

Yoden Village Quarry an ancient tropical barrier reef

Imagine a shallow tropical sea, alive with bright corals and shellfish. Just like the Bahamas - but along the Durham coast 260 million years ago. The rocks at Yoden Quarry represent a part of our geological history that is important scientifically. So important that the quarry is legally protected as a Site of Scientific Interest (an 'SSSI'). It is a geological feature unique in Britain.

How old are the rocks?

The rocks you see at Yoden Quarry are of Permian age, a geological period stretching from 299 to 252 million years ago. The name Permian was first used in 1841 by the geologist Sir Roderick Murchison, a former Durham School pupil, to describe rocks near Perm in the Ural Mountains of Russia.

Why was there a reef here?

Throughout geological time the surface of the earth, its outer shell, has seen great changes. Land masses have come together to form large continents and then broken up before joining together in a different way by the process we know as plate tectonics. Some 290 million years ago, at the beginning of the Permian Period, Britain as we know it today did not exist. Instead the area destined to be Britain was a vast Sahara-like desert, within a large continent very close to the equator.

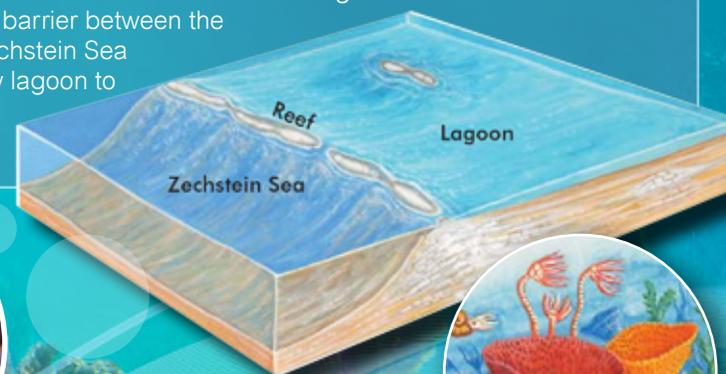
About 260 million years ago, global changes in sea level allowed seawater to flood onto the desert plains to create a shallow inland sea, the Zechstein Sea. As the sea deepened limy muds started to build up on the sea floor. These would eventually harden to become the layered rocks known as the Magnesian Limestone.

Over time a remarkable barrier reef began to develop towards the western side of the Zechstein sea with a wide shallow lagoon to the west and more open waters of the Zechstein Sea to the east. It was probably broadly similar in structure to the Great Barrier Reef in Australia and like modern barrier reefs it was flat-topped, with the reef top at or just below sea level.

Beyond the lagoon was the coastline, probably about 30km to the west, where the eastern edge of the North Pennines is today. In the lagoon, fine limy sediments accumulated, similar to shallow tropical seas like those around the Bahamas. By contrast, the eastern, seaward, side of the reef dropped away steeply into deeper water. Here a thick scree of blocks and rubble, that had tumbled off the reef built up on this steep slope.

Unlike modern reefs, the Permian reef was not made of corals. Instead, animals called bryozoans, which built calcium carbonate colonies in the shape of delicate nets, fans and cones, were the main reef-builders. Amongst the bryozoans lived shellfish such as brachiopods, bivalves and gastropods, as well as sponges, corals and relatives of starfish known as crinoids. The brachiopod *Dielasma elongatum*, pictured here, is present as a fossil in the rocks at Yoden Quarry. It was about 10mm wide, lived in groups and anchored itself to the seafloor with a long muscle.

This illustration shows a schematic cross-section through the reef, which formed a barrier between the deeper waters of the Zechstein Sea to the east and a shallow lagoon to the west. © E Pickett



Bryozoan



Bivalves and Gastropods



Bryozoan Fossil



The main reef-builders were Bryozoans, shown here as cones and fans.

Where can you see the reef?

The reef formed an almost continuous linear feature up to about 800m wide and at least 32km long. It is the remains of this reef, up to 60m high, that we can see today at Yoden Quarry. The rocks of the reef have been worn away, but their framework structure makes them more resistant to erosion than the surrounding layered rocks of the lagoon and sea so that they form higher ground and, in places, distinct hills (such as Tunstall, Humbledon and Beacon hills), that stretches from Down Hill near Sunderland southwards towards Hartlepool.

Yoden Quarry is important as a place where we can see the remains of the top (the crest) and seaward edge (the slope) of the reef today. If you look carefully at the main part of the quarry you can see how the flat-lying rocks on the crest suddenly turn downhill on what was the edge of the reef.

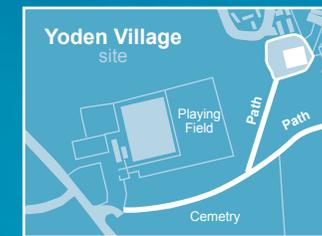
There has been a quarry here since at least 1861, shown on the old Ordnance Survey map as 'Old Quarries'. An open concrete reservoir serving Horden Colliery was built into the eastern part of the quarry floor sometime before 1940, but the main quarry face to the west of the quarry remained intact. The reservoir was eventually infilled as part of landscaping operations in 1986. It became an SSSI in 1988.

The lime rich soils overlying the rocks are beginning to develop species-rich grassland which may, in the future, support uncommon and rare wild flowers characteristic of the Durham Coast.

Yoden Village Quarry



The reef and today's coastline



Grid reference: NZ 435 417

Parking: Eden Park (Rugby Ground)

Please do not allow your dog to foul the paths and please pick up after your dog.



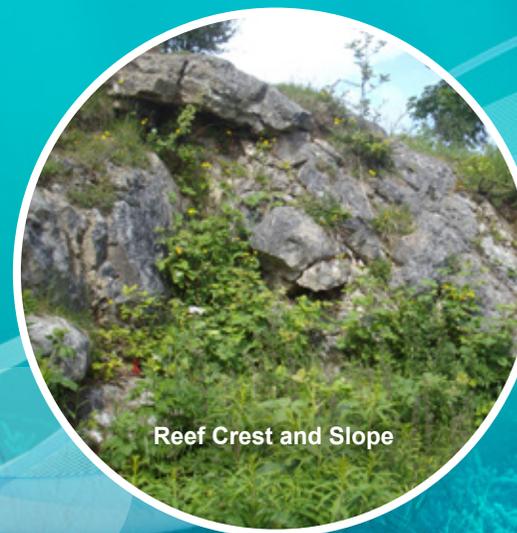
Sir Roderick Murchison



Quaking Grass



Quarry 1966



Reef Crest and Slope



Bee Orchid

The site is managed by Peterlee Town Council

Email: parks@peterlee.gov.uk

Tel: 0191 5862491

Further information about Permian rocks and the fossils found in them can be found in the Limestone Landscapes book 'Built on an Ancient Sea'
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