

PENMAEN AND THREE CLIFFS BAY

GEOLOGY, PREHISTORY AND HISTORY IN SOUTH GOWER

Discover geology and landscape: walking trails in rural Swansea

SCRATCHING THE SURFACE

CRAFU'R WYNEB

PEN-MAEN A BAE'R TRI CHLOGWYN

DAEAREG, CYNHANES A HANES YN NE GŴYR

Darganfod daeareg a thirwedd: llwybrau cerdded yn ardal Abertawe

9.5 KM
4 HOURS
GPS COMPATIBLE



START
GRID REF.
SS 53123 88789

near Penmaen church where there is parking (National Trust). Penmaen is served by bus.

PATH CONDITIONS

The trail follows marked paths. There is a steep descent into Three Cliffs Bay, which may be inaccessible at very high tides.

MAPS



Ordnance Survey 1:50,000 map 159 (Swansea & Gower)
1:25,000 Explorer map 164 (Gower)
Geological Survey 1:50,000 Sheet 247 (Swansea)

REFRESHMENTS



Parkmill

SAFETY

Take care crossing and walking along roads. Be aware of the tide in Three Cliffs Bay. The stepping stones between E and F may be slippery and are submerged at some stages of the tide. Grid references are for guidance only. Follow the Countryside Code (<http://naturalresourceswales.gov.uk>) and the Geological Fieldwork Code (www.rockwatch.org.uk/geological_code). Respect people, protect the environment and stay safe. Wear sensible clothing and footwear.

FURTHER INFORMATION

Local walking groups www.swansea.gov.uk/walking
Local geology www.swga.org.uk
For junior geologists www.rockwatch.org.uk
Geology and geological maps www.bgs.ac.uk
Gower Society www.thegowersociety.org.uk
National Trust www.nationaltrust.org.uk
Archaeology www.ggat.org.uk
Caves www.swcc.org.uk

The Geology of South Wales: A field guide by Gareth T. George (gareth@geoserv.co.uk, 2008)

A Guide to Gower edited by Don Strawbridge and Peter J. Thomas (Gower Society, 1999)

Text and images: Geraint Owen, Siwan Davies (Swansea University)
Welsh translation: Dyfed Elis-Gruffydd
Design: iconcreativedesign.com

9.5 KM
4 AWR
YN CYDWEDDU
Â GPS

This trail explores one of Gower's most beautiful bays and returns along wooded valleys to discover how geology shapes the Gower landscape and how people have made their mark on the landscape over tens of thousands of years. The trail is 9.5 km (6 miles); allow half a day.

Mae'r daith hon yn archwilio un o faeau hyfrytaf Gŵyr ac yn dychwelyd ar hyd dyffrynnoedd coediog er mwyn darganfod sut mae daeareg wedi llunio tirwedd Gŵyr a sut mae pobl wedi gadael eu hól ar y dirwedd dros gyfnod o ddegau o filoedd o flynyddoedd. Mae'r daith yn 9.5 km (6 milltir) o hyd ac mae'n cymryd tua hanner diwrnod.



Look for other trails in this series!



SCRATCHING THE SURFACE



CRAFU'R WYNEB

Discover geology and landscape: walking trails in rural Swansea

Darganfod daeareg a thirwedd: llwybrau cerdded yn ardal Abertawe

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email: g.owen@swansea.ac.uk #scratchingthesurface
<http://geography.swan.ac.uk/scratchingthesurface/>





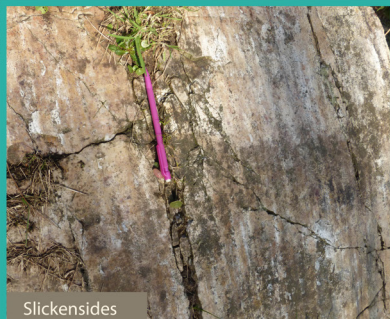
Turn left from the parking area, cross the cattle grid and go down the lane to the rocks behind the bus shelter before the main road. [0.2 km; SS 53217 88717]

A This rock is conglomerate, made of pebbles cemented together. It is part of the Old Red Sandstone. The pebbles were carried here by rivers 370 million years ago, in the Devonian period. The landscape then was a featureless gravel plain with sparse covering of primitive plants. The sea was far away. Over tens of millions of years, at least 4 km thickness of sediments built up and were compressed and cemented into solid rock. Layering is visible as bands of coarser and finer pebbles. These beds were originally horizontal, but were steeply tilted 300 million years ago in a mountain-building event, the Variscan Orogeny. Overlying rocks have been worn away by erosion. The white mineral is quartz. On some surfaces there are closely spaced parallel striations, called slickensides. They are quartz crystals that grew as long thin fibres while rocks were sliding along a fault and show the direction of sliding.



Conglomerate

Cross the road carefully. Walk along the lane opposite for 150 metres. Turn right at a junction and in 200 metres go through a gate into Nott Hill (National Trust). Pass houses on the right for a view of the bay. [0.6 km; SS 53452 88442]



Slickensides

B Three Cliffs Bay is named for the steeply dipping rib of rock on the left (east) of the stream, Pennard Pill. The ridge behind you is made of Old Red Sandstone conglomerate. To the west, this rises to become the long hill of Cefn Bryn, dominating this part of Gower.



Three Cliffs Bay

Take the steep path on the right down to the bay. Turn right on the coast path and cross a stream. Where the coast path turns right, continue ahead to the top of the dunes [1.0 km; SS 53501 88121]

C 20,000 years ago, the Earth's climate was much colder and this area was close to the edge of an ice-sheet. Sea level was over 100 metres lower and the Bristol Channel was a swampy valley. Glacial meltwater covered the area with sand and gravel, and rising sea level in the last few thousand years has pushed sand towards the shore, forming sandy beaches backed by wind-blown dunes. There have been periods of greater sand-dune movement, most recently a few hundred years ago. The ruins of the original Penmaen church, abandoned probably in the 1300s, are buried in sand dunes covering the cliff-tops above you.

Go down to the beach, to the rocks on the right 100 metres ahead at a corner. [1.2 km; SS 53529 88015]

D Fossil shells are common in this rock, which is limestone. Brachiopods have paired shells and are common in some warmer seas today, although they are unrelated to bivalve molluscs such as cockles and mussels. Crinoids are related to starfish and sea urchins and are known today as sea lilies. The soft parts of the animals decayed soon after they died, and only the shells are fossilized. Most were broken before the rock solidified, probably during storms hundreds of millions of years ago.



Brachiopods



Crinoids

Many surfaces are mottled with tube-like markings. These are fossil burrows, made by worms feeding on the sea-bed mud. Each bedding surface represents the ancient sea floor as deposits built up through time, like pages in a book. Imagine how long it took to accumulate such a thickness of rock! Intricate patterns of white lines are veins, sheets of the mineral calcite, which also makes the shells. They formed when buried rock broke and the cracks filled with mineral material.



Burrows



Veins

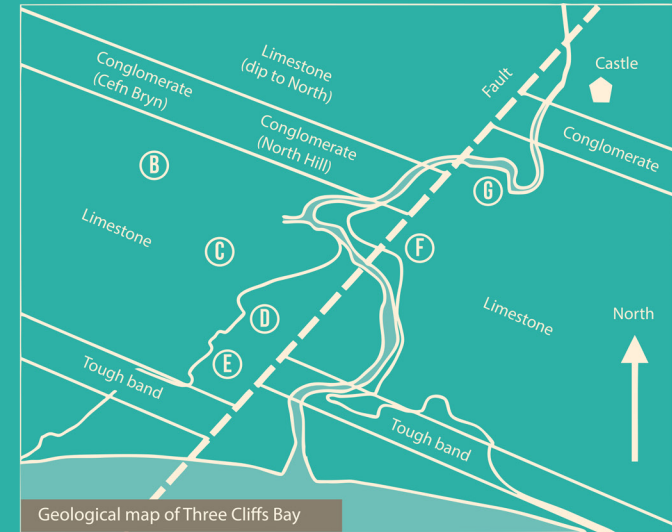
The rocks are part of the Carboniferous Limestone, which formed in warm shallow seas 350 million years ago, in the early Carboniferous period. Because of plate tectonics, Britain has since drifted from 20 degrees south of the equator to 52 degrees north. Carboniferous Limestone formed after Old Red Sandstone and is above it in the rock succession, but because the beds dip to the south, it is found at the surface south of Old Red Sandstone.

Go 100 metres along the cliff to a small embayment. [1.3 km; SS 53459 87971]



Fold and fault

E Compression 300 million years ago deformed the beds here into a fold, or anticline. Looking across the bay you are in line with the promontory of the three cliffs, a tougher layer of limestone. But the same layer on this side forms craggy stacks rising from the sand 300 metres ahead. The beds have been offset across the bay by a fault. Rocks near a fault are broken and weakened by the movements. This has allowed the sea to carve out Three Cliffs Bay. The fault itself is covered by sand.

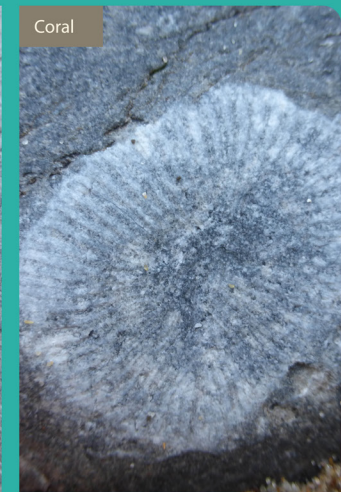


Geological map of Three Cliffs Bay

If the tide is not coming in, go to the next corner, where the rocks are full of fossil gastropods (snails) and corals.



Gastropods



Coral

Walk inland across the beach towards Pennard Castle. At Pennard Pill turn left to the stepping stones. You may have to detour around a pool where a stream joins Pennard Pill. The trail continues up the east (far) side of Pennard Pill. If you are unable to cross the stepping stones, you can return to B along a direct path from here, or follow a path up the west side of the valley to the main road, which you cross to the Heritage Centre and resume the trail towards H. To reach F and G, cross the stepping stones carefully and walk to the far end of the gravel ridge. [2.3 km; SS 53957 88172]

F The gravel ridge is a storm beach. Rocks eroded from the cliffs are washed to the head of the bay by storms. In very high tides the sea overtops the ridge and floods the valley, where a salt marsh has developed. On the seaward side, a clay-rich layer is being uncovered from beneath the gravel ridge and broken up by waves. This deposit is several thousand years old and has formed since the last ice age as sea level has risen. Similar deposits elsewhere in South Wales contain tree stumps and deer antlers.



Storm beach

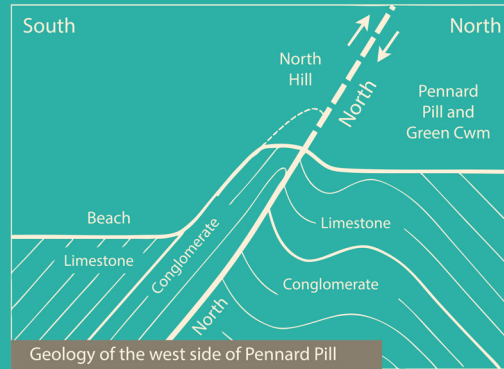


Clay deposit

Look back towards the stepping stones. The steep slope beyond marks the boundary between conglomerate forming the ridge and more easily eroded limestone in the bay.

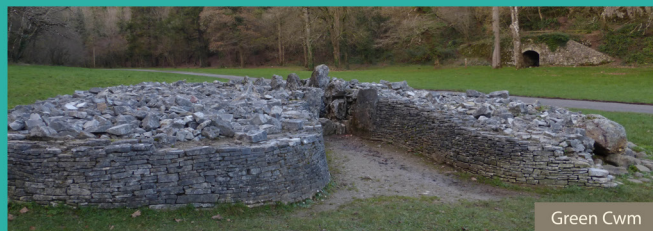
Turn left along a path up the valley to rocks on the right just before a wooden boardwalk. [2.6 km; SS 54155 88300]

G The rock is limestone - look for fossils. Looking across the river, you have passed the boundary between conglomerate and limestone, but you have not yet reached it on this side. This is the effect of the fault that runs through the bay; the valley of Pennard Pill has been eroded along it. At the foot of the slope across the river are beds of limestone, so there is limestone both south and north of the conglomerate ridge. The conglomerate is the core of an anticline, like you saw at E but much larger, formed in the Variscan Orogeny. The landscape has since been worn down, slicing through the fold. But the rocks vary in their resistance to erosion, so Old Red Sandstone forms the high ground of Cefn Bryn. The compression and folding were so severe that the rocks also broke along a steep fault. And remember that this faulted fold is offset across the valley by another fault. Geological structures beneath the surface can be very complex!



Take care on the boardwalk; it may be slippery. Follow the path along the valley for 1 km. Cross the river at a bridge to reach the main road at Parkmill. Cross with care and turn left along the lane past Shepherds store to the Gower Heritage Centre. Cross the stream and turn right on the road. In 1 km, turn right through a gate into a wide grassy valley and an area of stonework 400 metres ahead on the left. [6.2 km; SS 53748 89838]

H Parc Le Breos burial chamber, also known as Giant's Grave or Long Cairn, is a chambered tomb over 5,000 years old. The stone structure across the valley is a limekiln, with an old quarry behind it. Limestone (calcium carbonate) was burnt to make quicklime (calcium oxide), used for mortar, plaster, limewash and as a soil improver.

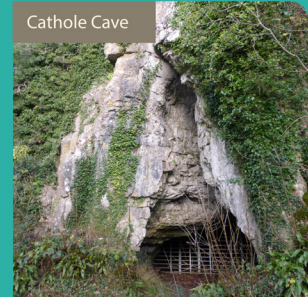


Green Cwm

No stream flows along this valley, variously known as Green Cwm, Llethrid Cwm, Parc Cwm or Parc le Breos valley. The underlying rock is limestone, which is dissolved by weak acids in the environment. Cracks become wider, allowing streams to drain into the ground, forming cave systems. A Scratching the Surface trail at Bishopston Valley explores such karst landscapes.

Follow the track for 300 metres to a sign for Cathole Cave on the right. [5.5 km; SS 53723 89990]

I Caves are also formed by limestone dissolution. Cathole Cave is now above the groundwater level and formed long ago. Excavations suggest that people used Cathole Cave for shelter over 20,000 years ago. Bones from Gower caves show that they would have hunted animals like mammoths, reindeer and woolly rhinoceros!



Cathole Cave

Continue along the track up Green Cwm. Turn left at a crossroads onto a woodland track, climbing gently onto the Old Red Sandstone of Cefn Bryn. After 2 km, at a kissing gate, turn left on a track, crossing the shoulder of Cefn Bryn. Just beyond the crest, at a Gower Way marker stone, Three Cliffs Bay comes into view. [8.7 km; SS 52679 88882]

J Enjoy the wonderful view of Three Cliffs Bay and reflect on the contrast between the coastal and inland landscapes of Gower and how geology has shaped them.



Three Cliffs Bay from J

You can turn right here and follow paths to the top of Cefn Bryn for a panoramic view of Gower, north Devon and the Brecon Beacons. Otherwise, follow the main track back to the starting point and consider following a Scratching the Surface trail at Llanmadoc or Landimore for a similar view.

FINISH