

# Berwickshire Coastal Geology Project

[www.berwickshirerocks.org.uk](http://www.berwickshirerocks.org.uk)

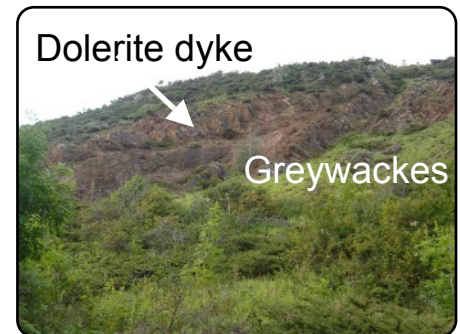
## BURNMOUTH HARBOUR AND CLIFFS

Visitors can park in Upper Burnmouth and walk down the steep hill to the harbour. The road is narrow and anyone wishing to drive down to the harbour should take great care. Park where the road is widest, near to the harbour [NT 959 608]. Buses from Berwick and Eyemouth (235/253) stop in Upper Burnmouth.

**TO SEE THE ROCKS IN SAFETY, MAKE SURE YOU VISIT AT LOW TIDE.**

The short walk takes you less than a mile towards the cliffs on the south side of the bay to look at the rocks on the headland. Keep away from cliffs after heavy rain. A toilet is available at the harbour.

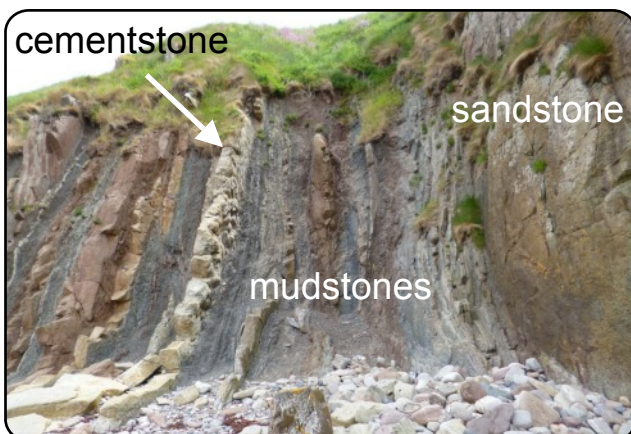
Facing the harbour, look to your left at the cliff above the line of fisherman's cottages at Partanhall. The grey crags are made of dark grey, impure sandstones called greywackes. As the greywackes weather, broken rocks create steep scree slopes covered by scrub vegetation. At the top of the hillside, above the road, some of the rocks are a bright orange colour and appear to cut across the greywackes. These rocks are part of a dolerite dyke which was intruded into the greywackes. It appears orange as the dolerite contains iron-rich minerals which rust as they weather.



To see more of the greywackes on the hillside, walk back up the road until you reach Burnmouth Church. The footpath to the right of the church takes you to the track to Partanhall. Turn left and in about 100 m you reach exposures of greywacke to the right of the track. Look up the hillside at the underside of the greywacke beds, some of which are covered with rounded flute marks. Flute marks are the depressions caused by vortices of rapidly moving turbid water currents which scoured the muddy sea floor during the Silurian period (430 million years ago). As the turbidity flow reduced in speed, they were filled with sediment and appear as elongated bulges.

## CARBONIFEROUS ROCKS AND FOSSILS

The rocks of Burnmouth shore and Ross Point are Carboniferous in age (350 million years old) and are called the Ballagan Formation by geologists. To see them more closely, follow the road towards the cliffs, observing the vertical beds of rock on the foreshore if the tide permits. Turn left after you have walked through the houses at Ross and take the steps onto the pebbly beach. You will be walking over boulders and clambering over rocks, which may be slippery when wet, so take care.

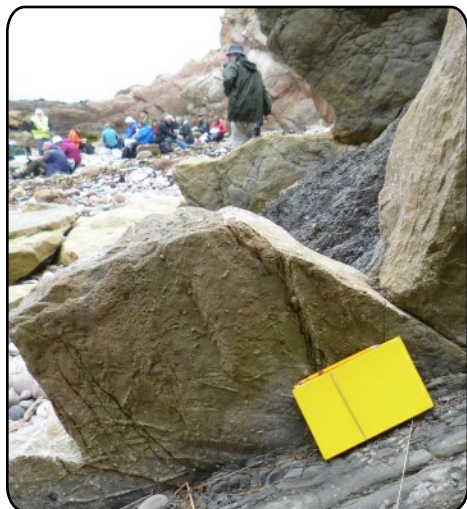


It takes a little while to recognise the three main types of sedimentary rocks in the cliffs and on the foreshore. Most clearly seen are beds of grey **sandstone**, several metres thick, which form small promontories on the cliffs and create ridges across the foreshore. Between the sandstones are many thin beds of yellow **cementstone** (a type of limestone) which form low walls crossing the pebbly beaches. Grey, black and reddish **mudstones** are best seen in the cliffs, sandwiched between the sandstones and cementstones; on the beach they are covered with seaweed and pebbles, as they are less resistant to marine erosion than the sandstones and cementstones.

The Silurian greywackes were folded intensely during the Caledonian mountain-building event which lasted about 30 million years until 420 million years ago. The Carboniferous beds of Burnmouth Bay were deposited on a relatively flat land surface when the Caledonian mountains had been largely worn away. A further mountain-building event about 200 million years ago, concentrated across central Europe, caused the Carboniferous rocks of this area to be uplifted, tilted and faulted, so that the beds at Burnmouth are near-vertical.



Vertical beds on the foreshore



Trace fossils on a sandstone bed

Many of the sandstones on the Burnmouth cliffs contain trace fossils, such as feeding tracks or burrows. Tree and branch fossils can also be spotted, as well as occasional shark spines. The fossils and red muddy soil horizons suggest that the environment was forest and marshland with sandy river channels and was periodically flooded by the sea. There was plenty of animal and plant life, enjoying a warm climate with wet and dry seasons.



A shark spine in sandstone

## EVOLUTIONARY CHANGES IN THE EARLY CARBONIFEROUS PERIOD

A gap in the fossil record has been filled by recent exciting fossil finds in the Ballagan Formation of Burnmouth (and in the Whiteadder river near Chirnside) by a scientific team from several universities and the British Geological Survey. The discoveries have thrown light on a time when the first four-limbed creatures developed lungs and were therefore able to live on land. The bones are tiny and easily removed by waves so it is hard to find examples on these cliffs. Further information about the Ballagan environment and the fossil finds can be found on the TW:eed Project website at <http://www.tetrapodworld.com/>



### USEFUL REFERENCE BOOKS

- Berwickshire Coast Rocks!* 2018 Helen Page
- Scottish Borders Geology - An excursion guide* 1993 A.D.McAdam, E.N.K.Clarkson & P.Stone
- Death of an Ocean - A Geological Borders Ballad* 2010 E.N.K.Clarkson & B.Upton
- Northumbrian Rocks and Landscapes - A Field Guide* 1995 (ed. C. Scrutton) Yorkshire Geological Society

### USEFUL MAPS

- OS 1:50,000 Landranger 67 Duns, Dunbar & Eyemouth
- OS 1:25,000 Explorer 346 Berwick-upon-Tweed
- British Geological Survey 1:50,000 Scotland Sheet 34 Eyemouth (Solid)

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