Reading the Rocks
Walk 3: The Blast Beach

Carboniferous: rocks: (345 – 290 million years old) The Upper Carboniferous Coal Measures dominate the underlying geology below sea-level. These rocks were deposited in a coastal environment where large river deltas built into the shallow marine waters. The Coal Measures show a repeated coal, sandstone and mudstone cycle which reflect relative changes in sea level. Coal represents the fossilised remains of vegetation which grew on the deltas (sandstone), while the mudstones were deposited under shallow marine conditions.

Permian rocks: (290-248 million years ago) The rocks form the solid geology above sea-level and were deposited in the Zechstein Sea. At the Blast beach the Permian rocks form part of the Upper Permian Zechstein Group (formerly called the Upper Magnesian Limestone). The Roker Formation (Zechstein cycle 2/Z2) was deposited directly on top of the reef and across an evaporite platform in a shelf to slope carbonate system during a high sea-level stand. Overlying the Roker Fm is the Seaham Residue (from the dissolution of the Fordon Evaporite Formation) and the Seaham Formation (Z3), again deposited during a high sea-level stand.

Quaternary sediments: (2.6 million yrs to present) Throughout the last 2.6 million years Britain has been subjected to alternating glacial and interglacial conditions and there have been multiple ice ages. Most of the the ice age history on the Durham coast comes from the Last Glacial Maximum (~ 28,000 – 18,000 yrs ago) with sediments laid down by subglacial, glaciolacustrine and glaciofluvial processes. The position of our modern coast is controlled by the elevation of interglacial sea-level.

Dave Roberts
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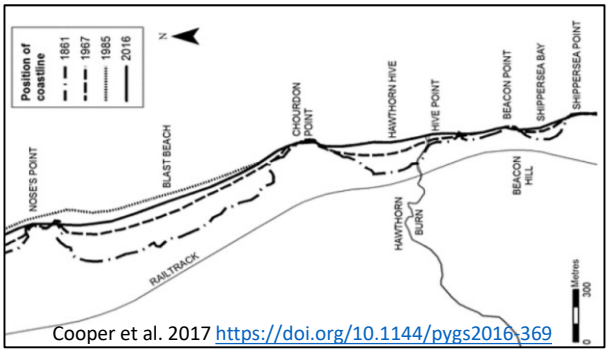

Cooper et al. 2017 https://doi.org/10.1144/pygs2016-369


https://ukafh.com/wp-content/uploads/2018/05/Seaham.pdf

Anthropocene: The legacy of coal extraction on the Durham coast over the last 100yrs

- The man-made beach platform is made of layers of dumped mine and industrial waste. This was mechanically dumped as well as reworked by natural processes. Different layers of material on the beach represent early industrial waste (e.g. Blast furnace, bottle factory [c. 1855], iron works [c. 1862], chemical works [c. 1865]), followed mining waste up to 1987.

- Dawdon pit (1907-1991). Employed 3800 men at its peak in the 1930s. The pit had a swimming pool 1945-1990! The pits at Seaham/Dawdon were linked underground and tunnels ran offshore for several miles beneath the North Sea. Vertical shafts were sunk through the Permian rocks to access the Carboniferous Coal seams below (e.g. Hutton, Low Main, Main Coal, Maudlin seams). At its height 2.5 million tonnes of waste were tipped each year. Over 40 million tonnes of waste was tipped along the coast all together, with some estimates suggesting 100 million tonnes being dumped in the foreshore/offshore zone.

- Miners boots, conveyor belt pieces and shaft supports are just some of the bits and bobs you should find. Waste was transported south by longshore drift and makes up most of the beach. The cessation of tipping (late 1980's/early 1990's) has enabled natural processes to start to rejuvenate the coast. *Turning the Tide* (early 1990's) was the first project to try and clear up the Durham mining legacy. The *Durham Heritage Coast*, *Limestone Landscapes* , *Seascapes* initiatives have followed.

Modern coastal processes:

- Dominant wave, wind and longshore drift enhances erosion of northern end of beach – material gets transported south. Higher wave energy in south is leading to erosion, transport, deposition and beach rollover. Imbricated boulder ridges and beach berms form to the south end of beach due to wave action and sediment transport, especially during big storms.
- The reverse gradient on the back beach. Mine subsidence or sediment aggradation at seaward edge of beach? This reverse gradient and impermeable waste (clay rich) is also helping to form unusual and toxic lagoons.
- Accelerated erosion of mining waste on beach in the last 20 years due to lack of sediment input. This coast is returning to its former hard-rock, cliff environment. Some vegetation (e.g. silver birch) has died off due to saltwater encroachment.