



JURASSIC	CRETACEOUS	TERTIARY	PLEISTOCENE	HOLOCENE
<ul style="list-style-type: none"> • First birds evolve from reptiles • Widespread shallow seas with ammonites 	<ul style="list-style-type: none"> • Evolution of flowering plants • Extinction of the dinosaurs, ammonites, large marine reptiles 	<ul style="list-style-type: none"> • First hominids evolve 	<ul style="list-style-type: none"> • Ice Age mammals • Palaeolithic • End of last Ice Age 	<ul style="list-style-type: none"> • Mesolithic • Extinction of mammoths • Neolithic • First crops farmed
200 million years ago	145 million years ago	65 million years ago	2.5 million years ago	750,000 years ago
			10,000 years BC	4500 years BC
				2000 years BC

SOMERSET'S JURASSIC COAST

Somerset's Jurassic Coast stretches from Blue Anchor eastwards beyond Lilstock, and some of the best exposures occur within the AONB area, especially in cliffs around East Quantoxhead and Kilve. Most of the rocks here were formed from sediments deposited on the bottom of an ancient seafloor approximately 195 to 200 million years ago. They consist of yellow-weathering grey limestones which alternate with units of darker mudstones and shales. Geologists refer to this part of the Jurassic as the 'Lower Lias'. Some individual limestone beds are traceable over long distances, and the regular alternations of harder limestone and softer shale layers produces a distinctive 'washboard-relief' pattern seen on the foreshore at low tide.



Global Boundary Stratotype Section and Point (GSSP) at East Quantoxhead



The coastline at Kilve. Ron Carlson www.focuswild.com

These Lower Lias rocks are of very high scientific importance. One particular cliff section near East Quantoxhead has been identified by specialists as a World reference point within the geological time scale. This is called a 'Global Boundary Stratotype Section and Point' (abbreviated to GSSP) and the rocks here mark an internationally agreed division between two parts of the Lower Lias succession, 196.5 million years old. This effectively means that all sedimentary rocks of this age in the world are related back to this cliff exposure within the Quantock Hills AONB.



Oil retort at Kilve

OIL SHALES

In 1916 a mining engineer named J. Berry, discovered that at Kilve some of the shales were bituminous (containing high quantities of organic matter) and oil-rich. Experimental retorts set up in the 1920s proved that extraction might be commercially viable, and some samples yielded an oil content of 40 gallons per 1.15 cubic metres of shale. The Shalime Company was set up but did not receive sufficient financial backing to make the venture successful. However, commercial retorts were built at Kilve and produced some hundreds of barrels of oil before operations ceased. One brick retort still stands at the northern end of the car park at Kilve Pill.

THE ICE AGES

The upper parts of some cliffs, especially near East Quantoxhead, are composed of reddish-brown soils full of sandstone pebbles and cobbles. Geologically speaking, these sediments are very young, mainly less than 20,000 years old, and are assigned to part of the Ice Ages called the Devensian Stage. Some of the pebbles appear to be orientated in particular directions, and may have been transported by glacial melt-water. Occasionally these deposits also contain the remains of prehistoric animals, including mammoths, and human-made stone implements.



Cliff tops at East Quantoxhead.

FOSSILS

The coast between East Quantoxhead and Kilve has long been known as a good location to find fossils. Particularly characteristic and numerous fossils are ammonites (extinct marine snails related to modern-day squids) and bivalves, including clams, scallops and oysters. Concentrations of small, ribbed shells (called brachiopods) often crowded together in large limestone blocks also occur. Occasionally fossils of large marine reptiles, called ichthyosaurs are discovered, although usually only individual vertebrae or bone fragments are found.



Small fossil ichthyosaur (1m long) from the Lower Lias near Kilve. Dennis Parsons, Somerset County Council Heritage Service.

The Somerset coast between Blue Anchor and Lilstock is designated a Site of Special Scientific Interest (SSSI) for its nationally important geological exposures and fossils. Therefore, fossils should be collected responsibly in accordance with the following code to ensure that future visitors can also enjoy this part of their natural heritage.

RESPONSIBLE FOSSIL COLLECTING CODE

- Follow the Countryside Code, and remain on public footpaths and rights of way
- Respect the landowner's wishes and always obtain permission before collecting fossils on private land
- Take only a few representative specimens. Collect only from loose material or fallen blocks – do not hammer the cliffs or collect from under them, they are very unstable
- Wrap fossils individually in paper or cloth for protection and include a label with them stating clearly when and where they were collected. Without this information your fossils will have no scientific importance
- Large fossils should normally be left for others to see and enjoy – but report any unusual finds to the local Museum of Somerset based in Taunton, Tel: 01823 278805 Email: county-museums@somerset.gov.uk
- Consult local tide times and remember this coast has a very high tidal range. It is best to visit on a falling tide
- Remember that a fossil site is for everyone to enjoy. Indiscriminate collecting will damage the site and fossil resource for future visitors

Quantock Hills AONB Service
 Fyne Court, Broomfield, Bridgwater, Somerset, TA5 2EQ
 Tel: 01823 451 884
 Email: quantockhills@somerset.gov.uk
www.quantockhills.com



If you have difficulty reading this publication we can supply it in large print, on audio cassette, arrange translation or provide a member of staff to discuss the details. For more details contact Somerset County Council on 01278 732845.



GEOLOGY AND LANDSCAPE

The Quantock Hills rise to over 350 metres, an ascent which passes through hill pastures, coniferous and mixed forests and sessile oak woodlands to open moorland summits with heathland. The rocks that form these hills are from the Devonian Period of geological time, and are approximately 380 to 400 million years old. Geologically speaking, the Quantock Hills fall neatly into three areas: The northern hills from West Quantoxhead via Dowsborough to Triscombe are formed of Hangman Sandstones which underlie the moorland summits at Thorncombe Hill, Higher Hare Knap, Hurley Beacon and Great Hill; the southern hills encompassing Broomfield, Kingston St Mary and Kings Cliff, are composed of Morte Slates which are less resistant than the sandstones and give rise to gently sloping topography. Between these areas, stretching from Holford to Cothelstone and Enmore, the hills are underlain by Ilfracombe Slates whose varied geology includes limestones and volcanic tuffs, and this gives rise to varying topography, dissected by steep-sided wooded combs. Many of the Devonian sandstones make good building stones, and their use has contributed much to the local character and built heritage of villages around the fringes of the Quantock Hills. Within the AONB is part of Somerset's own Jurassic Coast. Here the constantly crumbling cliffs are formed of limestones and shales which formed at the bottom of an ancient sea nearly 200 million years ago. These rocks contain many fossil shells, ammonites and occasional large marine reptiles or 'sea-dragons'.

Ron Carlson www.focuswild.com



PRECAMBRIAN	CAMBRIAN	ORDOVICIAN	SILURIAN	DEVONIAN	CARBONIFEROUS	PERMIAN	TRIASSIC
<ul style="list-style-type: none"> Formation of the Earth Evolution of first celled life 4600 million years ago	<ul style="list-style-type: none"> Evolution of first shelled animals 542 million years ago	<ul style="list-style-type: none"> Diverse marine faunas with molluscs and arthropods 488 million years ago	<ul style="list-style-type: none"> Oldest rocks in Somerset Vascular plants evolve 444 million years ago	<ul style="list-style-type: none"> First seed-bearing plants spread across dry land The 'Age of Fish' 416 million years ago	<ul style="list-style-type: none"> First true amphibians evolve Widespread Coal Measure swamps 359 million years ago	<ul style="list-style-type: none"> Evolution of reptiles Widespread desert conditions 299 million years ago	<ul style="list-style-type: none"> First shrew-like mammals evolve Start of the Age of the Dinosaurs 251 million years ago 200 million years ago

THE GEOLOGICAL SUCCESSION IN THE QUANTOCK HILLS

Devonian rocks in the Quantock Hills can be divided into three distinct 'units' (which geologists call 'Formations'). From youngest to oldest, these are:

MORTE SLATES FORMATION

This formation is over 500 metres thick, and contains lustrous silvery-grey or brown slates with some siltstones and thin sandstones. The rocks generally lack any fossils.



Characteristic slaty grey appearance of the Morte Slates.



Mixed Ilfracombe slates, siltstones and sandstones at Holwell.

ILFRACOMBE SLATES FORMATION

This formation is approximately 475 metres thick and contains a variety of rock types. Grey and brown sandstones are present mainly in the upper and lower parts, siltstones and slates occur throughout the succession. The upper part of the formation contains several impersistent limestone units, up to 15 metres thick, some of which contain fossil corals. A band of volcanic rock (the 'Cockercombe Tuff') occurs in the lower part of the formation at Cockercombe and Keeper's Combe.

HANGMAN SANDSTONE FORMATION

Massive purplish-brown sandstones are characteristic of this formation, although some siltstones and quartz-pebble or mud-pellet conglomerates also occur. The formation is approximately 800 metres thick and occasionally contains fragmentary plant fossils. Hangman Sandstones often form rubbly scree slopes within the combes and on hill slopes.

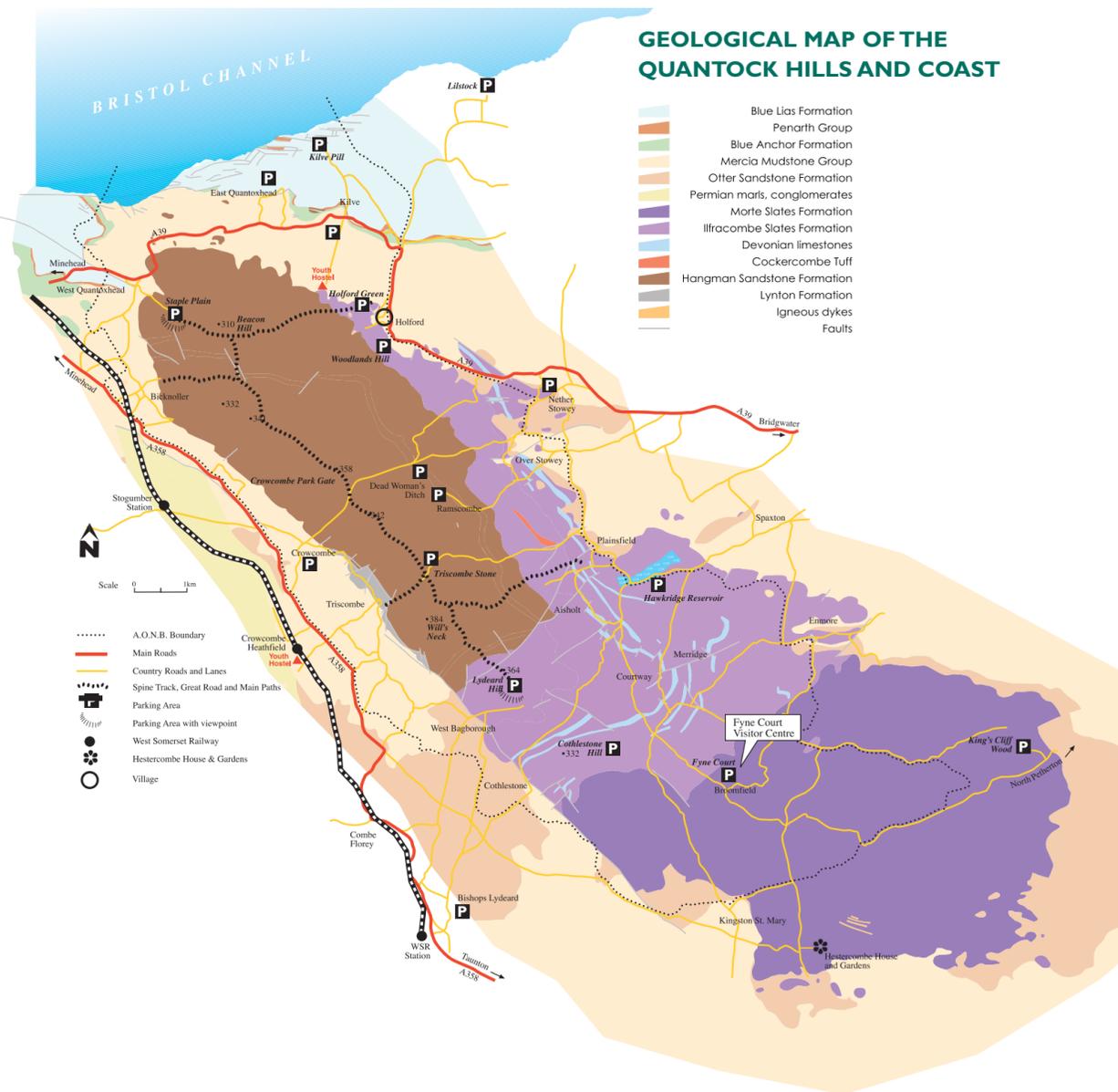


Hangman Sandstones at West Quantoxhead.

Other rocks in the Quantock area

The oldest rocks in the Quantock Hills are the 'Lynton Slates'. These are pale grey-green or reddish slates and thin sandstones and only occur in a very small area between Little Quantock and Triscombe.

Surrounding the Quantock Hills are outcrops of bright red-brown sandstones (the Otter Sandstone) and mudstones (Mercia Mudstones). These Triassic rocks are 245 to 205 million years old, and much younger than the Devonian rocks that form the Quantock Hills.



BUILDING STONES

Over the past few centuries many of the Devonian rocks in the Quantock Hills have been quarried for building stone, wall stone and roadstone, although none are currently worked. Some reddish-purple sandstones in the Hangman Sandstone and lower Ilfracombe Slates formations are quartzitic and very hard, these have been used in many local buildings (for example, Halsway Manor) and give much character to villages such as Bicknoller, Crowcombe and Holford. The largest quarry in the Quantock Hills is at Triscombe which formerly supplied high quality aggregate and roadstone, but it is no longer active. Villages on the western edges of the Quantock Hills, such as Bishops Lydeard, are mainly built from red Permian and Triassic aged sandstones.



Halsway Manor built of Devonian and Triassic red sandstones.



Plainsfield Gatehouse built from blocks of Cockercombe Tuff.

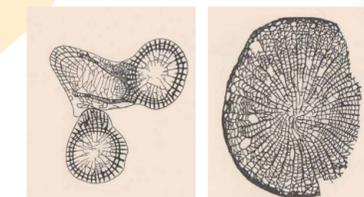
One of the more unusual and attractive building stones used in the Quantock Hills is Cockercombe Tuff. This distinctive greenish-grey volcanic rock was previously quarried at Cockercombe, and Plainsfield Gatehouse provides a wonderful example of its use.

In the southern and eastern parts of the Quantock Hills and surrounding fringes, the Morte Slates Formation was also quarried as a building and wall stone. The slates were used extensively in some villages such as Kingston St Mary and Broomfield.

LIMESTONES AND LIMEKILNS

Devonian limestones have been used for building farmhouses and walls, and occasionally churches, especially around Aisholt and Merridge villages. Smaller quantities of this stone were also burnt for lime and several former quarries exhibit remains of limekilns; a well restored example can be seen at the western end of Hawkridge Common.

Characteristically, many of the Quantock Hills limestones are a pinkish-grey colour, and some contain fossil corals indicating they were formed in a warm water, coral reef environment approximately 385 million years ago.



Drawings of cross sections through fossil corals *Thamnophyllum* and *Acanthophyllum* from Devonian limestones at Hawkridge Common and Holwell Combe



Restored Limekiln, western edge of Hawkridge Common.