

European UNESCO Geoparks: Short Communication

Early Cambrian (Marianian) Trilobites and Associated Faunas from the Sierra Norte de Sevilla Geopark: A Scientific and Heritage Approach

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Abstract

Some exceptional paleontological trilobite sites located in the Sierra Norte de Sevilla UNESCO Global Geopark are presented herein, together with an analysis of their geotourism / geotrail potential and a proposal for geoconservation. The sites are of Marianian age, a regional stage and age of the Cambrian Mediterranean Subprovince which was defined within the territory of the Geopark. This area constitutes the type area of six trilobite genera and twelve trilobite species and other associated faunas (hyolith, serpulid and echinoderm species).

Keywords: Fossils, Trilobita, Paleontological heritage, Seville, Spain.

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Introduction

The Sierra Norte de Sevilla Geopark was first nominated as a Spanish Natural Park in 1989. In 2011, it was declared a European Geopark and later recognized as a UNESCO World Geopark in 2015.

The unique paleontological features and the international recognition of the Early Cambrian trilobite sites within the geopark are briefly presented in this work. Following the discovery of the first trilobite site in 1938, about 20 Early Cambrian trilobite sites have been reported since then. They occur in the Benalija Unit near the municipalities of Cazalla de la Sierra, Guadalcanal, San Nicolás del Puerto and Constantina. These discoveries

resulted in several studies published by some of the most renowned Cambrian specialists from the 20th century, namely Richter and Richter (1940), Hupé (1953), Hennigsmoen (1958) and Sdzuy (1961, 1962). See Mayoral *et al.* (2008) and Mayoral *et al.* (2020) for more recent studies.

Geological and Stratigraphical Location

The trilobite sites occur in the Ossa-Morena Zone (Iberian Massif; Fig. 1A), in Cambrian outcrops of the northern limb of the Olivenza-Monesterio Antiform (Fig. 1B). More specifically, they are within the Benalija Unit (Fig. 1C). The sites are scattered throughout the stratigraphic succession of the Lower Cambrian Alanís Beds (Fig. 2).

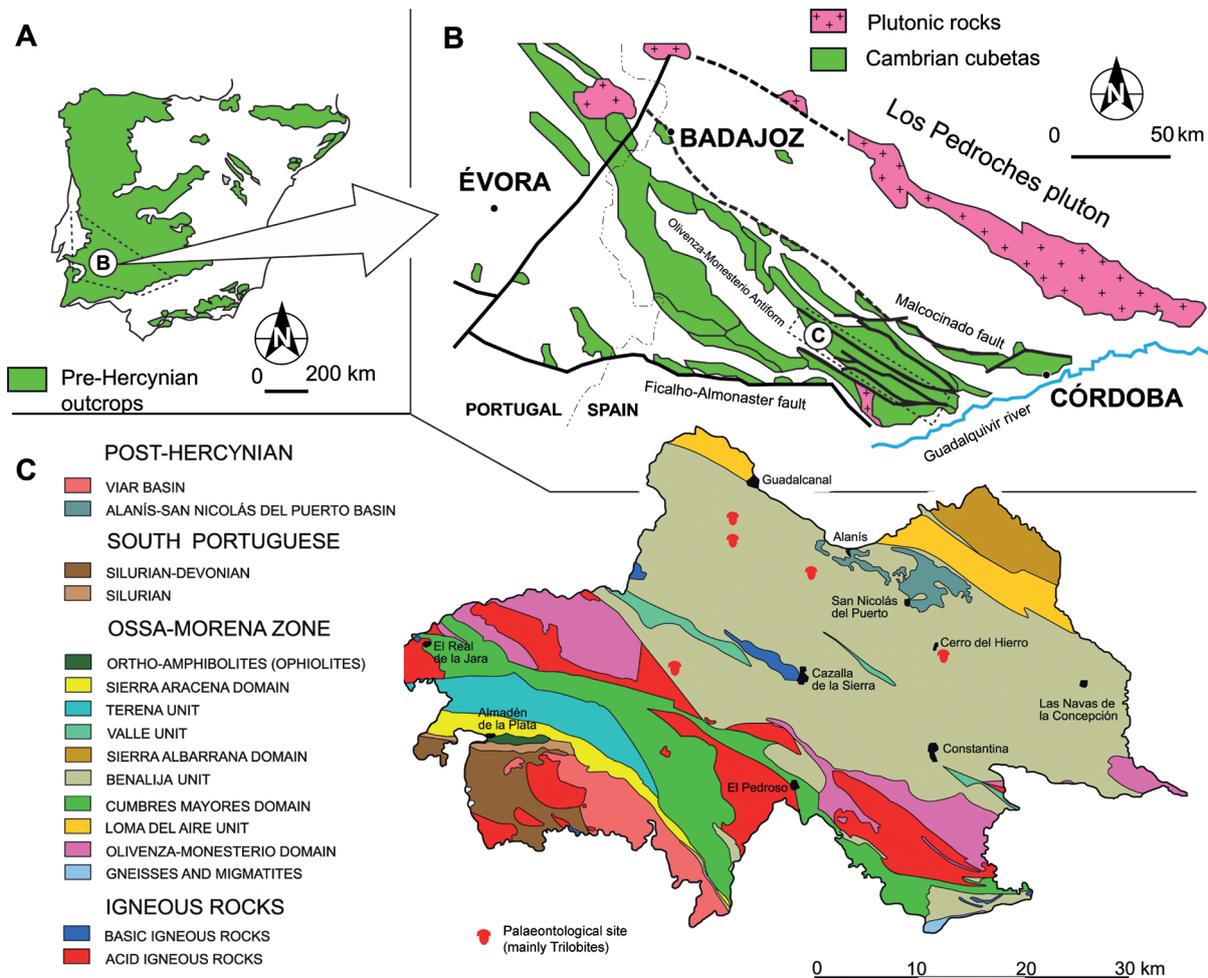


Figure 1. Location of the studied area. A. Ossa-Morena Zone (framed area). B. Cambrian outcrops and location of the Sierra Norte de Sevilla Geopark. C. Main sites with fauna of the Early Cambrian (Benalija Unit) in the Sierra Norte de Sevilla Geopark. Geological map modified from TRAGSATEC (2011).

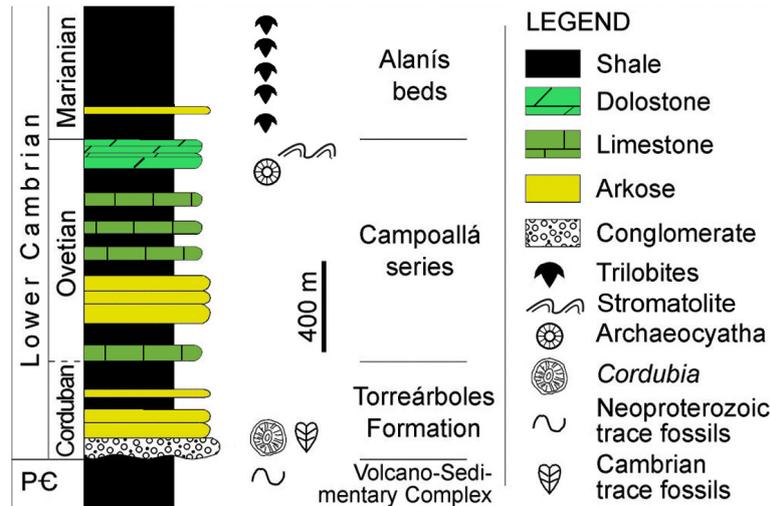


Figure 2. Synthetic Lower Cambrian stratigraphy of the area.

Paleontological Relevance of the Trilobite and Associated Fauna Sites

A total of 16 genera and 18 species of trilobites have been recognized in the Sierra Norte de Sevilla Geopark, one of the highest trilobite diversities worldwide for this geological time interval. The geopark also includes the original locations – type area, or *locus typicus* – where several trilobite genera were defined, namely *Alanisia*, *Saukian-da*, *Perrector*, *Eops*, *Strenuaeva* and *Andalusiana* (Fig. 3), as well as those of other species including twelve trilobites, one hyolith, one serpulid and one echinoderm.

In addition, the Sierra Norte de Sevilla Geopark is the type area where the Marianian Stage (from the Latin *Mons Mariani* = Sierra Morena) was defined. The Marianian is a formal geological unit of reference for the Cambrian Mediterranean Subprovince. The presence of Early Cambrian soft-bodied fossils was evidence to include this Geopark in the list of exceptional Lagerstätten sites, highlighting the scientific value of the sites in terms of natural heritage and the need for their conservation.

From a strictly scientific perspective, one of the most outstanding characteristics of the Geopark is that it allows the possibility of analyzing, both temporally and spatially, the variation in trilobite faunal assemblages and, therefore, to interpret the

changes in the communities of successive ecosystems. Furthermore, the Geopark offers the possibility of recognizing different paleoenvironments which range from coastal (Cerro del Hierro event) to marine platforms, with benthic and pelagic fossil fauna present, such as some tiny, pelagic eodiscid trilobites which are characteristic of the Lower Cambrian of both North America and Europe.

Geotourism and Geotrail Potential

The trilobite sites of the Sierra Norte de Sevilla Geopark have reached peak popularity since their first discovery in Alanís almost 100 years ago. Scientific expeditions by universities from Germany, France, Sweden, Belgium and Spain, as well as from international museums, have improved the geological and paleontological knowledge of the sites, and also their national and international impact (Liñán 2004).

The geotourism and geotrail potential is considerable. So far, a geological guide for the Sierra Norte Natural Park, now Sierra Norte de Sevilla Geopark (Moreno *et al.* 2008), as well as a paleontological route established within the Cerro del Hierro site (Mayoral *et al.* 2008), have been published. The Sierra Norte de Sevilla Geopark features well-developed touristic facilities, including several free public access routes, together with some other restricted trails used by authorized



Figure 3. Most representative trilobites of the Sierra Norte de Sevilla Geopark and some associated fauna. A) *Andalusiana cornuta* Sdzuy. B-C) *Alanisia guillermoi* Richter & Richter. C) Cranidium. D) *Eops* sp. E. Exuviae of gigantopygid trilobite. F) *Saukianda andalusiae* Richter & Richter. G) *Strenuaeva sampelayoi* Richter & Richter. H) *Acrothele* sp., an inarticulate brachiopod. All scale bars = 1 mm, except for A = 5 mm.

touristic-educational companies, one Information Point and some other facilities which adequately complete the services offered to visitors.

Geosites Conservation

The Sierra Norte de Sevilla Geopark finds its background in the declaration of the area as a Nat-

ural Park by the Law 2/1989, of 18 July, which approved the Inventory of Protected Natural Spaces in Andalusia. Furthermore, although the protection status of these paleontological sites is high, there are still potentially serious threats of uncontrolled exploitation of some trilobite sites highly desired by collectors. The future inclusion of the trilobite sites in the Andalusian Inventory of Georesources and the Geosites Inventory of the Sierra Norte de Sevilla Geopark will undoubtedly increase their conservation enforcement.

Conclusions

The Cambrian paleontological sites with trilobites and associated faunas in the Sierra Norte de Sevilla Geopark have a significant richness and a high heritage and historical value. Furthermore, the privileged geological environment where they are located makes them ideal for future exhibitions and the creation of new paleontological itineraries and georoutes, thus increasing the international projection of this Geopark.

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