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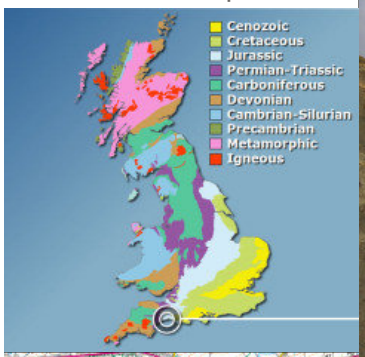
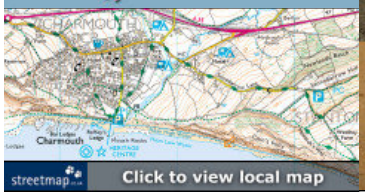
Written and designed by Roy Shepherd ©2011. Special thanks to my wife Lucinda Shepherd, friend Robert Randell and various experts for their support.

Contact details

Charmouth (Dorset)

Location maps





How might the Charmouth area have looked 190 million years ago?

Location summary

Geological period

Early Jurassic

Approximate age

190-185 million years

Fossil diversity

Ammonites, marine reptiles...

Supply of fresh material

High

Dangers to consider

Falling rocks, rising tide... read more

Equipment needed

Hammer, chisel, eye protection...

Protection status

This location is designated a SSSI

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Introduction

Charmouth was one of the first locations added to Discovering Fossils, and has since been the destination for several organised fossil trips. The famous coastline between Lyme Regis (in the west), and Seatown (in the east), has yielded a range of spectacular fossils, including: giant marine reptiles, intricate crinoids and ammonites.

Left: View west at Charmouth towards Black Ven and Lyme Regis. **Right:** Parking and refreshments are available alongside the mouth of the river Char.

The beach and cliffs are part of the Jurassic Coast (World Heritage Site), which encompass 95 miles of coast between Dorset and Devon. The area is well suited to amateur and experienced fossil hunters alike; throughout the year visitors flock in their masses to scour the beach for fossils washed out of the cliffs and foreshore.

The rocks at Charmouth date predominantly from the early part of the Jurassic period (around 190 million years ago), during which time this area lay beneath a warm, shallow sea, closer to the equator, approximately where North Africa resides today.

Left: A family explore the foreshore for loose fossils among the rock pools. **Right:** A young fossil hunter inquisitively hammers a foreshore boulder.

Charmouth is well equipped for visiting fossil hunters: parking, refreshments and a visitor centre displaying local finds are available all year round, alongside the mouth of the river Char (see above-right). From the car park visitors can follow the beach in an easterly or westerly direction (see above-left). The following page is concerned with the journey 4,000m to the east, beneath Stonebarrow Hill, and towards Golden Cap and Seatown.

The geology of Charmouth

The cliffs and foreshore between Charmouth and Seatown represent two stages within the Early Jurassic (or Lias) period known as the Sinemurian and Pliensbachian, dating from approximately 190-185 million years ago. During this time, an enormous, generally shallow epicontinental sea (less than 100m deep), spread over this area of the world, and laid down alternating layers of clay and limestone. At that time, Charmouth (as it's now known), lay closer to the equator, roughly where North Africa is today. Overlying the Jurassic sediments are younger Cretaceous deposits, including the Gault and golden coloured Upper Greensand (green when freshly split) - deposited around 106-102 million years ago (see Figure 1). See Lyme Regis for geology and fossils towards the west.

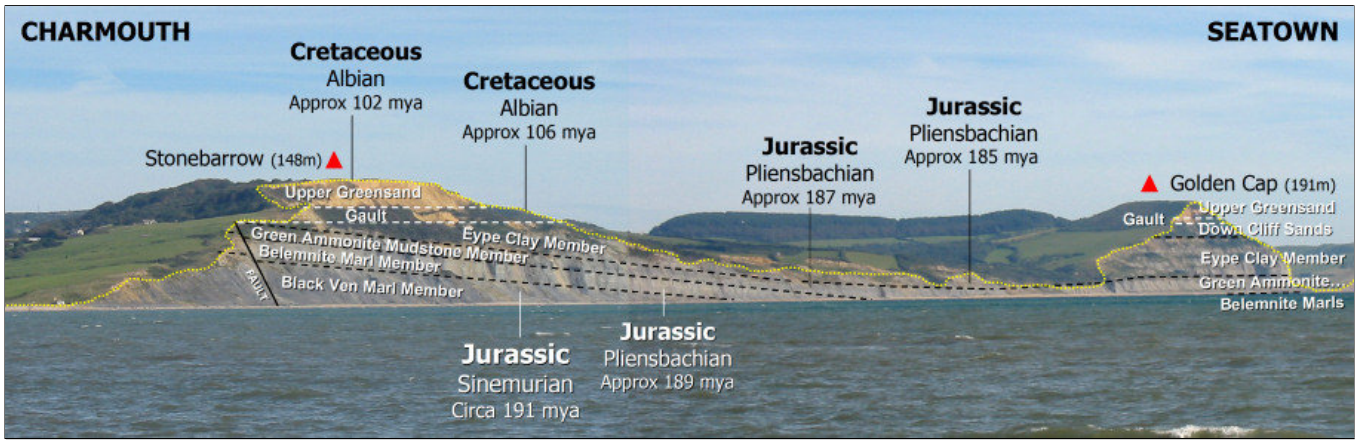


Figure 1: Diagram indicating the approximate positions of the key geological horizons at Charmouth. For a table of geologic periods click here.

Fossils can be found throughout the Jurassic and Cretaceous exposures between Charmouth and Golden Cap, however it's the Jurassic rocks in particular, that attract fossil hunters to Charmouth.

Life was abundant during the Jurassic period, giant marine reptiles inhabited the seas and pterosaurs flew across the skies. This was also the time of the dinosaurs, however the presence of sea over much of the area, and distance from any significant landmass, means their fossils are rarely found at Charmouth.

There are five important members present in the cliffs (not including the overlying Cretaceous sediments) between Stonebarrow and Golden Cap, from which a variety of fossils can be collected:

Black Ven Marl Member - This is the lowest and oldest of the sediments present beneath Stonebarrow, and is the first to be encountered travelling east, towards Golden Cap. The name is taken from the cliffs west of Charmouth - Black Ven, where the complete member is exposed. The full thickness of the member comprises 44m of mostly dark-grey mudstones, with subordinate beds of nodular and tabular limestone. The most conspicuous marker within the Black Ven Marls is known as the Lower Cement Bed (see Figure 2). This 0.3m thick limestone bed is visible in the lower part of the cliff beneath Stonebarrow, before disappearing beneath the shingle about 1,500m from the beach access point. Overlying the Lower Cement Bed (5m higher) is the Upper Cement Bed.

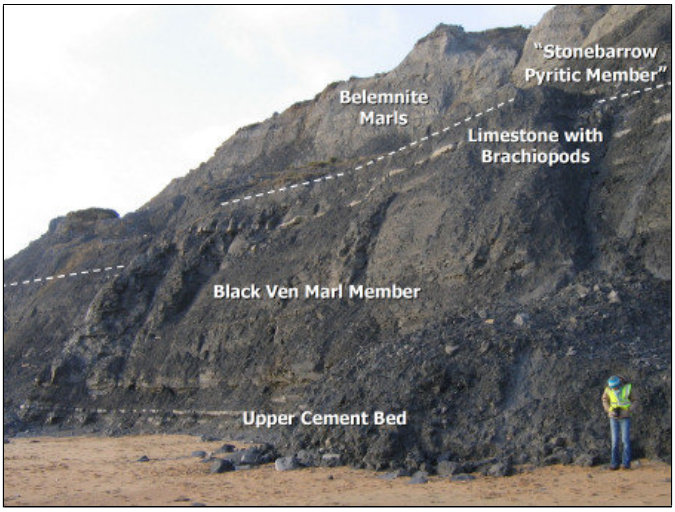


Figure 2: Lower Cement Bed nearing beach level. **Figure 3:** Upper Cement Bed at beach level, and Limestone with Brachiopods Bed midway up the cliff.

The Upper Cement Bed (pictured at beach level, fig.3 above), is identifiable by two closely spaced limestone bands. The photo above-right also shows the overlying Limestone with Brachiopods Bed (11m higher). It's recently been proposed to separate and name the upper 17m of the Black Ven Marl Member, the 'Stonebarrow Pyritic Member' (fig.4 and 6 below), although this is not yet formerly recognised and its inclusion within quotation marks is for illustrative purposes only.

Dr Paul Davis (NHM London): 'There are high volumes of pyritic fossils throughout the Black Ven Marl Member, however there is a distinct lithology change and it may – on a sedimentological basis - be sensible to separate the two units. As an aside the upper 'unit' pyritic fossils are much more susceptible to pyrite decay than those from below (e.g. how many pyritic Promicroceras decay as opposed to pyritic Echioceras or Eoderoceras!) I also think that this boundary (which is marked by the top of the Coinstones - Bed 89 of Lang) is mapable inland. It also represents a major nonconformity where 6 ammonite subzones are missing as there was a long period of non deposition – this can be seen on the top of the Coinstones by the fact they were exposed on the seabed for a long period of time – it is bored and has a very eroded upper surface and can make an obvious ledge or break in slope when looking at the cliffs.'

The proposed base of the 'Stonebarrow Pyritic Member' is 3m above the prominent Limestone with Brachiopods Bed (Figure 4 and 5), and extends upwards to the overlying, pale coloured, Belemnite Marl Member. The total thickness of the member would be approximately 17m.

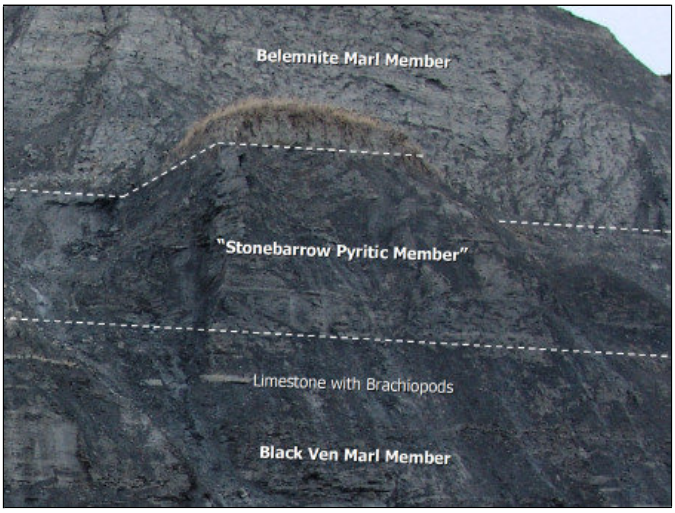


Figure 4: Proposed position of the 'Stonebarrow Pyritic Member'. **Figure 5:** Close-up of the proposed position of the 'Stonebarrow Pyritic Member'.

These dark-coloured sediments are largely responsible for the volume of pyrite ammonites that scatter the foreshore, and include: Crucilobiceras, Eoderoceras, Echioceras and the distinctive (smooth surfaced) Oxynoticeras lymense.

Belemnite Marl Member: These deposits are seen towards the top of the cliffs, but are best examined beneath the eastern side of Golden Cap, where they reappear on the sea-weathered foreshore. During a low-tide, belemnite guards can be seen in abundance, protruding from the exposed rock surface. Although abundant, the in-situ belemnites are protected by the SSSI status of the area, and should not be removed manually. Fortunately, a large number of belemnite guards can be found loose among the shingle and boulders. Despite the name given to the Belemnite Marl Member, ammonites are also abundant throughout the sediments.

Figure 6: Pale-layers of the Belemnite Marl Member in the upper cliff section. **Figure 7:** View towards Golden Cap; the Belemnite Marls reach beach level.

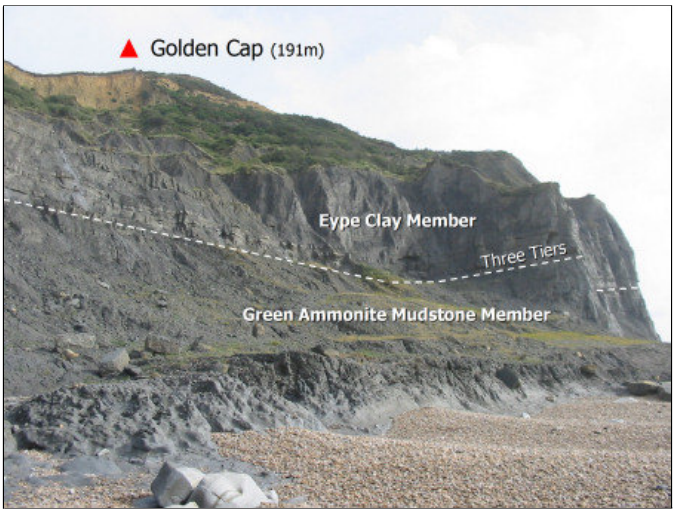
The Belemnite Marls are easily identified, by their alternating pale and dark horizontal bands (Figure 6 and 7). The different shades of grey are the result of the differing organic carbon content (higher in the darker bands). The Belemnite Marls extend 23m upwards, to the overlying Green Ammonite Mudstone Member.

Green Ammonite Mudstone Member: This member rests above the Belemnite Marls and measures some 15m thick at Stonebarrow and 34m at Golden Cap. Ammonites are abundant and include species of Aegoceras, Oistoceras, Liparoceras, Tragophylloceras and Androgynoceras (below-right).

Figure 8: The Green Ammonite Mudstone Member is visible in the lower 34m of the cliff. **Right:** A common ammonite *(Androgynoceras lataecosta)*.

Although present in the upper part of the cliffs at Stonebarrow, the Green Ammonite Mudstone Member is best observed at the base of Golden Cap (Figure 8) and beyond, towards Seatown. Please take additional care and wear a hard hat if venturing anywhere near the cliff itself; rock falls occur on a daily basis.

Eype Clay Member: The base of the Eype Clay Member is marked by three well-cemented, fine-grained, mudstones, each 0.5-1m thick; indicating an abrupt end to the underlying Green Ammonite Mudstone Member. These mudstones (known as the Three Tiers) form prominent ledges in the cliff (Figure 9 and 10).



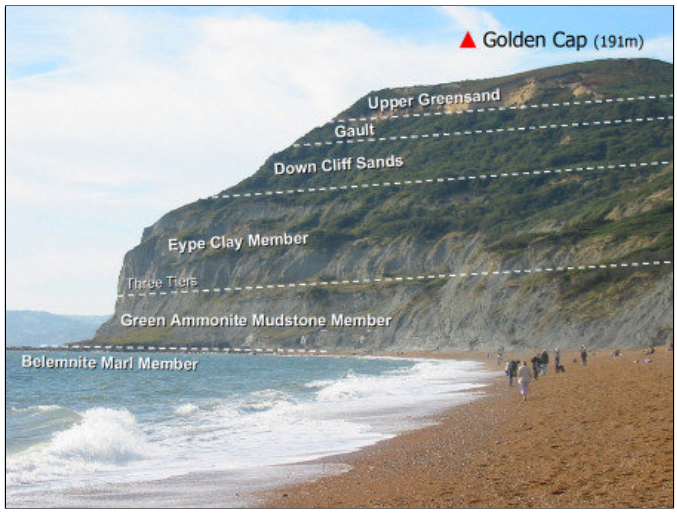


Figure 9: Eype Clay Member, looking east beneath Golden Cap. **Figure 10:** View west towards Golden Cap, from Seatown.

Above the Eype Clay Member, lies the Down Cliff Sands (Figure 10), however material from this unit is less commonly found at beach level, and is not the subject of this particular location review. Above this, lies the younger Gault and Upper Greensand, dating from the Cretaceous period.

Where to look for fossils?

Fossils can be found along the entire coastal stretch between Charmouth and Seatown, although the volume is highest within within the first 1,000m of the beach access point. The best (and safest) place to search is amongst the shingle and exposed foreshore, at low-tide, as shown below.


Left: Searching the shingle and exposed foreshore at low-tide. **Right:** Visitors, young and old, can find fossil with nothing more than a keen eye.

During a falling tide, fossils are deposited between the high and low-water mark, and are easily found with a keen eye. Among the most common finds include: pyritised ammonites, belemnite guards and crinoid stems. It's also worth examining the clay accumulations at the base of the slumping cliffs (see below-left); however, this should only be attempted where there's a minimal risk of injury from falling rocks. For much of the year, it's possible to examine the toe (end) of the clay accumulations, without getting too close to the cliff itself. As always, a reasonable judgment must be applied at the time, and children should be closely supervised.


Left: The muddy clay accumulates at the base of the cliff. **Right:** Close examination of the clay can reveal an assortment of ammonites and other fossils.

The toe of the clay accumulations ('Stonebarrow Pyritic Member', in this instance) are often subject to weathering from the sea at high-tide, and during stormy conditions in particular. This process washes away the soft clay, exposing the more resistant fossils on the surface (see above-right). Using a small steel point (see equipment), it's possible to gently ease exposed fossils from the clay.


Left: Towering cliffs beneath Golden Cap. **Right:** A partially exposed ammonite from within the Green Ammonite Mudstone Member.

Continuing along the beach (towards Seatown) you eventually reach the towering cliffs beneath Golden Cap. At this point the Green Ammonite Mudstone Member is exposed in the lower part of the cliff, within which some very well preserved ammonites (in particular) can be collected. For more information about the features and processes shaping coastal fossil collecting locations click here.

As with all coastal locations, a fossil hunting trip is best timed to coincide with a falling or low-tide. For a relatively low one-off cost we recommend the use of Neptune Tides software, which provides future tidal information around the UK. To download a free trial click here. Alternatively a free short range forecast covering the next 7 days is available on the BBC website click here.

What fossils might you find?

Charmouth is a destination for thousands of fossil hunters each year, and for good reason, this is one of the best fossil collecting locations in the country. Ammonites, nautili, belemnites, crinoids, bivalves, fish, marine reptile bones, and even insects and the occasional dinosaur bone, can all be found here. The most commonly collected fossils are pyritised ammonites; with a little patience and a keen eye, most visitors will find at least one. To read more about ammonites click here.

Below are a selection of finds, made over several visits. If you find something of particular interest during your own visit, please seek advice and support at the Charmouth Heritage Centre - alongside the car park.


Left: A pyritised ammonite *(Echioceras raricostatum?),* 'Stonebarrow Pyritic Member'. **Right:** A quick wash and the ammonite (shown left) is revealed.


Left: Ammonite *(Echioceras raricostatum)*, 'Stonebarrow Pyritic Member'. **Right:** A beach pebble containing crinoid arms *(Pentacrinites)*.


Left: A nodule on the foreshore from the Black Ven Marls. **Right:** Inside - a large unidentified fish, the pectoral fin is clearly visible in the lower-left.


Left: A split beach pebble containing a fragment of ammonite shell. **Right:** Ammonite *(Eoderoceras armatum)*, 'Stonebarrow Pyritic Member'.


Left: A flint echinoid *(Sternotaxis plana)* possibly from the Chalk west of Charmouth? **Right:** A belemnite guard found on the foreshore.


Left: A rolled beach pebble, comprised of three small ichthyosaur vertebra. **Right:** A small, isolated ichthyosaur vertebra, found on the foreshore.


Left: Ammonite *(Promicroceras planicosta)*, Black Ven Marl Member. **Right:** A yellow calcite ammonite *(Promicroceras planicosta)*, Black Ven Marl Member.


Left: Pyritised ammonite *(Gagaticeras gagateum)*, Black Ven Marl Member. **Right:** Ammonite *(Oxynoticeras lymense*?), Black Ven Marl Member.


Left: A small rolled ichthyosaur jaw containing a number of teeth. **Right:** A partial nautilus *(Cenoceras)*, Green Ammonite Mudstone Member.


Left: Pyritised ammonite *(Eoderoceras armatum)*, 'Stonebarrow Pyritic Member'. **Right:** Ammonite *(Amaltheus stokesi)*, Eype Clay Member.

Tools & equipment


Left: A group fossil hunting at Charmouth. **Right:** A geologist's hammer is ideal for splitting prospective rocks.

It's a good idea to spend some time considering the tools and equipment you're likely to require while fossil hunting at Charmouth. Preparation in advance will help ensure your visit is productive and safe. Below are some of the items you should consider carrying with you. You can purchase a selection of geological tools and equipment online from UKGE.

Hammer: A strong hammer will be required to split prospective rocks. The hammer should be as heavy as can be easily managed without causing strain to the user. For individuals with less physical strength and children (in particular) we recommend a head weight no more than 500g.

Chisel: A chisel is required in conjunction with a hammer for removing fossils from the rock. In most instances a large chisel should be used for completing the bulk of the work, while a smaller, more precise chisel should be used for finer work. A chisel founded from cold steel is recommended as this metal is especially engineered for hard materials.

Safety glasses: While hammering rocks there's a risk of injury from rock splinters unless the necessary eye protection is worn. Safety glasses ensure any splinters are deflected away from the eyes. Eye protection should also be worn by spectators as splinters can travel several metres from their origin.

Strong bag: When considering the type of bag to use it's worth setting aside one that will only be used for fossil hunting, rocks are usually dusty or muddy and will make a mess of anything they come in contact with. The bag will also need to carry a range of accessories which need to be easily accessible. Among the features recommended include: brightly coloured, a strong holder construction, back support, strong straps, plenty of easily accessible pockets and a rain cover.

Walking boots: A good pair of walking boots will protect you from ankle sprains, provide more grip on slippery surfaces and keep you dry in wet conditions. During your fossil hunt you're likely to encounter a variety of terrains so footwear needs to be designed for a range of conditions.

For more information and examples of tools and equipment recommended for fossil hunting click here or shop online at UKGE.

Protecting your finds

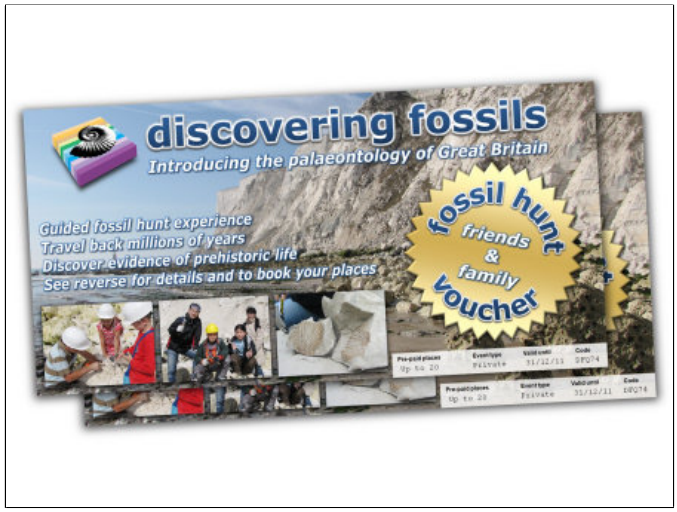
It's important to spend some time considering the best way to protect your finds onsite, in transit, on display and in storage. Prior to your visit, consider the equipment and accessories you're likely to need, as these will differ depending on the type of rock, terrain and prevailing weather conditions.


Left: Fossil wrapped in foam, ready for transport. **Right:** A small compartment box containing cotton wool is ideal for separating delicate specimens.

When you discover a fossil, examine the surrounding matrix (rock) and consider how best to remove the specimen without breaking it; patience and consideration are key. The aim of extraction is to remove the specimen with some of the matrix attached, as this will provide added protection during transit and future handling; sometimes breaks are unavoidable, but with care you should be able to extract most specimens intact. In the event of breakage, carefully gather all the pieces together, as in most cases repairs can be made at a later time.

For more information about collecting fossils please refer to the following online guides: Fossil Hunting and Conserving Prehistoric Evidence.

Join us on a fossil hunt

Left: A birthday party with a twist - fossil hunting at Peacehaven. **Right:** Send someone special a Fossil Hunt Experience Gift Voucher

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More information

References: www.jurassiccoast.com; British Lower Jurassic Stratigraphy, M.J.Simms; R.Edmonds, Discover Dorset - Fossils; The Geology of Britain, P.Toghill; http://www.g6csy.net/fossil/bvm.html; A Dynamic Stratigraphy of the British Isles, A. Anderton and co; Dr Ian West, www.soton.ac.uk; A Geologic Time Scale 2004, by F. Gradstein, J. Ogg and A. Smith. Many thanks to Dr Neville Hollingworth for his ammonite identifications. Special thanks to Prof. Norman MacLeod and Dr Paul Davis at the Natural History Museum of London for their continued support and advice.

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