North Berwick, Tantallon to St. Baldred's - an excursion

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Introduction

The second of three excursions that show typical examples of the volcanic and sedimentary rocks and some of the associated intrusions and volcanic vents so excellently exposed along 25 km of the North Berwick coast.

1. North Berwick to Canty Bay - covers the lower part of the sequence in descending order from the basaltic lavas to the Canty Bay Sandstone and the red cementstone facies
2. Tantallon to St. Baldred's - continues east to study the many agglomerate-and basalt-filled vents around Tantallon
3. Yellow Craig to Cheese Bay - going west from Yellowcraig, near Dirleton, looks at the upper part of the sequence in ascending order. from the basaltic lavas up to the dolomitic sediments.

The rocks are Dinantian (Calciferous Sandstone Measures) in age, and belong mainly to the volcanic facies known locally as the Garleton Hills Volcanic Rocks. The general succession is (McAdam and Tulloch, 1985)[1]:

- Sediments, dolomitic, tuffaccous and cementstone facies
- Trachytic turfs and lavas - Bangley member
- Basaltic lavas-Hailes member
- Basaltic lavas-East Linton member
- Basaltic tuffs, red, North Berwick member
- (Cementstone bands, North Berwick member
- Basaltic tuffs, green, North Berwick member
- Sediments, Canty Bay Sandstone, red cementstone facies

Gentle post-Carboniferous folding and faulting has given the beds a regional dip to the west.

The volcanic succession is thinner than in the Garleton Hills to the south, though most of the lava types are represented at North Berwick. At a late stage in the volcanicity basaltic and basanitic sills and dykes and phonolitic volcanic plugs were intruded into these rocks. Another feature of the volcanicity is the number of tuff and agglomerate-filled volcanic vents. These were first identified as vents by Cuthbert Day, a local geologist and geochemist, who in a series of papers described the geology of the whole North Berwick coast section. The vents and their relationship were further discussed by Martin (1955) and more recently by Leys (1982)[2]. Descriptions of deep-originating granulite blocks have been given by Graham and Upton (1978)[3].

1. Gin Head Vent: basanite intrusion, vent agglomerate

Parking for this excursion may be found at Tantallon Castle (NT 594 848) which can be visited all year round (note closing time) or at Seacliff (NT 607 845). The excursion starts at the west end of Canty Bay (NT 587 852) reached by a track down from the A 198 road. On the foreshore red and green bedded tuffs are cut abruptly by the upstanding west margin of the Gin Head Vent, which forms a prominent wave-cut platform. Green vent agglomerate is intruded by an irregular dissected sill of black, fine-grained, non-porphyritic, well-jointed basanite. The sill forms the stacks of Tapped Rock and Saddle Rock and the islet of Podlie Craig, while the green agglomerate occupies the lower shingle-covered ground. At H.W.M. below Taking Head, 100 m east of the last house, an irregular pale grey dyke cuts the darker roughly weathered basanite. The cliff on the west side of Gin Head consists entirely of green vent agglomerate with basanite bombs and large tuff blocks while on the east side an inclined basanite sill is intruded into the agglomerate. The cast margin of the vent cuts pink and white Canty Bay Sandstone which is traversed by W-E faults. Immense blocks of this sandstone are caught up in the vent both at Gin Head and in the cliffs 20 m north of a sewer pipe. This pipe goes along the northern margin of an older small vent filled with red bedded tuff and agglomerate, itself cut by the Gin Head Vent. In the cliffs above, the base of a basanite sill arches from vertical to horizontal and is picked out by a carbonate layer. Red ripple-bedded sandstones, mudstones and cementstone ribs crop out in the bay. N. B. cliffs on the north of this bay make access difficult above half tide.

2. Tantallon Vent: Vent Agglomerate

On the foreshore red bedded tuffs with large blocks and large basanite boulders, lying outside the vent, are exposed. The vent margin itself is obscured by shingle. Cliff sections show that the vent is filled with green unbedded tuff with small basanitic bombs. High up under the north wall of the castle is a large lenticular sandstone formed while the vent was dormant. Towards the middle of the vent there are zones with large reddish bedded tuff blocks and basanite bombs. The south part of the vent is mainly green bedded tuffs containing basanite bombs. Just beyond the waterfall amygdaloidal basanite bombs can be seen in white veined and impregnated agglomerate. Nearby there is a prominent curved basic dyke. The faulted southern margin of the vent can be seen in the cliff but is obscured by shingle where it crosses the foreshore.

3. Oxroad Bay: Green Bedded Tuffs

Cliffs on the south side of the bay comprise green bedded tuffs, with the low dip steepening towards the faulted vent margin. The green tuffs and fine agglomerate have planar and ripple-bedding, as well as contorted bedding possibly of algal origin. Yellow-weathering cementstone bands and ribs have yielded a diverse petrified flora of twenty-three species of pteridosperms and lycopods indicating a late Courceyan age (Barnard and Long 1975, Scott 1985). Networks of calcite and cementstone veins cut the tuffs. N. B. The gully and cave beyond are impassable above half-tide necessitating a walk round the cliff top.

4. Seacliff Harbour, The Gegan: Red and Green Tuffs

Green bedded tuffs continue on the cliffs beyond the cave. However, a contact between green tuffs and red tuffs to the north can be followed on the foreshore. This junction continues vertically up the cliff beyond, where it cuts across the gently inclined bedding showing that the tuffs have been affected by secondary staining. Seacliff Harbour is cut into red bedded tuffs with large-scale cross-bedding. Fine agglomeratic bands in the tuff contain basic and intermediate bombs and blocks of marl and limestone. Prominent rectangular jointing and calcite veining in the tuffs have been picked out by the vegetation on the flat-topped stack of The Gegan. A small fault round the base of the cliff opposite is indicated by a sudden change of dip. The vertical contact between red and green tuffs is again visible on the cliff south of The Gegan and on the foreshore. The green tuffs have been stained red by oxidation of the ferrous iron, an effect possibly associated with the basic intrusions.

5. Auldhame Quarry, Primrose Bank: basic intrusions

Auldhame Quarry, now partly filled and overgrown, can be reached by climbing the grassy bank. The dark, fissile, well-jointed, fine-grained rock is a non-porphyritic basalt of Hillhouse type with celestite in veins. Whether the intrusion is a plug or sill is not clear. A contact with red bedded tuffs seen in the road cutting on the east side of the quarry is inclined at 45°, to the west. From here tuffs can be followed eastwards to where they overlie the Primrose Bank sill. The 15 m thick sill has an amygdaloidal top and is formed of dark purple Craiglockhart basalt, containing large black augite phenocrysts and small red-brown olivine pseudomorphs. The cave in the sill is related to a higher late-Glacial sea-level. From this part of the coast there are fine views of the phonolitic trachyte plug of the Bass Rock.

6. The Car Vent

Return to the shore by the car park on the post-Glacial raised beach. The Car rocks are part of a complex vent. At the south end a cryptovent is shown by disorientated blocks of red tuff and contorted sandstone. Red bedded tuff, with vesicular basalt bombs, fills the rest of the vent. This bedding has steep dips and is cut by numerous prominent joints. Small leucite-basanite intrusions occur at the beacon and St. Baldred\’s Boat. N. B. Care should be taken to avoid being stranded by the tide.

7. Car Rocks: Sediments, Gleghornie Fault

Just east of The Car Vent are thick white and red sandstones with ripple-bedding and contorted bedding. They are cut by numerous small SW-NE trending faults, part of the Gleghornie Fault. On the shore south-east of the fault gently NW-dipping reddened cementstone facies sediments consist of red and green mudstones, siltstones and fine sandstones with cementstone ribs. Two thick channel sandstones exhibit ripple-bedding, cross-bedding and contorted-bedding, the southerly sandstone being fault-bounded.

8. Seacliff Tower Vent

The eastern half of this vent is excellently exposed on the foreshore where red vent agglomerate forms an upstanding platform abruptly cutting the sediments. In the cliffs prominent gently inclined joint planes can be seen to lie at varying angles to the shallow to steeply dipping bedding. Below the ruined tower large tuff blocks are etched out by weathering and a few basic bombs occur. In the south blocks of sandstone, cementstone and other sedimentary rocks are caught up in the vent.

9. Scoughal Vent

The eastern half of this smaller red vent is also exposed on the shore. It is filled with red unbedded tuff and contains blocks of sandstone and bombs of red basalt. Joints in the vent dome away from the centre.

10. Pillmour Volcano

The poorly exposed Scoughall Rocks are mainly red bedded tuff, marl and sandstone filling a vent, notable for large sandstone blocks. up to 100 m across, at its south end.

The excursion can be completed by returning along the shore or by Scoughall to the A 198. Alternatively continue south for 1·5 km across Peffer Sands and Ravensheugh Sands. Behind the intertidal sands high dunes of blown sand rest on the main post-Glacial raised beach which in turn covers a channel marking the pre-Glacial estuary of the River Tyne. The St. Baldred’s area can also be reached from the car park at Tyninghame Links (NT 627 809), and taking the track to ESE for 300 m to a bend, then the path through Links Wood to NNE to the noticeboard at H.W.M. The localities lie within the John Muir Country Park, permitted routes being indicated by 'green-footed' posts. The park commemorates John Muir, a native of Dunbar, revered in America as the person who had Yellowstone made the first of many National Parks in the United States.

11. Ravensheugh, Frances Craig: intrusions

At the south-cast end of Ravensheugh Sands, about 200 m north-west of the forest path, is a prominent 15 m high cliff of dark columnar fine-grained teschenite, part of a sill which can be traced inland in outcrops and old quarries. At the base of the cliff, pale brecciated teschenite has been chilled against pink baked sandstone. Frances Craig, near L.W.M. is a complex faulted outcrop of brown sandstone and purple altered teschenite.

12. Bathan’s Strand: sediments, raised beach

On the foreshore to the south-east reddened bedded sediments dip gently and are cut by small faults. Fine-grained sandstones are interbedded with siltstones, mudstones and cementstone ribs. The same beds and the small faults are exposed in the low cliffs on the peninsula to the south. Deposits of the post-Glacial raised beach on top of the sandstone cliff are very similar to deposits of the present beach. Angular basalt boulders lie in coarse shell sands with bleached whelks and limpets and purple mussels.

13. St. Baldred’s Cradle: basalt plug

The peninsula is formed by a circular plug of Craiglockhart basalt (ankaramite) possibly a feeder for lavas in the Garleton Hills (p. 109). The junction between the plug and the sediments can be traced round the foot of the cliffs on three sides. Opposite the stone scat is St. Baldred’s Cradle, the name given to a cleft excavated in the jointed rock. The fresh, dark fine-grained basalt has large black augite phenocrysts and small red-brown olivine pseudomorphs. An area of soft red vent agglomerate

is exposed on the foreshore on the south-cast side of the vent.

14. Whitberry Point: sediments

Along H.W.M. a pale brown cross-bedded channel sandstone, dips gently WNW. Lower down the foreshore the underlying reddened bedded sandstones, siltstones and mudstones, are similar to those at Bathan\'s Strand. Small faults trending WNW-ESE cut these sediments, and to the south-west the channel sandstone has a faulted basal junction. The forest road leads north back to the car park.

Tyne Estuary (NT 63 79): sedimentation, erosion

Active modern sedimentation and erosion, produced by river and tidal currents, can be seen around the Tyne estuary to the south. Sandy Hirst, a shingle and blown sand spit, is growing SSE from Tyninghame and the intertidal islet of Spike Island is growing north-west from West Barns. Curved spits along these show the direction of current action. Erosion is particularly marked on the south side of the estuary, producing good temporary sections in blown sand and beach sand, which can be reached from the south side of the Country Park at West Barns (NT 651 787)

References

1. ↑ McAdam, A D and Tulloch W 1985. The geology of the Haddington district. Mem. Geol. Surv. G.B.
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3. ↑ Graham, A M and Upton, B G J 1978. Gneisses in diatremes. Scottish Midland Valley: petrology and tectonic implications. J. Geol. Soc. London. 135, 219-226

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