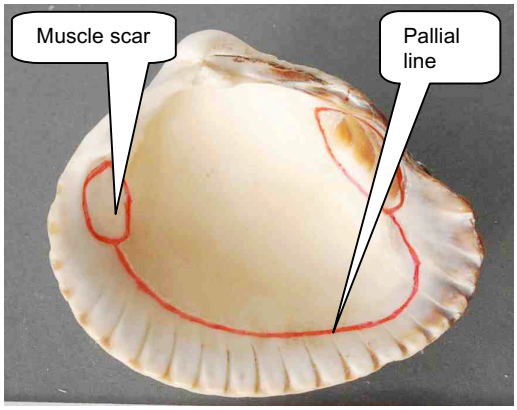
Sea shell survival

How are common sea shells adapted to their habitats?

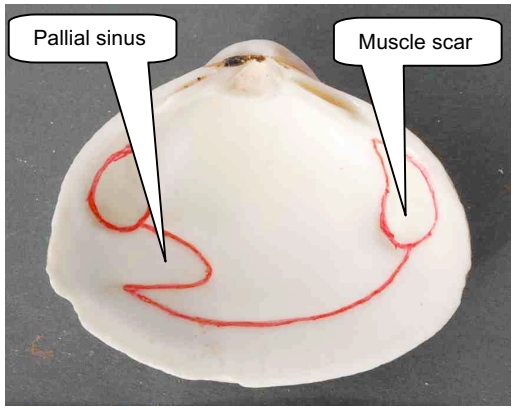
Living creatures are often beautifully adapted to live in particular habitats. Show pupils the pairs of photographs of three modern bivalve sea shells. Use the notes below the pictures to explain how the features can be related to the habitats in which the animals lived. In the photos of the interiors of the shells, the muscle scars and the pallial line have been marked in red ink. This line marks the outer edge of the soft parts of the animal. All the animals feed by filtering small food particles out of the sea water.

ai) Cockle shell (*Cerastoderma*) exterior



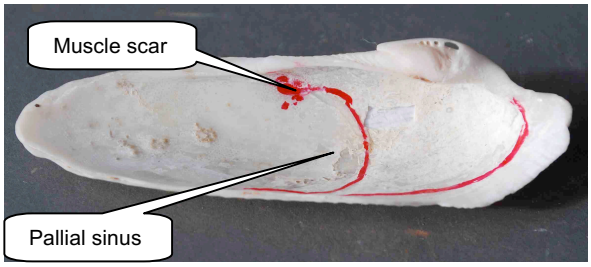
aii) Cockle shell (*Cerastoderma)* interior

bi) Triangle shell (*Spisula)* exterior



bii) Triangle shell (*Spisula)* interior

ci) Common piddock (*Pholas)* exterior



cii) Common piddock (*Pholas)* interior

Notes:
Cockle shells *(Cerastoderma)* have strongly ribbed shells. Each shell has two muscle scars, joined by a pallial line without any bulge (sinus) in it. *Cerastoderma* lives on a soft sea bed, and may even 'scuff' its way into the sediment for a short distance.
A triangle shell (*Spisula)* has thinner shells than *Cerastoderma* because it burrows deep into soft sediment, which gives it some protection. Each shell has a bulge in the pallial line, called a pallial sinus. This shows where it keeps two tubes, which it can extend up into the water to feed.

The common piddock *(Pholas)* has very thin shells, which do not close at the front, to allow a soft 'foot' to protrude, so that it can fasten onto a rock. The front edge is jagged, so that the animal can bore into solid rock, twisting round on its 'foot'. Its 'rocky home' keeps it safe from storms, and yet it can still feed by extending its feeding tubes up into the water.

Now show the class photographs 1 and 2 showing the exterior and interior views of four different bivalve sea shells. Ask them first to say which shells lived on the sea floor and which ones lived

in burrows in the sediment, or lived in holes which they had bored into the solid rock.
(*R has a thin shell and a very deep pallial sinus. It lived in a deep burrow in soft sediment. S has a strong shell and two muscle scars and no pallial sinus. It lived attached to rocks near the shoreline. T has a strong shell and no pallial sinus. It lived on or just below the soft sea bed. U has a very thin shell, with a jagged front edge and a large pallial sinus. It bored its way into solid rock and lived safe from storm action).*

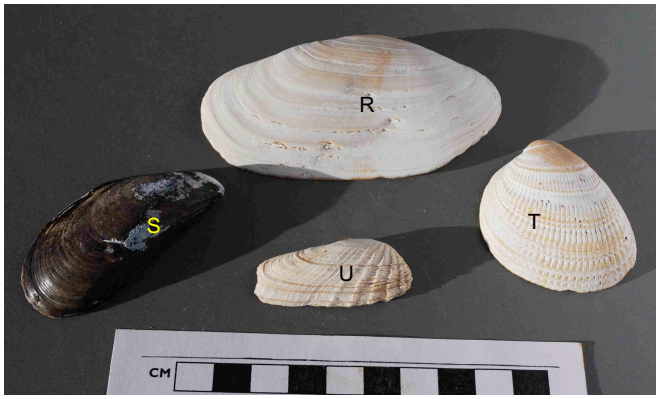


Photo 1: The exteriors of four bivalve sea shells

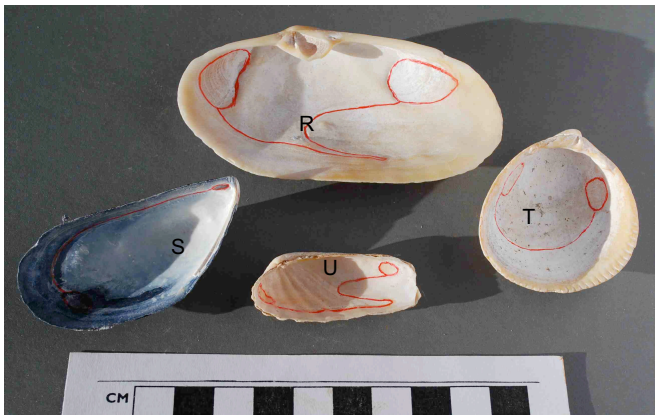


Photo 2: The interiors of the same four bivalve sea shells

Show the class Photographs 3, 4 and 5, with the captions. Ask the pupils which of the four shells shown in Photographs 1 and 2 could be expected to live in the tidal sand flat environment and which ones in the rocky wave-cut platform environment.

Photo 3: Students working (with permission) on a tidal sand flat in a river estuary, at low tide. They are looking at the animals in a block of soft sand which they have just dug out of a hole near their feet. (They replaced the sand and its animals afterwards)

Photo 4: The geologist is standing on the wave-cut platform near Whitby at low tide. The rock is a hard mudstone

Photo 5: A piece of mudstone broken off by storms from the wave-cut platform near Whitby (All photos: *Peter Kennett*)

Answers:
<u>Tidal sand flats</u>: Bivalve R was found living at about 10cm depth in the sand. Bivalve T was found at a depth of only a centimetre or so. There were no rocks for bivalve S to attach itself to and the sand was too soft for U to bore into it.
<u>Wave-cut platform</u>: Bivalve U was found living in the neat round holes like those shown in Photo 5 – it had used its jagged front edge to drill its way into the solid rock as it grew. Bivalve S was found attached to some of the boulders. The rock of the wave-cut platform was too hard for bivalve R to burrow into or for T to scuff its way into the top layers.

The back up

Title: Sea shell survival

Subtitle: How are common sea shells adapted to their habitats?

Topic: An introduction to the relationship between the features of shells of bivalves and their habitats.

Age range of pupils: 11 -18 years

Time needed to complete activity: 15 minutes

Pupil learning outcomes: Pupils can:
- observe close detail from photographs;
- relate the features of a shell to the animal which once occupied it;
- assign shells to the most appropriate habitats.

Context: Many marine animals are specially adapted to give them the best chance of survival in their habitats. These adaptations are reflected in their shell structure. This activity may be used as a prelude to determining ancient environments from the fossil remains or from the traces of similar organisms in rocks.

Following up the activity: Ask pupils to bring in any shells which they may have collected on holiday and see if they can allocate them to any of the modes of life in the examples shown in the photographs. Use the Earthlearningidea activity *Trace fossils – burrows or borings: what evidence do living organisms leave behind in rocks?* to apply these principles to trace fossils found in sedimentary rocks.

Underlying principles:
- Many organisms occupy specific habitats, to give them the best chance of survival.
- The shells of marine bivalves provide evidence of the arrangement of the soft parts, even when these have decayed away.
- Bivalves which live within the sea bed, either by burrowing into soft sediment or boring into hard rock, have long tubes called siphons, which can be extended into the water, so that they can feed and acquire oxygen.
- They have a space in the shell into which the siphons can be retracted, where the soft body is not attached to the shell – this space is outlined by the pallial line.
- Fossil bivalves usually display the same characteristics as living ones.
- The sea bed itself may retain evidence of the bivalve, even though the shell has gone.

Thinking skill development: Examining the structure of different bivalves involves skills of construction. Relating the examples in the photographs to pupils' own experience of coastal environments involves bridging.

Resource list:
- Copies of the photographs on pages 1 and 2.
- Optional – a selection of bivalve shells, collected from a beach.

Useful links:
http://www.nationalstemcentre.org.uk/elibrary/resource/730/life-from-the-past-introducing-fossils

Source: Written by Peter Kennett of the Earthlearningidea team.