Caves (CAV)

Block Description

Visit https://jncc.gov.uk/gcr-site-list, for more information on GCR blocks and sites
For Geomorphology GCR block descriptions and GCR site lists,
visit https://jncc.gov.uk/gcr-blocks-geomorphology

Introduction

Cave passages form through a limestone karst where there is an available flow of water, with chemical potential to dissolve the limestone, with an adequate hydraulic gradient between a sink and a rising, in a favourable geological structure. Extensive cave development therefore depends on a combination of geological and topographical factors, and on a climate which provides meteoric water charged with biogenic carbon dioxide.

For a description of karst development, see **Karst (KAR)**.

British karst regions

Most of Britain's caves and karst landforms occur on the thick and strong limestones of the Lower Carboniferous succession. The submarine palaeogeography of the Dinantian seas varied considerably across the area now occupied by Britain. Consequently, there is substantial lateral variation within the Carboniferous succession.

The major regions of cavernous karst are therefore defined by the major outcrops of the massive facies of the Carboniferous limestones – in the two parts of the Yorkshire Pennines, the Peak District, the Mendip Hills and South Wales. The finest limestone landscapes and the greatest extent of cave development lie in the glaciokarst of the Yorkshire Dales, formed on the thick Great Scar Limestone in the area around Ingleborough and Malham. The peripheral zone of the Northern Pennines includes all the karst on the thin Yoredale limestones, and also on outcrops of the thinner and faulted equivalents of the Great Scar fringing the adjacent Lake District and Morecambe Bay. Both the White Peak limestone area of the Derbyshire Peak District and the Mendip Hills are upland karsts which are clearly defined by geology and topography. The South Wales karst is spread along the limestone outcrop which fringes the coalfield syncline; it is not a conspicuous feature of the regional topography but it does contain many long, deep and important cave systems.

Each of the five main karst regions has suites of landforms and cave systems with their own distinctive characteristics. The regional individualities are largely imposed by the geological structure, the relationships between geology and topography, and the local Pleistocene history of fluvial, periglacial and glacial stages. Outside of the main areas of Carboniferous Limestone, Britain's karst is dominated by the large area of chalk outcrop; this has a distinctive landscape of rolling downland and dry valleys, but contains very few caves. There are more caves in the smaller outcrops of older limestones, notably in North Wales, the Forest of Dean, Devon and Scotland. The Jurassic limestones, and other less extensive carbonates, have limited development of karst landforms and very few caves.

Any single cave passage evolves through three distinct stages. Initiation creates the openings through the rock, which permit the flow of groundwater and allow the accelerated erosion of the next stage. Enlargement is the main stage of cave development, when the small, initial fissues are enlarged to reach and pass the size limit of accessibility by humans, that defines a cave. Degradation is the terminal phase of destruction, where the cave either collapses, is filled with sediment or is removed by surface lowering. In a complex cave system, all three processes take place simultaneously in passages at different depths and positions in the limestone; solutional enlargement and sediment infilling can take place at the same time in a single passage.

Karst and caves in the Quaternary Period

Most of Britain's landforms are the products of erosion and deposition during the Quaternary Period. The broad pattern of highlands and lowlands is a function of geological structure, with origins that reach back to Tertiary and earlier times. There are also remnants of uplifted, deformed and dissected erosion surfaces which predate the Pleistocene Epoch. But most

individual landforms, and all of the details of the landscapes, evolved within the Pleistocene and Holocene epochs – when the cyclic climatic variations exercised great influence over the karst processes. Solutional activity was at a maximum during each warm phase. Conversely, it was greatly reduced in most cold phases; it ceased completely in most areas during periods of total ice cover, though glacial meltwater poured through the caves in some limestone areas.

GCR site selection

The aim of the GCR has been to represent all the important aspects of Britain's caves, The criteria for selection have therefore been any one of four factors:

1 The finest example of any particular landform or cave type

2 Unique sites

3 Sites important for teaching and research

4 Important assemblages of landforms/ cave features

Beside their values to karst geomorphology, many caves have great importance and value in the stratigraphy of the sediments that they contain. In erosional upland environments, caves constitute unique preservation sites where sediments can accumulate in stable conditions and remain safe from destruction by continued surface denudation. The value of these sediments is enhanced by the climatic sensitivity of solution processes and karst hydrology, and also by the chronological record that is deduced from their radiometric dating. The cave sediments provide a record of events with implications for research into the evolution of landscapes far beyond the confines of the karst.

Many cave entrances or passages with immediate access from the surface have been used as animal lairs or have become natural pitfall traps. These bone caves have therefore accumulated valuable records of past faunas, but their importance is to Pleistocene palaeontology rather than karst geomorphology and are described in other parts of the GCR (**see Pleistocene Vertebrata (PCN-VTB)**). Similarly, the major tufa deposits are included with the Pleistocene/Quaternary Blocks of the GCR.