Gosford Bay–Aberlady Point

P. McL. D. Duff

O.S. 1:50000 Sheet 66 Edinburgh

B.G.S. 1:50000 Sheet 33W Haddington

Route: (Map 8)

Introduction

This excursion is intended primarily to illustrate the cyclic pattern of the sedimentation of Carboniferous (Dinantian) rocks exposed between Craigielaw Point and Aberlady Point. Cyclic sedimentation is the term used to describe sequences of rocks where different types (representing differing environments of deposition) tend to occur over and over again in a certain order. Carboniferous rocks at Aberlady show a type of cycle which in upward sequence may be marine limestone. Shale, sandstone, seatearth, coal, marine limestone... though occasionally units may be very thin or absent. There have been many theories put forward to explain cyclic sedimentation. but it must be emphasised that differences in scale and type make one single explanation unlikely. In the Aberlady area the cycles are considered to represent the normal sequence of events one would expect in a subsiding delta. Periodically, the trees growing on the muds and sands of the deltas died and were covered by the sea, in which limestone was formed, before the next influx of mud and sand shallowed the water sufficiently for another forest to establish itself. The seatearths in which traces of rootlets can be seen represent fossil soils.

The journey from Edinburgh may be made by First Group service bus (North Berwick) or by car on the A198 road. Before reaching the main area of the excursion, however, the opportunity can be taken to examine a raised beach and a dolerite sill of Stephanian age at the southern end of Gosford Bay (localities 1 and 2, not shown on route-map). After leaving Longniddry and joining the Port Seton road at the coast stop at the Longniddry Bents parking place [NT 443 777] just past the road junction. Walking distance from locality 2 to the beginning of the main excursion at the northern end of Gosford Bay [NT 449 789] is about 1.25 km. The main excursion i.e. to localities 3 to 12 and thence to Aberlady, involves a walk of about 3.5 km. If the car is left at the northern end of Gosford Bay the walking distance to locality 12 and back is about 2.5 km. This half-day excursion should be carried out at low tide.

1. Gosford Bay [NT 444 778]: raised beach

The first locality is on the shore below bushes at the point where the broad sweep of Gosford Bay first comes into view. A small cliff about 4–5 m high shows a section of sandstone underlain by about 3 m of interbedded black micaceous carbonaceous shales (with plant fragments) and thin fine-grained sandstone bands with well developed ripple marks. On the beach below the cliff outcrops of some of the beds show excellent trace-fossils (e.g. worm casts and trails). The beds dip between 15°-20° towards the east and form part of the southern limb of the Gosford Bay Syncline.

At the top of the cliff can be seen up to 2 m of raised-beach deposits containing at the base blocks of dolerite of presumed local origin, interstitial gravel and shells. Higher up shells and sand predominate. Oyster (*Osirea edulis*) shells are most prominent along with *Patella*, *Littorina* and other species (Smith 1972. p. 40). The shelly horizon represents the intertidal portion of the main post-Glacial raised beach with the high water mark at the time of its formation being about 8 m O.D. This marine transgression of the Firth of Forth area, took place 5500 years ago.

2. Gosford Bay Sill, south [NT 440 775]

At the seaward end of the small cliff baked shale is seen to be underlain by 'white trap'-the altered top of the Gosford Bay olivine-analcime-dolerite sill. (White trap is formed by the action, on the already crystallised rock-forming silicates, of CO2

and other organic gases driven out of carbonaceous sediments by heat, and consists of the carbonates of lime, magnesium and iron with kaolinite and muscovite.) The contact can be traced a considerable distance seawards.

Prominent sheet-jointing in the dolerite dips in the same direction as the contact, but south-westwards the joint-surfaces dip in the opposite direction, presumably indicating a change of attitude of the contact surface. The dolerite contains veinlets of calcite and quartz (in places amethystine) and patches of white trap are conspicuous. A large block of sandstone can be seen in the dolerite near the high water mark about 22 m from the contact. North-east of the contact, in Gosford Bay, outcrops are poor but sandstone and shale can be seen in places. For those particularly interested in volcanic phenomena a search at low tide may reveal the presence of two cryptovents (NT 443 780 and NT 447 783) discovered by Howells (1969) but the continually shifting sand and shingle of Gosford Bay often covers them. Similar structures are more easily seen at locality 9. (See p. 119 for discussion on cryptovents).

3. Gosford Bay Sill, north

About 180 m past the North Lodge gates of Gosford House take the footpath northwards along the shore for about 800 m, noting the outcrops of dolerite on the shore. Just past the golf course green, west of Hareston Cottage, the base of the sill is reached. Here the dip of the sediments is towards the south-west as we are now on the north-eastern limb of the Gosford Bay Syncline. The contact is not visible but baked sandstone can be seen within a half-metre of it.

Outcrops of undulating beds of sandstone and shale appear through the sand a few metres north-east of the contact. Dolerite and white trap are also visible, probably indicating the presence of a thin offshoot below the main sill.

Walk northwards across the large expanse of sand to the north-west, keeping to the east of Green Craig where the contact of the sill and sediments can be located to within about a metre. The line of contact can be followed to the Peffer Burn, west of Craigielaw Point, and again an isolated outcrop to the east and below the main contact shows altered sediments.

4. Middle Skateraw Limestone (D)

About 45 m north-east, across the intervening sand, the dip slope of a well-jointed limestone (D) is visible. The surface is undulating slightly but in general the dip is about 15° to the south-south-west. The limestone is a hard massive dark-grey bed about 8 m in thickness. It contains crinoid fragments and productid brachiopods. Immediately below the overhanging limestone is a dark-grey mudstone which has been extensively bored by present-day molluscs.

5. Lower Skateraw Limestone (C)

The beds below limestone D are poorly exposed but at a distance of about 27 m the next limestone (C) is seen. This well-jointed limestone is about 1 metre in thickness and is a hard grey rock also containing crinoids and brachiopods. Careful search below the overhanging limestone shows about 2 cm of mudstone underlain by 3 to 5 cm of coal. This coal is followed downwards by a seatearth, sandy shale and sandstone and about 27 m north-cast of the limestone a conspicuous false-bedded and ripple-marked sandstone crops out.

6. Upper Longcraig Limestone (B)

Below the false-bedded sandstone there is shale then flaggy limestone on top of pale-brown limestone with a nodular or 'rubbly' top surface. This lower part is dolomitic and contains many crinoid fragments. It forms a prominent scarp about 8.5 m high which continues seawards to form the Long Craig. There has been considerable undercutting of the soft shale and coal below this limestone. In places the coal reaches 25 cm in thickness and it is underlain by a seatearth.

7. Middle Longcraig Limestone (A) and Faults

Towards the east for a few metres there are many fallen blocks of limestone B before the lowest limestone (A) is seen. This is a particularly easy limestone to recognize; it is yellow-brown in colour and is made up largely of colonies of *Lithostrotion junceum* and *L. pauciradiale*. A field-name such as 'spaghetti-rock' or 'macaroni-rock' suggests itself immediately (cf. Catcraig, p. 134). The limestone is extremely fossiliferous containing, as well as compound corals, genera such as *Caninia* and *Zaphrentis*, and the brachiopods *Eomarginifera*, *Spirifer, Avonia*, *Pustula*, *Composita* and *Pugnoides*.

When traced towards high water mark (H.W.M.) the scarp of limestone B is seen to end abruptly and immediately below it can be seen limestone A. Higher up on the bank, just below the grass, the 'rubbly' limestone B can be seen again where it continues eastwards for about 18 m before it is thrown down again to beach level.

Two small north-westerly trending faults throwing up the strata between them cause this displacement of the outcrops. The effect can best be seen from the seaward end of the upthrown block.

8. Anticline in Middle Longcraig Limestone (A)

Limestone A can be followed eastwards along the shore, its dip decreasing until the crest of an anticline is reached. Below the limestone are sandstone and shales while in places thin (5 to 7 cm) sandstone dykes can be seen cutting the limestone. Excellent fossiliferous blocks can be found above H.W. M. below the golf course.

9. Middle and Upper Longcraig limestones (B and C)

About 70 m east of the crest of the anticline the now easterly-dipping limestone is faulted and its base thrown up to near H.W.M. Keeping to H.W.M. limestone B can once again be identified because of its characteristic appearance. The bed can be followed along the shore to just below the octagonal blockhouse where it swings out to sea. The dip in this area is slight and the outcrop of the soft beds between limestones A and B has widened considerably.

The flaggy upper portion of Limestone B is also recognisable and above it, about 45 m east of the blockhouse at H.W.M. raised-beach deposits can be seen.

10. Sandstone and shale

Continuing along H.W.M. a small cliff is reached exposing irregularly interbedded shale and sandstone. The shale forming a wave-cut platform at the base of this cliff contains productids and crinoids. Near the red-tiled cottage a false-bedded sandstone (cf. 5) is found at the top of the cliff. Farther east this sandstone can be seen swinging seawards and there is a small stack (the King's Kist) formed of an outlier of the sandstone which rests on undercut shales below.

11. Lower Skateraw Limestone (C) and cryptovent

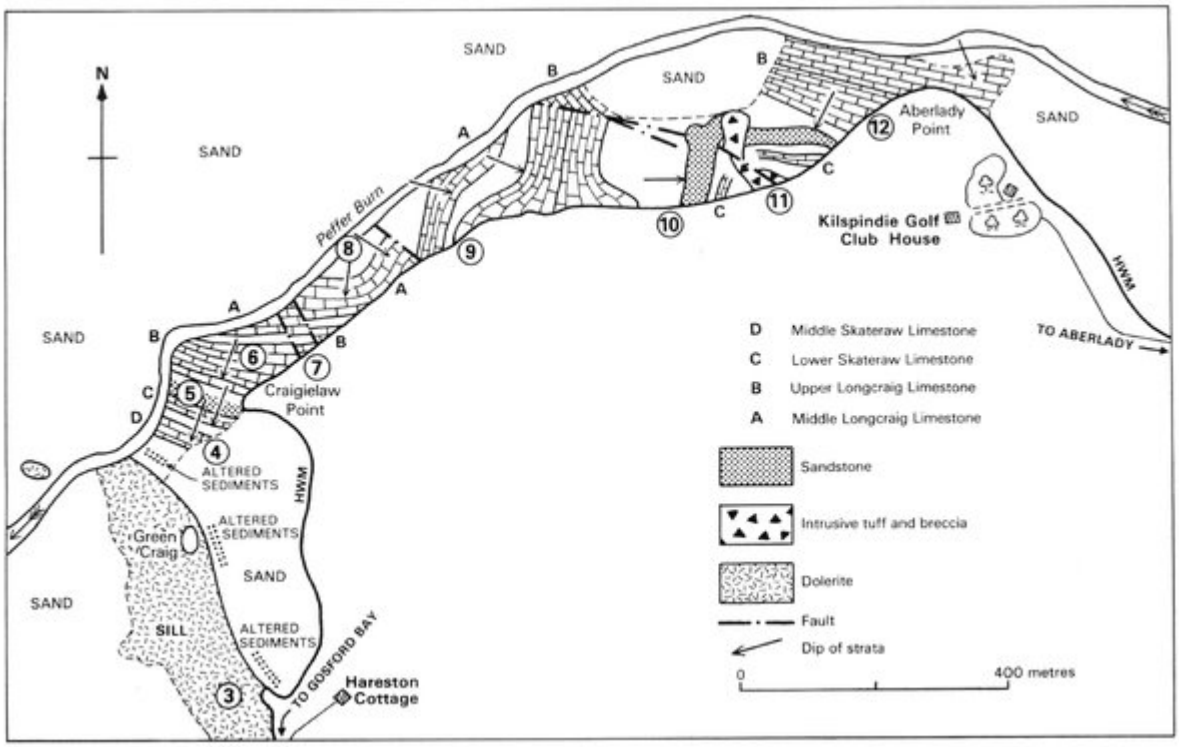
Eastwards from the red-tiled cottage the limestone C reappears and some 100 m from the cottage the axis of a syncline is reached. It has been breached by an elongate mass of volcanic breccia which can be seen (sometimes with difficulty because of shifting beach sand) to extend from H. W .M. for about 100 m seawards in a north-westerly direction. The breccia is made up of large fragments of limestone set in a matrix of broken-up shale, siltstone and tuffaceous material. Howells (1969) described this mass, and those mentioned previously in Gosford Bay, as cryptovents (small, roughly circular areas of highly disturbed strata, often with no trace of volcanic materials to confirm their volcanic origin). See discussion on p. 119.

12. Aberlady Point: Upper Longcraig Limestone (B)

West and east of Aberlady Point an extensive outcrop of limestone B is prominent, the dip being about 5° to the south.

From here the distance along the shore to Aberlady is about a kilometre. A footpath leads up to the church and from there it is 1.5 km back along the road to the starting point for locality 3. Alternatively the North Berwick–Edinburgh service bus passes through Aberlady.

References



(Map 8) Kilspindie shore.