations a single linear painting from Paraguaio can present. When it comes to the other combinations of morpho-technique features, for instance, between the points, shapes and lines, it was identified that, 4 is the maximum number of combinations of variations of morpho-technique. A very few number of paintings (13 figures), did exceed 4 variations morpho-technique combinations. Those ones that did exceed 4 combinations happen most for paintings arranged with lines and points or points, lines and shapes. The use of 4 combinations of morpho-technique features and their variations is clearly a tendency of painting execution.

In Paraguaio, morpho-technique feature combinations have clear uses that vary according to the painted motifs. For instance, the paintings that have been arranged by combinations between lines and points tend to give different roles for these morpho-technique features. Normally, for the anthropomorphs, the lines tend to make up their bodies and limbs, while the points tend to represent the head. The figures made exclusively by using points, they showed the particularity of having been done with the finger tips.

In Paraguaio, figures arranged by lines and circular shapes occur very often. These arrangements do not show more than 3 variations of lines associated with 2 circular shapes variations. The filled in circular shape is preferred and a leaking circular shape is very rare. This type of composition is most used to depict the zoomorphs (43 figures that presented this form of execution, were rheas, birds, felines, capybaras). It also occurs, to represent anthropomorphs (28 of the figures that presented this format of execution depict anthropomorphs).

Other combinations of morpho-technique features join lines and concave shapes that vary according to the depicted motifs. In any case, an important template has been identified involving concave plan shapes and lines. In Paraguaio, this kind of combinations is only used to depict zoomorphic forms.

Some other morpho-technique features like the oval, rectangles, squares and triangles are used most to represent zoomorphic and anthropomorphic forms. In any case, variations linked to their coloring and their position can be attested.

In relation to the means of applying pigment to the walls, it was revealed that the use of paint brushes (94 % of the corpus) was preferential in Paraguaio. Several measures of the stroke's thickness has been identified, being 0,1 cm the least thick and 5 cm the thickest. Other ways of adding pigment on the walls has been equally used, such as the application of pigments through the use of hands (3% of the corpus), or using crude raw material as crayons (3 % of the corpus). This allows assuming that, most of the rock-art in Paraguaio has been done by the use of pigments that have been manipuled or treated.

Through the analysis of 939 figures from Paraguaio, it was possible to identify 99 compositions that have their morpho-technique histories shared between 33 different painting expertise. This affirmation is based on information provided by the paintings, like the use of the morpho-technique features, their similarity, arrangements and templates. This was considered as a result of different kinds of know-how or rules of execution according to the identity of the authors. Between these 99 figures, it was possible to identify 28 different identity tendencies, likely meaning 28 individual identities that managed the execution of 86 figures.

Between these 33 identities comprising 99 figures, was identified that 5 identity tendencies (5, 7, 14, 16 and 28) comprising 13 figures may not be a result of the same individuals actions. In any case, these are figures executed under the same rules of painting

knowledge, therefore, by individuals that shared the same identity and possibly, were part of the same group.

Considering the superimpositions it was possible to identify that they occur in 4 tendencies, the 24 (figure 563), the 25 (figure 592), the 27 (figures 666 and 682) and the 28 (figure 702). All of them are overlapped by other figures and appear in the upper sector. The tendency 5 (figures 19, 116, 228 and 347) is the only identity tendency found in the lower sector that is overlapped.

Considering the motifs represented in Paraguaio it is possible to say that the anthropomorphic figures are the most depicted on the site, representing 31% of the corpus, followed by the zoomorphic figures that represent 26%. Some figures on the site seem to have been directly linked with the mythological universe of the painters. Like those in which the symbiosis have been identified, and other cases of difficult interpretation, like the figures 688, associated with the 683, 707 and 700 on the panel 7A.

About the chronology of the paintings, it was possible to hypothesize, based on interpretations, that some of the paintings could have been done by groups of hunter-gatherers around 9,0 Kyr BP, especially the cervids, rheas and other symbiotic paintings (3C, 137; 3D, 177; 3F, 208, 211; 4B, 241, 242; 5B, 345, 346; 5D, 387, 392; 5F, 472, 475, 476; 5I, 525; 5J, 540). Other paintings could have been done by ceramist groups around 8,0 Kyr BP (panel 1, 17; panel 2, 30, 32, 33 and 69; 3D, 163; 3E, 199; 4E, 312; 5E, 451 and 452 and 7A, 695).

The suggestion that some paintings could have been done by groups of hunter-gatherers is supported by the fact that those figures depict animals that were important for economical reasons. The importance of these animals is proved by the presence of paintings on which their shapes are mixed between two different species, as a kind of symbiosis that could have existed in the mythological world of these groups of hunter-gatherers. In Capivara, the single cervid's remain (a tooth of *Blastocerus dichotomus*) has been dated by ESR in two different labs, providing the estimated ages of 22,0 Kyr and 23,0 Kyr (Faure *et al.* 2010: 4).

The suggestion that, part of the rock-art from Paraguaio could have been produced by ceramists or sedentary groups, is supported by the presence of paintings that appear carrying or sharing objects, that have been interpreted as, pottery, basketry, polished axes and huts. The most interesting is when the archaeological background of the area is considered, a timeframe for the appearance of these technologies can be established.

In relation to the morpho-technique model it is possible to affirm that, it has been efficient to provide important information about the way the paintings were executed,

displaying evidences about the identities that painted a single site. The morpho-technique analysis proves that Paraguaio has not been painted as a unity, but most likely, it worked as stage for several identities to display their paintings, possibly in different periods.

This model brings another way of looking at rock-art, because it considers figures, as figures, without segregating them for interpretative criteria, such as the recognition of figures. Evidently, this is important data, but in first place the paintings should be understood on their morpho-technique plans.

The morpho-technique model has also been important to gather morpho-technique data from Paraguaio, that in the future can be compared with morpho-technique data from other sites in Capivara, as well as other places. With the application of this model in other places it will be possible in the future to establish styles based on the morpho-technique of paintings.

GENERAL COMMENTS

One important point about this model of analysis is the fact that its application is restricted to the conserved figures. In other terms, very little information about the incomplete or damaged figures can be gathered through the use of this model. Also, it has been applied only for paintings, its efficiency cannot be considered for other types of rock-art until its application.

It is important to note that some other paintings, especially those ones that appear together, being often interpreted as an action of the same group, did not show similarity in their morpho-technique. Two possibilities can be considered; a) in fact, the same group was not the author of these paintings; b) the model of analysis needs to be improved. It is most probably, the model of analysis that needs to be improved. With the improvement of this model, it is expected that it could be worthy for the identification of prehistoric rock-art styles widespread throughout the Southeastern region of Piauí.

For further research, it is also expected to establish an experimental rock-art site in Capivara to better understand the ways in which the paintings have been made witnessing this first hand.

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