
Whiteadder Water

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O.S. 1:50000 Sheet 74 Kelso

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Route: (Figure 19)

The Cementstone Group, the lowest series in the Carboniferous of Berwickshire, is exposed in many of the sections cut in the valley sides of the Whiteadder Water. It is difficult to relate these sections one to another, because of the lack of distinctive horizons, the absence of progressive upward lithological change and the variable structure (Greig 1988, pp 45–49).

Lithologically the cementstone facies consists of grey to dark grey interbedded mudstones, silty mudstones and siltstones (mudrocks) with thin grey-brown cementstone (dolostone) ribs, rare thin coal or oil-shale horizons, sandstone beds up to a metre thick and channel sandstones commonly 3 to 5 m thick; locally the beds are green- or red-stained. Deposition is interpreted as taking place in a coastal plain or delta traversed by distributary channels, with delta-top lagoons and inter-distributary bays. Emergent land surfaces nurtured a rich forest flora giving rise to well-preserved plant material, some permineralised in three-dimensions (Long 1961 et seq, Scott and Rex 1987). Variation in the environment from freshwater to brackish with rare marine incursions is reflected in the fossil faunas, from freshwater fish, bivalves, ostracodes and arthropods to marine brachiopods and gastropods (Brand 1991). Shrimp-like crustaceans, many well-preserved, were recorded from several localities along the Whiteadder Water (Peach 1908) and some of these have been relocated (Cater et al 1989). Carbonate muds forming in shallow water gave rise to the characteristic cementstones, and periodic drying out is shown by dessication cracks and preserved tracks, harsher conditions locally giving rise to the production of gypsum. Gentle dips produced by post-Carboniferous folding are characteristic of the beds in this area, generally southwards into the Tweed Basin. The localities selected as typical of the strata can all be reached, with more or less scrambling, from roads in the Chirnside–Hutton–Foulden area, which lies just off the A6105 Duns–Berwick road.

1. East Blanterne: Cementstone facies

One of several good cliff sections cutting cementstone facies in the Whiteadder Water, lies 2 km WNW of Chirnside by the B6355 road where there is limited roadside parking [NT 845 570]. Access can be gained from the west end of the cliff and the section examined by scrambling along the base. The cliff is some 5 to 10 m high and is surmounted by a few metres of red sand and gravel deposits resting on boulder clay. The strata dip generally to the south-east exposing some 30 m of section. The beds are dominantly grey in colour with some green and reddish beds. The strata are mainly composed of grey mudstones and silty mudstones, generally poorly-bedded and blocky, with beds of siltstone and sandstone, and ribs and bands of cementstone. Faulting affects the south-east end of the section. The bivalves *Modiolus latus*? And *Curvirimula*, *Spiororbis*, ostracods and fish fragments have been reported.

2. Willie's Hole: Cementstone facies, plants

Return to Chirnside and continue south through Allanton on the B6437 road. Take the first left past Broomdykes, left again at the next T-junction and straight on at the next junction. A good track goes down to the riverside where there is parking by the footbridge and ford. Walk west along the track across the alluvial plain for 500 m to a cutting beside the low riverside cliff, waterfall and pool known as Willie's Hole [NT 878 547]. A 1.5 m pale brown fine-grained sandstone, dipping at 12 degrees to the south, forms a low waterfall across the river. Above the sandstone are exposed 5 m of grey mudstones and silty mudstones with pale brown-grey nodular cementstone ribs less than 10 cm in thickness. Six metres of similar beds occur below the sandstone but with thicker cementstone bands up to 30 cm, one making a low weir

across the river. Well-preserved plants are found at this locality, including *Alcicornopteris* and *Archaeocalamites*. Also recorded are the bivalves *Lithophaga* and *Modiolus*, together with '*Estheria*', ostracodes, an early scorpion *Eoscorpius?*, rare fish fragments and eurypterid fragments. The shrimp *Tealliocaris* occurs in a silty bed towards the top of the section. Cater et al (1989) interpret the environmental setting of this shrimp-bed as a shallow 2-metre stagnant pond on the marine influenced coastal flood plain and the overlying sediments as deposited on dessicating mud-flats and in shallow ponds into which minor mouth-bars prograded. Going back along the riverside track for 300m gives a fine view of Steeple Haugh, on the north bank, a 13m section inaccessible because of a deep pool. It has beds lower than or equivalent to those at Willies Hole, but with well-developed channel sandstones.

3. Hutton Castle: Cementstone facies, gypsum

Farther downstream on the south bank of the river north-east of Hutton Castle Barns, there is an excellent 30-m cliff section [NT 893 547]. It can be approached from the tracks running north towards Edington Mill, from which a distant view of the cliff in red facies can be seen downstream. From the bend in the track half-way down the steep hill, the section can be reached by scrambling down the slope and working back upstream. A pale brown-grey cross-bedded channel sandstone with water seeping from its diachronous base forms the topmost 4m or so of this cliff. Below the sandstone the cliff shows typical cementstone facies of grey mudstones and silty mudstones with numerous cementstone ribs, a few prominent ones up to 30 cm thick but generally less than 10 cm thick. Bands of bedded sandstone, generally less than a metre thick, are mainly purple or dark brown in colour. Fossiliferous horizons occur at several levels and have yielded gastropod fragments, *Modiolus*, '*Estheria*' and ostracods. The beds dip at 18 degrees to SSW. An unusual feature of this section is the presence of white or pink gypsum, as nodules, as satin spar veins along the bedding and as large vugs.

4. Paties Cove: Reddened cementstone facies

The next southward loop of the Whiteadder Water forms an even more spectacular cliff, the east end of which is named Patie's Cove [NT 902 544]. It can be reached by going north from Hutton to Hutton Castle Mill, from which are good views of reddened cementstone facies cliffs across the valley, and then upstream along the alluvium. Much of the main cliff is inaccessible, but the cementstone facies is evident and there is a prominent channel sandstone some 3.5 m thick in the middle of the section. The beds show various shades of red, purple, brown and green. Most striking is the change in colour of the beds from the general greyish hues seen in the previous locality to the overall reddish tints at Patie's Cove. Gypsum is notably absent. Such major changes in so short a distance illustrates the difficulty of building up a stratigraphy in these beds. *Spirorbis* and ostracods have been found in the lower beds. The beds dip at 15 degrees to SW.

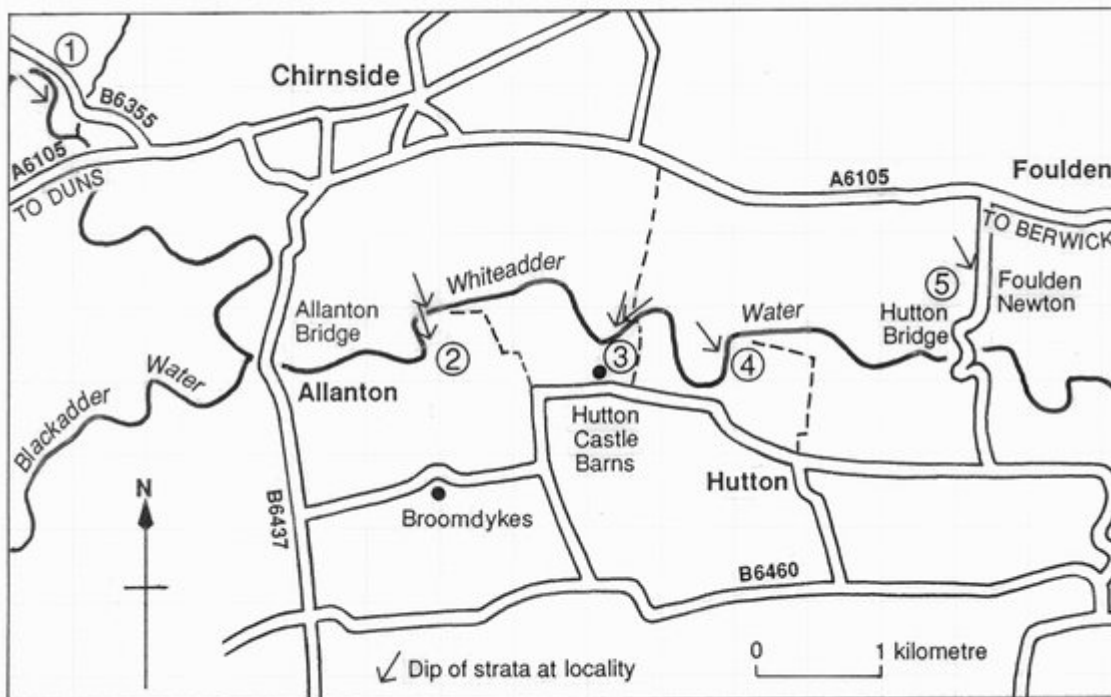
5. Foulden: Site of Special Scientific Interest

The nature of the Cementstone Group strata was fully investigated by a multi-disciplinary study on a locality excavated near Foulden Newton Farm [NT 922 553]. In this area, sediments of the Cementstone Group, mainly siltstones mudstones and cementstones, were deposited on an extensive flood-plain, crossed by small meandering rivers and passing southwards into coastal mudflats. Semi-permanent lakes surrounded by lycopod swamps lay scattered on the flood-plain and in one of these the Foulden Fish Bed, the principal subject of the investigation, was deposited. During its existence of perhaps a few thousand years, the lake was never more than a few metres deep and, though initially floored by a shell-bed, the bottom became too soft to support benthos. Through time the salinity of the water fluctuated, the lake became shallower and it finally silted up altogether. At its maximum extent the lake supported a rich fauna including the 2 m long fish *Megalichthys*. The relative proportions of the fauna changed with the salinity and there were two mass-mortality events. Results were published in a special part of the Transactions of the Royal Society of Edinburgh (1985) on the general palaeontology (Wood and Rolfe), the sedimentology (Anderton), the plants (Scott and Meyer-Berthaud), the miospores (Clayton), certain arthropods (Waterston, Briggs and Clarkson, Almond), the ostracods (Pollard), various fish (Forey and Young, Gardiner, Andrews) and the palaeoecology (Clarkson). Although protected the site can be visited and some of the 30 m section in grey cementstone facies can still be examined.

References

- 1 Greig, D.C. 1988. Geology of the Eyemouth district. Memoir of the British Geological Survey, Sheet 34 (Scotland), 78pp.
- 2 Cater, J.M.L., Briggs, D.E.G and Clarkson, E.N.K. 1989. Shrimp-bearing sedimentary successions in the Lower Carboniferous (Dinantian) Cementstone and Oil Shale Groups of northern Britain. Transactions of the Royal Society of Edinburgh, Earth Sciences, 80, 5–15.
- 3 Wood, S.P. and Rolfe, W.D.I. 1985. Introduction to the palaeontology of the Dinantian of Foulden, Berwickshire, Scotland. Trans. R. Soc. Edinb: Earth Sci. 76, 1–6. (This issue, part 1, pp 1–100, contains 12 papers devoted to the faunas, environment and ecology of Foulden).

References



(Figure 19) Whiteadder Water excursion.