

Berwickshire Coastal Geology Project

www.berwickshirerocks.org.uk

EYEMOUTH'S TILTED GREYWACKES

This walk starts at a car park to the east of Eyemouth (NT 947 645) and takes you along the cliffs on the coastal footpath for about a mile. To reach the car park take the A1107 from the A1 towards Eyemouth and turn right at the roundabout by Eyemouth High School. Follow the road towards the sea and turn left into the car park about 100m before the sharp left turn into the dock area. There are frequent buses from Berwick-upon-Tweed to Eyemouth (235/253). YOU CAN SEE ALL THE FEATURES ON THIS WALK AT HIGH TIDE BUT TAKE CARE ON THE CLIFF PATH WHICH IS SLIPPERY AFTER RAIN.

After enjoying the view across Eyemouth Bay to the town and the cliffs of Eyemouth Fort, cross the road to the footpath next to the Golf Course which takes you to the cliffs. You will find binoculars useful.

The cliffs along the coast between Eyemouth and Burnmouth are composed of sedimentary rocks called **greywackes** and **mudstones**. Greywackes are a type of sandstone, but they are composed of fragments of rock as well as grains of quartz, found in more typical sandstones. For greywackes to contain rock fragments, there must have been mountains nearby from which volcanic and metamorphic rock fragments were weathered, eroded and transported by rivers into a nearby sea where they were deposited, often with a thin bed of mud above.



As you reach the cliffs, turn to the right along the coastal path. You can see down into the cove to the east of Dulse Craig. The beds of greywacke are sloping (dipping) steeply towards the west and vary in thickness from about 10-100 cm. Careful study shows that they are folded into sharp folds like hairpins but that is difficult to see from above. As you walk past Tee 6 you can see finely bedded mudstones in the footpath. Follow the red or green marker posts around the golf course and watch for flying golf balls.

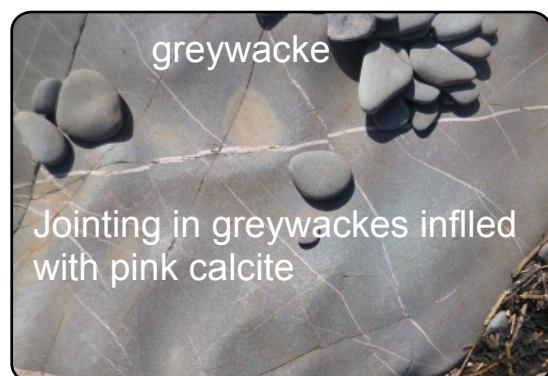
430 million years ago (the Silurian period), mountains on the continent of Laurentia formed the areas which are now Scotland, Scandinavia, northern Ireland and eastern North America. The ocean to the south of the mountains was filling with greywacke sediments which were being squeezed under Laurentia during a plate collision. In the process, the greywackes were folded and faulted under great pressure and these features can be seen from the coastal footpath.



The narrow inlets are probably eroded along fault lines and, with binoculars, you can see folding on the left of this inlet. The photo below shows the fold in detail.



If you want to have a close look at the greywackes, walk down the grassy slope into the inlet, taking care if it is wet. Look at the bedding planes which are uneven and knobby in places. Some of them are covered by pink calcite, which is also seen in the joints.





Another narrow inlet has steeply dipping rocks with raised ripple marks on the bedding planes, showing that currents were moving sediment on the seabed. As you continue, use binoculars to find further examples of ripple marks on the greywacke beds.



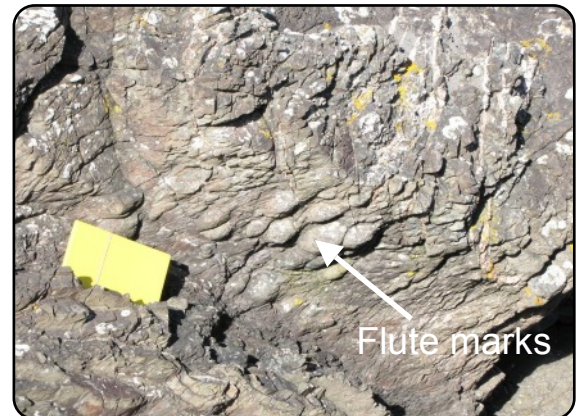
A series of folds is seen near Elgy Rocks, where a fold in a thick bed of greywacke has a rounded crest. Thinner beds are folded into tight, angular folds, shown by the arrows.

The wide bay at the corner of the wall is John's Roads. There are seats and benches to enjoy the view. Beyond John's Roads is a narrow peninsula, Agate Point, stretching out to sea. From the end you can look back at the cliffs and identify more folded rocks.

TURBIDITY FLOWS AND FLUTE MARKS

As the plate collision continued, the rock fragments deposited on the continental shelf were disturbed by earthquakes so that unstable piles of sediment tumbled down the continental slope into the deep sea in rapid flows called **turbidity currents**. As the speed of the flow decreased the heavier fragments were dropped first and eventually finer clay particles were deposited above when the current stopped moving. Each turbidity flow created a bed of greywacke with a thin layer of mud lying above it.

Continue along the coast, past a footpath to the right, until you reach the headland of Whalt Point, just before the path starts rising over the higher cliffs. Before you reach the seat take the small path on the left into the steep gully. In front of you are some elongated, aligned **flute marks**, which were formed by rapid flows of turbid water scouring the sea-bed into hollows. The 'lumps' that you see are the infilling of the hollows by sediment, which was deposited from the turbidity flow as the velocity reduced.



You can return to the car park along the coastal footpath or take the footpath at John's Roads, turn right onto the road and walk back along the pavement.



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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