FIELD TRIP TO NUNNEY AND HAPSFORD BRIDGE

21st January, 2019.

Main rock types: VL = Vallis Limestone - a type of Carboniferous limestone [CL]
Rhaetian - late Triassic sequence
InO = Inferior Oolite group - eg. Jurassic limestone [JL]

Introduction

On previous trips to east Mendip, we have seen the dramatic unconformity between the Jurassic and Carboniferous limestones at Tedbury camp and the De la Beche section in Vallis Vale. This time, the unconformity was between the CL and late Triassic Rhaetic beds and no less exciting. Both CL and JL were laid down in warm tropical seas, but during the time gap of 150 million years there were many changes: - the continent may have moved 6000km, crossing the equator at rate of approx 4cm per year;

- the first large sharks swam;
- reptiles appeared;
- nearly all life on earth died in a mass extinction;
- the first dinosaurs and then first mammals appeared;
- forests began to dominate the land.

Site 1 -Nunney Quarry [ST 735 457]

This outcrop of CL is near the eastern end of the Beacon Hill pericline and is covered by InO. The whole unit is topped by a layer of Fullers Earth, clay minerals derived from the breakdown of the glass in volcanic ash. The substance was formerly used for the fulling of wool, then in make-up and now in various industrial processes from oil well drilling to paper making and pet litter trays. CL is quarried extensively in this area. It is used as an aggregate for the foundations, but not as a top layer in road making, as its surface polishes and would be dangerously slippery.

Standing back to get a general view of the rock face, it was difficult to discern bedding planes in the CL, apart from towards the north-west, where they were up to a metre thick. It was also difficult to see the dip of these beds. A specimen (photo right) showed it was a fine-grained, grey limestone, the equivalent of Burrington Oolite, here called VL. Twelve pairs of eyes found a few fossils: crinoid ossicles and brachiopod shell fragments. Lichen covering the rock did not help. The warm tropical seas must have been teeming with life in order to produce such an enormous amount of $CaCO_3$, deposited at some distance from the high energy conditions near the shore.

One interesting feature was a faulted surface covered in striations. Formerly thought to be large scratches caused by the movement of the fault, electron microscope analysis has shown that they are calcite fibres, introduced by fluids passing through the fractures and marking the direction in which the rock has moved.

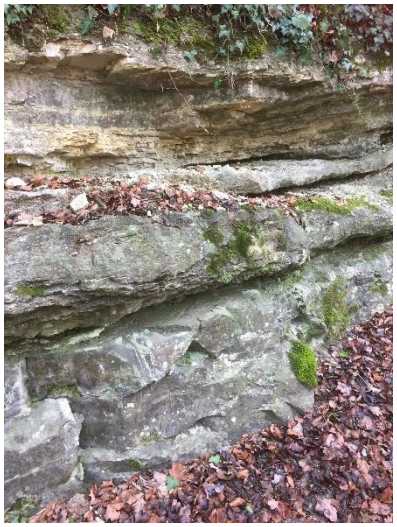
Site 2 Nunney Castle

Most castles are in high, defensive positions and use nearest suitable stone - not the case here. Nunney Castle was built in the 1370s by Sir John de la Mare, who had fought for Edward III abroad and become a court favourite. He showed his new wealth and status by building a showy castle in the French style, faced with carefully- dressed, regular blocks of JL brought some distance – no expense spared. It was extensively modernised in the late 16th century by Richard Prater a rich Londoner who bought the castle in 1560. It was eventually besieged and ruined by order of Parliament in the Civil War. Inside were seen a few slabs of CL, and smaller, irregular pieces of triassic sandstones and JL in the rubble core of walls.

InO is very different from the local VL. Coarser in texture, it consists of rounded ooliths and many smashed up shell fragments. It was laid down in a more dynamic environment, in a shallow sea closer to shore and so subject to waves and tides. The Jurassic seas were rich in iron, giving the rock its golden-brown colour.

Site 3 – Hapsford Bridge [ST762 496]

Over time, Nunney Brook has cut through the JL exposing a sequence of horizontal beds down to the penultimate Mendip outcrop of steeply dipping CL. We did not spend time examining this Black Rock limestone, as it was the beds lying unconformably on top that were of special interest. They dated from the late Triassic and marked the change from sub-aerial desert conditions that had lasted for millions of years. What followed was a period of enormous changes known as the Rhaetian. Several outcrops of these rocks have been studied on Mendip. Whilst there are some similarities in cyclicity, the differences show how varied conditions were over both time and even short distances. Consequently, there are beds of differing widths and rock types, all pointing to frequently changing environments of deposition.



The top surface of the CL was a smooth wave-cut platform, marking a significant incursion of the sea. [Also seen at Tedbury quarry.] Above was a conglomerate, with lots of small pieces of rock swept in by the sea. Water gradually covered the desert landscape and there were periods when there were quiet lagoonal environments where layers of clays were laid down in thin beds. Some were yellow, iron-rich deposits whereas two others were light and dark grey, still sticky and unconsolidated after millions of years. [Possibly, the clay minerals were so aligned that they were impermeable to later fluids that had passed through adjacent beds and provided a matrix to consolidate those other rocks.] It is likely that all the clays were formed from volcanic ash clouds or even similar clouds of melted rock after a meteorite impact. Both types of ash would have been made of particles of glass, which broke down to form clay. Electron microscopes will be used to confirm their origin and those of the small spherules found in one layer.

A common feature of Rhaetian rocks is the bone bed, at or near the base of the sequence. Here it seemed to lie between the two layers of sticky clay. This remarkable conglomerate of marine and river debris was full of fossils:- disarticulated bones, teeth, scales and coprolites of aquatic reptiles. Theories of its origin range from a mass mortality event, perhaps caused by changes in salinity in seawater, to storm deposits or decreased sedimentation rates.

Storm deposits were a major feature of the section at Hapsford. Whereas narrow clay beds were laid down over hundreds of years in quiet conditions, sudden floods could leave deposits of up to 30cm in minutes.

The evidence – most clasts in such conglomerates were rounded but unsorted. They had come from a river system draining the land mass to the south. Small, river- borne quartzite pebbles had been carried possibly from the nearest quarzite outcrops in Brittany by major flood events all the way to Somerset.

A final mystery was a strange rock riddled with worm burrows, ranging in length from 5cm to over 15cm. Such trace fossils are usually found in carbonate rocks – burrowing sea creatures produce an acid to dissolve the $CaCO_3$. Oddly, this fine-grained brown rock did not seem to be a carbonate.

Eventually, the fluctuating Rhaetic transgressions ended in the fully marine environment of the Jurassic seas. At Hapsford Bridge we were unable to see the highest beds to confirm this sequence, but PhD students are studying the section in detail. We look forward to revisting the site when their researches are finished to hear their conclusions.

Photos from left

- Small spherials
- Possible leaf impression
- Bivlave shell

Once again, thank you, Doug and Chris. We are privileged to have you open our eyes to such marvels.

Linda