Cretaceous Research 57 (2016) 639–661

Contents lists available at ScienceDirect

Cretaceous Research

journal homepage: www.elsevier.com/locate/CretRes

Upper Maastrichtian shallow marine environments and neoselachian assemblages in North Iberian palaeomargin (Castilian Ramp, Spain)

José-Carmelo Corral [a, *], Ana Berreteaga [b], Henri Cappetta [c]

[a] Arabako Natur Zientzien Museoa/Museo de Ciencias Naturales de Álava, Siervas de Jesús 24, E–01001 Vitoria–Gasteiz, Spain
[b] Universidad del País Vasco/Euskal Herriko Unibertsitatea, Facultad de Ciencia y Tecnología, Departamento de Estratigrafía y Paleontología, Apartado 644, 48080 Bilbao, Spain
[c] ISEM, CNRS UMR 5554, Université de Montpellier, Place Eugène Bataillon, F–34095 Montpellier Cedex 5, France

ARTICLE INFO

Article history:
Received 14 April 2015
Received in revised form
23 July 2015
Accepted in revised form 9 August 2015
Available online 11 September 2015

Keywords:
Neoselachians
Rare earth elements
Maastrichtian
Basque-Cantabrian Basin
Castilian Ramp
Spain

ABSTRACT

Upper Maastrichtian deposits formed in a nearshore subtidal environment within the Valdenoceda Formation (Castilian Ramp, North Iberian margin) are described together with two recently found selachian assemblages. Rare earth element concentrations (REE) have been used to assess the degree of taphonomic mixing and reworking, observing that it is minor or non-existent, and differences in degree of preservation and ecologic mixing can be explained by biostratinomic processes. The patterns of REE also helped to obtain a better understanding of the depositional environment, including the diagenetic history from burial to final degree of bone preservation.

The fossil assemblages here described are close to that of the late Maastrichtian of Albaina (in the enclave of Condado de Treviño, Burgos), both in the Basque-Cantabrian Region, but their age may be slightly older (early late Maastrichtian). In total, the new assemblages consist of 17 taxa, assigned to 11 genera of shallow-water dwellers combined with individuals from the outer shelf. They represent cosmopolitan taxa (*Squalicorax pristodontus*, *Serratolamna serrata* and *Rhombodus binkhorsti*) together with local species (*Rhinobatos echavei*, *Rhinobatos ibericus*). Although there are not significant differences between Albaina and Quintanilla la Ojada faunas, the new assemblages add interesting taphonomic and geochemical information to the few existing uppermost Cretaceous deposits with fossil sharks in southwestern Europe.

1. Introduction

Much of the knowledge on selachian faunas in the Basque-Cantabrian Region (northern Spain) was based on scant occurrences across few Late Cretaceous localities (Bardet, Corral, & Pereda, 1993; Corral, 1996) and chiefly through the works of Cappetta and Corral (1999), who reported an important collection of Maastrichtian selachians at the abandoned quarry of Albaina in the Condado de Treviño (a Burgos exclave in Álava province).

Upper Cretaceous strata (lower Campanian to upper Maastrichtian) crop out almost continuously in the central part of the Basque-Cantabrian Region, from eastern Urbasa Mountains to Anderejo-Vienda Mountains at the west, and across the provinces of Navarre, Álava and Burgos. Recent fieldwork in the region has produced a new collection of marine vertebrates, the principal of which are selachian teeth but actinopterygian microfossils and mosasaurs teeth also occur (Berreteaga, 2008; Berreteaga, Poyato–Ariza, & Pereda Suberbiola, 2011). A preliminary faunal list of the fossil site was made available by Berreteaga et al. (2010).

Here, we report the discovery of a new vertebrate fossiliferous site, which was discovered by geologists of the Basque Country University (UPV/EHU) while the doctoral research of one of us (A.B.). This material mainly consists of isolated teeth with a particular taphonomic and geochemical history, which extends our knowledge about the chondrichthyan distribution in the Basque-Cantabrian Region.

2. Location and geology

The new material was collected from two sand pits situated on the northern flank of the Vienda Mountain Range, in the vicinity of Quintanilla la Ojada (Burgos province, Spain; UTM coordinates: 30T

* Corresponding author.
E-mail address: corral.arroyo@gmail.com (J.-C. Corral).

http://dx.doi.org/10.1016/j.cretres.2015.08.001
0195-6671/

475337.8 4749958.1 and 30T 475570.5 4749464.2). Quarrying has targeted a bed of silica sand that outcrops along this hilly region within the Rioseco Member (see Stratigraphy description, below) (Fig. 1). The region, which is geologically named North Castilian Ramp, or Castilian Ramp (CR) in a simple form, contains several Upper Cretaceous series of clayey carbonates and limestones that are rich in pelagic fossils (Floquet, 1991, 2004). This domain broadly represents the distal part of a ramp-like platform developed within the Basque-Cantabrian Basin (northern continental palaeomargin of Iberian plate). Throughout the latest Cretaceous and early Paleogene a ramp-like platform developed in the southwestern part of the basin, and depositional environments ranged from inner shelf to coastal and even continental (Floquet, 1991; Pluchery, 1995).

The northernmost palaeogeographical domain of the CR comprises thick deposits (900–1000 m) of siliciclastic and shallow marine carbonates arranged in transgressive-regressive cycles (Berreteaga, 2008; Floquet, 1991, 1998). Fossil-rich Maastrichtian outcrops are, for the time being, limited to the northern limb of the Villarcayo Syncline (abbreviated as VS in Fig. 1), which forms the western end of the South Cantabrian Synclinorium. Similar uppermost Cretaceous materials have also been arranged in time equivalent transgressive-regressive cycles in the nearby Miranda-Treviño Syncline (Baceta, 1996; Baceta, Pujalte, & Orue-Etxebarria, 1999), where the comparable fossil site of Albaina is located (abbreviated as M-TS in Fig. 1).

2.1. Stratigraphic description

The Quintanilla la Ojada section (Fig. 2) is represented by marine bioclastic calcarenites in its lower part, corresponding to the top of the Tubilla del Agua Formation (defined by Floquet, Alonso, &

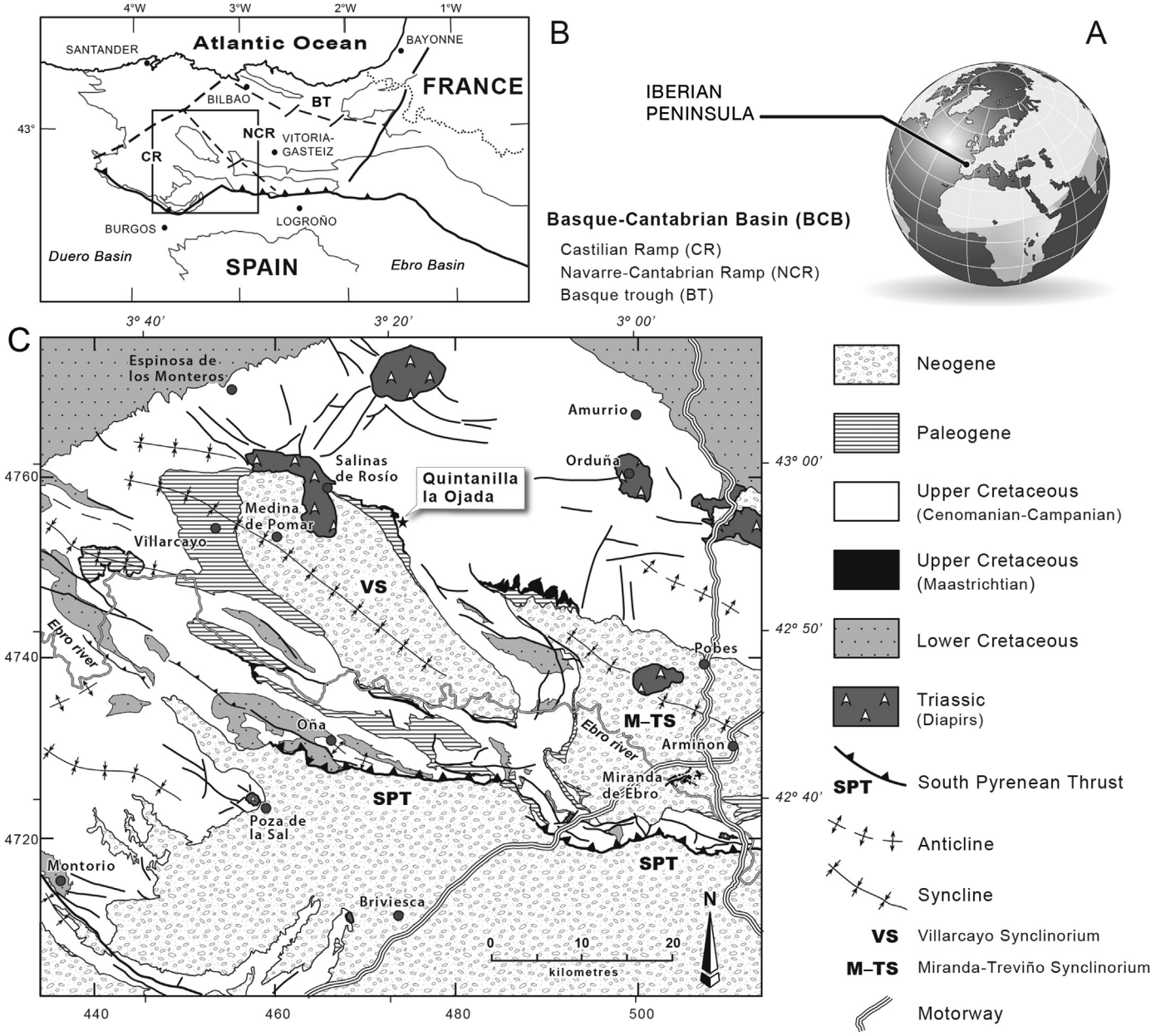

Fig. 1. A and B, general location maps of the study area; C, simplified geological map in the Villarcayo Syncline area (Navarre–Cantabrian Ramp of the Basque Cantabrian Basin), showing the location of the vertebrate fossil site (based on photomosaic maps, MAGNA E 1:50000, IGME, Spain).