

**TRIBUTE TO CHARLES DARWIN AND  
BERNISSART IGUANODONS:**

**New Perspectives on Vertebrate Evolution and Early  
Cretaceous Ecosystems**

**BRUSSELS 2009**

**EDITORS: PASCAL GODEFROIT & OLIVIER LAMBERT**

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**Programme, Abstracts and Field Trips Guidebook**

Programme .....	1
Abstracts .....	7
Field Trips Guidebook .....	103

## PALAEOENVIRONMENTAL CONTEXT OF THE 'BLACK MARBLE' OF DENÉE (VISÉAN, BELGIUM)

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Fish remains such as isolated teeth or scales are uncommon in Tournaisian and Viséan (Lower Carboniferous) rocks of southern Belgium. Moreover, large fragments or almost complete fishes are particularly rare and only known in two Viséan localities: Denée (Namur province) and Visé-Richelle (Liège province).

The quarries located around the village of Denée have yielded rare but remarkably preserved fishes and invertebrates (including echinoderms and dendroid graptolites). The latter have been collected within the 'black marble' of Denée when this black coloured limestone was intensively and manually quarried at the end of the 19<sup>th</sup> century and at the beginning of the 20<sup>th</sup> century. If it had not been worked, the 'black marble' of Denée would have been considered probably as azoic due to the rarity of the fossils. As most of the excavations were subterranean and as they are now flooded and disused, it is not possible to sample all the fauna anymore. Four fish species have been described for the first time on the basis of material collected in Denée: the chondrosteian *Benedenius deneensis* and three elasmobranchs (*Denaea fournieri*, *Cratoselache pruvosti*, *Sphenacanthus delepinei*).

The 'black marble' of Denée is now included in the Molinee Formation of Lower Viséan age (Moliniacian). This formation (c. 60 m thick) consists of a succession of thin-bedded, commonly laminated black limestones ('black marble') which alternate with thick-bedded, dark-grey limestones ('thick beds'). It developed in a confined intra-platform basin [central part of the Dinant sedimentation area (DSA)] progressively filled by distal calcareous turbidites originating from the southward prograding shelf to the north. This basin was bordered to the south by a discontinuous barrier of Waulsortian mudmounds built against a major synsedimentary fault separating the DSA from the southern Avesnois sedimentation area. The alternations of laminated and bioturbated lithofacies occurring within the Molinee Formation implies that the palaeoenvironment recorded several anoxic to dysoxic periods alternating with more oxygenated ones due to sea-level fluctuations of low magnitude. This periodic confinement of the central part of the DSA took place during a third-order sequence characterized by a low sea level, namely the sequence 5 of Hance *et al.* (2001). Low oxygen concentrations are also suggested by the existence of dysaerobic organisms such as the bivalves of the 'paper pecten' morphotype and the remarkable preservation of the fauna.

The 'black marble' of Denée is a fossil conservation deposit and belongs more particularly to the 'obruption deposits' of Seilacher *et al.* (1985) (Mottequin 2008). The turbiditic sedimentation with smothering effect (rapid burial) combined with deficient oxygenation of the bottom waters favoured the exceptional preservation of the faunas (e.g. fishes, echinoids, ophiuroids) by inhibiting the development of the necrophagous and saprophagous organisms during the deposition of the 'black marble' facies *sensu stricto*.

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