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In copertina: Il promontorio di Capo Colonna Area calanchiva di Aliano

Conservation of the palaeontological heritage of Araripe Geopark (Ceará, Brazil): threats and possible solutions

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ABSTRACT

The palaeontological heritage of Araripe Geopark has a worldwide recognition due to the diversity and quality of fossils that occur in the Santana Formation (Lower Cretaceous). Unfortunately, this rich heritage has been under threat due to various reasons: illegal collecting, quarrying, inadequate legislation, and ineffectiveness of authorities. The solution depends on federal, state, and local initiatives. The Araripe Geopark can play an important role in the life of local communities, namely by promoting a better knowledge on the region natural and cultural richness and by enhancing a sense of pride, which in turn can lead to the improvement of fossil conservation.

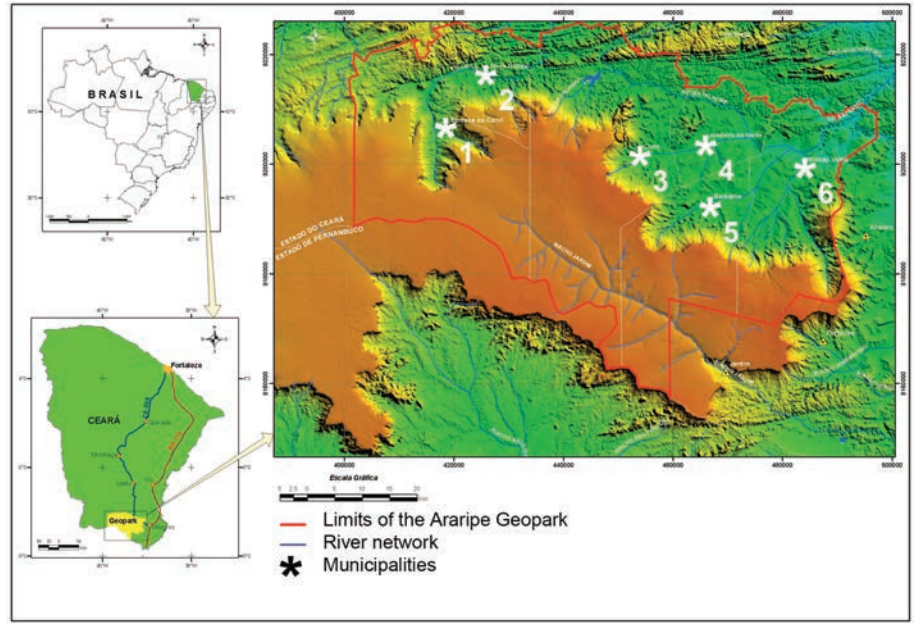


Figure 1 - Location of the Araripe Geopark. 1- Santana do Cariri; 2- Nova Olinda; 3- Crato; 4- Juazeiro do Norte; 5- Barbalha; 6- Missão Velha (modified from Geopark Araripe, 2010).

INTRODUCTION

The Araripe Geopark is located in the southern part of Ceará State in northeastern Brazil (figure 1). With an area of 3,796 km², it is almost entirely situated in the Araripe sedimentary basin, and it integrates the municipalities of Barbalha, Crato, Juazeiro do Norte, Missão Velha, Nova Olinda and Santana do Cariri. The Araripe Geopark was the first geopark of the American continent to be included in the Global Geoparks Network (GGN) in 2006 with the support of the Government of the Ceará State, which considers it an important socio-economical development project.

Due to the international relevance of Lower Cretaceous palaeontological record, the Araripe Geopark is well known throughout the world. The palaeobiodiversity of Araripe basin suggests that a favourable environment for life associated with special conditions of post-death existed there in the past. Both conditions were determinant for the exceptional preservation of fossils occurring in the famous Santana Formation constituted by the Crato and Romualdo members (figure 2). The Crato Member has multiple fossils: plants, arthropods, molluscs, fishes, amphibians, pterosaurs and birds' feathers, all typical of a

lower lacustrine sequence. On the other hand, the Romualdo Member represents an upper estuarine sequence with outstanding fossils of plants, arthropods, molluscs, echinoids,

fishes, theropods dinosaurs and a variety of pterosaurs (Carvalho & Santos, 2005).

Illegal collecting

In spite of the existence of legislation regarding fossil protection (Abaide, 2009),

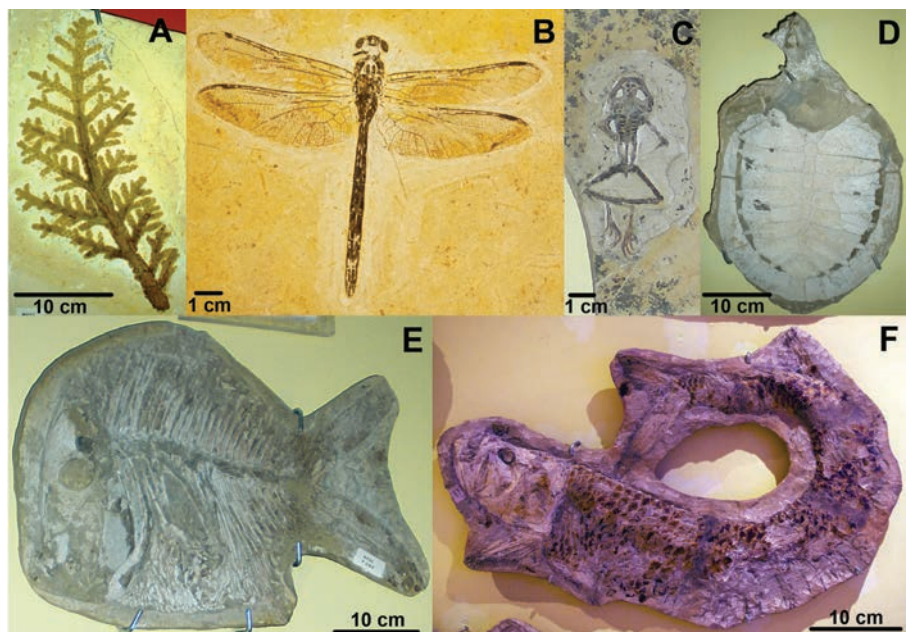


Figure 2 – Some examples of the richness of the Araripe fossils; A, *Brachyphyllum obesum* Heer, 1881; B, *Cordulagomphus fenestratus* Carle & Wighton, 1990; C, *Arariphymus placidoi* Leal & Brito 2006; D, *Araripemys barretoi* Price, 1973; E, *Neoprosicnetes penalvai* Figueiredo & Silva Santos; F, *Cladocyclus gardnery* Agassiz, 1841 (Moura et al., 2006; Saraiva et al., 2010).

illegal collecting constitutes a major pressure on the Brazilian palaeontological heritage. Like in many other countries, fossils are considered cultural heritage but the Institute for National Artistic and Historical Heritage (IPHAN) doesn't act accordingly. The National Department of Mineral Production (DNPM) is another federal institution responsible for the control of fossil sites and for permissions regarding fossil scientific collecting. Nevertheless, due to staff limitations and to the huge extension of fossiliferous regions in Brazil, DNPM actions are not enough to prevent illegal collecting of fossils.

Quarrying

The Santana Formation is very important for the local and national economy due to the exploitation of gypsum deposits and to the use of laminated limestone as ornamental rock. Most of the fossils of the Crato member occur in laminated limestone quarries and for many years this was an uncontrolled activity. The rocks of the Romualdo member occur near the surface and for most quarries they are considered a waste material that needs to be removed before reaching the gypsum and limestone layers. Many fossils are destroyed during this process or taken by local workers to be illegally sold to nationals and foreigners. The involvement of quarry workers in fossil selling is hard to stop due to their low salaries, low socio-educational levels, and no sense of pride concerning the existence of this rich and distinct heritage.

POSSIBLE SOLUTIONS

The protection of fossils has paramount importance to Araripe Geopark managers; they are facing the continuous loss of heritage with international relevance. Unfortunately some of the foreseen solutions are not possible to be implemented by them alone: the unsuitability of the existing legislation and the difficulties in the DNPM can only be solved by the federal government. Nevertheless, the geopark can do an important work with local communities especially in what concerns formal and non-formal education. Bringing together teachers, students, mining companies, DNPM, and the general public is something that the geopark can do in order to raise the awareness of the importance of Araripe fossils. Geopark managers are also promoting technical discussions about legal fossil protection. The desired and necessary change in local society is not a short-term endeavour but good results concerning the sustainability of this very important heritage will take place.

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