

# Bridport u3a Geology field trip to Charmouth. April 2021

Field trip leader. Vincent Sheppard.

Finally, with lockdown rules relaxed the group managed to fit in three socially distanced field trips to Charmouth in groups of six. The main aims of this trip were,

1. Review part of the lower Jurassic Charmouth Mudstone formation, that is the Belemnite Marl, Black Ven Marl and Shales with Beef members.
2. Review again the importance of the west to east dip along the coast.
3. How changes in the earth's rotational axis has caused climatic changes in the geological past.



It is important that if you are walking along this beach that you do so as the tide is falling. Please check the times of high and low tide. There have been numerous land slips and cliff falls along this beach. Keep away from cliff faces

Our field trips at Hive Beach, Eype and Seatown have shown us the Lower Jurassic rocks (Lias). During our last trip to Seatown we were introduced to the top members of the Charmouth Mudstone Formation, the Green Ammonite Bed and the spectacularly fossiliferous Belemnite Stone.

On the eastern side of the River Char we looked at the Black Ven Marl at shore level. It was a very dark mudstone with bands of shale and limestone. The formation probably was originally called Black Fen due to the boggy dark mudstone colour and over time the name was modified from Fen to Ven. It contains a lot of carbon material. Several thin limestone beds are seen dipping to the east.

Due to the nature of the cliff land slips, it is sometimes difficult to distinguish different clay and mudstone units. As you walk below Stonebarrow hill there are four mudstone units below the Cretaceous Greensand and Gault. It is easy to distinguish the light and grey banded Belemnite Marl member as seen in the photograph below in the sunlight dipping east towards Golden Cap. The Cretaceous sediments are above the Great (Angular) Unconformity and

are the orange light rocks in the upper left of the photograph. Along the beach these lighter

coloured rocks are eroded and sometimes cover the face the cliffs. A marl or marlstone is a carbonate rich mud.



The Black Ven Marl was deposited in a large lagoon sheltered from the open sea. It is thought that the lagoon contained a lot of seaweed for lengthy periods of time cutting out light which was not ideal for significant limestone formation. Any sea life like plankton on death would have fallen to the seafloor. The conditions in this shallow sea would have lacked oxygen which meant that the carbon material did not decompose easily. Hence the shale and mudstones are rich in carbon material. As the sediment was buried deeper the process of rock formation began and the conditions meant that the formation of pyrite (Iron Sulphide) or “fool’s gold” was common.



It is common along the beach to see significant dark brown patches of pyrite in the sand. This is due to heavily weathered oxidised pyrite. You will see significant nodules of oxidised pyrite, dark red and brown coloured at beach level. Some small ammonites formed of pyrite are common to find. Unfortunately, April was a very dry month in Dorset and most of the fossil treasures easy to find had already been taken by eagle eyed collectors.

We walked further east along the beach until the grey banded Belemnite Marl reached beach level. West Hay water is a beautiful outcrop of this formation. Unfortunately, the first group I lead there

only saw the cliff dried out. Fortunately, I had a photograph of West Hay water in its glory with water cascading over the cliff face, which picked out the beautiful bands of rock. See picture below.

We spent some time talking about the cause of the banding. The earth rotates on its axis but the axis over time both tilts and rotates like a spinning top with regular periodicity. The earth also rotates around the sun in an almost circular motion, but the orbit does change to an ellipse. This means the northern hemisphere axis may be pointing away or towards the sun as it orbits during a yearly cycle and this means that over several thousands of years the northern hemisphere climate may have been warm during summer and winter over many millennia or the climate was variable during summer and winter over many millenia. This had an impact on weathering and sedimentation in the Jurassic sea hence the changes in carbon, carbonate or mud content.



We walked back to the Charmouth Heritage centre. At the shore here, there is a shingle beach where the river Char joins the sea. The river Char is located very close to the Char normal fault with a throw of about 30m. The fault is not seen here but is inferred because the Shales with Beef member on the west beach is now below surface at this location. When the conditions are right on the beach it is possible to see intensely folded beds (Birchi Bed) around the fault. In fact, we see some folding of the Birchi Bed in the cliff to the west.

The Charmouth Heritage Centre itself was built as a cement works in in January 1863 by entrepreneur George Freat. There were existing lime kilns on site before. Horse and carts brought the larger blocks of limestones to the crusher while the smaller blocks (washers) were carried by the

women workers in wicker baskets. Business unfortunately did not thrive, and the cement works closed a year later.

We then walked west with Lyme Regis in the distance. The first formation we saw is the Shales With Beef. The photograph below shows the section from beach level to the top of the first hard limestone layer in the centre of the picture dipping east. This is the Birchi Tabular and marks the base of the Black Ven Marl above and the Shales with Beef below.



The name Shales with Beef is the term used by the miners who quarried the limestone. There are several bands in the Shales where calcium carbonate (calcite) has crystallised into fibrous calcite where crystals have grown vertically and forms a texture that looks like the side of a good piece of beef! The crystals can also grow under increased pressure to form a crystal growth known as “cone on cone” calcite as shown in the picture below.



The next field trip will take us to Lyme Regis, and we will review the last member of the Lower Jurassic, the Blue Lias and look at the ammonite pavements to the west of the Cobb.