TRACE FOSSILS

KEY DEFINITIONS

- Trace fossil = are fossils preserving the activity of the organism rather than the organism itself. They are evidence of fossil behaviour of the lives of the organism. They include tracks, trails, burrows, borings and excrement (coprolites).
- Coprolites = fossilized excrement.
- Tracks = footprints of the organism left behind in sediment from when it moved.
- Trails = are the impressions of whole animals travelling. This may be part or all of the animal dragging along the surface of the substrate.
- Resting traces = are a type of trail as the whole body of the animal comes to rest.
- <u>Bioturbation = refers to burrowing or working the sediment in a way that disrupts the bedding</u>. This is caused by the activity of living organisms.

Trace fossils provide glimpses of the nature and **behaviour** of ancient organisms in the geological record. They also help **determine palaeoenvironments**. Trace fossils have an exceptionally long fossil record, with evidence of some of the first **multicellular organisms**.

Many trace fossils may seem similar but are formed by different organisms. E.g. a burrow may have been inhabited by a **bivalve, crustacean or worm**.

If they were filled then the trace fossil may be seen on the **base of the infilling sediment**.

Crustacean = an arthropod of the large, mainly aquatic group Crustacea, such as a crab, lobster, shrimp, or barnacle.

Bivalve = is a class of marine and freshwater molluscs that have laterally compressed bodies enclosed by a shell consisting of two hinged parts. E.g. a clam, mussel or scallop.

HOW TO MAKE A TRACE FOSSIL

An organism walks across a soft, fine sediment, leaving the imprint of its feet. There is then a very small chance that a different sediment will infill these impressions before they are destroyed by water currents or wind. If they are infilled and buried, the trace fossil is found on the base of the infilling sediment.

Trace fossil morphology

Skolithos (Tube worm, vertical burrow)	Diplocraterion (U-shaped burrow)	Thalassinoides (Branching burrow)
Rusophycus (Trilobite resting trace)	Cruziana (Trilobite walking tracks)	

TYPES OF TRACE FOSSILS

Most trace fossils are found in low-energy environments where sediments are soft and very fine-grained (clay, mud or silt). This commonly includes marine environments. Although some terrestrial fossils can be found, they are rare. High-energy environments would immediately destroy any traces. Terrestrial environments are susceptible to weathering and erosion before fossils can be preserved.

Type of trace	Description	Conditions	Example	Picture
Tracks	Found on the base of bedding planes , imprints formed as the organism moved across sediment.	Soft or muddy, fine-grained, terrestrial or marine sediment	Usually the imprints of legs or feet.	
Trails	Traces made by the whole or part of the organism when at rest or travelling along sediment.	Soft or muddy, fine-grained, terrestrial or marine sediment	Resting positions showing Gill or leg structures A trilobite dangling its tail behind it Starfish impression	
Burrows	Vertical U-shaped, stacked or branching burrows. Maybe for dwelling, locomotion, protection or feeding.	The substrate must be soft sand or mud to allow for burrowing. Burrowing can mix layers of sediment by bioturbation .	U-shaped Diplocraterion, vertical Skolithos or branching Thalassinoides.	
Excrement (coprolites)	Faecal pellets (<10mm) and coprolites (>10mm) Evidence of large animals in the environment.	Quick burial is required to prevent decay or break up by currents	Dinosaur dung. Can be rich in phosphate .	
Root structures	Woody looking impressions in rocks or preserved as lignite.	Shallow marine, deltaic or terrestrial conditions.	Root often branching from trees or other plants	

INTERPRETING PALAEOENVIRONMENTS

A track of a dinosaur can give use information about that animal that made it -

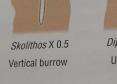
Shape of the soft parts	These are left as impressions in very fine sediment. The familiar three toes can often be seen along with
	impressions with claws.
Patterns of scales on the skin	Only rarely preserved in very fine sediments
Weight	Can be estimated by looking at the size and length of
	the feet.
Running or walking speed	This can be calculated by estimating the height of the
	animal based on its foot length. Generally, steps
	further apart mean that the animal was moving fast.



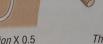
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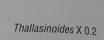
Figure 2 Dinosaur tracks and photographs showing dinosaur footprints











Branching burrow



Rusophycus X 1 Trilobite resting trace Figure 1 Trace fossil morphology



Cruziana X 1 Trilobite walking tracks



Figure 3 a Large U-shaped burrow into limestone infilled with clay and **b** Burrows both vertical and horizontal with sediment mixed by bioturbation