

NATIONAL INSTITUTE OF ARCHAEOLOGY, PALEONTOLOGY AND THE ENVIRONMENT OF THE SEMI-ARID REGION OF NORTHEAST BRAZIL - INAPAS

Annual Activity Report (2009.2-2010.1)

INTRODUCTION

The aim of this annual activity report is to publicize the scientific progress made at national and international level by researchers working in the subject areas to which the Institute accords priority.

Linked by a network of well-established scientific institutions, researchers from various academic disciplines conduct research in the fields of Archaeology, Bioarchaeology, Paleontology and the semiarid environment of the Northeast region of Brazil.

The central research theme of the Institute, which guides the way projects are developed, focuses on the migration routes of **Pleistocene human populations at the beginning of the Holocene in the vast areas of the modern Northeast semiarid region**, their survival strategies and adaptation to the Paleolithic environment. One of the overarching goals is to create an **Archaeological, Paleontological and correlate Sciences *Summa*** for the region on an interactive website.

The project comprises four separate strands:

The **Archaeological** strand, focusing on identification of human settlement routes in Northeast Brazil and chronostratigraphic investigation of the various human profiles in the region translated into culturally differentiated thematic maps.

The **Rock Art** strand provides continuity for the production of digital documentation, using laser-scanning to produce three-dimensional documents, whose purpose is to study, preserve and manage the cultural heritage of the Serra da Capivara National Park (which is a UNESCO World Heritage site).

The **Bioarchaeological** strand conducts research into the paleoparasitology and paleoepidemiology of hunter-gatherers in the Northeast region of Brazil, identifying the factors involved in the emergence and spread of parasitic diseases among these human groups, by investigating the bio-geographical history of parasites found in archaeological remains.

The **Paleontological** strand aims to identify fossil reserves in sedimentary basins and put together a georeferenced database of the Northeast region.

PARTICIPATING INSTITUTIONS

The National Institute was set up by four associates organized into a research network.

The **Museum of American Man Foundation – FUMDHAM** is a scientific institution that emerged from a Franco-Brazilian joint research venture studying the interface between human beings and the environment from prehistory to the present day. The main focus of research has been on the Serra da Capivara National Park, which is listed as UNESCO World Heritage site and where large quantities of ancient rock art can be found.

The **Federal University of Pernambuco – UFPE’s** Postgraduate Program in Archaeology is a well-established research and teaching center in the area of the Archaeology of the States of Pernambuco, Paraíba, Piauí and Rio Grande do Norte that has been working for over thirty years. The **Archaeological and Heritage Metrology Research Group**, comprising researchers from the Center for Technology and Geosciences of the Department of Nuclear Energy and Graduate Program in Archaeology, undertakes archaeological research using advanced analytical procedures. The **Paleontology Laboratory** has a long history of paleontological research into the meso-cenozoic interval in Northeast Brazil

The **Oswaldo Cruz Foundation in Rio de Janeiro – FIOCRUZ** has been studying parasites found in archaeological materials for thirty years at their Paleoparasitology Laboratory. Among the first samples examined by the Laboratory were the ones collected at the Serra da Capivara National Park. A scientific cooperation agreement has been established between FIOCRUZ and FUMDHAM, to work together, mainly in the area of Bioarchaeology.

The **Regional University of Cariri – URCA** in Ceará is also associated with the Project and is in the process of establishing itself as center for research and knowledge production in the field of paleontology.

The scientific partnership between **FUMDHAM, UFPE and FIOCRUZ** is three decades old.

Associated Institution

The **Seridó Foundation** is a scientific organization that has been conducting archaeological research in the Northeast region of Brazil, especially in the Seridó region (in the State of Rio Grande do Norte) for two decades and is also associated with the INCT/INAPAS .

Associated Laboratories:

The Federal University of Pernambuco's Department of Archaeology's Archaeometry Laboratory

The Archaeometry Laboratory forms part of the Archaeological and Heritage Metrology Research Group at the Federal University of Pernambuco. This laboratory carries out research into the use of Thermoluminescence (TL) Optically Stimulated Luminescence (OSL) and Electron Paramagnetic Resonance (EPR) to date sediments, pottery remains, and teeth, respectively. In addition to analysis of trace elements in archaeological and geological specimens, this laboratory also provides services in the areas of X-Ray diffraction, X-Ray fluorescence and digital radiography.

Activities

The most important features of the installation of dating techniques at the Department of Nuclear energy included:

- a) The installation of adequate Infrastructure.
- b) Mounting and calibrating equipment.
- c) Sample collection.
- d) A reliability test.
- e) Establishing a protocol for collection and dating of samples
- f) Dating and intercomparisons of results with other laboratories.

In addition to these activities, knowledge has been exchanged with other research groups by organizing scientific events such as the Meeting on EPR Spectroscopy applied to Dating and participation at events such as the *European conference On X-ray spectrometry*.

Infrastructure

(Captions – Handling Room – Hood and Hothouse) Furnaces, Irradiators- source of Co-60 , TL Reader)

Photogrammetry Laboratory – FUMDHAM

The Photogrammetry Laboratory was set up in 2008 with resources from the Serra da Capivara National Park, UNESCO World Heritage site: Photogrammetric Records of Archaeological Sites funded by FINEP. The laboratory is situated in the Museum of American Man Foundation – FUMDHAM, where part of the three-dimensional data processing aims to digitally replicate sites using laser scanners. The laboratory also edits photographs and puts together data banks of scanned sites. The laboratory's plotter can print large-scale rock art panels, enabling transportation to the field of a register of models to guide the work of the photographers.

Activities

Activities carried out by the Photogrammetry Laboratory include:

- a. Joining of frames taken with the Konica Minolta Vi910 scanner in **.cdm** format for archaeological sites using algorithms that automate the join on the basis of reference points recommended by the operator.
- b. Insertion of cloud points taken with a Faro LS880 scanner in **.pts** format for referencing various rock art panels at archaeological sites.
- c. Creation of archaeological site surfaces by way of an overall record of sets of frames to minimize the distortion between takes.
- d. Visualization, using the *Accuracy Analyzer* tool, of deviations caused by noise between frames to measure scanning accuracy.
- e. Separation of rock art panels maintaining the spatial reference between them.
- f. Insertion of two-dimensional photographs using polygon modeling created for three-dimensional representation of the surface of archaeological sites.

Geo-processing Laboratory – FUMDHAM

FUMDHAM's Geo-processing Laboratory categorizes data on a kilometeric scale using a geographic information system (GIS) for the Serra da Capivara National Park, with spatial data input using the ArcGIS 9.3 and AutoCAD Civil 3D 2008 software provided by the foundation. The Geographic Information System was designed to cover the overall archaeological context of the sites located in the Serra da Capivara National Park. In addition to spatial references, geo-referenced databanks of the archaeological sites provide information on the types of archaeological sites, the presence of rock art paintings and engravings; material remains; the presence of human and animal bones; the year of discovery; and archaeological interventions. These geoprocessed data function as a basis for microanalysis of the Serra da Capivara National Park and constitute a stage in the research that can be continually updated.

Activities

Activities carried out at the Geo-processing Laboratory include:

- a) A geo-referenced databank for the archaeological sites of the Serra da Capivara National Park;
- b) A drainage system based on SUDENE's 1:100,000 scale charts;
- c) Numerical Elevation Model (NEM) based on GeoTIFF images from data collected by the *Shuttle Radar Topography Mission* (SRTM). These images have a planimetric resolution of 90m and altimetric resolution of 1 m. Using the plugin *Image Analysis* for ArcGIS chart images were joined together at scales of 1:250.000, SC.23-X-A, SC.23-X-B, SC.23-X-C and SC.23-X-D. A *triangulated irregular network* (TIN) was created from a raster image;
- d) A 15m-resolution satellite image already available in FUMDHAM's databank;
- e) A 2.5m-resolution satellite image obtained using the Google Earth software;
- f) Level curves at a resolution of 2.5 with 10 and 50 meters of equidistance, based on the Numerical Elevation Model;
- g) Slope Model based on the Numerical Elevation Model;
- h) Geological Framework based on CPRM data;
- i) Vegetation cover, based on Empeiraire, L. (1983) data;
Municipal mesh based on the boundaries established by the IBGE (Brazilian Institute of Geography and Statistics), 2007;
- j) Boundaries of the Serra da Capivara National Park;
- k) Management information for the Serra da Capivara National Park, such as Sentry Boxes, Support Points, Roads. These data can be obtained through the Topographic Trimble GeoXT GPS receptor.

Parasitological Laboratory. FIOCRUZ

One field of specialization within the area of Parasitology is Paleoparasitology. It received this name in 1979, when Dr. Luiz Fernando Ferreira used the term to describe the search for parasites in archaeological or paleontological materials.

At the National School of Public Health (FIOCRUZ)'s Paleoparasitology Laboratory, an increasingly large number of researchers have been carrying out studies of materials of various origins.

With the introduction of trisodic phosphate technique for rehydration of coprolites (Callen & Cameron 1960), findings of parasites in archaeological materials have multiplied. The potential of this new science was recognized by archaeological teams who increasingly contributed not only by providing the

materials for analysis but also by participating in the discussions and interpretation of results (Reinhard *et al.*, 1988;).

Contributions of paleo-parasitological analyses to research topics:

1. Contributions to the development of theories of prehistoric human migration, as it became possible to trace the routes taken by ancient populations by finding parasites in archaeological remains.
2. Studies have challenged the belief that parasitic diseases were not significant in New World prehistory by finding *Trichuris trichiura* and ancylostoma eggs dating from the pre-Colombian period.
3. The introduction of new techniques has enabled progress to be made in diagnosis of the infectious diseases of the past. Molecular biology has become the diagnostic tool for parasitic diseases. Using the PCR technique (polymerase chain reaction) it has been possible to diagnose tuberculosis and Chagas disease in pre-Colombian South American mummies. These data contribute to studies of the origin of vectors, the relationship between these and the parasites, ancient human migrations, and the current distribution, emergence and reemergence of parasitic diseases (Araújo Ferreira 2000). Pollen and spores found furnish data on climate and vegetation in the regions under study.
4. Dietary studies have been performed and suggest that a wide variety of foodstuffs were consumed by prehistoric peoples, including animal protein, roots, seeds, and fruits.

Paleontology Laboratory – FUMDHAM

The laboratory develops activities that aim to identify and reconstruct the fossilized remains of megafauna for the purposes of chronostratigraphic correlations and paleoenvironmental reconstructions. These environmental components are essential for establishing the background needed when locating archaeological investigations. The results of taphonomic analysis are used to provide better understanding of fossilization, and the origin and formation of concentrations of fossils in the areas of archaeological interest in the Serra da Capivara National Park and the Serra das Confusões National Park.

The Federal University of Pernambuco's Prehistory and Archaeology Laboratory.

The laboratory includes an area for analysis of archaeological material collected at excavations, such as lithics, bones, malacological materials, ceramics and sediments. The material is numbered and stored in reliable deposits for future detailed analysis. Two adjacent facilities store and identify catalogued materials make them available for researchers and undergraduate students, establishing an archive that enables specific analyses to be conducted in other laboratories.

RESEARCH RESULTS

The principal research projects of the Institute were handled by institutional researchers according to the Target Plan initially designed.

ARCHAEOLOGICAL STUDIES

HUMAN SETTLEMENT IN THE SERRA DA CAPIVARA NATIONAL PARK REGION

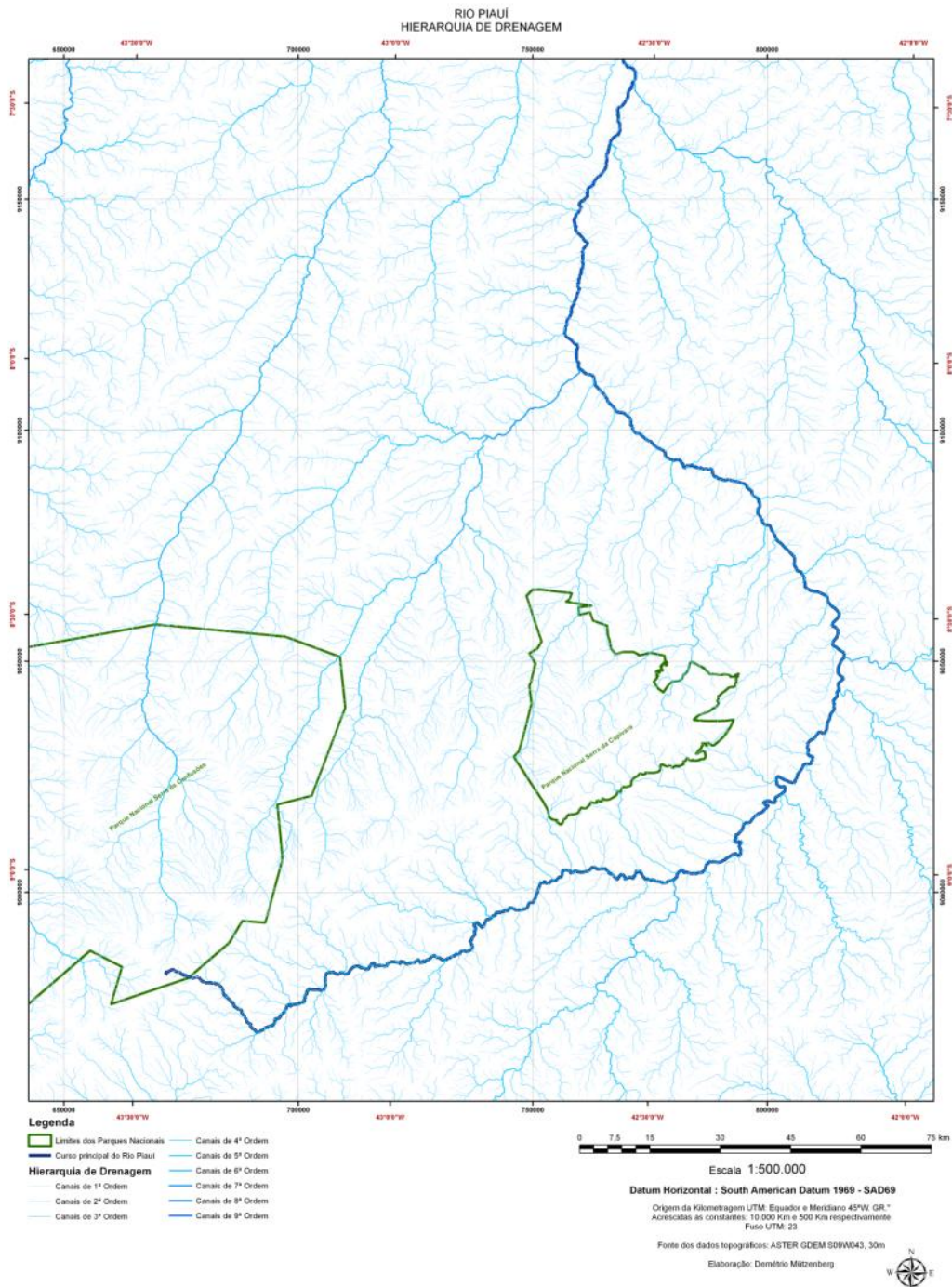
Continuation of studies aiming to fit archaeological remains into the hypothesis that the first human groups of the region that left remains at the Boqueirão da Pedra Furada site arrived through the plains of the Rio Piauí valley, dispersing at the base of the cuesta and the plateau. The scope of the studies of the area cover not only the immediate surroundings of the Serra da Capivara National Park but also the area of limestone outcrops in the southeastern part of the Park, the northern area encompassing part of the Piauí river drainage basin and the area separating Serra da Capivara from Serra das Confusões.

1. On the banks of the Piauí River 57 archaeological sites were prospected and georeferenced. The information registered enabled a map to be drawn up identifying sites during the first year of activities.
2. The land on which the Museum of American Man, the headquarters of INAPAS, was prospected. The Stratigraphic study for this excavation suggested that, 20,700 years +/- 2,700 (LVD 2243 LOE FATEC) ago, the bank of the Piauí River stood at a level curve of 380 meters. At that time, the river was nine kilometers wide in this spot. At present, the width of the river, at the same location, is less than 50 meters. The Piauí River, was in those days similar to the Amazon and was home to a different, more abundant fauna compared to the current one. The prospection also enabled the drainage net extension of the Piauí River during the Pleistocene to be determined: it was approximately 1.6 km from the Boqueirão da Pedra Furada site where excavations have allowed a chronostratigraphy to be established with numerous dates.

On other sites it was possible to detect evidence of climate change. At Toca das Moendas a complete maxillary bone and teeth of the *Blastocerus dichotomus* deer were found. This animal is typical of humid tropical forests and is no longer present in the region. The teeth were found near human bones and were dated to 23,000 years by the University of São Paulo Physics Department, indicating that the climate was completely different at that time.

At Toca do Enoque, seeds used in necklaces adorning interred bodies were from species found in the Amazon forest, indicating that until approximately 6,000 years ago, part of the rainforest fauna still persisted, even though precipitation levels started to diminish approximately 9,000/10,000 years ago.

At Toca do Alto do Capim, precipitation also diminished, giving rise to sediment deposits on the engraved rocky base. Dating suggests that this occurred around 6,180 BP. (Beta Analytic 258021).



Hydrographic map of the Piauí river

3. In addition to the prospection campaigns of the 2009.2/2010.1 excavations, prospection and collection of surface materials were also carried out at 18 sites the Rio Piauí basin. Prior excavations were resumed at Toca das Moendas with the aim of obtaining raw data to confirm dating. These excavations indicated the need for a geochemical study of the sedimentary deposits of the cave. The accompanying monograph is currently being prepared and will be completed when full analysis of results and dates has been completed.
4. Data obtained in the course of excavations were incorporated into the FUMDHAM databank and will be subjected to a thorough analysis for coherence verification that will enable conclusions and hypotheses to be published in the archaeological *Summa*.
5. Sample collection was stepped up at the study sites for archaeometric analysis
 - 5.1 Samples of ceramic remains and sediment was collected from the Aldeia do Carlos Site in the Serra da Capivara National Park (in the State of Piauí) for the purpose of establishing chronologies using Thermoluminescence dating (TL)
 - 5.2 Samples of sediment from different points in the National Park were collected to be used in optical stimulated luminescence dating (OSL).
 - 5.3 Sixteen samples of sediment (4x4m rectangles) were collected at Toca do Sítio do Meio for measurement of uranium, thorium, and potassium content using Gamma Spectrometry, a technique which yields the annual dose rate in the region. The results of these studies will help to establish a sample collection protocol for dating by luminescence. In addition, TLD dosimeters were installed at every point where sediment was removed for the purpose of obtaining the annual dose rate to compare with the calculations obtained using the U, Th, and K content measured using Gamma Spectrometry.

Table 1: Archaeological sites studied in the Serra da Capivara National Park

NAME OF SITE	REMAINS FOUND	LABORATORY	DATING
Aldeia do Boqueirão da Serra Nova	Lithics collected	-	-
Aldeia do Carlos or Umbuzeiros	Lithics and ceramic objects	-	-
Cascalheira Museu	Sedimentary deposit of the Piauí River	Glass and Dating Laboratory, FATEC - UNESP, 2243	20,700 years
Oficina Lítica do Cacique	Lithics	-	-
Praça José Gregório - São Braz	Lithics, Ceramic urn, charcoal	-	-
Estrada da Lagoa do Aldemar	Lithics	-	-
Baixão da Serra Nova	Lithics and ceramic fragments	-	-
Toca da Bastiana	Lithics	-	-

Toca da Janela da Barra do Antonião	Excavation 1: Eremotherium phalange	-	-
Toca da Lagoa de Cima IX	Hearth structure, lithics, animal bones	Beta Analytic 233909	10,480 years
Toca da Roça do Dalton II	Lithics, animal bones, shells	-	-
Toca da Roça do Zeca	Lithics	-	-
Toca da Urna do Serrote da Bastiana	Human bones, ceramics, megafauna bones	-	-
Toca do Alto da Serra do Capim	Human bones, animal bones, hearth structure, grass structure, ocher	Beta Analytic 265695 Beta Analytic 258021 Beta Analytic 253379	8,600 years 6,180 years 3,970 years
Toca do Baixão da Ana Maria	Lithics, bonfires, totaling 26 layers	Beta Analytic 260076	3,630 years for layer 14
Toca do Barrigudo	4 human skeletons, 1 of a giant sloth, lithics	-	-
Toca do Boqueirão da Pedra Furada II	Lithics	-	-
Toca do Chicão do Serrote da Bastiana	Lithics, animal bones, shells	-	-
Toca do Deitado da Lagoa de Cima	Lithics, ceramic fragments and a polished stone disk in layer 2	Beta Analytic 233164 Beta Analytic 233637	480 years, for layer 2 10,000 years for layer 10
Toca do Enoque	Human skeletons, lithics, ceramic fragments	Beta Analytic 262607 Beta Analytic 257091 Beta Analytic 257092 Beta Analytic 264124	3,430 years 6,210 years 6,590 years 8,270 years
Toca do Morro das Gravuras de Canaã	Structured hearths, lithics and ceramic fragments	-	-
Toca do Olho d'Água das Andorinhas	Lithics, ceramic fragments, animal teeth and bones.	-	-
Toca do Paraguaio	Lithics	Beta Analytic 232672	7,040 years
Toca do Serrote das Moendas	Human bones, megafauna fossils, animal bones, shells lithics, fragments and ceramics	LACIVID - USP Department of Physics - USP Ribeirão Preto 5CNRS Gif sur Yvette	4,891 and 4,076 years (Ceramic fragments) 22,000 and 23,000 years (deer teeth associated with human bones) 31,860 years (rock art)
Toca dos Crentes da Caieira do Adão	Human skeletons; lithics	-	-
Vale do Boqueirão da Pedra Furada	Lithics, structured hearths	CNRS Gif sur Yvette	18,660 years

HUMAN SETTLEMENT IN THE SERIDÓ REGION (RN)

The Seridó Archaeological Project worked on the hypothesis that populations endowed with a cultural heritage of traditional rock art originated in Southeastern Piauí and migrated to the Seridó region and to the valley bearing the same name in the Açu-Piranhas Basin of the State of Rio Grande do Norte. The graphic tradition known as Nordeste and identified for the first time in the Serra da Capivara National Park, in the State of Piauí used the Seridó region as a migration route. As a result, it was possible on the basis of systematic classification of catalogued rock art to identify the Seridó sub-tradition. As research progressed, an attempt was made to trace human settlement in the region in time and space, from the very first occupations registered around 9,400 BP to the conquest of the region by the Portuguese and the ruthless extermination of indigenous nations.

Table 2: Dating of the Pedra do Alexandre Site

LABORATORY	C 14 DATING	DATED MATERIAL	BURIAL TYPE/ AGE / GENDER
CSIC 1061	2620 ± 60 BP	Carbon - burial n. 7	Primary / 2 children
CSIC 945	2860 ± 25 BP	- Carbon burial n. 9	Secondary / 1 adult / Male
CSIC 966	2890 ± 25 BP	Carbon - burial n. 9	Not identified
CSIC 1054	4160 ± 70 BP	Carbon - burial n. 2	Primary / 1 adult / Male
CSIC 943	4710 ± 25 BP	Carbon - burial n. 1	Collective / 1 adult, 2 children and 1 fetus
CSIC 1052	6010 ± 60 BP	Carbon – lower level in relation to burial n. 1	Not identified
CSIC 1060	5790 ± 60 BP	Carbon - burial n. 6	Primary / 1 child
CSIC 965	8280 ± 30 BP	Carbon - burial n. 4	Primary / 1 adult
CSIC 967	9400 ± 35 BP	Carbon - burial n. 3	Primary / 1 child
CSIC 105	9400 ± 90 BP	Carbon - burial n. 3	Not identified

The possibility of continuing excavation of the Pedra do Alexandre and Casa Santa sites in Carnaúba dos Dantas was considered with a view to producing a monograph on these rock shelters with rock art, on which there are already several publications. In this first phase, involving INAPAS, it was deemed important to demonstrate the permanence and continuity of indigenous occupation in the region from the beginning of the Holocene until contact with Europeans. The colonial documentation available provides information on the occupation of the region by indigenous ethnic groups that are not well known to archaeologists.

Evidence of sparse human occupation of the rock shelters containing rock art in the Seridó region, with the exception of the ones used as cemeteries, led researchers to open archaeological sites and rock shelter sites not used for rock art. These sites could, hypothetically speaking, be dwelling places for the populations that produced the rock art. Nonetheless the sites with rock art seemed to be used for ceremonial activities and graveyards. Therefore, research focused on the Furna do Umbuzeiro and Sítio do Umbuzeiro sites, (Carnaúba dos Dantas), a rock shelter and what may be a village in close proximity to one another.

Table 3. C-14 Dating obtained from Furna do Umbuzeiro, Carnaúba dos Dantas, RN, from vegetal charcoal from the hearths of the site.

REFERENCE	LABORATORY	CONVENTIONAL C14 AGE (YEARS BP)	CALIBRATED AGE (CAL. YEARS BP)
Vegetal Charcoal Fires	CSIC-2097	3630 ± 32	3980 – 3810 (82.4%) 3800 – 3720 (13.0%)
Vegetal Charcoal	CSIC-2143	3170 ± 40	3450 – 3210 (95.4%)
Vegetal Charcoal	CSIC-2148	2804 ± 40	2950 – 2760 (95.4%)
Vegetal Charcoal	CSIC-2098	2666 ± 30	2800 – 2700 (90.1%) 2640 – 2610 (4.1%) 2580 – 2540 (1.3%)
Vegetal Charcoal	CSIC-2210	1775 ± 31	1710 – 1540 (95.4%)
Vegetal Charcoal	CSIC-2093	1316 ± 28	1290 – 1080 (95.4%)
Vegetal Charcoal	CSIC-2094	1315 ± 28	1290 – 1080 (95.4%)

RESEARCH INTO ROCK ART RECORDS

1- A georeferenced databank of images of rock paintings and engravings has been set up in the Northeast region with the first records of laser scanned sites. The production of this documentation adds to the georeferenced databank of images of major rock paintings and engravings. This procedure enables the use of an accurate tool for rigorous measurement of the conservation status of the sites and paintings enabling detailed diagnosis, monitoring and intervention to be carried out.



Boqueirão da Pedra Furada Site (Serra da Capivara National Park, Brazil). Digital photogrammetric reproduction of a niche painted.

2 – Based on the photogrammetric records obtained image processing was carried out to produce a final reference with micrometric precision. From the results obtained from six archaeological sites in the Serra da Capivara National Park (FINEP/CNPq) an applicability model was designed to document rock paintings and engravings using digital Photogrammetry.

3- Diagnosis of the conservation status of sites with rock art in the Serra da Capivara National Park was carried out using archaeometric analysis. These results, together with photogrammetric data, are useful tools for assessing the impact of conservation intervention. This information will be used to guide policy-making.

4. Documentation of analogue images relating to the conservation of rock art sites in the National Park has been analyzed and compared with the digital documentation of the georeferenced sites. The usefulness of scanning the areas of rock walls in the sites showing signs of geological, hydrological and microbiological damage has been proven. A new system will enable ongoing damage and the impact of conservation to be monitored.

5. The microbiological and geochemical degradation of rock art and selected sites were also assessed. Based on the results, intervention procedures for preservation and possible recuperation of the pathologies identified have been drawn up. Record-keeping protocols have also been designed to aid with conservation follow-up procedures.

6. The issue of the spread of fissures on the surface of the heterogeneous sandstone walls of the sites has also been investigated with a view to identifying the geo-archaeological structural behavior of the sites using the finite element method. The study has concluded that for dynamic geological simulations procedures are needed that are capable of providing topological and geometrical consistency. Volumetric meshes could only be generated internally for regions delimited by surfaces using an algorithm for tetrahedrons in arbitrary domains, thereby ensuring consistent treatment of internal restrictions.

7. Portable tools and non-destructive techniques were employed to analyze the pigments used in the rock art. Data from X-ray fluorescence, spectrophotometry and digital microscopy provide an analytical insight into the technical procedures used to produce the paintings.

8. For a body of graphic data that has always been studied in a highly subjective fashion, the possibility of working with quantitative variables is a promising line of investigation into prehistoric rock art.

9. The study of rock art has produced a technical report, an image bank, several georeferenced maps for each selected site, a report on the archaeometric sample survey and a scientific article.



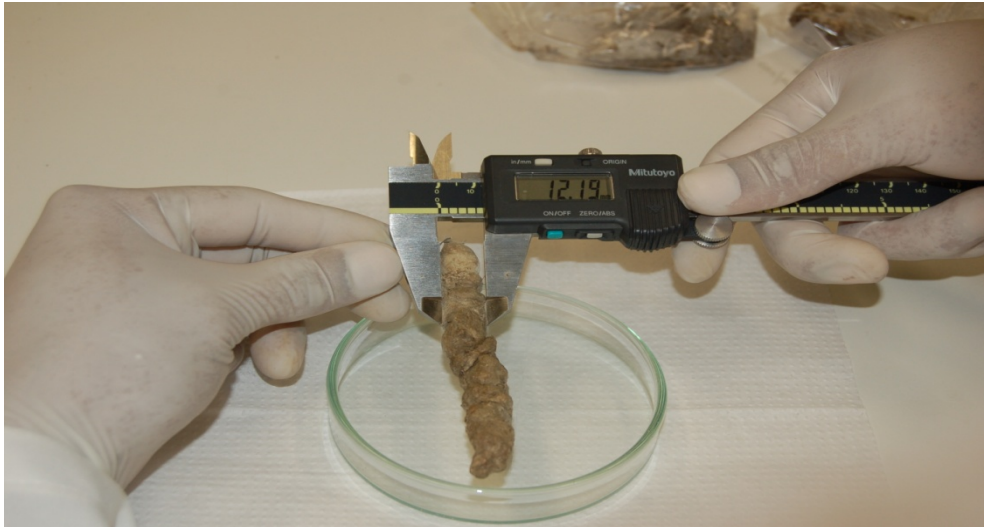
Toca da Entrada do Pajaú Site (Serra da Capivara National Park, Brazil). Capturing digital information from de paintings

Bioarchaeological Research:

The aim of this Project is to identify parasites at archaeological sites using the model tested at the Serra da Capivara National Park in Piauí and other regions in the Americas, in order to identify the emergence of parasite-vector-environment systems relevant to the bio-cultural conditions of prehistoric human populations. This will furnish a paleo-epidemiological approach to the hunter-gatherers of South America, especially of the Brazilian Northeast. Two sets of features are considered: the bio-geographical history of parasites and hosts and bio-cultural features such as diet and hygiene. This requires expansion of the empirical database, the introduction of new techniques and adaptation of existing ones in such a way as to provide tools that are more specific and sensitive.

The results obtained in this first year of activities have met the initial goal of consolidating analysis of samples deposited in paleo-parasitological collections, modern feces and new collections.

1. The collections of coprolites at the Paleo-parasitology Laboratory and of modern feces of wild animals at the Ecology laboratory are in the process of being organized to meet



FIOCRUZ – Working at the Paleoparasitology Laboratory

2. the standards established by FIOCRUZ. Reorganization includes inputting data into a computer and (where possible) georeferenced positioning, in addition of frequent submissions of new analyses to the *Archaeological Summa*.
3. The coprolite collections of the Paleoparasitology Laboratory contain approximately 2300 samples. During the year (April-2009/April-2010) the results of 267 samples from Piauí were included in the region's chronostratigraphies. Approximately 287 samples are being organized, 108 have been re-analyzed and 143 new samples analyzed, 33 of which were collected during the February 2010 expedition.



FIOCRUZ. Ecology Laboratory

4. The modern feces collection of the Ecology Laboratory contains approximately 1200 samples, 700 belonging to the archaeological region of São Raimundo Nonato. The reorganization of the collection is still under way. Of the 198 samples collected during the February 2010 expedition, 49 have already been analyzed. The occurrence of new parasites have been noted for *Tolypeutes tricinctus* (the armadillo), a species threatened with extinction still in the process of identification, in addition to various parasites afflicting other mammals.
5. The occurrence of lizard parasites in human coprolites opens new avenues of research into feeding habits in prehistory (Sianto *et al.*, 2009). The finding of *Trichuris* in feces and recent coprolites in *mocós* (*Kerodon rupestris*) in arid spots and mesic enclaves in the region raises the question of the continued presence of the species through climate changes and their value as indicators of these changes in the past, present and future (Chame *et al.*, 2009). The results compiled are being processed and there have been no further reported occurrences of parasites in terms either of geographical distribution or chronology. Nevertheless, new discoveries are changing previous theories regarding the absence of *Ascaris* (Leles *et al.*, 2009,2010).
6. The environmental parameters of landscapes surrounding archaeological sites in the Serra da Capivara National Park region and areas where recent feces have been collected are currently being entered into a spreadsheet designed for correlation analysis.
7. Coprolite collection protocols to be applied by archaeologists are being sent to archaeological teams for approval.
8. The field expedition that took place in February 2010 covered the ecological corridor area, PARNA Serra da Capivara and Serra das Confusões., where feces and coprolites had never been collected before. The landscape is a hybrid of the *caatinga* of the Serra da Capivara and the transition to *cerrado* with unique geomorphological and botanical specimens.
9. Chronostratigraphy to establish the presence of helminths in archaeological sites and in modern feces suggests greater diversity of helminths in the modern age, but it is still not possible to present this result because of the difference in sample size between the modern feces and coprolites collected at archaeological sites. Nevertheless, with the aid of the results for recent materials and the characteristics of their transmission areas, it will be easier to identify possible routes of transmission in the past.



Serra das Confusões National Park, Brazil. The field expedition looking for feces and coprolites an area never been collected before.

Paleontological Research

The paleontological project covers the study area located in the semiarid strip of the States of Piauí, Rio Grande do Norte, Paraíba, Pernambuco and Alagoas. The main focus of the study is on sedimentary basins and quaternary deposits outside the basins related to fluvial terraces, lagoons and natural tanks in alluvial environments and continental colluvial environments of scientific interest, since these environments preserve Pleistocene mammalian fossils. There is a possibility that these are contemporaneous with archaeological sites. The sedimentary basins under study are Parnaíba (Piauí) Potiguar (Rio Grande do Norte), Araripe (Pernambuco), Rio do Peixe (Paraíba), Jatobá (Pernambuco), São José de Belmonte (Pernambuco), Betânia (Pernambuco), Afogados de Ingazeira (Pernambuco) and Boa Vista (Paraíba). The sites in the Araripe sedimentary Basin will be studied in Pernambuco (gypsum region). The other basins and fossiliferous deposits located in the semiarid region will be addressed by other projects. The objective of the paleontological studies is to advance research into vertebrate and invertebrate macrofossils, in paleobotany and ichnofossils, by seeking to identify, draw up systematic records and spread knowledge of the paleontological potential of the Brazilian semiarid region.

Throughout the first year field work gave rise to the following results:

1. Discovery of **new fossiliferous areas in the surroundings of the Chapada do Araripe** in Baixo do Moco, in the municipality of Salitre, State of Ceará (geographical coordinates 8201000 - 9199000 and 357000 - 358000 UTM); in the Baixa Grande, in the municipality of Potengi, at coordinates: S 07 09'754'' and W 39 59' 188'' (East), S 07 s09'810'' and W 39 59'188'' (South), S 07 09' 897'' and W 40 00' 068'' (North) and S 07 10'158'' e W 40 00'895'' (West). Excavations were carried out at these paleontological locations of a "fine scale" profile where 223 fossil specimens were deposited in the Paleontology Museum of URCA – Santana do Cariri.
2. Three field stages were performed, two in Pernambuco and one in Paraíba for the purpose of georeferencing old outcrops studied in the 1970s, surveying stratigraphic sections, identifying new outcrops and collecting fossils. In Pernambuco the first field stage was performed in the **Sedimentary Basin of Jatobá**. The municipalities of Ibimirim (Vale do Catimbau National Park) and Petrolândia were also included. The sites visited were the Inajá and Aliança formations. The Inajá formation is made up of fine sandstone and marine siltites of the Devonian flat- topped platform, containing bivalve molluscs, brachiopods and ichnofossils. The Aliança Formation, an Upper Jurassic formation in the Jatobá Basin presents a paleofauna that includes vertebrates (fish and reptiles) new to Pernambuco, requiring further field prospection. The fossils collected are undergoing mechanical preparation for identification and classification.
3. The second field campaign in Pernambuco involved the municipalities of Boa Vista (PB), Pedra Lavrada (PB), Soledade (PB), Barra de São Miguel (PB) and Santa Cruz do Capibaribe. The municipality of Santa Cruz do Capibaribe (in the State of Pernambuco) is known in the paleontological literature for having good potential for the study of the mammals of the Pleistocene, owing to the specific diversity and quantity of fossiliferous sites. This field campaign also carried out geological and paleontological reconnaissance of fossiliferous sites in the **Sedimentary Basin of Boa Vista**. The fossiliferous potential of this basin has as yet received little study. Owing to its depositional environment (continental lacustrine and fluvial) and age (Oligocene), it is particularly important for the study of the evolution of mammals. The most promising fossiliferous locations in this basin for future research are: Mineração Bentonit União (a significant quantity of trunks with unknown botanic affinity); Fazenda Campinhos (large quantity and good preservation of dulciaquicoles, a fauna lacking systematic study); Fazenda Ambó (megafauna). The fossils collected are being mechanically prepared, described and classified for future publication.

4. In Paraíba work began in the municipality of Sousa (**Bacia do Rio do Peixe**). Efforts were made to survey the area and the fossils of ichnofossiliferous sites (dinosaur footprints and others) especially in the Sousa formation (argillites and siltites of lower Cretaceous flood plains and fluvial channels) and Antenor Navarro (lower Cretaceous sandstone, fan conglomerates and fluvial plains).
5. In the region of São Raimundo Nonato, Piauí, NE of the **Serra da Capivara National park**, trilobite fossils were found on the surface. Although now extinct, these were one of the dominant life forms in the Lower Paleozoic, between 521 and 251 million years ago. Judging from the type of rock on which they are found, there is evidence that trilobites were exclusively marine and these findings are thus important in determining the location of ancient oceans as well as the communication between them.



Serra da Capivara National Park (Brazil) - Trilobite fossil

Structure and Management of the Institute

The operational structure of the Institute consists of the General Coordinator and Managing Committee as established in Edict 15/2008. The Managing Committee comprises five project researchers and the presidency is held by the general Coordinator. The function of the committee, in addition to approving the annual target plan and resource allocation, helps to design a management model that lays the basis of a network integrating the various groups involved. This Committee comprises a representative of each institution and one representative of the Head Office.

The following individuals sit on the Managing Committee:

Anne-Marie Pessis (general coordinator)
Antônio Álamo Feitosa Saraiva (URCA)
Gabriela Martin Avila (UFPE)
Márcia Chame (FIOCRUZ)
Niéde Guidon (FUMDHAM)

The Institute works as an integrated management system enabling the gathering of the information required to build up a database and active management to achieve a balance between goals with short- and long-term objectives, and the financial resources for each work phase for each of the research groups involved.

The Management Model implemented aims to provide a system of performance indicators based on established time frames, team involvement, and the means used to achieve goals, thereby impacting the resource distribution, data publication and financial accountability.

The operational activity coordination system proposed to the Management Committee covers the following areas:

The General Coordinator – responsible for the general organization, design and alignment of the timetables for long-term objectives with operational and individual short-term objectives, by providing a general overview of research development.

Head Office Coordinator – synchronizes the actions of the Institute thereby helping it to grow as an organization.

Scientific Coordinator – Oversees groups and systematic actions, promoting interaction, optimizing information and the use of existing or acquired equipment by way of an integrated network.

Financial Coordinator – manages financial requirements based on an established budget timetable.



Scientific Publication Coordinator – is responsible for the Institute’s data collection and organization, and for the transformation of this into information to be made available to the general public.

The face-to-face meetings of the coordinators of the four INAPAS participating institutions initially envisaged had to be reconsidered, owing to the difficulty of adapting their agendas to work meetings.

An on *line* meeting system between the general coordinator and members of the Management Committee and representatives of participating institutions has thus been adopted. The Coordination staff is responsible for the flow of information.

Three face-to-face meetings were held in the second semester of 2009 and the first semester of 2010 to integrate actions across teams for the purpose of coordinating field expeditions, establishing basic parameters for formatting data-collection protocols for research topics, sharing graphic and non-graphic databases, designing the *Archaeological Summa* architecture and establishing a format for published results.

During the first meeting held in August 2009, the procedures to be used for the operation of the Coordination and Management Committee were approved. The two other face-to-face meetings were held to discuss operational financial problems and adjustments to be made to the timetable of initial goals.

SCIENTIFIC PRODUCTION

ARCHAEOLOGY

Archaeological Research in the region of the Serra da Capivara National Park and Surroundings

GUIDON, N. PESSIS, A.-M MARTIN, G

The aim of this study is to summarize the result of research into “Human settlement and the environment during prehistory in the Serra da Capivara National Park”, in southeastern Piauí. The specific aims of the research were: to reconstruct of the regional environment, regional human settlement, and the cultural profiles of the human settlers. It was decided to illustrate the data from the excavations by ways of maps that reveal the changes in the landscape over the last ten millennia. Prospection was carried out to select the sites that, owing to their location in the relief, were more likely to furnish data enabling the drainage network that formed part of the landscape until approximately 9,000 years BP to be reconstructed. GUIDON, N.; PESSIS, A.-M; MARTIN, G. Pesquisas Arqueológicas da Região do Parque Nacional Serra da Capivara e seu entorno (Piauí 1998-2008). *FUMDHAMentos*, n. 8, 2009. p. 1-61

Fossils of Human Teeth and skulls of Garrincho (Brazil) and the ancient settlement of the Americas

PEYRE, E. GRANAT,J., GUIDON, N.

The *Serra da Capivara* National Park (Piauí, Brazil) shows solid cultural evidence of the most ancient human presence in the Americas: some of the oldest archeological artifacts in the Pedra Furada Rock Shelter date back to as early as 53,000 BP for stone tools and 32,000 BP for hearths. Human skeletal remains were found in the karst outcrops around this sandstone massif which are exceptionally old for the Americas. The fossils (a skull and teeth) found in the Antoniao and Garrincho caves dates back to 10,000 and 14,000. The more recent discovery of two new fossils in the Garrincho limestone cave confirms the outstanding interest of the site for the history of the first settlement of the continent. These findings consist of 29 teeth of a nine-year-old child and one half of an adult skull unearthed from sediments dating from 24,000 BP (according to optically stimulated luminescence) and 14,000 years (according to thermal luminescence). This study reports the characteristics of the teeth of the pre-adolescent, which constitute the most ancient specimen of the kind known to this day in the Americas and examines the biometrics of the adult skull. The presence in these two new fossils of some notable features which can be regarded as archaic and that can also be found in the four previously discovered specimens, while being more clearly marked in the more recent discoveries, confirms the hypothesis of there having been much earlier human settlements in the Americas than the ones estimated on the basis of Clovis's findings. In terms of settlement studies, interest in these fossils has grown with proof of a human presence in Piauí at Santa, a cave close to Garrincho, as early as 6,000 BP.

PEYRE, E.; GRANAT,J. & GUIDON, N. Dentes e crânios humanos fósseis do Garrincho (Brasil) e o povoamento da América. *FUMDHAMentos*, n. 8, 2009. p. 62-69

Toca das Moendas, Piauí – Brazil, preliminary results of archaeological excavations

GUIDON,N ; GUERIN,C.; FAURE,M.; DALTRINI FELIC,G ; IGNACIO,E

The first excavations carried out at Toca da Moenda furnished interesting data on the paleofauna related to archaeological remains. The environment of the cave provided fossilization not only of human bones but of the paleofauna, suggesting that they are contemporaneous. The 72 species of great mammals indicates a very different environment from the modern one with higher humidity and significant vegetation cover. Large deer, horses, camels, capybaras, Mylodontidae, Pampatherium and Glyptodontes would not have sufficient food and water to live in a caatinga-type biome. The only species found in Toca das Moendas and still present in the region are small deer, *Mazama gouazoubira*, peccary, *Tayassu tajacu*, three species of armadillos, small cats, the jaguar and the puma, the small carnivore *Conepatus* and two species of anteaters. In addition to the information on paleofauna and the paleoenvironment it is worth noting the presence of three human skeletons. Skeleton No. 3 is especially remarkable, in that it was found beneath a calcite layer and solidified sediments dated by TL/OSL to 13,000 years BP, which has been established to be the minimum age for

this skeleton. The association of this skeleton with deer teeth, dating from between 22,000 and 23,000 years BP attest to the Pleistocene origin of the bones. GUIDON, N.; GUERIN, C.; FAURE, G. D.; BUCO, C. & IGNÁCIO, E. Toca das Moendas, Piauí-Brasil, primeiros resultados das escavações arqueológicas. *FUMDHAMentos*, n. 8, 2009. p. 70-85

Burials at Toca do Enoque (Serra das Confusões-Piauí): Preliminary notes

GUIDON, N.; DA LUZ, M.F.

Toca do Enoque is an archaeological site comprising a 60m-long and 10m-high sandstone wall. It is located in Serra das Andorinhas in the Serra das Confusões National Park in the municipality of Guaribas, in the State of Piauí. Excavations at Toca do Enoque have unearthed two burial sites, the first containing one individual and the second ten complete skeletons and a pile of bones of different types, which may indicate the existence of other individuals, although only further analysis will be able to determine the exact number. The great diversity of material remains (necklaces, shells, lithics, ochre plates, hardened ceramic plates) collected at the burial sites demonstrates the extreme care with which corpses were prepared. This may be related to the value of each individual or to the feelings linking them to the group. Cause of death may be established through bone analysis which will also make it possible to determine the age and gender of the individuals. Any kinship relations will be established by the DNA analysis that is already under way. Although the site has not been fully excavated, the majority of the remains collected are funerary in nature, apparently demonstrating that the location was not used as a dwelling place but for funeral rites. This is one of the first sites to be excavated in the Serra das Confusões and the first finding of its kind in Southeaster Piauí. GUIDON, N.; & LUZ, M. de F da. Sepultamento na Toca do Enoque (Serra das Confusões): Nota Prévia.. *FUMDHAMentos*, n. 8, 2009. p. 115-126.

Serra da Capivara National Park, Brazil

PESSIS, A-M., GUIDON, N.

This cultural heritage, ever-growing as new sites are being unearthed, with walls crowded with thousands of painted figures, faces a pressing issue, hard to be solved in a country where governmental initiative, after 30 years of research and findings, stands aloof and unresponsive. Ravaging on the Serra da Capivara National Park's cultural patrimony didn't show the same impact as similar asset destruction in countries presently in war or amid civil unrest. Decay of this asset is like the silent disappearance of art works, fine art prints and paintings that are vanishing in consequence of environmental conditions worsening, as altered by human actions. Cultural asset preservation become then almost impossible as each regular handover of power produces a disruption in consequence of new technical norms and adoption of new politics favoring rock art degradation and destruction of archeological sites. Over time it becomes evident that governments will easily commit themselves promising to preserve the world heritage sites, but in reality commitments are not honored. It is necessary to adopt global solutions that will warrant assets preservation.

World Heritage listing, where governments want to register their archeological sites, warrants an international acknowledgement of the asset value, though it ought also to require from each country its due diligence to ensure asset preservation.

The Serra da Capivara National Park is here depicted as an example to highlight the importance of the last sites discovered between 2002 and 2005 and the grave problems of vandalism by invaders, clear-cut and fires in the National Park buffer zone. SAMRA & UNESCO Rock Art, conservation, development, promotion. Eyzies-de-Tayac (Dordogne) France 2005

Serra da Capivara National Park, photogrammetric records of archaeological sites.

PESSIS, A-M., MUTZENBERG, D., CISNEIROS, D., MARTIN, G., GUIDON, N., SULLASI, H., SOUTO MAIOR P.M, KHOURY, H., CORREA, A.C., MENEZES LAGE, M.C.S.M., GUZZO, P., BAFFA, O., BOUSTA, F., TOURON, S. VALLS, M., MEDEIROS, E.

This report discusses the implementation of a georeferenced database for archaeological sites with prehistoric rock art in the Serra da Capivara National Park by way of hybrid digital three-dimensional models of rock art panels and colorimetric, microscopic, fluorescence and X-Ray diffractometry of the rock art glyphs in these panels. The intention is not to make interpretative studies of rock art redundant, but to introduce a quantification device in such a way that theoretical options are translated into hierarchically organized quantitative variables. These results will enable a level of confidence to be established for interpretations and conclusions.

The Open Contour Prehistoric rock art of in the Serra da Capivara National Park

CISNEIROS, D.

The open contour figures form part of a series of individual figures present in small proportions in the rocky shelters of the Serra da Capivara National Park. These figures can be characterized initially by a simple contour, with incomplete extremities, through which the object, even though it is not completely contoured, can be understood. These paintings were studied in order to identify the meaning of the glyphs and hence develop standards that could be related to other kinds of writing. The graphic profile of the open contour figures was identified using cognitive (thematic) and analytical (scenographic and technical) elements established in the graphic phenomenon. The exchange of descriptive data regarding the glyphs, in combination with a review of documentation of the typical styles found in the Serra da Capivara Archaeological Area and the archaeological context enabled the open contour paintings of the Serra da Capivara National Park to be characterized.

The jaguar and the women at prayer: a review of traditional classification of rock art records in NE Brazil.

MARTIN, G; GUIDON, N

Various parts of Northeast Brazil contain a high concentration of rock art sites and this has extended the scope of the area known as the rock art provinces of the region. In addition to the Serra da Capivara and Serra das Confusões national parks, both in southeastern Piauí, there are sites in Seridó, Rio Grande do Norte and Paraíba, the Chapada Diamantina, in Bahia and the Cariri Paraibano in addition to various areas in Pernambuco. The number of sites registered suggests the need for a review of the classification based on the two major categories proposed in the 1980s: the Nordeste

and Agreste traditions. Reflections on the need for new documents are presented in this article.

A onça e as orantes: uma revisão das classificações tradicionais dos registros rupestres do NE do Brasil. *CLIO- Arqueológica*, 2010, n. 25, UFPE, Recife.



Serra da Capivara National Park (Brazil) - Toca do Estevo III site.

Dating Rock Art Paintings in Serra da Capivara

PESSIS, A-M., GUIDON, N.

It is still not possible to date the rock art paintings in the Serra da Capivara National Park accurately and reliably, although different techniques used on samples from the sites have provided numerous results. Multiple dating and sampling techniques have demonstrated how important it is to adapt the process to the circumstances and specific conditions of each site. Dating rock art by a method that combines various archaeometric processes has been proven to be possible by the work carried out in Toca do Serrote da Bastiana.

The dating of teeth using EPR Spectroscopy: Rudiments, Methods and Applications.

SULLASI, H. L.; AZEVEDO, R. L.; PESSIS, A-M.

This study presents the fundamental guiding principles underlying the EPR Spectroscopy dating technique, as well as the methodological basis of the dating of teeth. This technique can be and has been applied to dental material in an attempt solve problems in paleontology and archaeology. SULLASI, H. L.; AZEVEDO, R. L.; PESSIS, A-M. *Datação de Dentes por Espectroscopia RPE: Fundamentos, metodologia e aplicações. Clio Arqueológica*. v. 24, n. 1, 2009, p. 97-117.

Prehistoric Pigment and Saline Efflorescences from Toca do Estevo III

CAVALCANTE, L.D.; ABREU, R.R.; LAGE, M.C.S.M.

Excavations carried out in the Archaeological Area of São Raimundo Nonato have furnished a variety of remains that are being studied as extensively as financial resources allow. Research has enabled significant progress to be made in the field of paleontology and led to remarkable discoveries, such as the Sítio Toca dos Coqueiros

skeleton and the human remains from Toca Gordo do Garrincho. The chronological sequence has been very well established by carbon 14 dating in combination with various other factors, such as the appearance of ceramics around 8,900 years ago, polished rock 9,200 BP and calcite at Toca da Bastiana. This has led to the postulation of viable alternative routes capable of explaining the inland settlement of the American Continent. Multi- and interdisciplinary studies carried out in this archaeological enclave have included archeochemical investigation of pigments, alteration deposits, paleosediments, and the setting up of a rock art conservation team for site conservation and preparations for public visits. The aim of this work was to study the prehistoric pigments and saline efflorescences of the site providing the data required for future conservation work. CAVALCANTE, L. C. D.; ABREU, R. R. de S. & LAGE, M. C. S. M. Pigmento Pré-histórico e eflorescência salinas da Toca do Estevo III. *Fundamentos*, n. 8, 2009. p. 107-114.

BIOARCHAEOLOGY

The paleoparasitology of Chagas disease: a review.

ARAÚJO, A. ; JANSEN, A.M. ; REINHARD, K. ; FERREIRA, L.F..

This is a review article, published at the invitation of the Associated Publishers, which comments on research into Chagas Disease in pre-Colombian populations. The study was inspired by the hypothesis raised in 1984, on the occasion of the first visit to the archaeological region of Serra da Capivara, in Southeastern Piauí, as to the possibility of finding Chagas disease infection in prehistoric groups in Brazil. This hypothesis has been proven by necroscopy and evidence of anatomopathological lesions in mummies of the Andean region before the introduction of molecular biology. This has proven that not only infection by *Trypanosoma cruzi*, but also by Chagas disease was prevalent in populations inhabiting what is now the northern part of the State of Minas Gerais seven thousand years ago. The conclusion is that Chagas disease is as old as the human presence on the continent, even though this depends on the existence of vectors and other infected vertebrate carriers.

The diversity of intestinal helminths in wild and domestic mammals in the Caatinga region of the Serra da Capivara National Park, southeastern Piauí, Brazil.

BRANDÃO, M. ; CHAME, M. ; CORDEIRO JL ; CHAVES, S. A. M.

The article derives from Martha Brandão's Master's dissertation on the diversity of helminths found in kinegetic animal feces in the Serra da Capivara National Park following Chame's 20 years of study in the region. The diversity found is distinct and larger than that previously noted in analyses of the feces and coprolites of animals in the region, leading to the hypothesis that the fragmentation process and anthropic pressure have been altering the patterns of occurrence and distribution of diseases in the species.

Invasive exotic species affecting human health

CHAME, M.

The article derives from Martha Brandão's Master's dissertation on the diversity of helminths found in the feces of cinegetic animals in Serra da Capivara following Chame's 20 years of study in the region. The diversity found is distinct and larger than that previously noted in analyses of the feces and coprolites of animals in the region, leading to the hypothesis that fragmentation and anthropic pressure have been altering the patterns of occurrence and disease distribution in the species.

ITS1 intra-individual variability of *Ascaris* isolates in Brazil.

LELES, D. ; ARAÚJO, A. ; VICENTE, A.C. ; IÑIGUEZ, A.

This article describes the genetic variability of contemporary *Ascaris lumbricoides*. This has implications for research results for ancient DNA found in coprolites in addition to demonstrating how investigations can be conducted into the origins of parasitism in this species. The aim is to determine whether the source is the swine parasite *Ascaris suum* or if the human species mutated and began infecting domestic pigs.

Molecular diagnosis of ascariasis from human feces and description of a new *Ascaris* sp. genotype in Brazil

LELES, D. ; ARAÚJO, A. ; VICENTE, A.C. ; IÑIGUEZ, A.

Molecular techniques are applied to diagnose infection by ascariades in humans, with a view to improving the sensitivity of detection in archaeological material and contemporary feces, with possible infections by this species in pigs.

Animal helminths in human archaeological remains: a review.

SIANTO, L. ; CHAME, M. ; SILVA, C. ; GONÇALVES, M. L. C. ; REINHARD, K. ; FUGASSA, M. ; ARAUJO, A.

This article is derived from Luciana Sianto's 2009 PhD thesis. The article reviews cases of parasite infection of humans by animal species and attempts to separate cases of real and false parasitism. Zoonosis must have occurred frequently in prehistoric populations, not only because of their close contact with animals, but also because they were part of the human diet. One of the cases of false parasitism described shows the presence of oxyuris eggs, a lizard parasite in human coprolites. In the same material scales and other remains of the carrier animal were also found and it can be concluded that it had been eaten whole. In this case, the parasite eggs passed through the human intestine without infecting it, as has also been shown in other cases. (Leles *et al.*, 2009).

Burial IV of the Lapa do Boquete Archaeological site (in the State of Minas Gerais), bone pathologies, parasitosis and Chagas Disease

SOUZA, S. ; SIANTO, L. ; FERNANDES, A. ; JANSEN, A.M. ; VICENTE, A.C. ; KIPNIS, R. ; FERREIRA, L.F. ; DITTMAR, K. ; ARAUJO, A.

This article provides a detailed account of the excavation and examinations carried out on the mummified body from Lapa do Boquete in Minas Gerais, in which infection by *Trypanosoma cruzi* was detected using molecular biological techniques along with a pathological Chagasic megacolon lesion from approximately 600 years ago. The review

is not internationally indexed but recognized as one of the most important by the community of archaeologists, who are the main suppliers of material for this area of research.

The state of the art of wildlife health in Brazil.

CHAME, M. ; LABARTHE, NORMA ; ANDREAZZI, C. ; GUIMARAES, H. J. L. ; CORDEIRO, J.L ; MORATELLI, R.

Basic text introduced for discussion by 130 specialists at the workshop, “The state of the art of wildlife health in Brazil” whose aim was design a method for mapping areas of pathogen occurrence in wild animals with potential harm to human health and the identification of environmental and landscape parameters responsible for the emergence of these diseases. The initial patterns used were paleoparasitological, in particular the results obtained in the Brazilian semiarid region. The results form the basis for the WildLife Health Information Center of which the INAPAS project is the point of reference for the modeling of the occurrence of diseases in prehistory and changes in the present day and in the future, as well as for information management in this area.

Before Carlos Chagas: the paleoparasitology of *Trypanosoma cruzi* infection

ARAUJO, A. ; JANSEN, Ana Maria ; FERREIRA, Luiz

This volume was published by Fiocruz Publications to commemorate the 100th anniversary of Carlos Chagas’s discovery. This chapter deals investigation of occurrence of the disease prior to its discovery, using paleoparasitological data.

The River Patterns of a Drainage basin in the Lower-Middle São Francisco

CORREA, A. C. B; SILVA, F. L. M. da; SOUZA, J. O. P.; AZAMBUJA, R. N.; ARAÚJO, M. S. B.

This article presents a detailed analysis of the geometry of the fluvial channel and its deposits in a semiarid microbasin in Northeast Brazil. The research was based on a detailed field survey of fluvial features, in combination with in-house digital processing of spatial data, enabling the canal to be compartmentalized into three sectors: confined, semi-confined, and not confined, thereby revealing a close connection between the alluvial plain and confining margins and the type of functional process and resulting depositional forms. Mobile geometry of erosive scars and deposited bodies along the whole length of the canal were also addressed and compared with forms of land-use that are also heavily interdependent on the geomorphological context. In the confined sector, the main interferences take the form of riverbed damming resulting in an instantaneous rise in local base levels and erosion by subsequent torrents in addition to the degradation of the native riparian vegetation by the overgrazing of goats or the need to collect firewood for fuel. In both cases the principal consequence is the reemergence of regressive erosion of the river banks, the removal of planosol or litholic neosol cover generating amphitheatres of the exposed rocky bed adjoining the alluvial plain. All the transformations noted in the fluvial styles are closely dependent on the ten-year climate cycle and adequate land-use, in addition to non-cyclical events and the intervals between them. CORREA, A. C. B; SILVA, F. L. M. da; SOUZA, J. O. P.; AZAMBUJA, R. N.; ARAÚJO, M. S. B. Estilos fluviais de uma bacia de drenagem no submédio São Francisco. *Revista de Geografia* (Recife), v. 26, p. 181-215, 2009.

Feeding habits, sexual dimorphism and size at maturity of the *Cnemidophorus ocellifer* lizard (Spix, 1825) (Teiidae) in a reforested restinga habitat in the Northeast region of Brazil

SANTANA, G.G.; VASCONCELLOS, A.; GADELHA, Y. E. A.; VIEIRA, W. L. S.; ALMEIDA, W. O.; NÓBREGA, R. P.; ALVES, R. R. N.

The feeding habits and sexual dimorphism in size and sexual maturity of the actively foraging lizard, *Cnemidophorus ocellifer*, were analyzed in a reforested Restinga habitat located in the municipality of Mataraca, along the northern-most coast of the State of Paraíba, Brazil. Seventy-five specimens of *C. ocellifer* were examined (46 males and 29 females). Of this total, only 23 specimens had prey in their stomachs. The most frequent prey consumed were orthopterans (50%), coleopterans (23.9%) and arachnids (10.9%); termites and insect larvae were consumed less frequently (both 2.2%). There were no significant differences observed between the numbers of prey consumed by either males or females. There were significant differences in SVL (snout-vent length) between the sexes, with males attaining larger SVL values. When the influence of SVL was removed from the analyses, sexual dimorphism in form was still reflected in the head size of these lizards. Sexual maturity in females and males was attained with an SVL of 42.2 and 49.0 mm respectively. Although no significant difference was observed between the SVL of the females and the number of eggs produced, there was a clear tendency for larger females to produce more eggs. The low structural complexity of the vegetation and the poor soil quality in the reforested restinga area examined does not furnish a favorable habitat for insect and termite larvae, contributing to the marked differences in the diet of the population of *C. ocellifer* observed in the present study in relation to the diet of their conspecifics in undisturbed areas of the restinga, cerrado and caatinga.

A parasitological paradox: Why are ascarid infections so rare in the prehistoric Americas.

LELES, D.; ARAÚJO, A. ; IÑIGUEZ, A.

Human bone remains at Toca do Serrote das Moendas: recovery, inventory and summary description.

ALMEIDA,T; . NEVES,W

The morphocranial diversity of human bones at Serra da Capivara: implications for the origin of human beings in the Americas.

VEERNARDO,D ; NEVES,W

PALEONTOLOGY

A Guide to Paleontological Field Work in the Araripe Basin

SARAIVA, A. A.; ALCANTARA, O.; BANTIM, R.; LIMA, F.

This guide to paleontological field work in the Araripe Basin was designed for the purpose of publicizing work involving fossil biodiversity in the Araripe basin as well as to help ongoing paleontological studies funded by INAPAS. This book provides the necessary relevant information for people initiating field work in the Araripe Basin, the precautions that need to be taken to avoid accidents, an updated list of all published macrofossils, information on fossilization, the formation of calcarean structures, field record models, region maps and a stratigraphic profile of the Araripe basin and Formação Romualdo (where the Grupo Santana paleontological excavations are being carried out). This small book provides a guide to paleoecology and taphonomy for those studying macrofossils.

Taxonomical notes on the Cretaceous decapod fossils of Chapada do Araripe, Brazil and ecological inferences

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Beurlenia araripensis Martins-Neto and Mezzalira, 1991 (Decapoda: Caridea) and *Paleomattea deliciosa* Maisey and Carvalho, 1995 (Decapoda: Penaeoidea) are reviewed based on new and better preserved samples. The new specimens were found at the Santana Formation, in the Araripe Basin, Northeast Brazil, in Crato and Romualdo respectively. *B. araripensis* is represented by a well preserved specimen, where is possible to see a cephalothorax with antennal and branchiostegal spines, a rostrum with 14 dorsal spines, and a telson with posterior spines. This material permits a better characterization of the morphology of the species and its placement within the Palaemonidae. The Dendrobranchiata material from *P. deliciosa*, found in the bituminous shale of the Romualdo formation, was recorded for the first time in clusters of fragmentary parts that suggest mass mortality and in morphologies that point to a planktonic lifestyle, as occurs in the case of contemporary forms of sergestidae.

Animal-based folk remedies sold in public markets in Crato and Juazeiro do Norte, in the State of Ceará, Brazil

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Human communities consistently develop a detailed knowledge of the therapeutical and medicinal properties of the local flora and fauna, and these folk remedies often stand in for medicines produced by the pharmaceutical industry. Animals (and products derived from them) are essential ingredients in the preparation of many traditional remedies. The present study involved the preparation of an inventory of the animals sold in public markets in the cities of Crato and Juazeiro do Norte, in the

Brazilian State of Ceará. Information was obtained using semi-structured questionnaires in interviews held with 27 vendors of medicinal animals (18 in the municipality of Juazeiro do Norte [11 men and 7 women] and 9 in the municipality of Crato [6 men and 3 women]). The Informant Consensus Factor (ICF) was calculated to determine the degree of consensus as to which species are effective for particular ailments, as well as the species Use Value (UV) to determine the extent to which each species is used. A total of 31 animal species, distributed among 21 families were identified as being used medicinally. The most frequently represented taxa were: insects (8 species), mammals (7), fish (5), reptiles (5) and birds (4). The animals sold in these markets are used to treat a total of 24 ailments, with rheumatism, asthma, and inflammations being the most commonly cited. Three species not previously reported as having medicinal use were encountered: *Leporinus steindachneri* (used for treating cholesterol problems), *Gryllus assimilis* (used for treating urinary infections), and *Phrynops tuberosus* (used to treat asthma, rheumatism and bruises). The composition of the local fauna, the popular culture, and commercial considerations are factors that sustain and drive the market for therapeutic animal products – and the lack of monitoring and regulation of this trade is worrying from a conservationist point of view. A detailed knowledge of the fauna used in alternative medicine is fundamental to the conservation and rational use of Brazilian fauna.

Vertebrates, from the Aliança formation, in the Jatobá Basin, in the Northeast Region of Brazil

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The Upper Jurassic part of the Jatobá river basin, also known in Brazil as Andar Dom João, is represented by the Sergi and Aliança formations, which together form the Brotas group, which makes up the pre-rift tectonic sequence of the basin, situated in almost every part of the State of Pernambuco, occupies an area of approximately 5,600 km². Based on this sequence, the Aliança formation, is characterized lithologically by brownish and greenish foliates and siltites, with intercalations of fine arenites, locally rough, as well as whitish and light brown calcarenites and calcisiltites, which are lenticularized and fossiliferous and, less frequently, layers of evaporite. The depositional environment is considered to be continental fluvio-lacustre. The Aliança formation is the best area for outcrops for the study of mesozoic vertebrates, represented by fish, sharks, and crocodile-like reptiles. This study aims to provide better knowledge of the Upper Jurassic part of the Jatobá basin, and to correlate it with other basins of the same geological period in the Northeast region of Brazil. The initial observations regarding the occurrence of vertebrate fossils in the Jatobá basin date from the end of the 19th century and were made by Derby, in a study of the layers on the banks of the River São Francisco in the States of Sergipe, Alagoas, Pernambuco and Bahia. He recorded calcaries with bones and scales of the actinopterigius *Lepidotes* fish, shark and reptile teeth, found near the municipality of Jatobá, in the State of Pernambuco.