

Chapter 2: Geology of the limestones

Introduction

Cave systems in the Yorkshire Dales occur predominantly within the rock unit known as the Great Scar Limestone Group. This Group, which is restricted in extent to northern England, was deposited during the early Carboniferous, ranging from Tournaisian to Visean age, about 359 to 330 million years ago. Britain then lay close to the Equator and the area now including the Dales was submerged beneath warm, clear tropical seas. These waters had rich and diverse communities of corals, brachiopods, crinoids, bivalves and algae colonising the sea-bed, and free-swimming ammonoids (coiled molluscs, commonly referred to as goniatites). Their lime-rich remains accumulated on the sea-bed, were bored by organisms or broken by wave and current activity, to produce carbonate sands, silts and muds, which, with time, lithified to form limestone.

Early Carboniferous tectonic plate movement resulted in a broadly north–south stretching of the continental crust beneath the area that is now Britain. This resulted in a series of crustal blocks forming topographical highs (horsts) and basinal lows (grabens), which greatly influenced the distribution and thickness of subsequent limestone deposition. One such structural high, the Askrigg Block, underlies the Yorkshire Dales, where the Great Scar Limestone beds were deposited in shallow waters on top of older basement rocks. Sedimentation into the basins adjacent to the Askrigg Block led to development of rocks of deeper-water facies including mudstones and thinner bedded limestones, some of which are slightly older than the Great Scar Limestone.