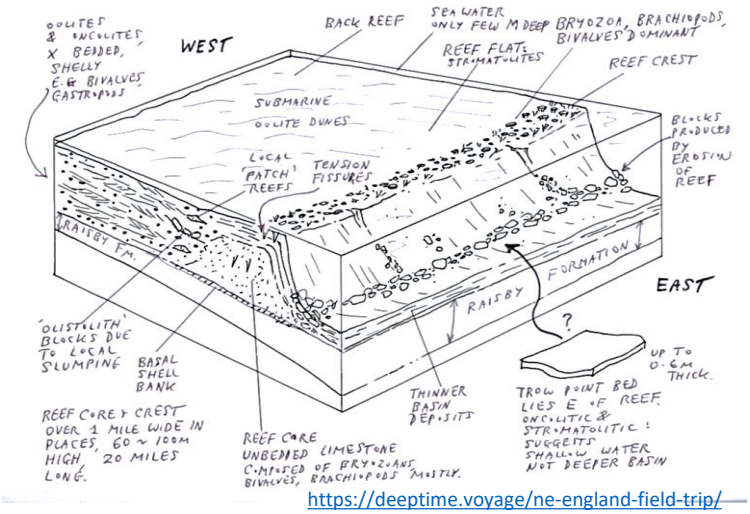
Reading the Rocks: Walk 5 Castle Eden Dene to Blackhall Rocks

Permian rocks: (290-248 million years ago) Permian Magnesian limestone forms the solid geology of the Durham coast above present sea-level. During the early Permian the area was terrestrial, hot and arid with desert conditions. However, as sea-level rose regionally the Zechstein Sea inundated the area. This sea was partially landlocked and, due to its proximity to the equator, periodically dried out and evaporated causing the cyclical deposition of limey muds (limestones) and evaporites such as halites (sodium chloride) and anhydrites/gypsum (calcium sulphates).

- At Blackhall Rocks several formations formed along the edge of an ancient barrier reef system. The reef top (Ford Formation Z1), shelf (Roker Formation Z2) and Seaham Formation (Z3) of the Zechstein Group. The shelf-edge reef rocks includes the Hesleden Biostrome composed of algal laminites (mm thick layers of filamentous blue-green algae) and boulder conglomerate (reef rampart deposits formed in a high energy surf zone) (Ford Formation). There are also domed stromatolites (intertidal). Some are characterised by laminated 'crinkly beds' formed by microbial activity (mineral "microbial mats" which build up layer by layer). Due to the salinity bryozoans, cyanobacteria and other microbes were the main life forms. The Hesleden Dene stromatolites bear a striking resemblance to modern stromatolites in Shark Bay, Australia. Beds of oolites (ooids = "coated" sedimentary grains of calcium carbonate) and pisolites (precipitation of calcium Carbonate around nuclei) formed were wave energy was higher.

Permian Magnesian Limestone reef



https://deeptime.voyage/ne-england-field-trip/

https://naturelogblog.wordpress.com/2019/11/03/blackhall-rocks-2/

Circa 1900-1909
Source : http://ppparchive.durham.gov.uk/Photos/picviewer.asp?previous=20

- The beach at Black Hall Rocks contains some spectacular caves. The Gin Cave is a littoral sea cave and highlights the link between coastal erosion processes and the formation of fissures, caves, arches, stacks and eventual long term cliff retreat. This part of the coast has changed a lot in the last 100yrs.

Dave Roberts
31/08/2022

Castle Eden Dene: The Durham 'denes' are steeply incised palaeo-valleys cut postglacially. Several theories may explain their formation including subglacial drainage, excess meltwater discharge with rivers adjusting to base level and glacial lake outburst floods. Intriguingly CED is situated adjacent to a little know ice dammed lake called '*Glacial Lake Edder Acres*' which formed close to Peterlee 19,500 yrs ago.

- Castle Eden Dene is a *SSSI* and *National Nature Reserve*. It is the largest of the denes and the largest area of semi-natural woodland in NE England. It is incised through the Magnesian Limestone and overlying glacial deposits. The majority of the woodland is dominated by ash and wych elm, though sycamore and yew is common. Is the yew the source of its name? "Eden" being derived from the earlier "Yoden", or Yew dene. Alternatively, "Eden" and "Yoden" derive from Old English Idun, meaning "a spring, water". Over 450 species of plants have been recorded in the wood: wild garlic, dog's mercury, sanicle, lily-of-the-valley, herb paris, bird's-nest orchid and round-leaved wintergreen. Through spring the woodland floor is covered with the yellow flowers of primrose, lesser celandine, wood anemone, bluebells.

https://www.gov.uk/government/publications/durhams-national-nature-reserves/durhams-national-nature-reserves#castle-eden-dene

Blackhall and Horden Colleries

- Horden colliery was sunk in 1900 and closed 1986. It produced 4,200 tons of coal per day from the *Five Quarter, Main Coal, Low Main and Hutton Seams*, and employed over 3500 people. Blackhall Colliery was opened 1909 by Horden Collieries Ltd. It was producing 3,350 tons per day by 1929. At its peak 2,492 people were employed at Blackhall Colliery in 1950. It closed 1981.
- Rockwaste from the mines was mechanically dumped using 'aerial ropeways' at Easingtopn, Horden and Blackhall. The waste was then transported along the coast by wave action and longshore drift. It led to the burial and devastation of the natural coastline for the best part of 60yrs (post WWII).
- The cessation of tipping enabled natural processes to partially rejuvenate the coast but waste still remains in pockets. *Turning the Tide* (early 1990's) was the first project to try and clear up the Durham mining legacy. The *Durham Heritage Coast*, *Limestone Landscape*s, *Seascapes* initiatives have followed.
- Blackhall beach appeared in the 1971 film *Get Carter*. The famous black beaches of Durham also appeared in films such as *Alien 3* (Blast Beach).
- Despite the impacts of coal extraction on the Durham coast the natural Permian Magnesian Limestone habitats have endured. 92% of the coastal Magnesian Limestone grasslands in Britain occur here in County Durham.
- The cliffs tops and meadows are actively managed by organisations such as the *National Trust* and *Durham Wildlife Trust.* Offshore there are natural 'reefs' and fish, crustacean and mammal species are returning, as are kelp forests.


Dave Roberts
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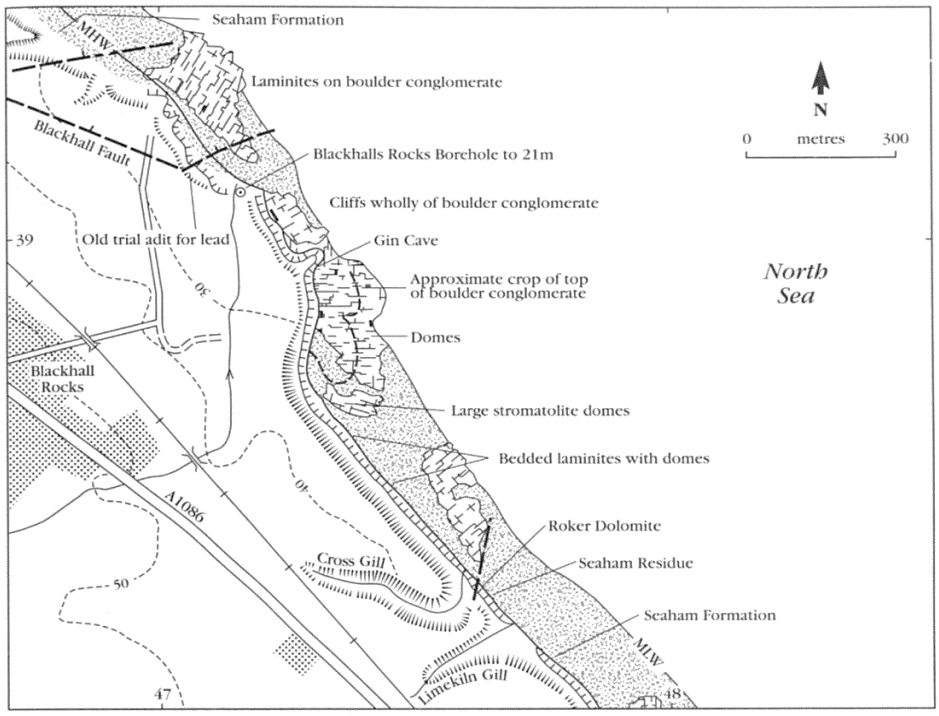
Supplementary info



Denys Smith – GCR vol 8.

Rock platform
Beach deposits mainly shingle but sand in south
Built-up area
Fault
Cliff (rock)
Steep slope (drift)
Road
Railway
Borehole
50 Contour (metres above OD)

	Formation	Thickness	Description
Z3	Seaham Formation Z3C	35m +	Offshore – transition zone facies containing tube-like fossil, *Calcinema*. Contains concretionary fabrics and is affected by collapse brecciation. Collapse breccias contain red marl from overlying Roxby Formation. Top not exposed.
Z2	Fordon Formation Seaham Residue Z2A/1, Z2S & Z2A/2	1.8m	Dissolution residue of khaki green to brown clay originally consisting of 20 – 30m of nodular anhydrite or gypsum.
	Roker Formation (inc. Crinkly Bed) = Z2C	56m	Shallow to very shallow-water facies of various types with 1.3m Crinkly Bed near base forming part of 20m interval of stromatolite and pisoid grainstone shoal facies. Oolitic facies near top of succession. Consists of three smaller-scale packages, Z2C/1, Z2C/2 and Z2C/3.
Hartlepool Anhydrite (Z1A) absent - not deposited here			
Z1	Boulder Conglomerate Z1C/2	7m	Clast-supported rock consisting of cobbles and boulders derived from reef-crest and reef-flat facies. Interbedded intervals of laminated microbialite and wackestone and packstone contain Z1 fauna and define clinoform units.
	Ford Formation Z1C/2	100m	Reef-front facies composed of reef-rock with bryozoan framework and also much microbialite and marine cement. Also steeply inclined sheets of laminated microbialite. Reef-flat facies composed of wackestone and packstone interbedded with laminated microbialite. Well preserved fossil biota including brachiopods, nautiloids and bryozoans. Only top 2m exposed.

LGA visit 2015 with Mike Mawson

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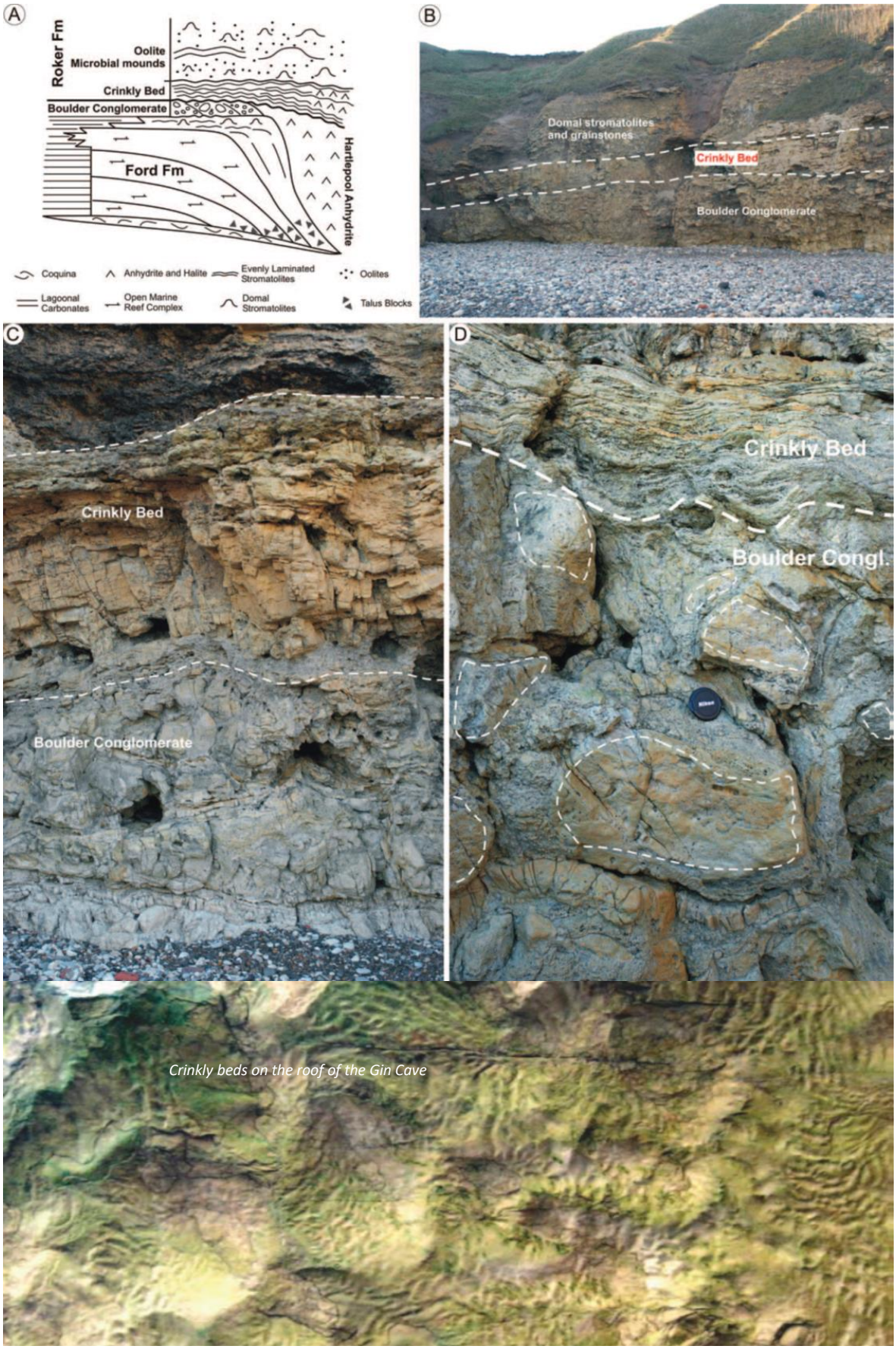

Perri and Tucker (2013) DOI:10.2110/jsr.2013.65