

# PAVILAND CLIFFS

## SPECTACULAR SOUTH GOWER: CLIFFS AND CAVES IN CARBONIFEROUS LIMESTONE

Discover geology and landscape: walking trails in rural Swansea

### SCRATCHING THE SURFACE

### CRAFU'R WYNEB

# CLOGWYNI PEN-Y-FAI

## GWYCHTER DE GŴYR: CLOGWYNI AC OGOFÂU YN Y CALCHFAEN CARBONIFFERAIDD

Darganfod daeareg a thirwedd: llywybrau cerdded yn ardal Abertawe

5.5 KM  
3 HOURS  
GPS COMPATIBLE



**START GRID REF.**  
SS 44647 87144

in the lane to Pilton Green farm, between Scurlage and Rhossili, where there is space to park. Buses to Rhossili pass this point.

### PATH CONDITIONS

The trail follows clear paths, including part of the Wales Coast Path. There are several stiles.

### MAPS



Ordnance Survey 1:50,000 map 159 (Swansea & Gower)  
1:25,000 Explorer map 164 (Gower)  
Geological Survey 1:50,000 Sheet 246 (Worms Head)



**REFRESHMENTS**  
Rhossili and Scurlage

### SAFETY

Take extra care crossing roads and close to cliff edges. Limestone is very slippery when wet. 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](http://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](http://www.swansea.gov.uk/walking)  
Local geology [www.swga.org.uk](http://www.swga.org.uk)  
For junior geologists [www.rockwatch.org.uk](http://www.rockwatch.org.uk)  
Geology and geological maps [www.bgs.ac.uk](http://www.bgs.ac.uk)  
Gower Society [www.thegowersociety.org.uk](http://www.thegowersociety.org.uk)  
National Trust [www.nationaltrust.org.uk](http://www.nationaltrust.org.uk)  
Wildlife Trust [www.welshwildlife.org](http://www.welshwildlife.org)  
Archaeology [www.ggat.org.uk](http://www.ggat.org.uk)  
South Wales Caving Club [www.swcc.org.uk](http://www.swcc.org.uk)

The Geology of South Wales: A field guide by Gareth T. George ([gareth@geoserv.co.uk](mailto: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](http://iconcreativedesign.com)

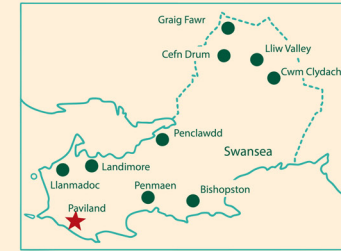
5.5 KM  
3 AWR  
YN CYDWEDDU  
Â GPS

The South Gower coast comprises rugged cliffs of Carboniferous Limestone. This trail explores some of the finest coastal scenery, to unravel 350 million years of Gower's history. The trail is 5.5 km; allow 3 hours. The section between B and D is rough and steep, but can be avoided by going directly from B to E, shortening the trail by 0.8 km.

Sail clogwyni garw arfordir deheuol Gŵyr yw Calchfaen Carbonifferaidd. Mae'r daith hon yn archwilio rhan o arfordir godidocaf y fro er mwyn datrys 350 miliwn o flynyddoedd o hanes Gŵyr. Mae'r daith yn 5.5 km o hyd ac mae'n cymryd tua 3 awr. Mae'r rhan rhwng B a D yn arw a serth, ond gellir ei hosgoi drwy fynd yn syth o B i E, sy'n torri 0.8 km oddi ar hyd y daith.



Look for other trails in this series!



## SCRATCHING THE SURFACE



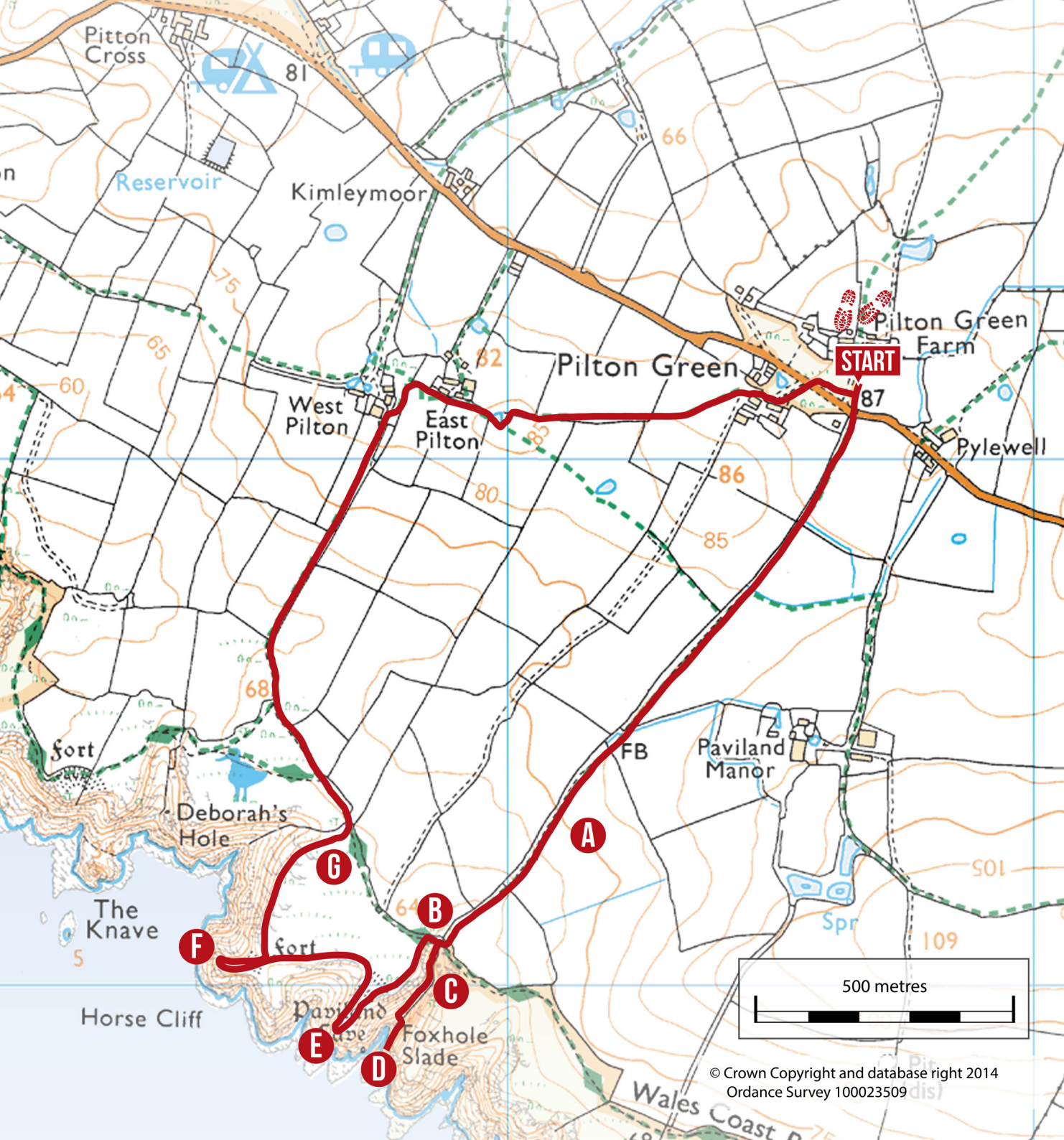
## CRAFU'R WYNEB

Discover geology and landscape: walking trails in rural Swansea

Darganfod daeareg a thirwedd: llywybrau cerdded yn ardal Abertawe

© 2015 Geraint Owen and Siwan Davies (Swansea University)  
email: [g.owen@swansea.ac.uk](mailto:g.owen@swansea.ac.uk) #[scratchingthesurface](https://twitter.com/scratchingthesurface)  
<http://geography.swan.ac.uk/scratchingthesurface/>





Carefully cross the road to a gate just left of the house. Keep close to the hedge on your right across 3 large fields (ditch between fields 2 and 3) and one short one. Stop half-way along the fifth field and examine the stony soil. [1.1 km; SS 44065 86300]

**A** The underlying rock is limestone, which you will see at B, but most of the blocks are brown or white sandstone; look closely and you will see tiny sand grains. The blocks are erratics, carried here by an ice sheet tens of thousands of years ago in the ice age. When the ice melted, it released debris picked up further north, covering the limestone bedrock with several metres of a deposit called till.

Cross another field, go through a gate and turn right on the Wales Coast Path. Cross a wall at a gate. Follow the coast path right and left for 20 metres to crags on the right where the path begins to climb. [1.4 km; SS 43873 86100]

**B** This rock is limestone. Look closely and you will see it is made of tiny spheres, each less than a millimetre across. These are ooids, named after the Greek for egg, because they look like fish eggs. They actually form in warm, shallow seas when lime (calcium carbonate) is precipitated around specks of silt or shell being washed around by waves. They form today in places like the Bahamas, but the ooids in the rock formed 350 million years ago, early in the Carboniferous period. South Wales then was covered by a warm tropical sea and today's landscape did not exist.

The Carboniferous Limestone is made up of layers (beds). The surface of each bed represents the sea floor at different times. Younger beds are higher in the rock succession. They were originally horizontal but are now tilted (dip) about 45 degrees towards the north-east. Look carefully for patches of ooids crossing between beds. These are infilled burrows made by animals in the sea-bed sediment 350 million years ago.



Oolitic limestone with fossil burrow



Foxhole Slade

To visit C and D, return to the wall and take the rough path down Foxhole Slade, keeping the wall on your left. After about 80 metres, just after a rocky step, there is a small cave on the right. [1.6 km; SS 43851 86021]

**C** Caves form in limestone because the rock dissolves in weak acids, which come from rainfall or decaying plants. The rock dissolves along fractures, allowing water to flow underground in cave systems. That is why there is no stream in Foxhole Slade. The curtain of structureless rock hanging from the cave roof is flowstone: precipitated lime, similar to stalactites and stalagmites.



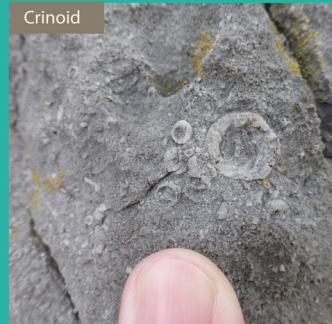
Cave in Foxhole Slade

The ground near the path is covered with broken limestone; this is scree, or talus. Most of it dates from the last glacial episode, about 20,000 years ago, when temperatures were much colder than today. Water freezing in cracks broke the rock into pieces.

Many of the limestone blocks contain ooids, and fossil shells of animals that lived in the early Carboniferous sea. They include corals, echinoderms and brachiopods, animals that flourish today in tropical seas. The rest of the rock is lime mud and broken shells, compressed and cemented over millions of years as more sediment formed on top.



Coral



Crinoid



Gastropod

Continue down the path, crossing the fence at a stile. Continue carefully onto the rocks of the intertidal zone. [1.8 km; SS 43768 85868]

**D** Foxhole Slade ends in a deep inlet. Notice that the rock layers are not continuous across it. This is the line of a fault, a fracture across which the rocks have slipped. Fault movements generate earthquakes, but this one is no longer active. The sea has formed the inlet because rocks along faults are shattered and fractured. Look for veins - sheets of white calcite crystals filling cracks. There are many similar faults on Gower, trending SSW-NNE. Many have been preferentially eroded, forming valleys and inlets like Caswell and Mewslade, as well as Foxhole Slade.

There are lots of fossils here, but not many ooids. Circular discs a few millimetres in diameter are parts of crinoids (sea lilies), relatives of sea urchins and starfish. Their discs, or ossicles, make up most of the limestone in some beds. Geologists subdivide thick successions of rock like the Carboniferous Limestone. The oolitic limestone at B is part of the Hunts Bay Oolite and the fossil-rich limestone here belongs to the older High Tor Limestone. Variations in the limestone reflect environmental changes in the Carboniferous seas, such as changes in depth or storminess.

Part-way up the high cliff across the fault, facing the sea and so not visible from here, is the entrance to Goats Cave, also known as Paviland Cave. The next stop is the headland above Paviland Cave, where its significance will be considered.



Erosion along a fault in Foxhole Slade



Cliff at Paviland

Retrace your steps to B and leave Foxhole Slade on the coast path. Where it levels off, don't follow the fence ahead, but turn left on a faint path along the rim of Foxhole Slade. Cross several ditches and mounds to a point overlooking the sea. Be very careful here! [2.6 km; SS 43671 85921]

**E** Paviland Cave is beneath you, inaccessible from here. Excavations have yielded the bones of animals that lived here as much as 120,000 years ago. They show that climate has changed over that time from an interglacial period (like today) to glacial conditions, when the edge of an ice sheet lay across Gower. In 1823 human remains were found, commonly known as 'The Red Lady of Paviland'. The bones are now known to be those of a young man who lived about 26,000 years ago.

Looking across Foxhole Slade (east), notice how the valley cuts sharply into a level plateau eroded across the dipping limestone beds. You can appreciate the total thickness of limestone beds on Gower - about 1000 metres - which built up over several tens of millions of years.



Erosion across dipping limestone beds in Foxhole Slade

In the other direction (west) you look across a broad hollow - another dry valley eroded along a fault. F is the headland on the far side of this bowl. The floor of the valley is made of layered deposits of coarse blocks cemented together. These are talus deposits like you saw at C, but older. They formed in the last glacial episode, about 20,000 years ago, when this area lay just south of the ice sheet. Precipitated calcium carbonate has cemented the blocks together in a deposit called head.

The mounds and ditches you crossed to reach E are ramparts constructed in the Iron age, about 2,000 years ago, to defend the level headland. There are many of these 'promontory forts' on Gower.

Retrace your steps across the ramparts - how many can you count? Bear left around the rim of the valley to reach the cliff-top overlooking the sea. This is Horse Cliff. Be careful! Turn right to look over the next bay and the coastline beyond to Worms Head. [3.0 km; SS 43467 86047]



View west towards Worms Head

**F** This is one of the finest views along the South Gower coast. The steep rock across the bay is The Knave, with Worms Head beyond. The limestone plateau is conspicuous, with Rhossili Down above it; a Scratching the Surface trail at Llanmadoc explores this landscape.

The beds along the coast all dip inland, to the north. The tilting is due to compressional forces of plate tectonics. Just as the Himalayas have formed by the collision of India and Asia in the last 80 million years, so two continents south of Britain collided 300 million years ago, consuming the ocean that separated them and forming a chain of mountains. The mountains have been worn down by erosion, but the rocks remain bent, tilted and broken. This event is known as the Variscan Orogeny.

The bay ahead has two dry valleys, locally called slades, running into it. Like Foxhole Slade, they follow fault lines. Notice how suddenly they begin from the limestone plateau. They were probably eroded very rapidly by glacial meltwater 20,000 years ago, when the edge of the ice sheet lay just to the north. The caves were blocked with debris, or ice filled the cracks feeding them, so meltwater flowed over the surface, rapidly eroding the limestone. In the cliffs between the slades is another bone cave, Deborah's Hole.

Follow the rim of the valley along a faint level path. Rejoin the coast path at a junction of walls. [3.5 km; SS 43700 86324]

**G** On the right just before this point are two shallow depressions. They have formed by collapse over caves and are called dolines. Together with caves and dry valleys, dolines are typical of landscapes formed on limestone, called karst landscapes after the Karst region of Slovenia.



Doline

Turn left through a gated stile on the coast path. You can continue on the coast path to Mewslade, Worms Head and Rhossili, from where there are paths back to the start. To complete the trail, however, take a marked path after 100 metres bearing right off the coast path, following a stone wall on the right. Cross a stile ahead and bear right along the field edge to another stile. Continue uphill on a track across two fields. At the barn, bear right on a faint grassy path, go through a gate, and turn right over a stile towards a large barn. Cross the field, keeping the barn on your left, to another stile. Pass a small pond and follow the hedge on your left for about 50 metres, then cross it at a stile. Turn right, keeping the hedge on your right. After the next stile, bear left to a gate next to a telegraph pole by some buildings. Go through 3 gates, turn left at a track and carefully cross the road to return to the starting point.

**FINISH**