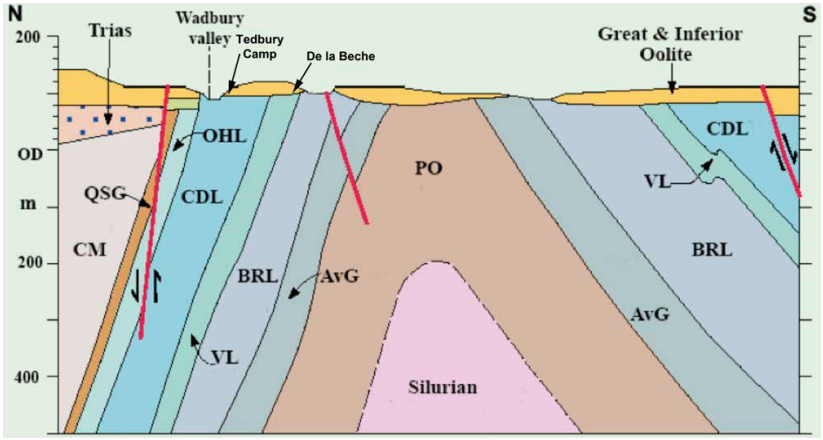
Field Trip To Vallis Vale And The De La Beche Unconformity.

August 20th 2018.

This took place with a visit to the Tedbury Camp followed by exploring the De la Beche unconformity along the Mells River, a branch of the River Frome.

TEDBURY CAMP.



CDL = Clifton Down Limestone.
OHL = Oxwich Head Limestone.
Trias = Triassic rock underneath.
VL = Vallis Limestone

We started at Tedbury Camp. This was an amazing area which looked like a disused quarry but in actual fact was about the size of a football pitch and completely flat. The floor was made of Carboniferous Clifton Down Limestone (CDL) with traces of thin muddy patches of Jurassic limestone called the Inferior Oolite in narrow strips on the surface. This was a left over from the quarried overburden. On these Jurassic patches we saw hundreds of fossils mostly oysters, and the underlying CDL had lots of corals usually outlined in black. Facing us to the west was a high cliff of Jurassic "inferior oolite" that had not been quarried away.

It was noted that the difference in ages of these adjacent rocks was in the order of 200 million years. Looking at the left side of the map at the cross section below we expected to see CDL under our feet and the Inferior Oolite Jurassic limestone above at Tedbury Camp while, at the De la Beche site, we expected to see the softer Vallis Limestone under our feet but with a fairly similarly softer Jurassic limestone "en face".

On discussing the formation of the Carboniferous limestone, we realised it was made of layers that had been folded or crunched during the formation of the Mendip Hills which were initially about 1500 metres higher than they are today, with the steeper limbs of the folds pointing north and less steep limbs pointing south. It was laid down at the latitude of, present day, Cairns and had moved north about 7,500 kms at a rate of approx. 4cms pa. The folding was a result of the collision between the African and North American plates. This crunching or folding was responsible for a 40% contraction or reduction of distances; such as making a spot corresponding to Bristol being about 28 miles distant from Wells previously, rather than the present day 20 miles. We also saw this at Deer Leap. The formation of such a very flat unconformity surface developed on such a hard rock is difficult to explain, as a high energy marine environment would be needed to erode such a surface. However, the Jurassic rocks overlying the unconformity surface were deposited in calmer seas and probably not energetic enough to undertake such erosion. The only other rocks found nearby are the Triassic red beds (250-200 Ma) of an arid desert setting, and again it is unlikely this surface would have formed in such a setting. There are no rocks of Permian age (300-250) in the region and so no evidence is present as to what happened in this period – perhaps this surface was eroded by high energy seas during this "missing" time period.

We proceeded to look down at the edge of the CDL, which required some clambering, in order to see some bi-valve fossils, corals and streaks of Chert between layers of the CDL. Chert is a colloidal material that was precipitated from hot waters passing through these rocks in the past, and became hard and flint-like in texture today.

Back up onto the flat surface we could now identify long lines of bedding planes. There were lots of 340 million-year-old corals including worm shaped corals called Lithostrotium spread over the surface. There we noted low 20 cms sized ridges where it is believed there had been slithering or jerking of the huge bedding planes one against another. The thin Jurassic slabs lying on top of the CDL were very rich in oysters.

We also saw Trypanites which looked like tube-shaped holes made by Jurassic worm-like creatures possibly secreting some acid substance to bore into the sea floor formed of Carboniferous limestone to ingest any dead organic material nearby. On examining with a hand lens, one could see them looking crystalline in cross section.

1- 4

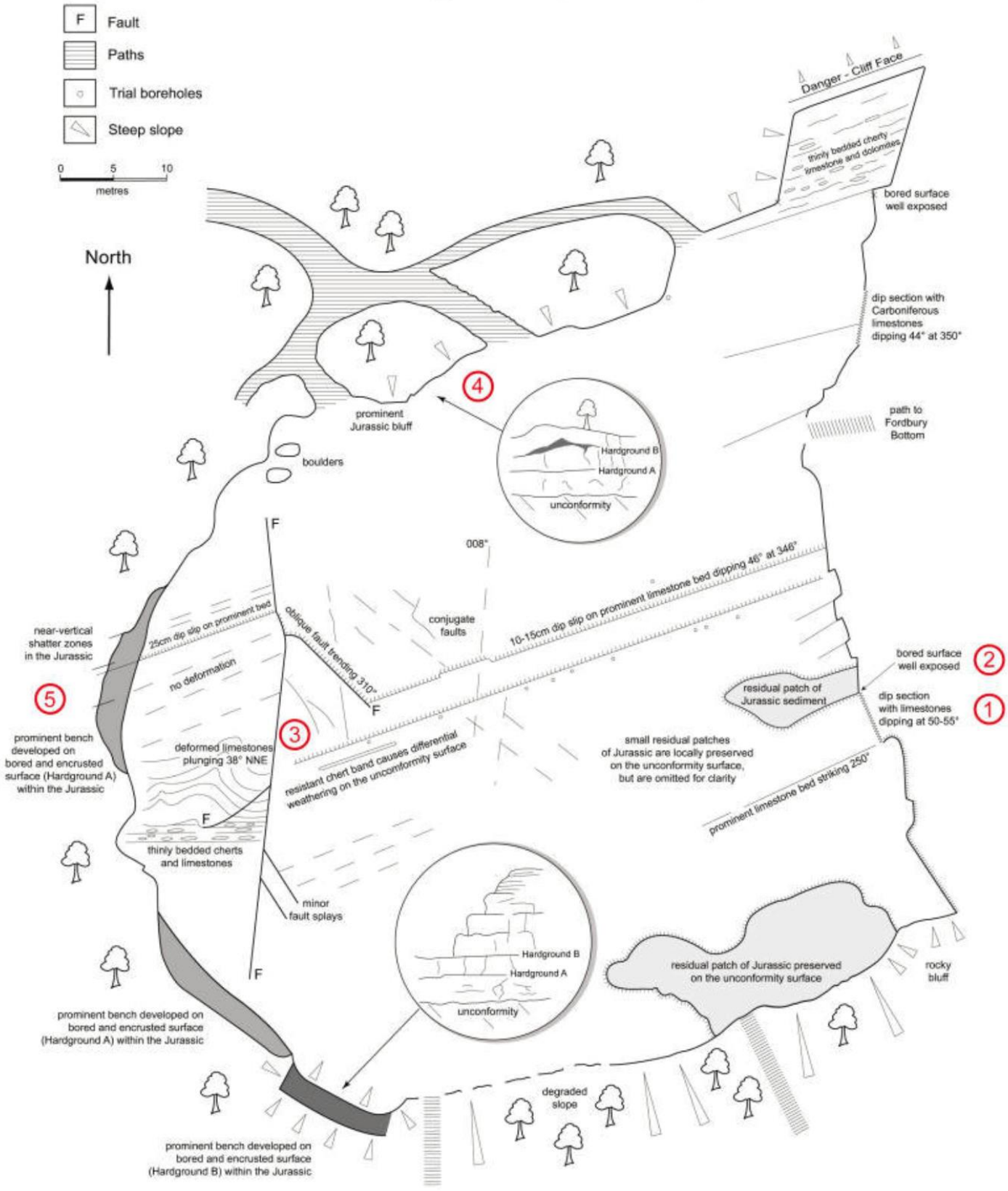
5-7 ⬇

8-10 ⬇

1+4.Lines of bedding planes showing bedding plane slip due to fault movement.
2.Jurassic sediment with oyster shells.
3.Lithostrotium coral
5.Bivalve shells in CDL
6.Oyster shells in sliver of Jurassic rock on unconformity surface
7.Bedding plane with chert.
8.Trypanites worm burrows into CDL at unconformity surface
9.Jurassic sediment with oyster shells
10. Swirling of CDL bedding planes

Before leaving Tedbury we noticed a strange swirling of the CDL bedding planes which might have been deposited where it was, thinner and therefore a more plastic type of CDL, so as to be stretched into this swirling shape. Another theory for this strange swirling might be that the lime-like or transiently viscous mud may have slumped whilst still an oozy seabed before it was compressed into rockWe looked at the Jurassic cliff face; its irregular strata suggested the past buffeting by powerful waves combined with subsequent exposure to the atmosphere. Then we progressed to look at several prominent slabs of rock on the platform showing the Trigonia bivalve fossil on many of their surfaces.

Sketch Map of Tedbury Camp Quarry



From ESTA (Earth Science Teachers Association)

As we walked down from the Tedbury site we noticed the CDL Bedding planes again inclined in a northerly direction. At one point, beside the Mells, river we found a huge slab of rock many metres below the side of theTedbury platform. This broken huge slab had clearly fallen down the steep hillside from the bedding plane above, it beautifully showed very tightly packed unbroken corals on its surface like a massive burial ground and an in situ colonial set of corals. (see below)

DE LA BECHE UNCONFORMITY.

IRON WORKS.

We passed by a defunct iron works where Doug asked the question: Why should there be such a thing as iron works near Mells in the 18th century knowing the nearest iron ore deposits were near Northampton?

According to the Internet there were at least seven iron works in this particular area:

1. Upper Mells works.
2. Lower Mells works.
3. Great Elm Tool works.
4. Chantry Edge.
5. Railford Works.
6. Nunney Works.
7. Gurney Slade.

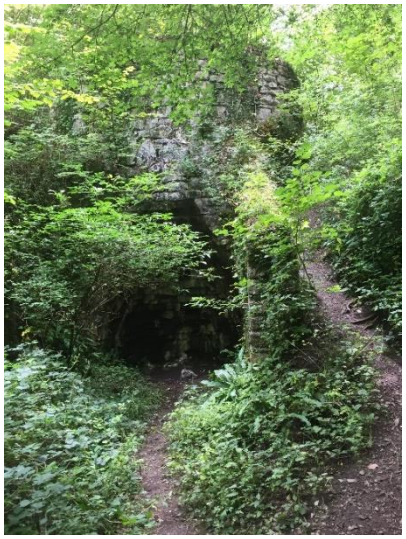
The Fussell family was first mentioned in a parish register in 1644, but it wasn't until 1744 that the first iron works (Upper Mells works) was established by James Fussell III. The Upper Mells works was in operation in 1804, but probably abandoned in the mid-nineteenth century at the same time as his son James Fussell IV developed the Lower Mells Works farther down the valley. This industry continued until the latter part of the nineteenth century. The lower site continued to exist as a water-powered sawmill throughout the first half of the 20th century, and possibly as late as the 1960s. This showed that recycling has taken place a long time ago.

There is no evidence of iron ore being mined for use in the foundry; it was scrap iron and iron pigs brought in from elsewhere that provided the raw material for making a variety of tools and wheels for agricultural purposes. The power for these works came from water turbines where water was taken directly from the Mells River. Most of the iron works faded away when the Industrial Revolution arrived when larger tools were needed and in larger numbers. This meant that Mells and the other local iron works could not compete with the larger industries in the north.

As regards the sources of power we very soon saw relics of some of these sluices at sudden drops in the river bed which were suitable for the water wheel power to drive the foundry machinery.

LIME INDUSTRY.

Replacing the iron industry in the 19th century came the industrial use of the plentiful Carboniferous Limestone in the Vallis Vale area. The illustration here showed the lime-extracting kilns nearby which were prevalent in the 19th century, sometime after the closure of the iron works.



Few relics of these were seen apart from one that had been restored in the 20th century shown opposite. The photograph on the left was taken some time ago because when we saw this same structure, photograph to the right, it was veryovergrown. From Roman times until probably well into the 20th century the main demand for lime was for building, limewash, lime plaster or mixed with clay as a binder.

From the mid 17th century lime began to be used as a soil conditioner especially reducing soil acidity. Industrial kilns serving a commercial market did not really develop until after 1870 when larger operations were needed and established by about 1900 in Vallis Vale. The industry helped the East Mendip kilns when local coal supplies were available. Contrary to some accounts cement was never produced in Mendip on a commercial scale.

De la Beche Unconformity

Further down the Mells River we reached the dramatic clearing and rock face known as Thomas De la Beche unconformity. We came upon this through a large arena-like space and then we walked single-file up a very gentle bramble-covered slope to see the dramatic effect of a different version of limestone called Vallis limestone (VL), which had formed by massive folding over three hundred million years ago; all this while the Mendip Hills were being formed. The darker Vallis limestone was seen, illustrated below and to the left, with the younger bright yellow Jurassic rock unconformity overlying above.

Here we saw the coarser, younger Vale Limestone strata in broad folds interspersed with thin powdery mud debris, again, inclined in a northerly direction. We saw crinoid ossicles on the surface and occasional rugose corals. As it was a relatively late hour we did not climb up to the shelf-like platform clearly demarcating the Vallis Vale Limestone below from the Jurassic rocks above. Steve Thompson showed photographs from his previous visit where he had seen masses of oyster impressions still visible on that high platform.

To the left -these are in Carboniferous Limestone and are both solitary Rugose corals. One on right looks like a Cyathoclisia – like we saw at Uphill

Below left- Carboniferous limestone with fossils of crinoid ossicles

Below right is of Mesozoic Inferior oolite with coarsely ribbed bivalve called Trigonia found by eagle eyed Stephen.

In summary this field trip gave us the chance to see some of the limestones laid down in the Carboniferous and Jurassic seas that once covered this part of East Mendip. Clearly, conditions varied considerably while sea levels rose and fell. The marked unconformity showed that over a long time the earlier rocks had been subjected to huge tectonic forces before the top of the anticline forming the Mendips Hills had been eroded.

Everyone agreed it was another good day out and a privilege to have seen one of the most dramatic geological bits of landscape around the Mendip Region in Somerset. The whole group gave thanks to Doug Robinson for his time, knowledge and energy in making this Field trip so interesting and enjoyable.

Walford Gillison wishes to thank Sue Knight for the images and Stephen Thompson and Linda Gilson for help in preparing the above report.

POST-SCRIPT.

Short biography of Sir Thomas De la Beche and his main contributions to Geology in the U.K.

Sir Henry Thomas De la Beche. 1896-1855.

Born into a wealthy family but sadly his father died when he was very young while living in Lyme Regis. There he befriended a poorly educated young woman called Mary Anning who however was a very gifted discoverer and preserver of fossils including one of the first documented Ichthyosaurs and Plesiosaurs.

At 16 he was in military training until the threat of the French invasion was over after the Battle of Waterloo. He resigned from the army at the age of 21 in order to study geological matters. Then he joined the Geological Society of London where he not only presented Mary Anning's creatures to the Society but also made sure she was financially supported.

He explored many sites of Geological interest all over the world but later specialised in the study of the Devon, Cornwall and South Wales coastlines.

De la Beche was the main pioneer for a complete geological map of the British Isles with the added incentive that such knowledge would be of benefit to the mining and mineral industries.