GGS excursion to The Berwickshire coastal Path, 9 Km from Cove Harbour to Siccar Point

Joint excursion of Glasgow Geological society with Edinburgh Geological Society Saturday 25 June 2016
Leader Dr. Angus Miller Participants From Glasgow 20
Report by David B. Hollis From Edinburgh 20

The area of interest lies on the Berwickshire coast path south of Barns Ness lighthouse and Torr Cross nuclear power station, on O.S. Landranger sheet 67 : Duns and Dunbar, or O.S. Explorer sheet 346: Eymouth, and on and on B.G.S. 1:50000 sheet 34: Eymouth. The nomenclature used here is that which is still familiar to most of us. It was in current use until about year 2000. In a later revision of "Geology of Scotland", 4th edition, edited by N.H. Trewin, a more recent revision of nomenclature of geological strata, in use in recent works, is presented. A bibliography is included at the end of this report, for further reading.

About 20 G.G.S. members, and a similar number of E.G.S members met at Cove car park [O.S. NT 778 718]. We followed down the stratigraphic succession along the cliff path (the Berwickshire Way) from Lower Carboniferous sandstones of Cove Harbour, through the Old Red Devonian sandstones of Pease Bay, to the Devonian-Silurian unconformity at Siccar Point. [(O.S. NT 812 711]

We first visited cove Harbour [O.S. NT 788 718] to study Carboniferous sedimentary rocks. As a result of drag on the strata by the Cove Fault, the strata dip steeply to the sea. The beds consist of oxidised sandstones which show evidence of soil horizons (clay shale beds with plant fragments) .

Steeply dipping terrestrial sandstone at Cove Bay

Some "seed ferns" have been found at Cove Harbour; this indicates a terrestrial environment. Occasional incursions of the sea in Visean times gave marine sediments which contain pieces of Crinoids.

Marine and lagoonal beds at cove Harbour

But as our leader pointed out, well preserved fossils are rare in this locality. The general facies are those of river laid deltaic and lagoonal sediments. These beds are possible equivalents of the Ballagan Beds which exist north of Dumbarton near Glasgow. Alternatively, these beds are believed to correlate to the West Lothian Oil shale Beds. Indeed, on the north-west cliff of Cove Bay (best seen from Cove village), an oil shale bed does exist.
However, apart from a few shaly bands, the strata at Cove Harbour are almost free of oil shales**.**

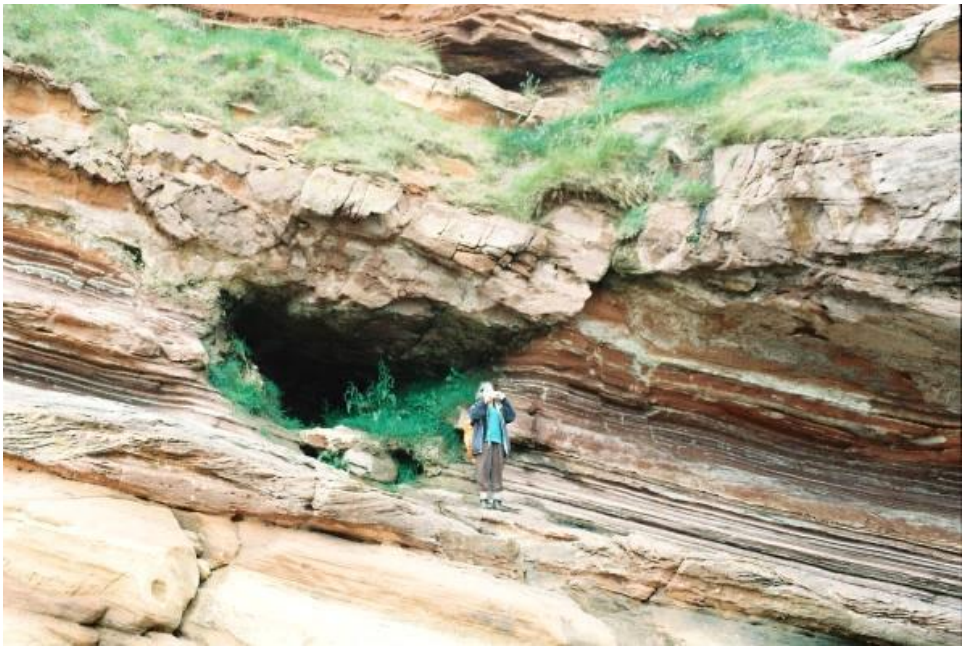
North-west cliff at Cove Bay

We then returned to the cliff path to follow the coastal path southwards to Pease Bay. En-route, some discussion ensued about the exact boundary between Devonian and Lower Carboniferous rocks. On the beach below the cliffs, the strata dip seawards. The Devonian strata are closest to the cliffs, while the Carboniferous strata are further away. However, the boundary between the two was not easy to discern**.**

Dr. Miller discusses the Devonian-Carboniferous Unconformity

At Pease Bay [O.S. NT 795 710], we had lunch, before examining the Devonian sedimentary strata in the cliff at the north- west end of Pease Bay**.(P5)**

The north-west cliff at Pease Bay



Channels showing flow from north to south are incised into more or less flat beds which dip down seawards at about 30 degrees. One striking example of a channel had partly collapsed into the underlying strata

The channel had collapsed into the strata beneath it

The sea had eroded these, to form a cave beneath the sediments deposited within the channel. The strata into which the channels are incised, and which show flow from West to East-South East, consist of material which is sourced from the Caledonide Uplift. Bright red clasts, a few centimetres in size, of hard material, within the beds were noted. The formation of these nodules within the sandstone strata indicate periods of concretion and desiccation, with the formation of caliche and cornstone. Also noted were green “reduction spots” in numerous places. Indeed, one thin, green stratum could be traced over several tens of metres. Possible evidence of Aeolian wind-blown material was also considered.

Crossed bedding and foresets, some of which were “beheaded” by subsequent erosion and overlay of later material, were evident.

The “beheaded” crossed bedding

All these features indicate periodic aerial and sub aqueous conditions, such as in flash floods, and formation of temporary wadis. Since few large clasts were found, the inference is that these beds are distal from the source of material.

The party continued along the cliff path to the Old Chapel [O.S. NT 804 697]. The view northwards towards Barns Ness (Torr Cross) lighthouse, showed the downward succession from the chimney of the cement works (marine carboniferous limestone workings) to the famous Barns Ness Carboniferous coral beds near the lighthouse.

On the east side of the Torr Cross nuclear power station, Bass Rock (a Carboniferous basalt/phonolite plug dating from mid-Visean times) was visible. Just west of the power station was visible the top of North Berwick Law, another Carboniferous basalt plug. Nearer at hand were the Carboniferous sandstones of cove Harbour. Closer still were visible the Devonian sandstones of Pease Bay. Again, en-route, the exact location of the boundary between the Upper Devonian and Lower Carboniferous was questioned.

Our final goal was Siccar Point [O.S. NT 813 710], which lies beyond the Old Chapel [O.S. NT 804 697]. Several of the party descended to the shore down the steep slope.

Descent to Siccar Point

All returned to the top safely. Others went inland a few hundred metres and then turned to the cliff edge, where a fine view of the South-east elevation of the unconformity is clearly visible

Southern aspect of Siccar Point

The near vertical grey Silurian **marine** turbidites are overlain by near horizontal sandstone beds. Pre Devonian earth movements, during the closure of the Iapetus Ocean, uplifted the Silurian sediments, and placed them in a near vertical position. Subsequent erosion, which removed any Devonian and lower Carboniferous beds (if these were ever deposited), resulted in a serrated land surface, in which the softer, more clay rich, Silurian beds were partly removed, giving clefts between the more resistant silica rich beds. The sandstones directly above the Silurian beds contain fragments of the Silurian greywackes. That indicates erosion with subsequent redeposition, with continuity into the higher sandstone beds. The higher sandstone beds are of mid to upper Visean age. The dull, misty weather made the contrast between the overlying red Devonian rocks (which dip seawards) and the underlying nearly vertical grey Silurian strata less striking than it would have been on a sunny day**.**

We returned to the Siccar Point car park. The contrast between the red colour of the soils derived from weathering of the Devonian rocks in the fields near the top of the cliffs, and the pale ochre colour of the soils derived from the Silurian rocks near the Siccar Point car park is plainly apparent.

Our coaches took us to the Mercat restaurant near Musselburgh where, in company with our counterparts from Edinburgh, we enjoyed a high tea which consisted of a cooked meal followed by cakes and coffee. The two groups then said their goodbyes and went their separate ways.

A special mention should be made of a professor of geology from Northridge College, University of California, near Los Angeles in California- “Peggy”, alias Martha Ahlstrom, who was touring around Scotland. She made a special effort to contact the Glasgow Geological Society so that she could visit the Siccar Point exposure. She took the trouble to descend to the beach, and take photographs which she will show to her students on return to America. We pointed out to her that the rocks of Scotland are “part of America”, and that England (south of the Iapetus Suture) is “foreign”!

Finally, special thanks are due to the Edinburgh Geological Society for organising such an interesting visit, and their leader, Dr. Angus Miller, who gave erudite and succinct explanations of the geology, and answered our many questions.

Bibliography

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