



Field Trip – 19th August 2023

St Andrews East Beach to Kinkell Ness

Led by Dr Simon Allerton / Dr Angus Miller

This photo notebook shows some of the features encountered, including:

- Carboniferous sedimentary rocks
- Late Carboniferous igneous rocks
- Faulting
- A complex volcanic vent
- “Rock & Spindle” sea stack
- “Maiden Rock” sea stack

In the LH photo, St Andrews may be seen through a gap in the sedimentary rocks formed in the early Carboniferous (Viséan) period.

The excursion started from **Sandy Craig** and progressed eastwards to **Kinkell Ness**.

The beach path from St Andrews to Kinkell Ness passes a caravan park which essentially sits some 20m above the present beach level on what is a raised beach. The sedimentary cliffs at Sandy Craig dip about 30° in a syncline.



Sandy Craig (NO 523 159) sedimentary facies – early Carboniferous (340 – 325 mya)

These rocks are at the current beach level and appear to have formed in a deltaic estuary with a tidal influence.



Black streaks in the rocks – evidence of plant material



The rock here shows the fossilised burrows of polychaete worms.



This strange nodule, commonly called Cat's Brain, was picked from the beach here. (7cm x 5cm x 4cm)

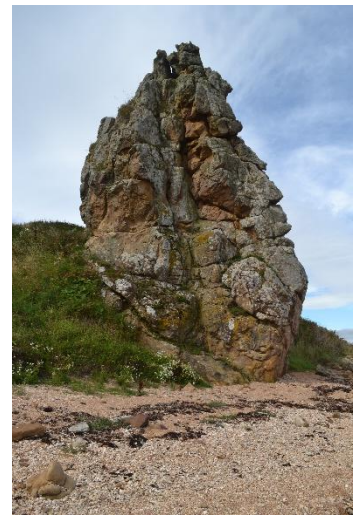


Landslide (NO 524 158)

The shallow cliff has slumped leaving rocks strewn on the beach. The slid sandstone and sticky mudstone have turned to clay.

In the RH photo, shards of coal are also present in this outcrop.





Maiden Rock (NO 526 158)

The prominent Maiden Rock is an old sea stack, which formed about 6500 bp and is the eroded remnant of a low raised beach when the sea level was some 4m higher than present day. The stack comprises vertical dipping sandstone. The RH photo shows the east facing side with a fault running through it and the middle picture shows the west side.

Note the dipping syncline rocks protruding into the North Sea on the LH photo.



Maiden Rock Syncline (NO 526 158)

The next 30m of shoreline are occupied by strata folded into the Maiden Rock syncline. On the fold's east side, the beds dip between 60-80° and on the western limb they have overturned and dip at angles up to 130° to the east.

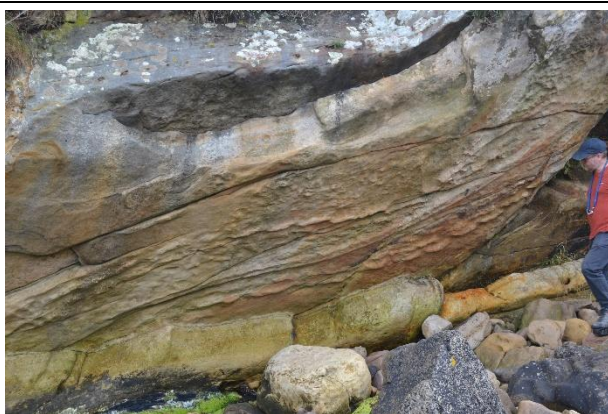


Maiden Rock Saddleback Anticline (NO 527 159)

The anticline is some 200m east of the Maiden rock.

This feature is approximately 10m high above the current shore level.

Fossilised Trackways



Hibbertopterus trackway (NO 531 158)

Tracks from a huge 1.6m long water scorpion are displayed in this overhanging rock face. Hibbertopterus had 6 legs making the footprints some 0.9m apart with its tail scratching out the central track which is about 6m long here. The lower sandstone has eroded leaving an inverted image of the creature's path.



Giant Centipede Trackways (NO 531 158)

Hibbertopterus normally lives in water but the trace on the left shows that it was also capable of dragging itself onto land. The photo above shows the traces (~50cm apart) of 2 giant land centipedes which are converging (perhaps mating). This normal trace fossil was only 50m from that of the inverted trace of Hibbertopterus



Rock & Spindle (NO 539 156)

This prominent stack (approx. 8m high) near the HW line marks the northern limit of the Kinkell Ness Vent. Behind it, in the photo above, is the neck of the vent, itself. In front of it, towards the North Sea, are radial tuff ring beds, as shown in the photo below.

Rock & Spindle Tuffaceous Neck (NO 538 156)

An initial volcanic outburst produced a vent which after a long pyroclastic activity, formed an ash cone which then collapsed into the vent. The photo, above shows the hard tuffaceous neck with volcanic breccia, remaining after surrounding sedimentary rock had been eroded away. Crinoidal limestone Xenoliths are also present in this neck.



Rock & Spindle

The radial "spokes" of the "Spindle" are of columnar-jointed monchitquite, which BGS classifies as a type of lamprophyte in which feldspar is absent.

Note the jointing in the RH lower photo, taken on the south side of the stack.

The tall column, "Rock", is formed of xenolithic monchiquite.

The base of the structure appears to be the bedded ash through which the igneous rock intruded. (See the LH photo)



References:

"Fife and Angus Geology – an Excursion Guide" by A.R. MacGregor published for the University of St Andrew's, 1968.