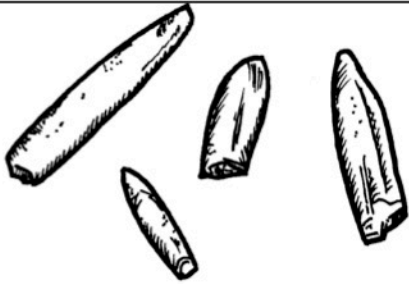


Geology fact sheet: BELEMNITES



Belemnite fossils

The cigar-shaped fossils that are commonly found in the Chalk are the remains of part of an extinct mollusc – more specifically, they are a sort of internal shell (called a guard or rostrum), similar to a cuttlefish bone. Mussels, scallops, snails, slugs, cuttlefish, octopuses, nautilus and extinct ammonites are all types of mollusc. The name 'belemnite' is derived from the Greek word for dart, referring to the pointed end of many belemnite guards.

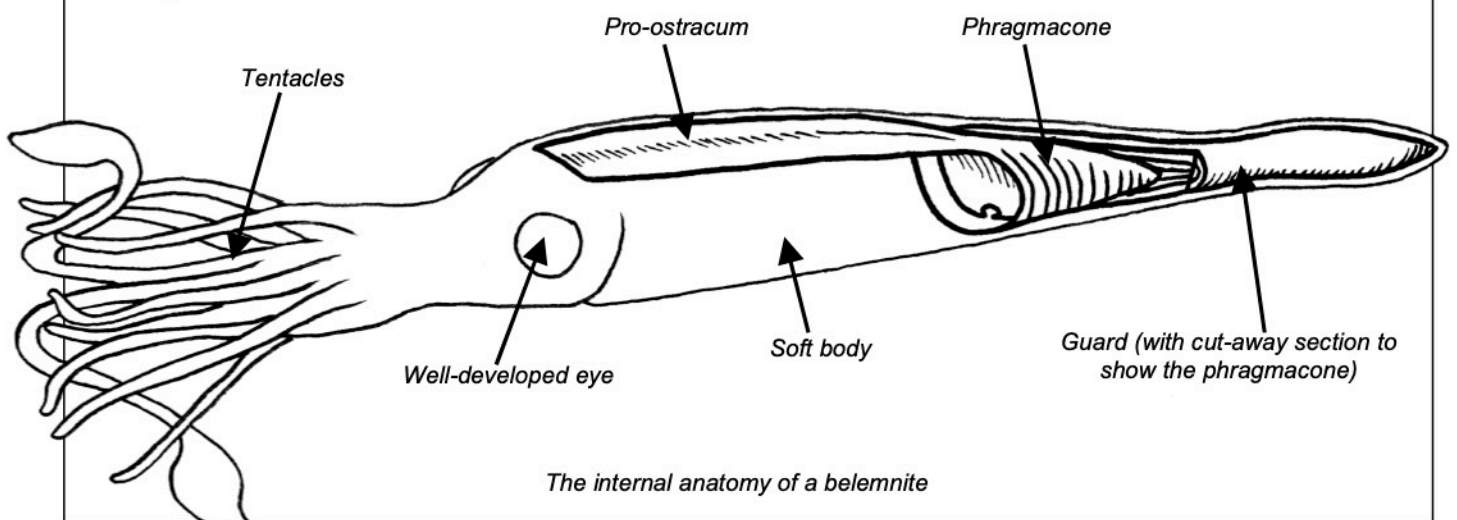
There is evidence that belemnites first appeared in the Lower Carboniferous period (about 350 million years ago), but they became common in the Jurassic and Cretaceous periods (from 213 to 65 million years ago). They died out early in the Eocene Epoch (by about 54 million years ago).

In any one layer of the Chalk, there is rarely more than a single species of belemnite present. This is very useful for correlating rocks of the same age. Belemnites lived in relatively shallow waters, close to the shore. Some rare fossils have shown that they possessed ink sacs, like modern squid and octopuses. Belemnite ecology closely resembled that of modern squid – they were predators, they grew extremely rapidly, they bred once, laid their eggs and then died. Belemnites were very common during the period when the Norfolk Chalk was being deposited, about 78 to 73 million years ago. In one very large quarry in south Norfolk (working on the basis that there were on average three belemnite guards per square metre) 100,000 to 135,000 belemnites are present.



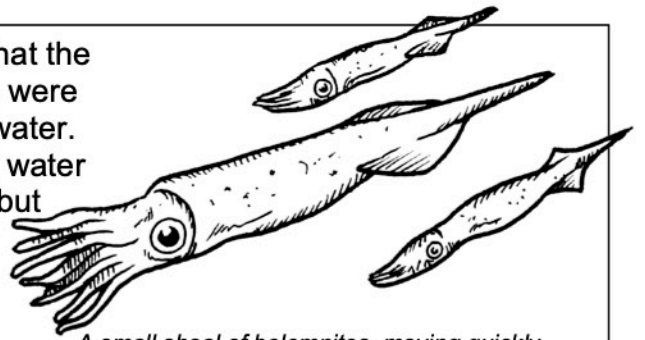
A belemnite within the Chalk at East Runton

Originally, the guard of the belemnite was made of alternating thin layers of calcite and organic material. Fossilisation re-crystallised the guard so that it is denser and heavier than it was in life. Fossil belemnites consist of crystals of calcite radiating from the centre of the guard. If you look at a complete guard, you can see that there is a circular hole at one end. This is the entrance to a conical hole called the alveolus. There is also a narrow slit connecting the outside of the guard to the alveolus. This is the ventral fissure, and indicates where the underside of the animal would have been. The phragmacone is the chambered, conical-shaped part of the shell. The external part of the phragmacone is quite fragile and is usually not found in fossils.



The internal anatomy of a belemnite

The purpose of the belemnite guard was to ensure that the belemnite's centre of gravity and centre of buoyancy were close to each other. This balanced them within the water. All cephalopods can manoeuvre by expelling a jet of water through a funnel in their body called the hyponome, but belemnites also had fins. Their streamlined, bullet-shaped body meant that they could move very swiftly through the water, much like squid can today.



A small shoal of belemnites, moving quickly through the water during the Cretaceous period

In order to accurately identify species of belemnite the guard has to be carefully measured at several key points. It also helps to split the fossil along its length to reveal further important anatomical features. However, in the Chalk of east Norfolk, the main belemnite genera are *Gonoteuthis*, *Belemnitella* and *Belemnella*. Of these, *Belemnitella* is by far the most common.

Belemnella



Gonoteuthis



Belemnitella



The most common types of belemnite fossil guards found in Norfolk (shown actual size)



Cross-section through a *Belemnitella* guard, showing conical alveolus and radiating crystals of calcite that make up the fossil (shown actual size)