
Karst features

Karst features are those formed over soluble rocks such as limestone, dolomite or gypsum, and characterised by sinkholes, caves and underground drainage. The term derives from the massive limestone country of Yugoslavia where many of the landforms have been produced by solution.

Karst features in Great Britain

Karst features in Great Britain include limestone pavements, cave systems, stalactitic and stalagmitic deposits, tufa and calcareous spring deposits, sink holes or dolines, and dry valleys.

In Great Britain most karst features are associated with limestone outcrops. Excellent karst features are therefore to be found in areas of extensive limestone outcrops. Notable examples include the outcrops of Carboniferous limestones in North and South Wales, the Mendips, Derbyshire, South Cumbria and the Yorkshire Dales. Good karst features are developed on comparatively small outcrops of Cambrian limestones in North West Scotland and the Isle of Skye.

Gypsum is a much more soluble rock than limestone. Indeed, it is so soluble that such beds have normally suffered extensive dissolution near to the surface and natural outcrops are rare in Great Britain. Most beds of gypsum within Britain occur within rocks of Permo-Triassic age. Gypsum karst features, mostly caves and surface collapses above them, include those associated with the outcrops of these rocks at Ripon in North Yorkshire. Collapse features associated with gypsum dissolution are known in the Darlington area.

Karst features give important evidence of the processes involved in the active dissolution of soluble rocks in the comparatively recent geological past. Caves systems may contain sediments which yield evidence of their former occupation by a variety of animals, including early man.

Geological SSSIs

SSSI and GCR Name/Grid Reference/GCR Block

Fairy Holes Cave [NY 936 356] Caves

God's Bridge [NY 957 126] Karst

Durham County geological sites

There are currently no karst features designated as Durham County geological sites.

Karst features in County Durham

The following karst features, all associated with limestones, are present within County Durham:

Sink holes or dolines

Springs

Caves

Dry valleys

Limestone pavement

Tufa deposits

The majority of karst features within County Durham are associated with the Carboniferous limestones in the west of the county though a smaller number are present in the east of the county on the outcrop of the Permian Magnesian Limestone.

Karst features associated with Carboniferous limestones

Although limestones are important components of the succession of Carboniferous rocks within County Durham they are mostly comparatively thin and separated from one another by substantial thicknesses of insoluble rocks such as shales and sandstones. Karst features are therefore less prominent within the county, and generally much less well developed, than in the nearby limestone country of South Cumbria and the Yorkshire Dales.

However, the outcrops of many of the Carboniferous limestones in the county are associated with lines of sink holes or dolines which, in areas with a moderate covering of superficial deposits, may provide valuable clues to the presence of limestone. Particularly good examples may be seen marking the top of the Great Limestone at numerous places in parts of Weardale and Teesdale.

Springs, or lines of springs, occur close to the base of many Carboniferous limestone outcrops. During periods of prolonged dry weather Harehope Burn disappears underground through enlarged joints in the Great Limestone. The stream emerges at the surface several metres downstream as a prominent spring. The county does not exhibit the conspicuous dry valleys which are such characteristic features of some limestone areas.

The few cave systems known in the county are confined to the Carboniferous limestones and are generally of limited size and do not match the spectacular systems of the Yorkshire Dales. The area's best known caves are those at Fairy Holes and Jacob's Pot, in Weardale, and the Teesdale, or Moking Hurth, Cave near Langdon Beck. The Teesdale Cave is known to have yielded mammalian bones.

County Durham also contains Britain's finest example of a natural limestone bridge, in the Great Limestone at God's Bridge near Bowes.

The county contains no good examples of limestone pavement to match those in adjoining areas of Cumbria and North Yorkshire. However, outcrops of Smiddy Limestone and metamorphosed Melmerby Scar Limestone ('Sugar Limestone') on Widdybank Fell, Teesdale, where free of soil cover, locally exhibit widening of joints reminiscent of limestone pavement.

Small areas of tufa are forming adjacent to a lime-rich spring in Greenfoot Quarry, Stanhope.

Karst features associated with Permian limestones

Karst features are much less common associated with the Magnesian Limestone of eastern County Durham.

Whereas open fissures resembling sink holes, or dolines, are known in parts of the Magnesian Limestone outcrop, especially where superficial cover is thin, these appear to be related to subsidence over areas of former underground coal mining. Recent investigations suggest that they mainly result from continued, or renewed, dilation of joints and collapse of joint-filling materials. Substantial open fissures in the Magnesian Limestone in Hawthorn Dene may be true dolines.

Solution features are rare within the Permian limestones, though some evidence of slight solution-widening of joints and thin coatings of calcite 'flowstone' can be seen in several quarries. Substantial parts of the Magnesian Limestone comprise dolomite or dolomitic limestone and are thus much less soluble than pure limestone.

The denes of the Durham coast comprise deep canyon-like valleys cut through the cover of superficial deposits into the underlying Magnesian Limestone. Although not true karst features, in some instances, e.g. at Castle Eden Dene, the valley is in part a dry valley with drainage underground for substantial periods of most years.

Tufa deposits are associated with springs at two localities in the Trimdon and Shotton areas.

Influence on the landscape

Features such as sink holes and dry valleys are small, but conspicuous and integral, parts of the area's landscape.

The denes on the outcrop of the Magnesian Limestone are well-known and important elements in the landscape of the east of the county.

The small number of caves are significant, though concealed, landscape features.

Influence on biodiversity

Caves provide important specialised wildlife habitats. These include important bat roosts. The Fairy Holes Cave is said to support a unique fish population.

Limestone grasslands are important plant habitats.

Lime-rich spring water locally has a strong influence on plant communities.

Economic use

Karst features appear to have been of little economic use within the county.

Environmental issues

Although extensive cave systems are rare within the county, sink holes and solution-widened joints are common within the Dinantian and Namurian limestones. Due caution should therefore be applied when planning and undertaking of any form of groundworks or land-filling on, or in the vicinity of, such limestone outcrops.

Solution features are not known to be widespread within the county's Permian limestones. However, joints and fractures in the vicinity of known faults may locally be dilated and potentially unstable in areas undermined by abandoned coal workings. Particular attention should be paid to the possible presence of such fissuring when planning or undertaking groundworks in such areas.

Joints and fissures in limestone, particularly where enlarged by dissolution, may provide ready pathways for contaminants, especially in quarries and landfill sites.

Threats

Portions of the Fairy Holes Cave system have been removed during limestone extraction at Eastgate Quarry. The quarry has now closed and the cave entrance is secured.

Filling of sink holes or dolines with farm, or other waste may locally threaten to damage or obliterate examples of these features, though this is not currently seen as a serious threat.

Wider importance

The Fairy Holes Cave, Weardale, is scheduled as an SSSI as "...the longest known stream passage in the Yoredale limestone of the North Pennine Dales... it is significant as the best developed example of its type."

The mammalian fauna recovered from the Teesdale Cave is an important example of a Quaternary fauna.

God's Bridge is scheduled as an SSSI as Britain's finest example of a natural limestone bridge.

The surface fissures associated with the outcrop of the Magnesian Limestone, though not necessarily exclusively karst features, have been the subject of research relevant to geological processes which affect Magnesian Limestone elsewhere in Great Britain.

Selected references

Johnson and Dunham, 1963; Pounder, 1989; Waltham et al., 1997.

Photographs

(Photo 57) Aerial photograph of sink holes into Great Limestone, Teesdale. Aerial photograph by ukperspectives.com.

(Photo 58) Jacob's Pot, Harehope Quarry, cave in Great Limestone. CL Vye, BGS, ©NERC, 2004.

(Photo 59) God's Bridge. A natural arch in Great Limestone over the River Greta. B Young, BGS, ©NERC, 2004.

(Photo 60) Entrance to Fairy Holes Cave in Great Limestone, Eastgate Quarry, Weardale. B Young, BGS, ©NERC, 2004.

Full references



(Photo 41) Closehouse Mine, Lunedale. The wide barytes vein adjacent to the Lunedale Fault . Photographed 1984. B Young, BGS, ©NERC, 2004.



(Photo 42) Middlehope Burn, Westgate, Weardale. Folded Dinantian sandstones on north side of Slitt Vein. B Young, BGS, ©NERC, 2004.



(Photo 49) Shippersea Bay, Easington. Quaternary debris filling fissure in Magnesian Limestone. B Young, BGS, ©NERC, 2004.



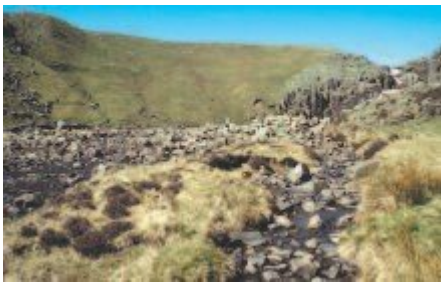
(Photo 50) Haugh Hill, Harwood, Teesdale. Till overlying striated pavement of Whin Sill dolerite. B Young, BGS, ©NERC, 2004.



(Photo 51) Devil's Stones, Crook. Erratic boulders of volcanic rocks from the Lake District. DJD Lawrence, BGS, ©NERC, 2004.



(Photo 52) Herdship Fell, Teesdale. Large erratic mass of Dinantian limestone. B Young, BGS, ©NERC, 2004.



(Photo 53) Cauldron Snout, Teesdale. The pre-glacial channel of the River Tees, now plugged with till, can be seen in the river bank. B Young, BGS, ©NERC, 2004.



(Photo 54) Shippersea Bay, Easington. The Easington Raised Beach. B Young, BGS, ©NERC, 2004.



(Photo 55) Hawthorn Hive. Pyrite-rich sand derived from colliery spoil. B Young, BGS, ©NERC, 2004.



(Photo 56) Durham Gravel Pit. Glacial sands and gravels. Photographed 1965. BGS, ©NERC, 2004.



(Photo 57) Aerial photograph of sink holes into Great Limestone, Teesdale. Aerial photograph by ukperspectives.com.



(Photo 58) Jacob's Pot, Harehope Quarry, cave in Great Limestone. CL Vye, BGS, ©NERC, 2004.



(Photo 59) God's Bridge. A natural arch in Great Limestone over the River Greta. B Young, BGS, ©NERC, 2004.



(Photo 60) Entrance to Fairy Holes Cave in Great Limestone, Eastgate Quarry, Weardale. B Young, BGS, ©NERC, 2004.