

“COMPLEX CONTINENTAL ICHNOFABRICS FROM CENTRAL PATAGONIA: INTERPRETATION AND APPLICATIONS”

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Scientific Report

Introduction

Several localities with known bioturbated continental deposits were selected to study its trace fossil content and to understand its ichnofabric. Some of these localities were visited in two fieldtrips partially funded with this grant.

In the first fieldtrip, developed from 1st to 6 of May 2007, I visited an area known as Meseta de Baqueró (Baqueró Plateau) in the Santa Cruz Province, Argentina.

During the second field trip, from 15 to 25 of October 2007, I visited and study the following localities, Cañadón Puerta del Diablo, Senguer and Mayo Rivers Junction, Estancia La Juanita, and Gran Barranca, all of them in the southern part of the Chubut Province, Argentina.

I wish to acknowledge the support provided by the IAS Grant Scheme. The grant was used to cover partially the fieldwork costs of my PhD Thesis. Data obtained in this fieldtrips will help to understand the significance and evolution of the ichnofabrics in the palaeosols of Central Patagonia, Argentina. Future work is focused in the integration of the results obtained from the data collected in these two fieldtrips, with the information obtained in other localities of Patagonia.

Field Trip # 1

The study area is located in the Deseado Massif geological province in the north of Santa Cruz Province. The massif records a thick succession of Jurassic-Cretaceous continental volcanoclastic sedimentation. The studied units were deposited during the Late Jurassic to the Early Cretaceous times. They are the Bajo Grande, Bajo Tigre and Punta del Barco formations.

The Bajo Grande Formation is a volcanoclastic unit, ranging from 20 to 300 m in thickness. It is, mainly, composed of tabular and well defined beds, of primary and reworked tuffs and tuffaceous breccias. This unit is unconformably separated from both the underlying volcanic Bahía Laura Group as from the overlying Baqueró Group, which is composed of the Anfiteatro de Ticó, Bajo Tigre and Punta del Barco formations.

Remaining studied units are the Bajo Tigre and Punta del Barco formations. The Bajo Tigre Formation is a 26-70 m thick succession of tuffaceous breccias and massive, bioturbated tuffaceous sandstones, typically arranged in fining-upward cycles. This unit is very similar to the Bajo Grande Formation and is recognised in large outcrops for its laterally continuous horizontal beds of light brown to light orange and grey colour. Presence of cornices and pipe rock relief is typical in both units. The remaining unit is the Punta del Barco Formation (up to 110 m thick) which has a more restricted distribution and is composed of similar rocks than the previous unit. It shows a transition from a braided fluvial system to a meandering system. This change would have been produced by a continuous accumulation of volcanic sediments that gradually filled the basin. This unit is the top of the local Cretaceous sequence and is unconformably covered by the marine Tertiary units.

Results

Four sedimentological logs were surveyed in the three studied formations (Figure 1). There, the diversity of the ichnological content is moderately low but the abundance of traces is high. Taking into consideration the associations of trace fossils, the manner in which they occur and the sedimentary facies where they are present, four recurrent ichnofabrics were determined.

#1 Crayfish burrows dominated ichnofabric, basically formed by vertical to near vertical crayfish burrows, which can be accompanied in lower number by large meniscate burrows (*Taenidium* and *Beaconites*); other components of this ichnofabric are root traces. Typically it occurs in massive tuffaceous sandstones and siltstones.

#2 Large meniscate burrows dominated ichnofabric, integrated by *Taenidium* and *Beaconites* of similar diameter to crayfish burrows. Late ichnofossil can be present as minor additional component. Meniscate burrows are totally randomly arranged. This ichnofabric occur in similar facies to the Crayfish burrows dominated ichnofabric; is probable that both ichnofabrics will be related genetically and that may be indicating different conditions of the environment. *Taenidium* and *Beaconites* are probably also produced by crayfishes.

#3 Earthworm burrows dominated ichnofabric, this ichnofabric bioturbate almost completely the involved beds. Its main component is a diffuse network of interconnected small diameter burrows, which can be meniscate or not, with enlargements in jointing points. In some cases sub spherical chambers can be connected to the meniscate burrows. Additionally, and in very low numbers, can be present crayfish burrows, *Taenidium* and *Beaconites* specimens.

#4 Decapod breeding structure dominated ichnofabric, only present in one locality. It is formed by two main components, decapod breeding structures and root traces. They appear separately one of the other in very weakly developed soils. Occasionally, rare crayfish burrows specimens can be present but in low number.

The trace fossil associations show that in central Patagonia and for the Late Jurassic to Early Cretaceous the dominant macrofauna of the soils were decapods, probably crayfishes, and earthworms.

Field Trip # 2

In this field trip the following localities were visited, Cañadón Puerta del Diablo, Senguer and Mayo Rivers Junction, Estancia La Juanita, and Gran Barranca, all of them in the southern part of the Chubut Province, Argentina. These localities are in the San Jorge basin, approximately 150 – 200 km to the north of the localities of Field Trip # 1. Different units were visited in each locality, Laguna Palacios Formation (Upper Cretaceous) at Cañadón Puerta del Diablo, Bajo Barreal Formation (Cretaceous) at Senguer and Mayo Rivers Junction, Koluel Kaike Formation (Eocene) at Estancia La Juanita, Sarmiento Formation, Colhué Huapi Member (Eocene-Oligocene) at Gran Barranca.

Results

This fieldtrip was finished recently, and then only preliminary results can be presented. In all the localities is very important the presence of bioturbation in the palaeosols. The Bajo Barreal Formation has low ichnological content, which is restricted to a few levels with high unidentifiable small burrows bioturbation. The Laguna Palacios record the appearance of insect traces (*Cellicalichnus*, *Rebufoichnus*, *Fictovichnus*) and lower proportion of decapods traces respect to the older units studied in Field Trip # 2. The Sarmiento Formation record the highest diversity and abundance of insect trace fossils, *Coprinisphaera*, *Tesseirei*, *Cellicalichnus*, *Rebufoichnus*, *Celliforma* and *Feoichnus* are some of the traces recorded in high numbers in this unit. In many levels the ichnofabrics are very complex. Together to the insect traces are other traces, as *Taenidium*, a diffuse boxwork of small burrows, rhizoliths and indeterminate burrows. In the Laguna Palacios Formation the insect activity has its earliest record which stays in younger units reaching its maximum diversity in the palaeosols of the Sarmiento Formation.

After of its appearance in the Upper Cretaceous the insects become a main actor in the past soil ecosystems replacing to the decapods that were dominant in the Jurassic and Lower Cretaceous. Earthworm populations seem to maintain after the Cretaceous an important role in the palaeosols.