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# Fast Castle

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O.S. 1:50 000 Sheet 67 Duns and Dunbar

B.G.S. 1:50 000 Sheet 34 Eyemouth Solid and Drift

Route: (Figure 7)

## Introduction

The object of this excursion is the examination of Silurian greywackes in some excellent exposures on the Berwickshire coast, at the north-eastern end of the extensive outcrop of Lower Palaeozoic rocks which forms the Southern Uplands of Scotland. Attention is drawn particularly to tectonic and sedimentological features of the rocks. Certain glacial deposits and landforms will also be noticed (Geikie 1864, Greig 1988).

The area lies between Siccar Point and St Abb's Head, north of the A1107 between Coldingham and the A1 road south of Cockburnspath. The road to Dowlaw and Fast Castle turns off the A1107 road at Old Cambus Wood [NT 828 688], 8 km from Coldingham and 5 km from the A1. The excursion lies within the farms of Dowlaw and Lumsdaine to the east. It involves between 5 and 6 km of walking, mainly over hilly grassland, but some 400 m are across a rocky shore, which is reached via steep slopes of vegetated scree between 50 and 100 m high. Additional descent, and ascent, of about 100 m of scree may be considered worthwhile at one locality. Stout footwear is essential, with a good grip in the soles.

The greywackes are of Silurian (Llandovery) age, part of the Gala Group, and were deposited by turbidity currents which swept down submarine slopes and deposited their load of sand and mud in the flatter areas of the sea-floor. Each bed corresponds to one episode of flow and in many cases the lower, coarser part of the bed is graded, the coarsest material having settled first. Bed thickness is generally up to 2 m, but in exceptional examples may range up to 6 m. Near the bases of a few of the thicker beds tiny angular pebbles or shell fragments can be seen with the naked eye together with larger, detached pellets of the very fine shaly beds. Structures related to the slumping of unconsolidated sediment can be identified in places and solemarks on the bases of greywacke beds are very common. The upper surfaces of greywacke beds may preserve ripple-marks, in most cases transverse to the linear bottom structures (sole marks) and hence to the current which caused them. The spectacular folding of the strata is the result of sequential deformation during the late Silurian caused by the closure of the ocean in which the rocks were deposited. This has left bedding steeply inclined, commonly vertical or inverted, and the recognition of grading and of top- and bottom-structures is an essential technique if the order of deposition of the beds is to be established. Fossils are not abundant. Traces of graptolites may be visible in the field occurring in apparently random pockets among the fine-grained shaly rocks. They are all of upper Llandovery age (Strachan 1982<sup>3</sup>).

## 1. Harly Darlies: greywacke, glacial deposits

A disused quarry [NT 836 694] 950 m along the Dowlaw road, displays greywacke with transverse current-ripple-marks, well developed on the upper surface of the beds, which dip north-westwards. Just to north, across the road, ridges of glacial gravel have fluvial channels and swampy hollows (kettle-holes) among them and separating them from the rocks to south-east. These ridges are eskers deposited by englacial streams which were here diverted south-eastwards, towards the Dowlaw Burn (see below), from the eastward course they had followed to this point. Glacial gravels are widely deposited on the slopes leading down towards the sea-cliffs and there is ample evidence of eastward drainage along these slopes, between high ground followed by the road and glacial ice to north-west and in the sea. The deposits here at Harly Darlies occupy a relatively low col in the high ground. Crag-and-tail features are well developed on the moorland to south-east.

In normal weather this is an excellent point for viewing the East Lothian coastal plain (Lower Carboniferous), the outer Firth of Forth, and Fife. Much nearer is the historic locality of Siccar Point.

## **2. Dowlaw Dean: Post-Glacial gorge**

The farmer at Dowlaw [NT 856 702] should be consulted about the parking of vehicles. From the farm follow a track eastwards down to a bridge across the Dowlaw Burn on to the lands of Lumsdaine, and then cross the fields along the right bank of the deeply cut Dowlaw Dean, largely Post-Glacial, to the cliff-top near Brander. On the way notice high on the opposite side of the Dean one or two short sloping benches, developed by erosion at an early stage in the cutting of the gorge.

## **3. Brander: Anticline**

This narrow headland is formed by greywackes dipping steeply to north-west, close to a spectacular anticline which can be viewed from several points on the cliff-top and the screes south-west of the headland. A good head for heights is essential in places! Where first seen, looking seaward across the screes, the fold has a well rounded unbroken form, approximately symmetrical about a very steep axial plane, each bed maintaining its thickness across the nearly horizontal crest. Within somewhat steeper beds immediately to the left (north-west) the crest of a subsidiary anticline can be seen, plunging towards the viewer at 30°. If these subsidiary folds are congruous with the main anticline the thin-bedded strata to the right must include a complementary syncline, perhaps represented by a plane of bed-parallel faulting. These subsidiary folds are isoclinal, their axial planes parallel to the bedding and dipping steeply to NNW. They are seen again to south-west, on the landward side of the scree, but here they are more open and more widely separated, though still with a marked plunge to south-west, and are perceptibly diverging from the main fold. (The main fold also changes form. From the sea it appears to have an angular crest and to be somewhat disturbed by steep faulting). An analogous development of subsidiary folding will be seen again at Locality 5.

## **4. Muscle Craigs: syncline**

Descend to the shore by the screes west of Brander. About 40 m north-west of the angle in the tide-line a syncline is well exposed in a small upstanding rock, from which it can be followed seaward across the shore, clearly indicated by the gradual convergence of the beds. This difference in strike across the fold results from an axial plunge of 10° to WSW, seen on the small stack, where the axial plane is seen to dip very steeply to NNW. Greywacke beds approaching 6 m in thickness occur on Brander and are seen again to north-west, beyond a run of thinner greywackes and siltstones in the core of the syncline. It has not been established, however, that they are the same strata. Low-angle accommodation faults, variously oriented, are seen at several points among the near-vertical beds on the north-western limb of the syncline.

## **5. Dowlaw Burnfoot: sedimentary and structural features**

Continue north-westwards across the steeply-dipping strata. At the point where the cliffs turn in towards the mouth of the Dowlaw Burn good examples of flute-casts and groove-casts may be seen on the base (NW side) of a bed of greywacke. These approximately linear features dip at 25° to the right (SW) and indicate by their shape that the currents which formed them flowed from the left. They originated as asymmetric channels eroded in the underlying sediment, now removed, by the submarine turbidity current which introduced the greywacke material now preserved as a cast. The more linear grooves were cut by fragments of rock carried along by the current. Analysis of observations from the whole coastal outcrop indicates that most of these turbidity currents flowed towards the south-west (allowance having been made for the subsequent folding of the strata). An anticline following the north-west side of the Dowlaw gorge can be seen on the cliffs just to the right of the waterfall, and on the shore 50 m north-west of the burn a pair of folds is developed, their axes 4.5 m apart, apparently dying out rapidly along the strike. Near the corner of the beach, 50 m farther on, the rocks are again synclinally folded. As at the major folds of Brander, Muscle Craigs, and Dowlaw Burn, the syncline is asymmetric; strata in the vertical limb young (face upwards) towards the south-east whereas those in the

other limb dip at 60° to north-west. On the foreshore this syncline is seen to have a complex profile, with a central asymmetric anticline, which varies both downwards and along the strike. The 'simple' syncline in the cliff is seen on close examination to carry on its southern limb the central anticline of the shore, now almost a vertical isocline, to the left of which must lie the second syncline, presumably replaced by a fault. This variable development of subsidiary folds is analogous to that already seen at Brander, and to be seen later below Fast Castle. The localised folds on the shore to south-east lie slightly oblique to the major folds and are typical of minor drag-folds developed by bedding-plane slip on the broad limbs of major structures. Other examples of flute-casts and groove-casts, of upper-surface ripple-marks, and of small low-angle faults may be seen in this area.

## **6. Souter: Stack, glacial deposits**

Climb up the screes and bracken-covered slopes, 50 m high, behind the beach, and continue northward along the cliff-top to Souter Brae. The prominent stack of Souter (the cobbler) is formed by a thick vertical bed of greywacke. From a distance it is often mis-identified as Fast Castle. Near the cliff-top are several exposures of laminated sand and gravel overlying unsorted coarsely gravelly clay, or stiff chocolate-brown clay with few stones, altogether up to 9 m thick. Souter Brae, immediately to landward is the lowest of four erosion levels on the slopes within 400 m to west, mainly forming small swampy clay-filled pockets. These are interpreted with the gravelly deposits as evidence of the eastward flow of meltwater, marginal to sea-ice progressively wasting towards the north.

## **7. Big Byrips: multiple anticline**

The second erosion level forms a small patch of brown clay at the cliff-top 250 m west of Souter Brae. The next major fold can be seen only on the foreshore north-east of here. It is a multiple anticline, made up of at least nine closely spaced subsidiary folds, separated by 220 m of very steep strata from the syncline at Locality 6, and with a much less steep limb to north-west, as in the folds seen earlier. (Descent to the shore here is recommended only to the enthusiast with time available.

## **8. Hawks Heugh: syncline**

From the cliff-top some 150 m farther west a broad syncline can be clearly seen on the long east-facing cliff, Hawks Heugh, which runs southward from Fast Castle. Although apparently a simple symmetric fold with both limbs dipping at 60°, closer inspection shows it to comprise at least three elements, and in addition it is displaced by a low-angle fault clearly visible on the cliff-face. The cross-strike width of the south-eastern limb of the syncline is just over 300 m, and of the north-western 200 m.

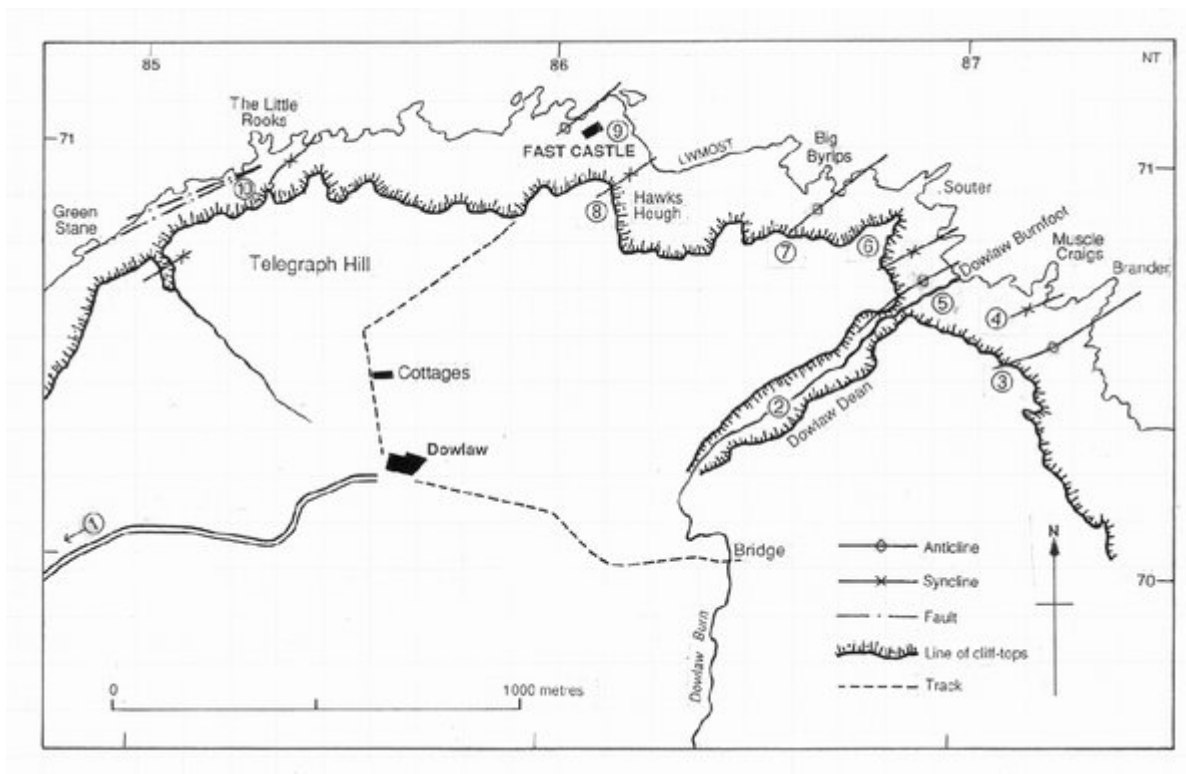
## **9. Fast Castle: complex anticline**

Continue westward and northward, along the top of Hawks Heugh, to meet the path leading down north-eastward to the ruins of Fast Castle. In places within the first 100 m of the descent the greywacke are seen to be overlain by up to 3 m of poorly sorted meltwater gravel. The castle, perched on an almost impregnable vertiginous cliff, has a place in Scottish history and legend. It may have been used as a refuge by the Earl of Bothwell, whose family, the Hepburns, held it at the time he fled from the court of Mary Stuart. A tradition that he concealed there a hoard of the royal treasures led to excavations some 20 years ago in search of the Gold at Wolf's Crag (Douglas, 1971<sup>4</sup>). Nothing was found. The castle is also believed by some to have been the setting of Scott's novel *The Bride of Lammermoor*. At the site the geologist can contemplate the dip-slopes of greywacke which drop steeply towards the sea to south-east, but the principal interest here lies in the complex antiformal structure which traverses the shore on the north-western side. This feature may be studied from the cliff-top to south-west but the spectacular changes in fold profile can be appreciated only by descending the 100 m to the shore. The least difficult approach is probably by a scree-slope 250 m south-west of the castle. The 'antiform' is seen to consist of a complex hinge involving at least five subsidiary folds, but towards the south-west the central of the three anticlines degenerates into a minor irregularity in the axial region of a syncline.

## 10. The Little Rooks: multiple fold, fault breccia

From the top of the screes a footpath ascends gradually across the heather to south-west and then southwards, through a gateway, to Dowlaw, but if time allows the cliff-top may be followed westward for 700 m, as far as the burn which descends north-westwards from the farm. This part of the coast runs sub-parallel to the strike of the greywackes, which dip north-westward at 60°. Some 800 m west of Fast Castle, and 300 m across the strike of the beds from the anticline there, a syncline is exposed at the cliff-top and may correlate with the hinge better exposed near L.W.M. 150 m east of The Little Rooks. The multiple nature of this structure is seen in the burn within 50 m or so upstream from the cliff-top. This last example of folding is typical of the style seen across the extensive inland outcrop. Bands of fault-breccia, not seen elsewhere along the coast, follow the shoreline from The Little Rooks to Green Stane, and are taken to mark a significant fracture, parallel to the strike, separating the rocks of these seaward stacks from those of the cliff sand the area to south-east. No change of lithology is apparent. Return to Dowlaw by following the burn upstream.

### [References](#)



(Figure 7) Fast Castle excursion.