<u>TEDBURY CAMP & SOMERSET EARTH SCIENCE CENTRE</u>

Several trips had been organised for the last day of the GA Conference. Five people had signed up to go to the Somerset Earth Science Centre and only three turned up. But we three were treated like royalty. There were five people there to look after us as they had initially expected twenty or so delegates to be there. Cakes had been especially baked for the visit (Fig. 1) so we (or should I say I) felt obliged to eat a fair share. Due to the uncertain weather for the day it was decided to go to Tedbury Camp first and have a talk on the Mendips after lunch. Unfortunately the De La Beche unconformity part of the trip was not completed due to the extreme weather forecast.

Fig. 1 Home baked cakes at the Centre.

We all piled into the Centre's minibus, including all the volunteers. We had the honour of having Dr. Peter Hardy as one of the volunteers. For those that do not know, he is the author of 'The Geology of Somerset'.

<u>Tedbury Camp</u> [51^0 14' 20" N 2^0 21' 52" W]

The striking feature of this site is the large flat area of lower Carboniferous Limestone (Fig. 2). This limestone was laid down in shallow seas 330 Ma ago and then buried by Upper Carboniferous sandstones and mudstones. Compaction and cementation took place. During the Variscan Orogeny (290-280 Ma), at the end of the Carboniferous and into the early Permian, the area underwent folding as landmasses were pushed northwards (Gondwana and Laurussia colliding to form Pangea). The Mendip area was deformed into east-west trending asymmetric anticlines, or some say periclines. The beds at Tedbury are situated on the northern limb of one of the anticlines and dip steeply to the north at 60^0.

The Mendips underwent sub-aerial erosion during the Permian and early Triassic, a period of approximately 50Ma, when conditions were dry and hot. It is thought that 3km of Carboniferous layers were removed from the tops of the anticlines during this period.

During the Triassic rainfall increased causing flash floods, causing wadi deposits to develop in the valleys that had been created by erosion in the mountain. Salt flats and playa lakes surrounded the Mendip higher ground by the end of the Triassic (210Ma) creating an archipelago. Continuing relative sea-level rise submerged the archipelago and an extensive wave-cut platform was created (Fig. 2). Part of which is now exposed at Tedbury (after clearance of the overburden by quarrymen).

Fig. 2 Wave-cut platform of steeply dipping lower Carboniferous Limestone, Tedbury Camp.

The wave-cut platform is an unconformity surface and was continually covered by varying levels of sea during the Jurassic. A major sea rise in middle Jurassic (170Ma) submerged the area. It was into the 'hard ground' of the platform and during the Jurassic that borings occurred (by unknown species), and bivalves (*Lithophaga*) embedded themselves into the surface (Figs 3 & 4).

Fig. 3 Jurassic Inferior Oolite infilling boreholes and bivalve 'crypts' (rounded blobs) into Lower Carboniferous Limestone. Peter is holding the bivalves responible.

Fig. 4 Jurassic Inferior Oolite infilling boreholes and bivalve ‘crypts’ into Lower Carboniferous Limestone with evidence of Oysters accreting to the surface

The dark grey is the lower Carboniferous limestone and the lighter coloured Jurassic Inferior Oolite infills the borings and ‘crypts’ left by the bivalves. Crypts are where the bivalves have anchored themselves and probably used acid dissolution to create them. The top surface shows evidence of oyster shell where the oysters adhered to the ‘hard ground’. The tubes have also been thought to be a type of sponge, but it is uncertain as to what created them.

The erosion surface (Fig. 4) observed is the last of seven stages of erosion and there is a 100Ma time gap between the two types of rock.

Within the Lower Carboniferous beds are the disarticulated remains of Lithostrotian corals (Fig. 5) and some solitary corals (Fig. 5).

Fig. 5 Disarticulated Lithostotian coral on exposed at the surface of the wave-cut platform

Fig. 5 Solitary coral, possibly silicified, exposed at the surface of the wave-cut platform

Step features can be seen on the platform (Fig. 6). These are thought to have slipped after the erosion removed top layers and formed the platform. Showing that there was continued movement of rocks underground.

Fig. 6 Slippage between bedding planes on the wave-cut platform.

One small area is exposed where the borings can be observed (Fig 7). This is also the unconformity between the two rock types. An interesting silica body is also present here. It appears to avoid the burrows and forms around them. So there are unanswered questions about their formation.

Fig. 7 Unconformity between Jurassic and Lower Carboniferous showing borings and silica nodules (partially forming around the burrows).

An intriguing area on the platform shows an area of swirling limestone (Fig. 8). This may have formed during the orogeny whilst this particular part was still unlithified, but other beds were lithified sufficiently to be nearly upended and form the anticlines.

Fig. 8 Swirls of Lower Carboniferous Limestone which formed during the folding perhaps due to being less consolidated/unlithified.

During uplift the rocks were stretched and this cause cracking in the limestone. The crack was then filled by Jurassic oolitic sediment forming a Neptunian Dyke.

Fig. 9 Neptunian Dyke - cracking created by swelling of the rock as it flexed during upklift and later infilled with Jurassic Inferior Oolite to form the dyke.

During the Jurassic, as sediment was being laid down, sea levels kept changing and continued to erode those deposits. Two more unconformities can be seen, as ledges, (Fig 10) within these sediments sitting above the Carboniferous platform.

Fig.10 Jurassic (Bajocian) oolitic limestone, containing bivalves, brachiopods, rare ammonites and echinoids. Two erosional surfaces shown in this photo which are unconformities.

<u>Somerset Earth Science Centre</u> [51^{0} 12' 34" N 2^{0} 29' 13" W]

The Earth Science Centre (SESC) is situated next to the working andesite quarry of Moon's Quarry and very near to Whatley Quarry where Carboniferous Limestone is quarried. These will be trips for another day.

In the afternoon Dr. Hardy gave an overview of the geology and origin of the Mendips. The Centre has a wonderful range of rock samples and fossils to tell the story of the Mendips. Many of the samples are from Peter Hardy and thanks go to him for letting us see his superb collection, a couple of examples are below.

Fig. 11 Part of Dr. Peter Hardy's collection

Fig. 12 <u>Caloceras johnsoni</u> (Watchet) - from Dr. Peter Hardy's collection

Fig. 13 A lovely example of Trigonia costata (Dundry Hill)

My thanks to the staff and volunteers of the SESC for their hospitality and a superb day looking at the geology of the area. Also to Dr. Peter Hardy for his book on the area which helps clarify it all.

ACKNOWLEDGEMENTS

Dr. Peter Hardy; Adel Avery; Gill Odolphie; Steven; Lucy – all of SESC

REFERENCES

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