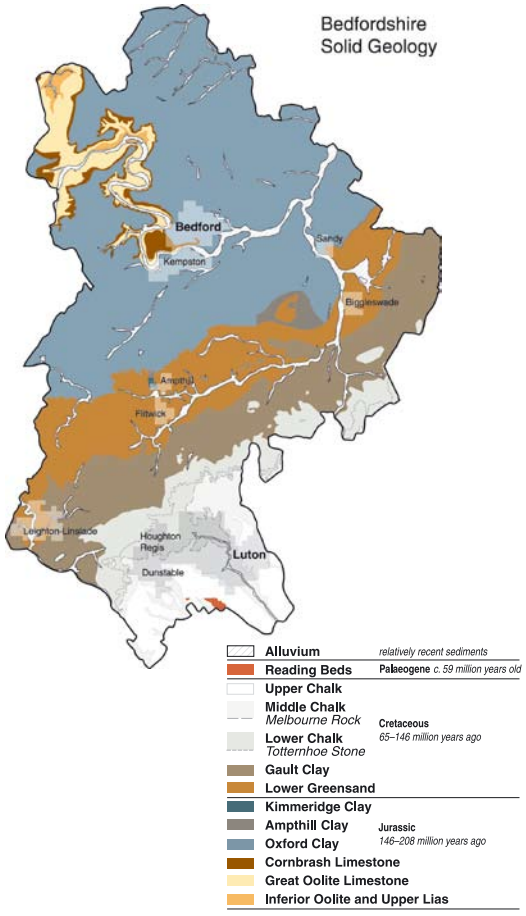
PRESENT

QUATERNARY
2.6 million years
TERTIARY
65 million years
CRETACEOUS
146 million years
JURASSIC
208 million years
TRIASSIC
245 million years
PERMIAN
290 million years
CARBON-IFEROUS
362 million years
DEVONIAN
408 million years
SILURIAN
439 million years
ORDOVICIAN
510 million years
CAMBRIAN
570 million years
PRE-CAMBRIAN
4.6 billion years

Bedfordshire in the Bahamas

The rocks of Bedfordshire date from the early Jurassic to the Tertiary Period, about 190 to 40 million years ago. (The rocks laid down during the late Cretaceous and Tertiary are missing in our area, worn away by time and the glaciers of the Ice Age) All these rocks are made from many layers of sediments – limestones, clays and sands.

During the Jurassic and Cretaceous periods what is now Bedfordshire was under water at the latitude of the modern Bahamas. The fossils found in the Chalk and the Jurassic clays tell us something about life in the oceans over a million years ago.



Bedford Museum is the best place (and the easiest) to see the remains of Bedfordshire's sea monsters and dinosaurs. Joining a BLGG field trip may give you the chance to see their remains *in situ*, buried in the sediments on the floor of the sea in which they lived and died. Alternatively, watch for fossils as you walk across the landscape. Ice age glaciers left fossils from the Jurassic clays of north Bedfordshire in glacial till and gravels; *Gryphaea* shells are so frequent that they've got the common name 'devil's toenails', and the fragments of belemnites were thought to be 'elfshot' (fairy arrowheads), or possibly the tips of lightning bolts. Flint is thought to be re-crystallised silica from Cretaceous sponges; some flints are casts of sea urchins *tests* (shells) and others contain hidden treasures: the remains of sponges or corals. The Chalk itself is made of untold billions of microscopic fossils, the skeletons of tiny algae. Our leaflet *Cretaceous Chalk: Dunstable and Whipsnade Downs* (available for download from our website) will tell you more.

The Bedfordshire & Luton Geology Group exists to encourage understanding of the geology and geomorphology of the county and to undertake site recording, interpretation, advice and education

Regionally Important Geological and Geomorphological Sites (RIGS) are places that reveal our geological past and are considered important enough to deserve conservation. They include sites where rocks can be seen (such as quarries and road cuttings) or where the geology or geological processes can be inferred from the shape of the landscape. Official RIGS are recognised by county councils and by Natural England.

For more information about the BLGG and our events as well as the geology and geomorphology of your area visit our website at

www.bedsrigs.org.uk

or contact B&LGG c/o Bedford Museum, Castle Lane, Bedford, Bedfordshire MK40 3XD.
Tel: 01234 353323; Fax: 01234 273401

Heritage Lottery Fund

Local Heritage *initiative*

Bedfordshire's Sea monsters!

Bedfordshire & Luton Geology Group

bringing landscape to life

The clear blue sky above this chalk rock near Totternhoe is a reminder that the Chalk was deposited at the bottom of a warm blue sea!

During the Jurassic and Cretaceous periods Bedfordshire's landscape was forming at the bottom of a tropical ocean. The fossil record can tell us something about the monsters that lurked in the depths!

Jurassic Bedfordshire: the open sea

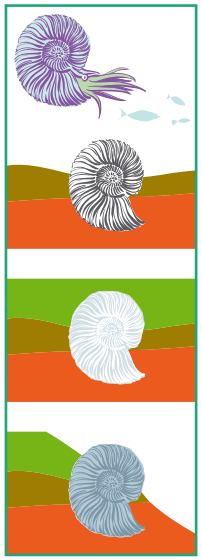
During the Bathonian stage of the Jurassic period (170 million years ago) Bedfordshire was covered with a shallow, warm sea. The limestones deposited at that time are discussed in the 'Jurassic Limestone' leaflet available from *www.bedsrigs.org.uk*.

As time passed the water deepened and dry land lay further away. 150 million years ago only small, light particles were carried far enough to fall on the limestone seafloor to become our Jurassic clays. The open sea was full of life, including crinoids, ammonites, oysters and other bivalves, many fish, and the ichthyosaurs and plesiosaurs that preyed on them – and each other.

Cretaceous Bedfordshire: a tropical ocean paradise

for marine life! Most of western Europe was covered by about 100m of tropical ocean, conditions similar to those off the modern Bahamas. Marine life continued to thrive, especially nanoplankton, whose fossilised skeletons are now the Chalk. At the end of the Cretaceous period something, probably a meteor impact, caused a mass extinction: terrestrial dinosaurs, most marine reptiles, ammonites, belemnites … all of these disappeared, leaving only their fossils.

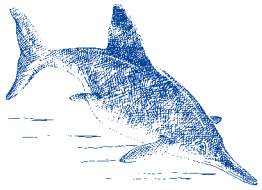
How do fossils form?



Most animals never appear in the fossil record: many things have to be 'just right' if a fossil is to form and be found. When an animal dies only its shell or skeleton remains: its soft body parts are eaten or rot away. If the hard remains are buried in sediment and remain undisturbed for thousands of years *permineralisation* may occur: calcite, iron and silica replace softer chemical compounds, literally turning the shell or bone to rock. Sometimes the remains dissolved entirely and the cavity filled with minerals to form a cast of the bone or shell. Eventually – if we're lucky – erosion or our activities may expose the fossil.

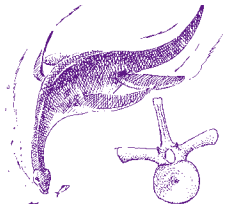
Some sea monsters

(more accurately, marine reptiles)



Ichthyosaurs

Icthyosaurs are known from both the Jurassic and the Cretaceous, when they reached 10m in length. With streamlined bodies resembling modern dolphins these predators may have reached 25mph chasing ammonites, belemnites and fish. They breathed air and gave birth to live young; some have been found with fossil baby ichthyosaurs within the body cavity. Parts of ichthyosaurs have been found in Bedfordshire's Jurassic clay.



Plesiosaurs

A long-necked plesiosaur looked like "a snake pulled through a turtle" – nothing like anything alive today, at least as far as we can tell from the fossils. Their long necks may have allowed them to snap up unwary fish or other prey. There were also short-necked plesiosaurs (known as *pliosaurs*). Pliosaurs from the Oxford Clay were among the largest known carnivorous marine reptiles: some may have been as large as the better-known terrestrial 'terrible lizards' such as *Tyrannosaurus*. Both types of plesiosaur are known from Bedfordshire.

Terrestrial monsters

Bedfordshire was under water but dry land was not far away. Sometimes the remains of dead dinosaurs washed out to sea: the bones of *Cetiosauriscus*, *Ornithopsis* and *Eustreptospondylus* have been found in the Oxford Clay brickpits of Peterborough, while *Lexovisaurus* (a small stegosaurus) and an ankylosaurus are known from the same clays in Bedfordshire. Dinosaurs are less common in the Chalk, but bones from an ankylosaur were found in Kent and fragments of pterosaurs that may have flown out over the ocean have been found in Cambridgeshire.

Jurassic clays in Quest Pit, Stewartby

Other sea creatures

Fossil shells, the casts of shells or other animals and trace fossils (the remains of burrows and other features that tell us about animal life) are found in both the Chalk and the Jurassic clays.

Ammonites and belemnites

These cephalopods were relatives of the squid and octopus. Ammonites are important because they are *zone fossils*: their shells changed rapidly over time, so if the same fossil is found in two locations we know the sediments are of the same age. Both were common in the Jurassic and Cretaceous

Crinoids and sea urchins

These are echinoderms, still living in the sea today. Both are far more frequent in the Chalk.

Molluscs

The hard shells of bivalves and gastropods are often preserved as fossils. *Gryphaea* shells (similar to oysters) are common in the Oxford Clay. Many different molluscs are known from the Chalk, most as casts although fragments of pearly shell may survive.

Fish and sharks

The teeth and scales of fish and sharks are more frequent than bones.

Gryphaea, *upper (flat) and lower (curved) shells*

Who ate what (or who)