

Com os melhores cumprimentos,  
Carlos Marques da Silva

## CACELA'S PALEONTOLOGICAL HERITAGE IN THE RIA FORMOSA NATURAL PARK (ALGARVE, PORTUGAL)

A. SANTOS\*, T. BOSKI\*, C. MARQUES DA SILVA\*\*; M. CACHÃO\*\*, D. MOURA\* & L. CANCELA DA FONSECA\*\*\*

\* Universidade do Algarve, U.C.T.R.A., Campus de Gambelas, 8000 Faro, Portugal.

\*\* Faculdade de Ciências, Departamento de Geologia, Rua da Escola Politécnica, 58, 1294 Lisboa, Portugal.

\*\*\* C.E.A.M. Parque Natural da Ria Formosa, Quelfes, 8700 Oihão, Portugal.

There is a growing social concern about the conservation of the different heritages that represent the basis of cultural identity. The idea that the conservation of the natural heritage constitutes a key-factor for a rational management of our society leads each of us to try to rejoin himself with nature (Alcalá, 1993). However, this trend is focused mainly on the living creatures, and does not include the geological substrate or its related history. So, due to the inexistence of a conscience towards its preservation, paleontological sites are subjected to several aggressions, especially of anthropic nature, which often result in irreparable losses of important paleontological data.

The safekeeping of the Palaeontological Heritage is justified by its own specificity, which results from its limited visibility, spatial variability and irreproducibility. Since the fossil outcrops from a certain geological time period do not constitute a renewable heritage resource, the need of an effective protection becomes evident, both in order to counter natural destructive fossildiagenetic processes, as to protected them from anthropical aggressions to which they are exposed (Alcalá, 1993).

In Portugal, concerns about the protection of natural resources only began to obtain some

importance in the beginning of the 70's. In fact, at this time the concepts of "Natural Park" and "Natural Reserve" were introduced in the portuguese legislation by the Decreto-Lei nº 9/70, of the 19<sup>th</sup> of June 1970. Since then, those concepts have evolved, and nowadays are regulated by the Decreto-Lei nº 19/93, of the 23<sup>rd</sup> of January 1993, in which are defined as follows:

- National Parks, Natural Parks, Natural Reserves and Natural Monuments, relative to the preservation of areas of national importance.
- Protected Landscapes, relative to the preservation of regional and local areas.
- Sites of Biological Interest, relative to the preservation of private areas.

So, the only portuguese laws concerning with the preservation of natural areas focus on the protection of threatened living species and their habitats, neglecting any geological aspects, much less the concept of "Palaeontological Heritage".

In Portugal, Palaeontological Heritage doesn't have any legal protection. This would be of extreme importance, because, as Morales y Azanza (1997) refer, this heritage represents an irreplaceable testimony of the biological

diversity of passed times. The most paradoxical portuguese example is the Jurassic of Cabo Mondego (near Figueira da Foz), where the first attempts of establishing its legal protection occurred more than twenty years ago. This stratotype, although being formally established and internationally recognised, has not yet been given any attention by the competent authorities (Henriques, 1998).

This situation should be changed as soon as possible, since there is starting to be a growing interest and concern, both by the paleontological community as by the general population, regarding the importance of places like these. An example of this trend is the interest arisen by the dinosaurs' footprints of Carenque (in the vicinity of Sintra) and by those from Pedreira do Galinha (in Serra de Aire e Candeeiros Natural Park).

The present analysis refers to the fossil outcrop of Ribeira de Cacela, included in the Natural Park of Ria Formosa (Algarve, Sou-

thern Portugal) (fig. 1). With a total area of 18 400 ha, distributed along approximately 60 km of coastline, this important natural area was given the status of Natural Reserve in 1978 (Decreto-Lei nº 45/78, of the 2<sup>nd</sup> of May) and in 1987 the status of Natural Park (Decreto-Lei nº 373/87, of the 9<sup>th</sup> of December). The reason for its creation were mainly the protection and conservation of the Ria Formosa lagoon system, particularly its flora and fauna, including their respective habitats. However, the important and abundant palaeontological heritage located in this area was not considered.

In Ribeira de Cacela, although representing a place of great paleontological importance no concrete inventory has yet been made, nor have any effective protective measures been applied. These result in a continuous dilapidation of the palaeontological heritage, due to sediment removal and, especially, due to the continuous looting of fossils. The obvious consequence is the loss of important scientific information.

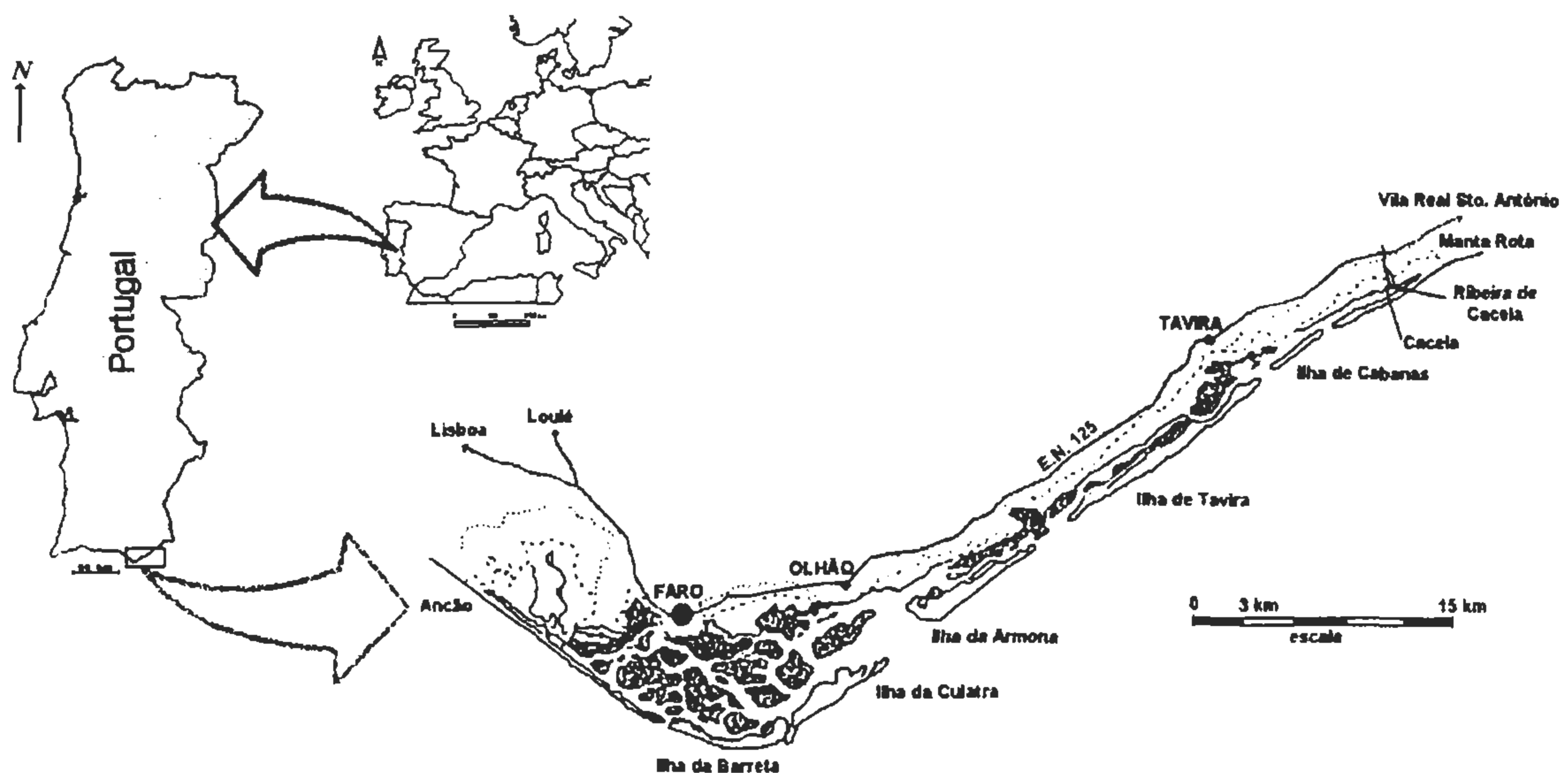


Figure 1. Geographic location of Ria Formosa Natural Park and the fossil outcrop of Ribeira de Cacela (Algarve, Portugal).



Considered as a Classic outcrop, since a long time ago, the fossils contained in the Ribeira de Cacela, have been the target of attentions by numerous authors and publications. The interest for this fossil outcrop goes back to the mid-nineteenth Century, with works by Pereira da Costa (1866-67 in Dollfus *et al.* 1903-04) and Cotter (1879 in Dollfus *et al.* 1903-04). Latter, several other works were made, of which the most important are Dollfus *et al.* (1903-04), Bourcart & Zbyszewski (1940), Chavan (1940), Zbyszewski & Almeida (1950), Veiga Ferreira (1951), Freneix (1957) and Brébion (1957). After a thirty-year interval, the study of this area was continued by Antunes *et al.* (1981), Pais (1982), Antunes & Pais (1982), Cachão & Silva (1992), Cachão (1995), and Gonzales Delgado *et al.* (1995).

Some singular characteristics that make Ribeira de Cacela a heritage to preserve are:

- Its historical value, since it was already known in the mid-nineteenth Century.
- The richness and diversity of the associations that are present, especially invertebrates; noticeable is the presence of a great abundance of bivalves (*Glycimeris*, *Cardium*, *Megacardita*, *Panopaea*, *Pelecypora*, *Callista*, *Solen* and *Gigantopecten*, besides Veneridae, Corbulidae and Nuculanidae), as well as gastropods (Turritelidae, Naticidae and Conidae, among others) and scaphopods (Cachão 1995).
- The fossil's excellent taphonomic preservation, particularly the bivalve molluscs and gastropods; the existence of vestigial coloration in some exemplars and the way many are preserve in life position.
- The fact that it is the only portuguese outcrop of the Upper Tortonian (Biozone CN9a of Okada & Bukey, *circa* 8,2 to 7,5 Ma of Cande & Kent in Cachão 1995).
- The existence of fossils from this site in collections of numerous European Museums, and its almost complete absence in portuguese collections; this absence was caused mainly by the big 1978 fire in the Portuguese Natural History Museum, which resulted in the loss of the majority of collections; there is also a lack of appropriate infrastructures (Geology and Paleontology Museums), where the manage-

ment and the use of the enormous portuguese paleontological potential could be made.

- Its importance for pedagogical (paleo)environmental activities, as well as its importance for the local communities.

For all those reasons, the Ribeira de Cacela outcrop is already considered as a reference in European paleontology.

Considering the paleontological importance of this area, as well as its scientific, educational and cultural interest, it is fundamental to make a formal inventory of this outcrop. This inventory would be coordinated by the entity already responsible for its preservation and protection - the Ria Formosa Natural Park. Once we have a complete knowledge about the characteristics of the outcrop, it will be possible to propose and apply objective legal measures in order to assure an effective preservation of the existing Palaeontological Heritage.

For all the given reasons, a formal proposal will be made to the Instituto da Conservação da Natureza (the portuguese nature conservation institute), in order to classified this outcrop as Natural Monument. The same was done, for instance, for the Pedreira do Galinha, included in a Natural Park, which has already been given the legal status of Natural Monument.

Consequently, Ria Formosa Natural Park would comprehend another area of knowledge, that until now has not been explored, promoting the diversification of its heritage and increasing the scientific, natural, educational and cultural importance of this area.

The importance of safekeeping this heritage should be clearly underlined, in order to promote its protection from looting, vandalism and uncontrolled collecting. This protection must be accompanied by simultaneous valorisation measures, that will allow it to be accessible to acknowledged researchers and palaeontologists, as well as to develop educational (paleo)environmental activities, in order to achieve its divulgence.

So, although we know that the proposed legal protection will constitute a long end difficult process, these will largely be compensated by the resulting benefits, in terms of protection



and management of the existing palaeontological heritage. With a timely application of those measures, it will be possible to guarantee the preservation of this natural heritage, as well as its passing on to future generations.

## REFERENCES

- Alcalá, L. 1993. La conservación de los yacimientos paleontológicos europeos. *EUROPAL-European Palaeontological Association*, 4: 17-21
- Antunes, M. T.; Bizon, G.; Nascimento, A. & Pais, J. 1981. Nouvelles données sur la datation des dépôts miocènes de l' Algarve (Portugal), et l' évolution géologique regional. *Ciências da Terra* (U.N.L.), Lisboa, 6: 153-168.
- Antunes, M. T. & Pais, J. 1992. The Neogene and Quaternary of Algarve. in Atlantic General Events During Neogene, I Cong. RCANS, *Ciências da Terra* (U.N.L.), nº esp. II: 57-66.
- Bourcart, J. & Zbyszewski, G. 1949. La faune de Cacela en Algarve (Portugal). *Com. Serv. Geol. Portugal*, Lisboa, XXI: 3-60.
- Brébion, Ph. 1957. Le *Mitra fusiformis* des couches tortoniennes de Cacela est une espèce nouvelle: *Mitra pereirai* n. sp. *Com. Serv. Geol. Portugal*, Lisboa, XXXVIII, 1: 241-242.
- Cachão, M. & Silva, C. M. 1992. Neogene palaeogeographic evolution of Algarve Basin (Southern Portugal): a two step model. Preliminary data. *Gaia*, 4: 39-42.
- Cachão, M. 1995. Utilização de Nanofósseis calcários em biostratigrafia, paleoceanografia e paleoecologia. Aplicações ao Neogénico do Algarve (Portugal) e do Mediterrâneo Ocidental (ODP 653) e à problemática do *Coccolithus pelagicus*. Tese de Doutoramento, Faculdade de Ciências da Universidade de Lisboa, Lisboa, 356 pp.
- Chavan, A. 1940. Les fossiles du Miocène supérieur de Cacela. *Com. Serv. Geol. Portugal*, Lisboa, XXI, 61-106.
- Cotter, J. C. B. 1879. Fósseis das bacias Terciárias marinhas do Tejo, do Sado e do Algarve. *Jorn. Sc. Math. Phys. Naturaes*, Lisboa, VII, 26: 112-122.
- Diário da República 1970. Decreto-Lei nº 9/70, de 19 de Junho.
- Diário da República 1978. Decreto-Lei nº 45/78, de 2 de Maio.
- Diário da República 1987. Decreto-Lei 373/87, de 9 de Dezembro.
- Diário da República, 1993. Decreto-Lei 19/93, de 23 de Janeiro.
- Dollfus, G. F., Cotter, J. C. & Gomes, J. P. 1903-04. Mollusques Tertiaires du Portugal. Planches de Cephalopodes, Gastéropodes et Pélécypodes laissés par F. A. Pereira da Costa. *Com. Serv. Geol. Portugal*, Lisboa: 46 pp.
- Ferreira, O. V. 1951. Os Pectinídeos do Miocénico do Algarve. *Com. Serv. Geol. Portugal*, Lisboa, XXXII, 1: 153-173.
- Freneix, S. 1957. Lamellibranches nouveaux du Miocène du Portugal. *Com. Serv. Geol. Portugal*, Lisboa, XXXVIII, 1: 227-239.
- Gonzales-Deigado, J.; Andres, I. & Sierro, J. 1995. Late Neogene molluscan faunas from the Northeast Atlantic (Portugal, Spain, Marocco). *Geobios*, 28, 4: 459-471.
- Henriques, M. H. 1998. O Jurássico do Cabo Mondego e a projecção internacional do património geológico português. In I Encontro Internacional sobre Paleobiologia dos Dinossáurios. Programa de Musealização para pistas de Dinossáurios em Portugal. Museu Nacional de História Natural, Lisboa: 98-103.
- Morales, J. y Azanza, B. 1997. Los parques paleontológicos, una alternativa de gestión para recursos paleontológicos de alto potencial didáctico, cultural y artístico. En: Pallí, L. y Carreras, J. (Eds). *Comunicaciones de la III Reunión de la Comisión de Patrimonio Geológico*, Girona: 51-54.
- Zbyszewski, G. & Almeida, F. M. 1950. Os peixes miocénicos portugueses. *Com. Serv. Geol. Portugal*, Lisboa, XXXI: 309-412.