



Fossil assemblages and palaeoenvironments in the Cenomanian vertebrate site of Nazaré (West Central Portugal)

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Abstract



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A palaeontological site with early and middle Cenomanian vertebrate remains has been located near Nazaré, a village on the west coast of Central Portugal known for its large promontory with exposures of Upper Cretaceous platform carbonates and "Garumnian" siliciclastic beds. The sampled remains are rather well preserved biomineralized skeletal elements, including bones, teeth and fish scales of disarticulated and fragmented specimens. The vertebrate remains preserve their volume without signs of distortion, and many of the original biological characteristics are still visible. Their taxonomic study allows the identification of several middle Cenomanian osteichthyans, including isolated teeth of *Coelodus* sp., a few jaw fragments and an almost complete tooth of cf. *Enchodus*, and a large and articulated teleostean specimen (Teleostei indet.) with well-formed and ossified vertebrae and cycloid scales. The turtle remains are late early Cenomanian in age, and include several indeterminate fragments, besides a costal plate fragment and a complete peripheral plate corresponding to the oldest occurrence of a probable member of the clade Pan-Chelonioida in the Iberian record. The crocodyliform specimens are represented by three osteoderms of *Mesoeucrocodylia* indet. and a dorsal vertebra collected from middle Cenomanian beds. This last element is attributed to *Eusuchia*, a clade poorly known in the European Cenomanian. The late early Cenomanian assemblage with sea turtles and associated benthic faunas have been interpreted as the record of an open inner shelf environment with bivalve biostromes of *Ilymatogyra pseudoafricana* and *Ceratostreon flabellatum* located close to an intertidal flat with mixed carbonate-sand sedimentation. The inner shelf episode was followed by the development of a lagoonal environment during the middle Cenomanian, with oyster communities of *Gyrostrea ouremensis* and a diverse vertebrate assemblage with several fish and crocodyliform species adapted to more restricted ecological conditions. These new discoveries increase the

limited number of European locations with Cenomanian vertebrate assemblage records, and provide additional data for several less well known taxa.

Keywords: CARBONATE PLATEFORM; CENOMANIAN; CROCODYLIFORMES; LAGOONAL ENVIRONMENT; NAZARÉPORTUGAL; OSTEICHTHYES; TESTUDINES; VERTEBRATA

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