

# **The educational book *Fossils Trail: questions and answers* – a tool for educational and geotourism activities at the Naturtejo Geopark (Portugal)**

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*ABSTRACT: The Fossils Trail was established in 2003 and goes along the Ichnological Park of Penha Garcia, one of the 16 geomonuments of the Naturtejo Geopark. The educational book “Fossils Trail – Questions and Answers (Ichnological Park of Penha Garcia)” published in 2009 by the Idanha-a-Nova Municipality is a part of the author's Masters Dissertation of the University of Minho. This resource is addressed to tourism technicians, biology and geology teachers and monitors of the Educational and Geotouristic activities organized by the Geopark staff in the fossils trail of Penha Garcia.*

*KEYWORDS: Educational book, Ichnological Park of Penha Garcia, Fossils Trail, Naturtejo Geopark.*

## **1. INTRODUCTION**

The Fossils Trail which goes along the Ichnological Park of Penha Gracia, one of the geosites of the Naturtejo Geopark, welcomes visitors from different educational backgrounds and interests. The general public is usually hosted by the guides and staff from the Tourism Office of the Idanha-a-Nova Municipality, from the Geopark and from local tourism entertainment companies. Schools and geotourists may engage in field trips organized by monitors with scientific and pedagogical training in geosciences belonging to the Naturtejo EIM Company. This educational book is addressed to those technicians and also to teachers who are teaching geological themes and want to prepare field trips together with their students, organizing them autonomously or with the assistance of the Geopark staff, namely the Field Trips A (“In the Fossils Trail of Penha Garcia searching for the Trilobites”) and C (“The fossils of Penha Garcia and the residual blocks of Monsanto”) from the Educational Program called “School goes to the Geopark”.

Several questions are asked to the guides, monitors and teachers during the activities. Thus came this educational book in 2008 in the context of the Masters Dissertation of the University of Minho entitled “Valuing and Promoting the Geological Heritage of the Naturtejo Geopark: strategies for the Ichnological Park of Penha Garcia”. The issues in this book are shown through questions and answers in order to be an easy information guide. It works as an interlocutor between visitors and the geological heritage. In the 27 selected and characterized stops of this book visitors are invited to observe the rocks, the fossils and the landscapes of Penha Garcia which have 600 millions years of the Earth history and Life evolution.

## **2. THE ICHNOLOGICAL PARK OF PENHA GARCIA AND ITS RICH HERITAGE**

The Ichnological Park of Penha Garcia is a place of geological interest within an area of around 1km<sup>2</sup>. This geosite comprises a set of quartzite layers which belong to the Armorican Quartzite Formation (Lower Ordovician) (Sequeira & Serejo Proença, 2004). These two authors consider this geosite of worldwide relevance due to its sedimentary, educational and tectonic structures of high interest along with the exceptional palaeontological and landscape features (Sequeira & Serejo Proença, 2004).

The Ichnological Park of Penha Garcia arenigian rocks contain a relevant ichnofossil record due to its preservation quality, abundance, diversity and individuality associated to a remarkable geological heritage. The most relevant ichnofossils are the *Cruziana*, feeding trails produced by trilobites and other morpho-similar life forms. The Idanha-a-Nova Municipality has determined to give a legal status to the Geological, Palaeontological, Biological, Historical and Cultural heritage in the gorge of the Ponsul River, and has classified this area as a Property of Municipal Interest. The PR3 - *Fossils Trail*, a circular pedestrian trail with 3Km long, was established in 2003, with the goal of promoting that relevant heritage (Catana *et al.*, 2007). This is not only a Palaeontological trail, but also a Geological Trail due to the great observable geodiversity features, namely rocks and minerals, sedimentary structures, biostratigraphic environments, tectonic structures and landforms.

### 3. THE EDUCATIONAL BOOK *FOSSILS TRAIL – QUESTIONS AND ANSWERS*

The educational resource *Fossils Trail – Questions and Answers (Ichnological Park of Penha Garcia)* was made with the purpose of filling the lack of a written document which could be geologically useful for the fossils trail guides training. This was an educational resource presented as a strategy for the valuing of the geological heritage of the Naturtejo Geopark in the above cited Masters Dissertation. As a support document in workshops for guides it also becomes a wide promoting strategy of the geological heritage, each time the guide who owns it and/or attends a workshop based in it accompanies the visitors of the fossils trail.

In 2004 the geologist Neto de Carvalho made a detailed inventory of the palaeontological and geological sites of interest in the Ichnological Park associated to the ethnographical and historical heritage establishing 74 sites (Neto de Carvalho, 2004).

Twenty-seven selected stops in the fossils trail are integrated in the educational book with the following criteria (Catana, 2008):

- stops which allow the understanding of the geological heritage, especially the ichnological one, and which give us the possibility to tell the story of the 600 million years of the landscape and life's evolution in the area of Penha Garcia;
- the relevance of the geological heritage and its promotion associated to the cultural one;
- valuing and promoting addressed to three types of public: the general public, schools and the specialized one;
- the visitors age group from 6 to 75;
- the level of geological knowledge of the three types of public.

Three criteria defined by Brilha (2005) and based in Uceda (2000) were taken into account to select the sites of interest: intrinsic, potential use and protection needs. Sixteen of the twenty-seven selected stops are of geological interest and eleven are cultural (Table 1).

The educational book is divided into 9 chapters: Introduction; 1. Geoparks; 2. The Naturtejo Geopark; 3. Naturtejo Geopark's integration in the Geoparks Networks; 4. Geosites of the Naturtejo Geopark; 5. Ichnological Park of Penha Garcia; 6. Earth and Man – an “ancient” relationship; 7. The rocks and landscape of Penha Garcia - a 600 million-year-old geological history; 8. PR3 – Fossils Trail (with a characterization record sheet of each of the 27 stops and a map where they are signaled); 9. Tips and useful information for tourists; Bibliography; Appendices (27 record sheets with support materials such as photographs, diagrams, poems, maps, legends and a stratigraphic chart).

Table 1. Selected stops and types of heritage typology (Catana, 2008).

Nº	Stops	Heritage Typology
1	<i>Beginning of the PR3 — Fossils Trail</i>	<b>Cultural:</b> ethnographical
2	<i>Chapel of the Holy Spirit</i>	<b>Cultural:</b> religious architecture
3	<i>Tourism Office of Penha Garcia</i>	<b>Cultural:</b> civil architecture
4	<i>Pillory</i>	<b>Cultural:</b> civil architecture
5	<i>Future Museum of the Palaeozoic</i>	<b>Geological:</b> paleontological <b>Cultural:</b> civil architecture
6	<i>Parish Church of Penha Garcia</i>	<b>Cultural:</b> religious architecture
7	<i>Belvedere with a view over the river Ponsul and the “Ordovician sea”</i>	<b>Geological:</b> geomorphological, tectonical, structural, stratigraphical, petrological
8	<i>Armorican Quartzite</i>	<b>Geological:</b> petrological, mineralogical, sedimentological, stratigraphical
9	<i>Belvedere with a view over the ruins of the Medieval Castle</i>	<b>Geological:</b> geomorphological, tectonical <b>Cultural:</b> military architecture
10	<i>District of traditional houses built with quartzite</i>	<b>Cultural:</b> civil architecture
11	<i>“Lapa do Castelo” cavern (Castle cavern)</i>	<b>Geological:</b> tectonical, structural <b>Biologic:</b> birds
12	<i>Mine of “Ti Meio Quartilho”</i>	<b>Geological:</b> mineralogical and petrological
13	<i>Fault plane and ichnofossils</i>	<b>Geological:</b> structural, ichnological
14	<i>“As cobras pintadas” (Painted snakes)</i>	<b>Geological:</b> ichnological
15	<i>Folds in the schist and quartzite layers</i>	<b>Geological:</b> tectonical and structural
16	<i>Strata of quartzite in vertical position</i>	<b>Geological:</b> tectonical, structural and stratigraphical
17	<i>Flagstone with 4 types of ichnofossils</i>	<b>Geological:</b> ichnological, sedimentological and stratigraphical
18	<i>Piperock de Skolithos</i>	<b>Geological:</b> ichnological, petrological and stratigraphical
19	<i>Waterwheel windmills &amp; The Fossils House</i>	<b>Cultural:</b> civil architecture and ethnographic <b>Geological:</b> ichnological and sedimentological
20	<i>Ripple Marks and vertical galleries</i>	<b>Geological:</b> sedimentological and ichnological
21	<i>Cruziana with circular behaviour</i>	<b>Geological:</b> ichnological and stratigraphical
22	<i>Pool of the “açude do Pego”(Pego’s dam)</i>	<b>Cultural:</b> ethnographical
23	<i>Windmill of “Ti Catafoio”</i>	<b>Cultural:</b> ethnographical
24	<i>Panoramic view of the strata sequence (of the southwest wing of the Syncline of Penha Garcia) and drag fold</i>	<b>Geological:</b> tectonical, structural, stratigraphical and geomorphological
25	<i>Windmill of “Ti Serrano”</i>	<b>Cultural:</b> ethnographical
26	<i>Windmill of the “bank of Cagueta”</i>	<b>Cultural:</b> ethnographical
27	<i>Windmill of “Ti Lourenço André”</i>	<b>Cultural:</b> ethnographical

### 3. CONCLUSIONS

This educational book should be used along with workshops, which include the presentation and characterization *in situ* of the selected stops. In January and February 2010 we had the first related workshop named “Let's tell the Story of Earth and Life on the Fossils Trail of Penha Garcia” (Catana, 2010). The two first days consisted of theoretical activities in a room of the *Centro Cultural Raiano* in Idanha-a-Nova. The field practical activities of the last two days took place in the building of the future Paleozoic Museum and in the Ichnological Park of Penha Garcia. Around 30 participants have attended the workshop.

This guide may undergo some future changes so that it can be edited and purchased by the common citizen who is then able to participate in the activity of exploring the fossils trail autonomously since the general public has been showing interest in acquiring this educational book after consulting it in the tourism offices of the Municipality of Idanha-a-Nova. The contained information and its structure can be the basis for the creation of field guides addressed to the public school and with pedagogical activities which the students can engage in during field classes in the Ichnological Park of Penha Garcia. This educational book can be used as a model, with the needed adjustments, to other educational books of trails with geological interest within the Naturtejo Geopark, other Geoparks or even places where geotourism is promoted, since it turned out to be a useful educational tool after being used and tested in a workshop.

### Acknowledgments

*The author of this paper wants to thank Maria Cardoso.*

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