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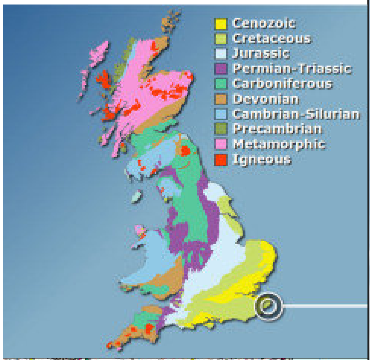
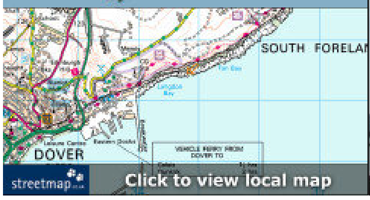
Written and designed by Roy Shepherd ©2011. Special thanks to my wife Lucinda Shepherd, friend Robert Randell and various experts for their support.

Dover (Kent)

Contact details

Location maps





Location summary

Geological period

Late Cretaceous epoch

Approximate age

89-85 million years

Fossil diversity

Echinoids, bivalves, sponges...

Supply of fresh material

Limited

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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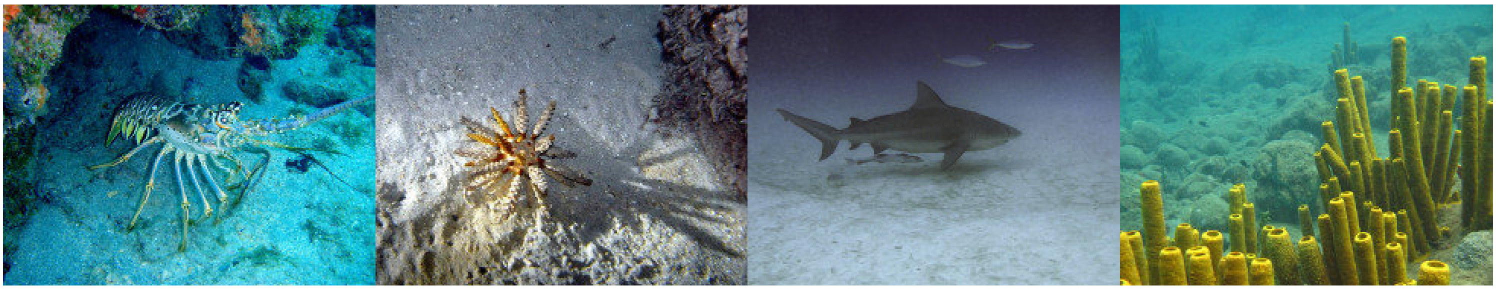
How might the Dover area have looked 87 million years ago?



Introduction

Dover is a coastal town and major port in the southeast corner of Kent, and home to over 28,000 people. The town is well known as a crossing point between England and Calais in France, a journey across the English Channel of 21 miles. Maritime evidence dating from c.4,000 years ago reveals Dover has long been used by people travelling to and from the continent, however it's the fossil evidence that predates human endeavours by many millions of years that is the subject of particular interest here.

Immediately east of the town and continuing 2 miles towards St Margaret's Bay are the famous White Cliffs of Dover, an exposure of Middle and Upper Chalk dating from the Late Cretaceous epoch, 89-85 million years ago. At this time the Dover area lay beneath a relatively shallow sea, over a hundred miles from the nearest land. Fossils reveal the prehistoric sea was home to a variety of organisms, in particular sediment burrowing echinoids, bivalves, sponges and other marine organisms including crustaceans and sharks.

Access to the cliffs and beach is made from the hill-top, from which it's a fair walk along the coast to Langdon Hole, where a zigzag path descends the cliff-face. Parking is available along Upper Road or within the National Trust pay-and-display car park shown below.

Left: Limited roadside parking is available along Upper Road. **Right:** Alternatively a National Trust pay-and-display car park is available further along the road.

From the car park a number of well trodden routes connect with several major footpaths travelling broadly east and west along the cliff-top. The best route is towards the east via the lowest footpath, which briefly heads towards the west beneath the car park, before taking a sharp-left and descending to the cliff-edge.

Left: View from the lower coastal footpath looking back across Dover Port. **Right:** Lucinda overlooks the ferry terminals and lower footpath from the cliff-top.

The footpath continues along the coast before descending steeply into Langdon Hole (shown below-left) - a shallow eroded valley formed by seasonal melt water towards the end of the recent ice age, 14,500 years ago (see the Seaford Head report for more details of eroded chalk valleys). Follow the path into Langdon Hole and up the other side. Shortly before reaching the top of the other side, a narrow path leads off to the right and zigzags down the cliff-face. At the bottom of the path a ladder spans the remaining 8 metres to the beach (shown below-right).

Left: The coastal path descends steeply into Langdon Hole. **Right:** Langdon Stairs zigzag down the cliff-face to a ladder which connects to the beach.

The geology of Dover

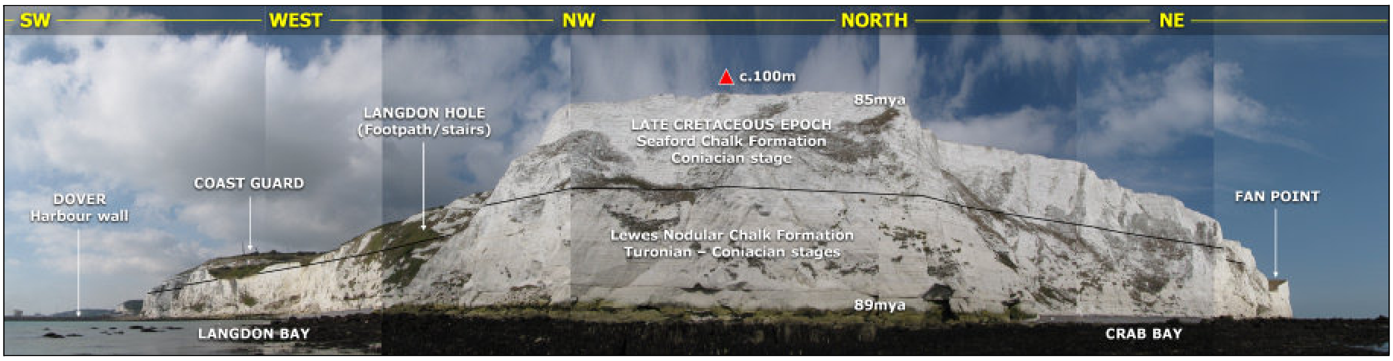


Figure 1: Summary of the geological horizons present in the cliff-face between Dover and Crab Bay.

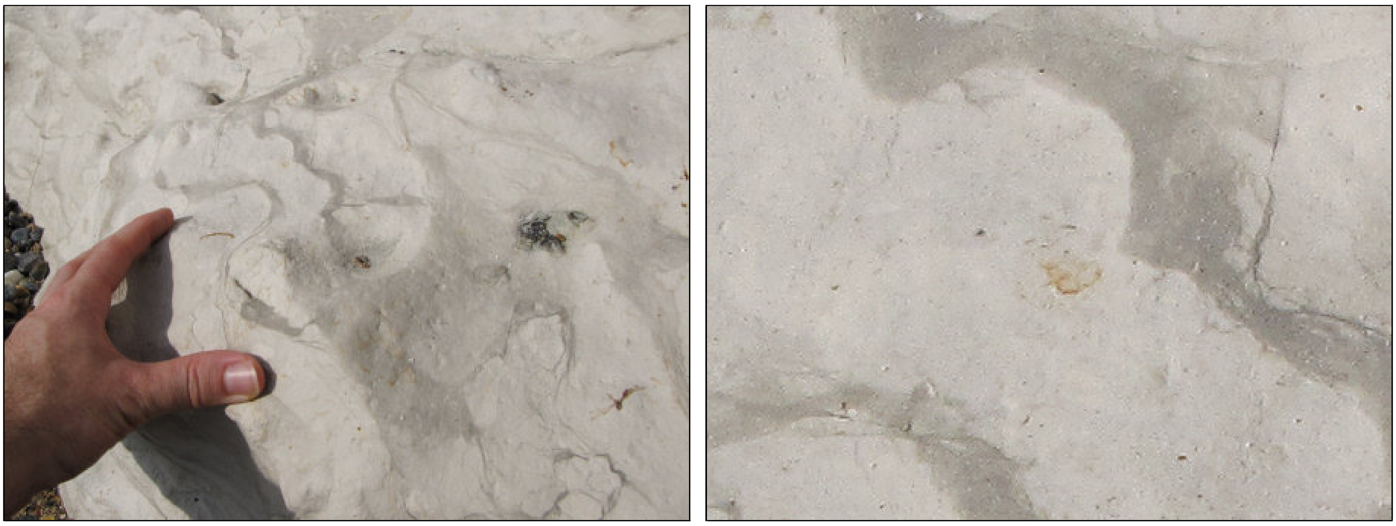
The chalk exposed east of Dover belongs predominately to the Upper Chalk, and was deposited during the Turonian and Coniacian stages of the Late Cretaceous epoch between 89-85 million years ago (mya). At this time the Dover area and much of Great Britain, along with Europe, lay beneath a relatively shallow sea approximately 40°N of the equator, on an equivalent latitude to the Mediterranean Sea today.

In comparison with present-day conditions, global sea-levels during the Late Cretaceous were over 200 metres higher. The higher sea levels likely reflect a combination of extreme greenhouse conditions and heightened plate tectonics. Elevated plate tectonic activity and the associated volcanics delivered greenhouse gases to the atmosphere, fuelling the greenhouse effect. Global high temperatures melted much (perhaps all) of the ice at high latitudes, introducing significant amounts of water to the world's oceans. Uplift of the ocean-floor in regions of active plate tectonics displaced further water onto the continental shelves.

The evidence of higher sea levels is reflected in the white chalk at Dover. The purity of the chalk indicates its formation took place far from land, mostly free of terrestrial sands and silts that would otherwise have coloured it. Evidence indicates the nearest landmass was where Wales is today. At Dover the lower half of the cliff and foreshore contains a slightly greater volume of land-sourced sediment, this is particularly evident in the hardgrounds described below. Chalk is largely comprised of the skeletal remains of planktonic algae known as coccolithophores which accumulated to form a white ooze on the seafloor. This soft sediment was later compacted and hardened (lithified) to form chalk - a relatively soft rock itself. To discover more about chalk click here.

Today the chalk appears above sea level, the result of lower present-day sea levels and widespread uplifting caused by the pressure of the European and African continental plates colliding (generating the Alps), a process that took place at its greatest extent 30-25 mya. More recently, following the end of the last ice age and subsequent increase in sea levels (albeit to a lesser extent than 84 mya), the coastline has moved inland, exposing the elevated chalk to intensive erosion and sculpting it into a vertical cliff-face.

A short distance east of Langdon Hole a conspicuous layer of white chalk interspersed with soft, grey chalk, can be seen at the foot of the cliff and on the foreshore. This layer within the Lewes Nodular Chalk Formation is known as a hardground complex (shown below).



Left: The hardgrounds within the Lewes Nodular Chalk Formation. **Right:** Close-up.

Hardgrounds are understood to reflect disruptions to the steady accumulation of chalk forming sediment, during which sedimentation simply ceased and/or the unconsolidated, soft surface sediments were stripped away by bottom currents or slumping, exposing the older consolidated chalk sediment. Research has shown that a single hardground may have been exhumed 16 or more times before long-term burial took place. For more information about hardgrounds see Seaford Head.

Another striking characteristic of the chalk at Dover is the presence of dark-coloured nodular and sheet flints that appear as horizontal bands in the cliff-face and as loose pebbles on the beach (shown below).


Left: Horizontal bands of nodular and sheet flints visible in the cliff-face. **Right:** Flint pebbles accumulated on the beach at the foot of the cliff.

Although flint is inorganic, the silica that formed it was originally sourced from the remains of sea sponges and siliceous planktonic micro-organisms (diatoms, radiolarians). Flints are concretions that grew within the sediment after its deposition by the precipitation of silica; filling burrows/cavities and enveloping the remains of marine creatures, before dehydrating and hardening into the microscopic quartz crystals which constitute flint. Consequently it's common to find fossil evidence of these creatures preserved as flint, especially the internal moulds of *Micraster* echinoids.

Where to look for fossils?

Fossils can be found on the foreshore and at the cliff base in either direction from Langdon Hole, although for the purposes of this page the focus is towards the northeast (left when looking out to sea). The most productive and safest place to search for fossils is on the foreshore at low-tide. Chalk boulders and flint nodules are scattered along the entire stretch, providing a constant supply of fossils.


Left: A large inoceramid bivalve visible on the surface on an air-weathered boulder. **Right:** Fossils can be found in and among the flint pebbles on the beach.

Please note that any *in situ* chalk is assigned SSSI status, which requires visitors avoid damaging (including hammering) the area. From a fossil collecting perspective this means it's not permitted to extract specimens that are *in situ*. Collecting efforts should be directed towards the loose boulders and pebbles on the foreshore.

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?

Below is a selection of fossils discovered at Dover over several visits. Where possible the genus of each specimen has been indicated, if a confident ID can't be achieved a question mark has been added to indicate so. Among the more frequent finds include echinoids, brachiopods, bivalves and sponges; less common finds include shark teeth and crinoid stems among others.

Left: A *Micraster* echinoid, found loose among the beach pebbles. **Right:** A second *Micraster*, found *in situ* within the Lewes Nodular Chalk.

Left: The worn internal flint mould of a *Sternotaxis(?)* echinoid, found loose among the beach pebbles.
Right: A tiny internal flint mould of a *Micraster* echinoid, found loose among the beach pebbles.

Left: An *Echinocorys* echinoid, found *in situ* within the Lewes Nodular Chalk.
Right: A *Phymosoma(?)* echinoid spine, found on the surface of a fallen boulder.

Left: An *Temnocidaris* echinoid spine alongside an orange-coloured sponge, on the surface of a fallen boulder.
Right: A sponge on the surface of a fallen boulder.

Left: An isolated fragment of *Isocrinus* crinoid stem on the air-weathered surface of a fallen chalk boulder. **Right:** A fragment of *Enoploclytia(?)* lobster claw.

Left: A Lamniform shark tooth, found within a fallen boulder. **Right:** An upturned *Gryphaeostrea(?)* oyster and *Spondylus(?)* valve on an air-weathered boulder.

Left: A *Concinnithyris* brachiopod on the surface of a fallen boulder, probably originating from the Lewes Nodular Chalk.
Right: A large fragment of an inoceramid bivalve shell.

Left: A flint pebble containing two inoceramid bivalves. **Right:** The impression of a *Spondylus* bivalve on the surface of a flint pebble, found loose on the beach.

Tools & equipment

It's a good idea to spend some time considering the tools and equipment you're likely to require while fossil hunting at Dover. 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.

Left: Walking boots, a strong bag and sunglasses to protect your eyes from the sun and dazzling white chalk on sunny days are recommended.
Right: A hammer and chisel are recommended for extracting specimens from loose boulders.

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 chalk. 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

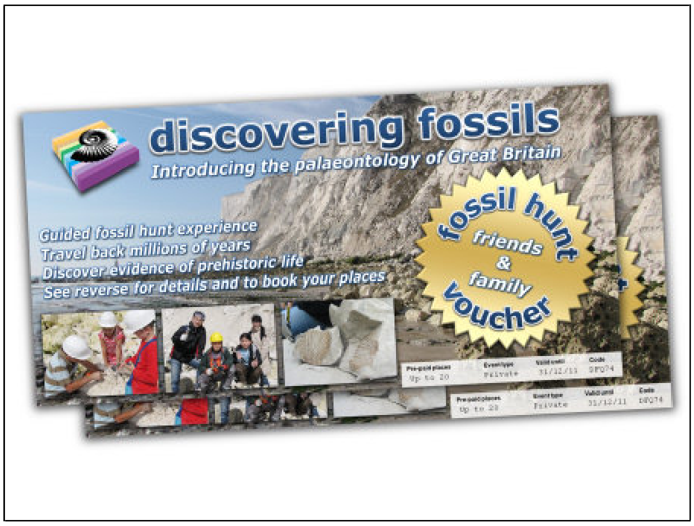
It's important to spend some time considering the best way to protect your finds onsite, in transit, on display and in storage. Prior to your visit, consider the equipment and accessories you're likely to need, as these will differ depending on the type of rock, terrain and prevailing weather conditions.


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

Discovering Fossils guided fossil hunts reveal evidence of life that existed millions of years ago. Whether it's your first time fossil hunting or you're looking to expand your subject knowledge, our fossil hunts provide an enjoyable and educational experience for all. To find out more **CLICK HERE**

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More information

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References: Atlas of Palaeogeography and Lithofacies, The Geological Society Memoir No. 13, J. C. W. Cope; A Dynamic Stratigraphy of the British Isles, A. Anderton, P. H. Bridges, M. R. Leeder and B. W. Sellwood, 1992; Geologists' Association Guide No.57, The Chalk of Sussex and Kent, R. N. Mortimore, 1997; Geological Conservation Review Series, British Upper Cretaceous Stratigraphy, R. N. Mortimore, C. J. Wood and R. W. Gallois, 2001; Fossil of the Chalk, second edition, A. B. Smith and D. J. Batten, 2002; A Geological Time Scale, F. Gradstein, J. Ogg and A. Smith, 2004; www.en.wikipedia.org; www.chalk.discoveringfossils.co.uk.

Safety notice: Fossil hunting can at times pose a risk to personal safety, in particular within environments close to the coast, cliffs or in quarries and when using the tools and equipment illustrated. Discovering Fossils provides a free resource to inform you about this fascinating subject and does not accept any liability for decisions made using this information. We recommend all individuals abide by the fossil hunting guidelines available by clicking on the icon at the top of the page.

