DORSET TRACE FOSSILS

Traces found in the Mesozoic rocks in Dorset are between 65 and 190 million years old. The most easily seen traces in Dorset rocks are in sandstones, such as the 'doggers' in the Thorncombe Sands. On the beach under Thorncombe Beacon, west of Eype Mouth, these boulders can be seen from all sides, revealing trace fossils on the bedding planes and down into the rock. The fillings of the trails and burrows are shown by their contrast with the texture or colour of the host rock. In the orange Thorncombe Sand boulders the burrows tend to be deeper orange, perhaps due to the former presence of pyrite produced by the decay of organic material which has later oxidised.

In the Jurassic Lower Lias shales near Charmouth the small *Chondrites* burrows show up because they are filled with lighter grey material surrounded by dark grey shale.

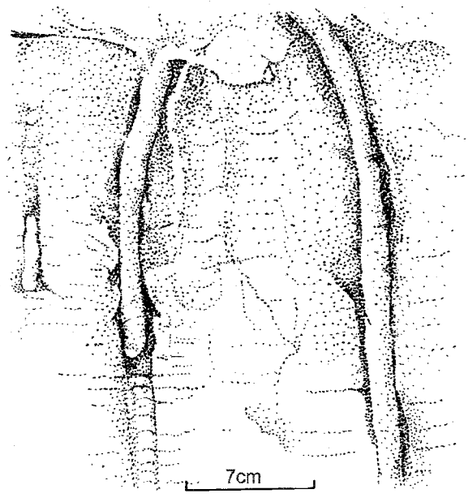
In the yellow sandstones of the Bridport Sands, both vertical and horizontal burrows are filled with harder material of the same colour so that the rain washes away the surrounding rock, leaving a honeycomb of burrows protruding from the cliffs at Burton Cliff. The sand itself seems the same as the host rock, but the burrow fill has become harder because it has more calcite cementing the sand together.

Sometimes a track is filled with softer sediment, which washes out quickly when exposed to the weather. A particularly good example of this is the dinosaur footprints in the Cretaceous Purbeck limestones, where the tracks were made in a shell sand which has since hardened into limestone and were filled with a soft marl or clay.

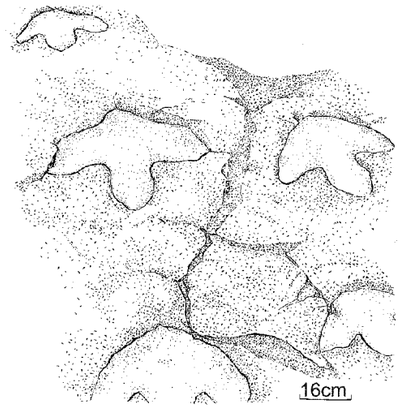
The names given to trace fossils rarely have any connection with the animals that made them. Early geologists were uncertain of the origin of the structures they saw, and even today we can only put forward theories based on the activities of present day organisms, except in the rare case of a creature dying at the end of its track!

The following are some examples from Dorset. Simple movement trails are the most common together with feeding and dwelling structures. Systematic grazing trails are also common, like the marks made by modern limpets on rocks.

The most common burrows seen in both siltstones and limestones are the single vertical burrows. These were made by several different



bivalves as a shelter from which to collect particles suspended in the water. Burrowing bivalves tend to have an elongated shape. Some could burrow down quickly using their shells, others fixed themselves to the bottom of the burrow using retractable threads with which to pull themselves down quickly in case of danger.



All the other traces were made by invertebrate animals (without backbones) but vertebrate animals, such as fish, reptiles and mammals also lived in the Mesozoic. Body fossils of these creatures are found where the sediment was suitable for their preservation, and trace fossils in the rare cases where footprints left a lasting impression. Dinosaur footprints in the Purbeck rocks show that there were many different species as many trackways have been uncovered by the quarrymen. They seem to be best preserved in limestones that consist of small shells cemented together with fine powdery calcium carbonate, that hardened quickly in a sub-tropical climate.

WHAT IS A TRACE FOSSIL?

Trace fossils are the record in the rocks of the activities of creatures who lived millions of years ago. The tracks and trails made by animals on the surface of soft sand or mud, or burrows within it, have been preserved in compacted rock over a long period of time. Actual remains of the animals, and the impressions left by their bodies on death, are known as 'body' fossils. Fossilised animal droppings are known as coprolites. Borings in shells, bones, wood, or already hardened rocks may be produced by plants or animals. They are created either by rasping with hard parts, such as teeth or claws, or by using chemicals to dissolve the substrate. In addition the roots of trees may run into mud which hardens into rock before the roots decay.

Most tracks or trails will be destroyed within a short time by wave and tidal action in the sea, or by rain and wind on land. Only very special conditions will lead to their preservation. Firstly the texture and water content of the sediment will decide whether a feeding trail or footprint will leave an impression. Secondly the habits of particular animals in excavating and keeping open a burrow in which to live and feed is important; simply displacing the sediment leaves no trace.

Many burrowers simply move through the sediment feeding as they go, excreting waste material behind them. This mixes up any layers within the sand, and is known as bioturbation. However, some animals line the burrow with mucus or pellets to keep it open, or bore into harder materials. It is then possible for sand or mud, perhaps of a different colour or texture, to fill the burrow or boring later. Lastly, the track or trail on the surface, or the burrow within the sediment, needs to be buried rapidly by more sediment to protect it. Given the right chemical conditions, the sediment may be cemented very quickly with calcite to preserve the traces.

The very earliest animals were soft bodied, but traces have been found of grazing trails in 700 million year old sandstones in Australia and China. Traces of the activities of hard-bodied animals, increasing in variety as these evolved, can be seen in Palaeozoic rocks, such as those in Wales and south west England.

Trace fossils are usually not collectable, but provide excellent opportunities for close-up photography, or sketching. **Please do not be tempted to hammer at the boulders – you will not succeed in removing the traces intact, and will in the process ruin them for the next visitor.**

Illustrations by
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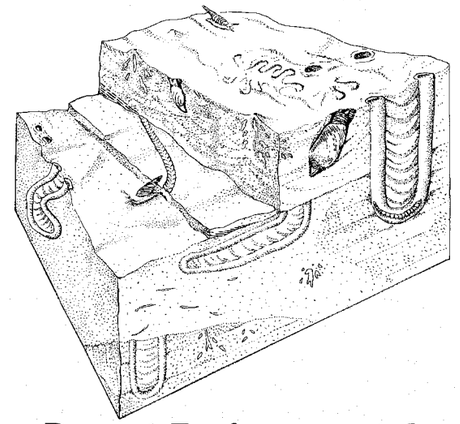
TRACE FOSSILS



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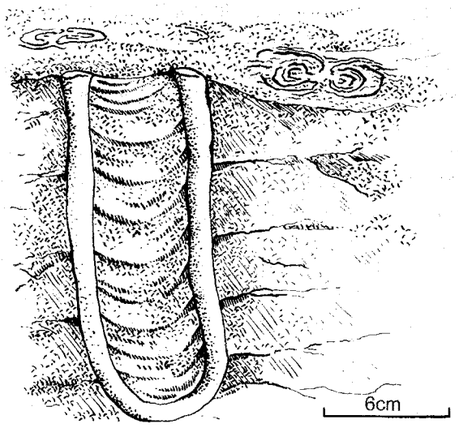
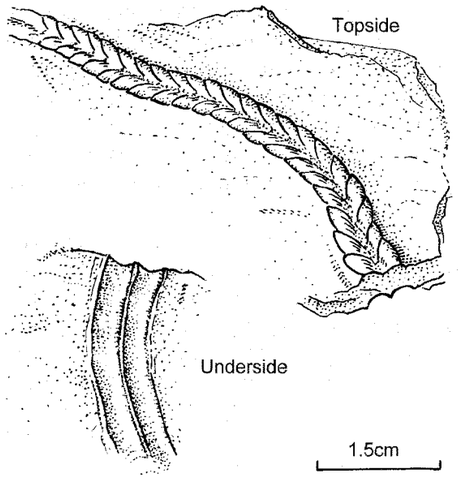
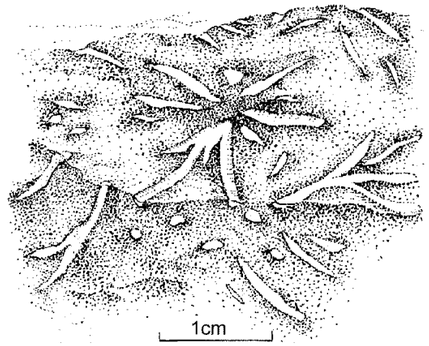
ENGLISH NATURE



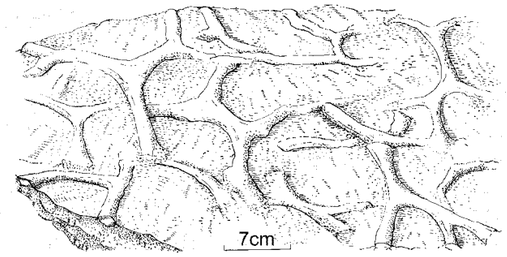
Diplocraterion is a vertical U-shaped burrow, probably occupied by a suspension feeding animal, in which the reworking of the sediment between the arms of the U is due to the upward, or, less commonly, downward migration of the U. The sand may accumulate or be swept away fairly rapidly in shallow seas and the animal will dig deeper, or move upwards, in order to maintain a constant depth in which to rest and reach out for food suspended in the water above. Examples of *Diplocraterion* may be seen at the top of the Belemnite Marls near Charmouth.



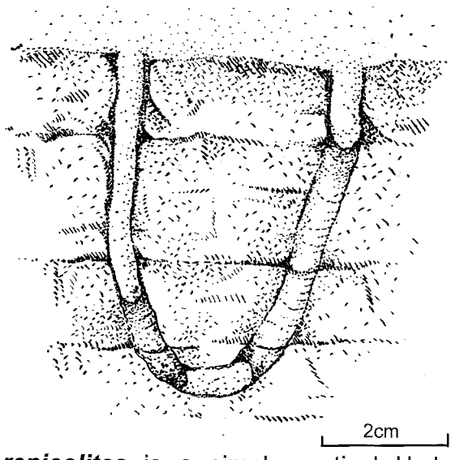
Gyrochorte looks like a fine plaited rope laid in a curve over the rippled sand. The thin 'tiles' on which it is found in the Forest Marble often show matching grooves on the underside. There are several suggestions as to the animal that may have made these marks, including a spired gastropod, a crustacean, or a worm. The thin 'tiles' can be found on the shore of the Fleet, and at Fault Corner east of Eype Mouth, where they weather out of the clays of the Forest Marble Formation.



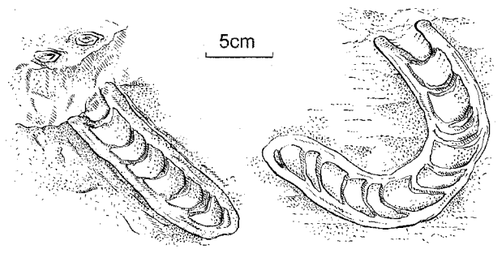
Chondrites is a system of branching tunnels starting from a central vertical stem, and fanning out obliquely or horizontally. The radial burrows branch again laterally, giving the impression that the occupant was reaching out from a central position. It is thought that a sipunculid worm could have lived in the centre, using a proboscis to feed on the particles in the sediment. The branching tunnels never cut each other, and were lined with mucus to keep them open as the proboscis was retracted. Small *Chondrites* appear as mottling within fine sediments, particularly light and dark grey in the Lower Lias and Kimmeridge Clays. Large systems can also be seen on the Middle Lias siltstone boulders on the beach west of Eype Mouth.



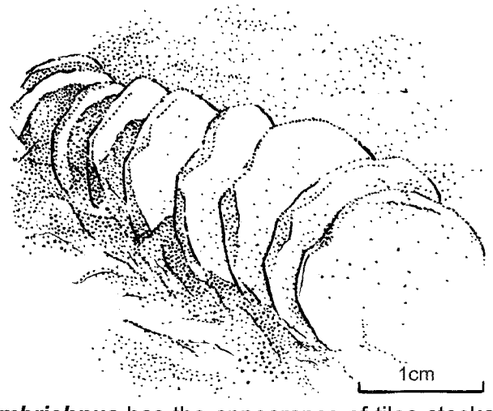
Thalassinoides is a quite large burrow system, with burrows 2 to 20cm diameter, showing Y-shaped branching. It is usually horizontal, following bedding planes. The burrow fill sometimes contains faecal pellets, or shows scratch marks on the walls. These clues have led to the conclusion that these burrows were produced by decapod crustaeans, similar to shrimps, and were used as a permanent dwelling and for feeding and brooding. Large *Thalassinoides* burrows have been found in sands which were deposited in environments affected by wave activity, smaller ones in quiet environments. In the Chalk many *Thalassinoides* burrows became filled with flint, possibly due to the presence of organic material. Strange shaped flints which have weathered out can be found over the Chalk uplands, or redeposited in Tertiary gravels.



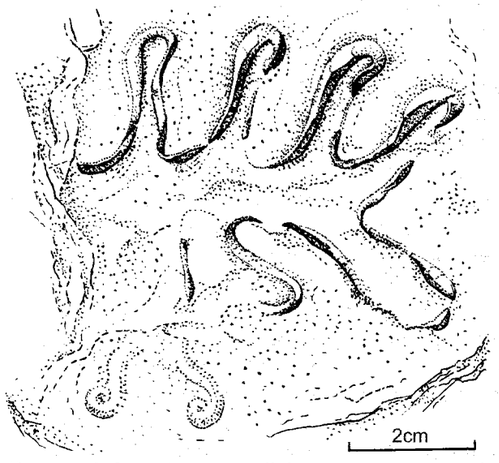
Arenicolites is a simple vertical U-shaped burrow without reworking between the arms of the U. The burrow was probably the dwelling of a detritus-feeding worm, which would shelter in the burrow, and come out on to the surface to feed on organic matter which had settled on the sea floor. They can be found in Corallian rocks between Weymouth and Ringstead.



Rhizocorallium is a large U-shaped burrow, up to 15 cm long, which is horizontal or oblique. The sediment between the arms of the U was reworked by the arthropod crustacean as the burrow was extended. The crustacean may have fed on material in the muddy sand during excavation of the burrow, and then have used it as a home while filtering food from the water above. *Rhizocorallium* is widespread in Jurassic rocks, particularly the Corallian and Portland Sand. It is one of the few trace fossils to be preserved in the clays of the Fullers' Earth, Oxford and Kimmeridge Clays.



Imbrichnus has the appearance of tiles stacked on one another along the length of the track. These may have been formed by a bivalve moving its foot forward, then contracting the muscle and pulling its body forward. These are also seen on the Forest Marble 'tiles', among many other traces perfectly preserved. The state of preservation suggests that the tracks and trails hardened and were swiftly covered by new sediment.



Phycosiphon is a small burrow system, where the animal was grazing systematically through the sediment. It consists of a series of tightly packed U-shaped loops very similar to the grazing trails of modern gastropods. They have been likened to antlers, and may be seen on the bedding planes of siltstones and sands from the Middle Lias.