VALE OF GLAMORGAN
Elizabeth Devon

REPORT OF FIELD MEETING ON JUNE 27TH
LEADER: Dr. GERAINT OWEN, UNIVERSITY OF SWANSEA

We arrived by coach on a truly dismal summer's day and parked in a most unlikely layby to wait for Geraint Owen. The rain was almost horizontal and our coach driver was sure we were in the wrong place; the situation could only improve - we were early after all. At exactly the agreed time, Geraint arrived and the rain stopped; spirits lifted.

We were in the little seaside town of Ogmore-by-Sea which is situated on the southern edge of the Carboniferous synclinal basin and western edge of the Vale of Glamorgan. *Refer to geology maps on accompanying sheet.*

At our first site, (SS865746), the Carboniferous Limestone High Tor beds are apparently flat but that is only because here we are at the centre of a large anticline. This feature is evident on the Bridgend BGS map as the High Tor Limestone reappears in the offshore Tusker Rock, with the older Gully Oolite to the east. The Gully Oolite is west of High Tor limestone at Ogmore.

At this site there are many excellent fossils, whose shells have been silicified so making them more resistant than the surrounding limestone and consequently, well preserved. There were many examples of rugose corals, for example, *Caninia* - solitary and horn-shaped. These grew straight up from a soft sea floor. Many show a definite kink in the cone around 10cm up. This probably represents a storm event which knocked the coral over. It then regrew upright again. There was also *Zaphrentis, the* solitary horn-shaped rugose, *Syringopora,* a colonial rugose with separate corallites and *Lithostrotion.* On one of lower levels we found a huge specimen of the latter which had been flipped over, presumably by storm conditions again. *Michelinia,* a tabulate coral was also evident.

To add to all these corals, and to Charles' delight, we also found the trace fossil, *Zoophycus,* indicating calm conditions offshore on the outer shelf and some Productid brachiopods, *Delepinea* Again these are upside down.

An interesting discussion about the possible palaeoenvironment at this site some 300 million years ago followed. It was generally concluded that it was suitable for fossils to grow large but experiencing high energy conditions occasionally. This could represent hurricanes in a tropical sea.

At this location a series of Carboniferous Limestone beds had been seen and each has a slightly different fauna. The Carboniferous limestone here also exhibits palaeokarst features. There is evidence of potholes (?Triassic age). In other localities, similar features have yielded fossil mammals. One eroded pothole here shows evidence of Triassic infill material. Several potholes can be seen on the top surface.

At the eastern end of this site, mineralised veins with galena, barytes and calcite can be found.

We then walked further along the coast to the south east to 867743 where we reached the marginal Triassic facies, (clearly shown on BGS map). Here the breccia, with some huge blocks of Carboniferous Limestone, rests on the Carboniferous Limestone in an irregular unconformity. This unconformity is flat and then stepped, flat and then stepped and represents a terraced boundary. There was a long period of erosion of the Carboniferous after it had been uplifted and folded in the

Variscan orogeny. Britain was now experiencing desert conditions and this breccia was deposited by a river flowing from somewhere near present-day Ogmore, down to a playa lake. It is a violent flash-flood deposit in a wadi. At this time there must have been a hill made of Carboniferous Limestone, near Ogmore. The area would have exhibited karstic features. It must have been similar on Mendip where the valleys on the sides of that anticline are filled with Triassic flash-flood material.

At 868742 (further along the coast to the south east), there is another unconformity between the Carboniferous and the marginal facies of the Lower Lias (Jurassic) - Sutton Stone. There are more rounded clasts in this conglomerate than in the previous one and the fossils are poorly preserved. Some of the clasts are brown sandstone (Triassic) and have borings in them, just like the borings that can be found in modern-day pebbles. Corals can be found in this deposit so indicating that it was marine. After about 100 million years of erosion of Carboniferous and Triassic, the tropical seas of the Jurassic now rose against this land surface. Prof. Derek Ager used to say of this area that standing on the Carboniferous Limestone, you could imagine dipping your toes in the Jurassic sea! As the sea rose so islands of Carboniferous Limestone were left upstanding. The Sutton Stone here is diachronous, advancing over the land, as the sea rose. This unconformity, unlike that between the Carboniferous and the Triassic, is flat as it was planed by coastal erosion.

Further south-east along the coast (873740) at Pant-y-Slade, there is a lump of Carboniferous Limestone sticking up by about 2m. This could represent the base of a stack so all the features of a modern-day coastline were probably present here as the Jurassic seas advanced. In fact, the palaeogeography would have been much as it is today, but then, the sea was tropical. At this locality you can walk to the end of the Carboniferous 'island' and then the cliffs are made entirely of Jurassic material. Here there are some strange calcite markings on the rocks. They could be worm burrows or possibly travertine. Stylolites are also visible here between the beds.

After lunch on the beach at Dunraven Bay (883732) we looked at the The Blue Lias which is typical of the Lower Jurassic offshore environment that can be seen in southern Britain and over northern Europe. It is alternating limestones and shales, very fossiliferous, with large bivalves, e.g. *Pinna*. If you intend to visit these sites, please note that they can only be seen at low tide.

The origin of the bedding of this Blue Lias raises a problem in that there is no sharp, clearly defined boundary between the limestone and the shale. In fact it could be that the material is all the same but some of it is cemented with calcium carbonate in certain bands. The limestone could be viewed as a series of joined nodules so making the bedding a secondary feature. Perhaps the mud was lime-rich and then lime-poor and maybe each lime-rich band represents a rise in sea level (so bringing in more calcium carbonate) and each lime-poor band represents a fall of sea level. This will continue to be argued; it's fashionable at the moment to relate everything to sea level change!

Between the Sutton Stone (marginal Lower Lias facies formed at the base of the unconformity) and the Blue Lias are the Southerndown Beds. These represent an environment somewhere between the two. There are pieces of chert within these beds, oysters and bits of wood - also some ooids.

We found many fantastic fossils in the Southerndown Beds including huge *Thalassinoides* burrows, *Nautilus.* Ammonites, *(see photograph 1)* the bivalves *Gryphaea* and *Pinna.* The latter were numerous and appeared as large diamond-shaped cross-sections of the shell.

By climbing around Trwyn y Witch Headland towards the south to 885725, it is possible, with average to good climbing skills, and only at low tide, to see the unconformity between the Carboniferous and the Sutton Stone, *(photograph 2).* There are massive pieces of chert at the base of the Sutton Stone. The Southerndown Beds are on the top.

Photograph 1: Ammonite in Southerndown Beds, Dunraven Bay (photo by John Parkins)

Photograph 2: Unconformity between the Carboniferous and the Sutton Stone, Trwyn y Witch Headland (photo by John Parkins)

A major feature to the north of Trwyn y Witch Headland at 886726, a reverse fault which brings Sutton Stone up against the Blue Lias. The fault has caused folding in the Blue Lias, *(photograph 3)*. This earth movement may have been caused by mid-Cretaceous deformation.

Photograph 3: Folding in the Blue Lias, caused by reverse fault, the plane of which can be seen in the background (photo by John Parkins)

To end our day in the field we travelled to Bendrick Rocks, Barry (ST 133670), to view the marginal Triassic facies. Here there was probably a salty lake with higher ground inland and streams flowing from the north. There were flood events which deposited the breccias. It is the site of many dinosaur footprints, the best of which have now been collected and are preserved in Cardiff Museum. The dinosaurs probably congregated here to drink; this idea appealed to the three 'Rockwatch' members of our party who promptly tried to fit their feet and/or hands into the tracks. There are three-toed footprints of upright dinosaurs and prints of those that walked on four feet.

It had been an excellent day in the field and we had seen a tremendous amount. Grateful thanks were expressed to Geraint Owen for giving up his free time and for explaining everything in such a clear, vivid fashion and with considerable enthusiasm and patience.