Hands On Learning
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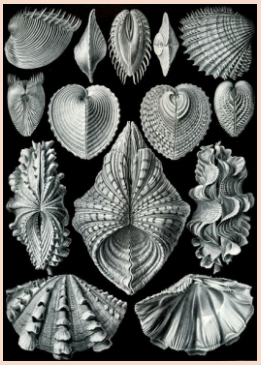
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BRITISH SEASHELLS Z15C

Human beings have hard bones inside their body to support and protect the soft, fleshy bits. Some animals, though, have a hard outer case to do the same job. Insects and molluscs both do this.

Most shells that you find on the beach were made by molluscs. Shells are usually made of a substance called nacre. Mollusc blood is rich in dissolved calcium and this, in the form of calcium carbonate, is one of the basic chemicals of the shell. Nacre is continually deposited onto the inner surface of the animal's shell and forms the iridescent layer known as Mother of Pearl. Shells may grow over time as the animal inside adds nacre to the leading edge near the opening. This causes the shell to become longer and wider to better accommodate the growing animal inside.

Univalves & Bivalves



All the shells in this box are from the seas around the British Isles. Shells from these seas tend to be less colourful and exotically shaped than those found in the Pacific and Indian Oceans. Animals with shells divide into two major groups univalves and bivalves.

Animals that have a single shell are known as univalves (or gastropods). Univalves have a shell which is in one piece and usually coiled or spiralled. Several species have an operculum that operates as a trapdoor to close the shell. Winkles, for example, are typical of this kind of animal. Limpets, too, are univalves, although their shell does not have a spiral shape. Univalves are the largest and most successful class of molluscs, with 60,000-75,000 known living species.

Bivalves have a two-part shell, with both parts being more or less symmetrical. Many of the shells in this box are from bivalves, even though in most cases only a single shell is included. The two shells are held together by a ligament that can look like glue oozing out between the two parts. The shells are held slightly open at rest, but can be kept closed by a pair of powerful muscles. They usually bury themselves in sand or other sediments and feed by siphoning and filtering small particles from water. These forms typically have a strong digging foot. Some bivalves can move by extending their foot, which then swells and acts as an anchor. The foot muscle is then shortened, pulling the rest of the animal after it. Some can swim by clapping their valves together. The bivalve class has 30,000 species, including scallops, clams, oysters and mussels.

Above: a drawing of a selection of bivalve shells

Reading Borough Council

Heritage Lottery Fund

Common European Oyster (*Ostrea edulis edulis*)



The European oyster is found along the western European coast from Norway to Morocco. It has been part of the human diet for many centuries. The Romans built ponds to stock and sort oysters and were very fond of them as a food item. They are still eagerly eaten today. (see photograph of one open, bottom right) During the eighteenth and nineteenth centuries the natural stocks were over-exploited and shortages prompted the development of artificial oyster beds.

Oysters feed by opening and drawing water in over their gills to filter food from it. Healthy oysters consume algae and other water-borne nutrients, each one filtering up to five litres of water an hour. Oysters breathe much like fish, using both gills and mantle. The mantle is lined with many small, thin-walled blood vessels which extract oxygen from the water and expel carbon dioxide. A small, three-chambered heart, lying under the abductor muscle, pumps colourless blood, with its supply of oxygen, to all parts of the body.

The native oyster usually inhabits water depths of between 8 and 25 feet (2-8 metres). The hard surfaces of oyster shells and the nooks between the shells provide places where a host of small animals can live. Hundreds of animals such as anemones, barnacles, and hooked mussels use oyster reefs as habitat. Many of these animals serve as food for larger animals.



The common European oyster is, like many molluscs, hermaphroditic - that is, it can change from being a male to a female and back again. Oysters generally change sex twice during a single season. They function as males early in the spawning season and later change to females and vice versa. They produce between 500,000 and 1 million eggs per spawning.

Portuguese Oyster (*Crassostrea angulata*)



This is not a native species, but it has been introduced into commercial oyster farms in British waters and colonies can survive for several years. It was first introduced from Portugal into the River Blackwater, Essex, in 1926. This colony was thought to have died out in 1965 because importations had ceased in 1962, but there was still a substantial population in the River Blackwater in 1970. It has been found in other scattered localities, including some estuaries of south-west England (Dart, Teign and Exe) and in the Menai Strait. The Portuguese oyster spawns at water temperatures of 18.5-24° centigrade and this seems to be the main reason for their limited success around the coast of Britain. Adults may persist for years, but without reproducing. For example, specimens from a disused oyster farm at Tighavullin, Scotland, were observed in 1993, nine years after the farm was shut down, though no young were observed.

Common Limpet (*Patella vulgata*)



The common limpet is a well-known seashore species and can be found attached to the rocks all year round. It is abundant on all rocky shores exposed to the waves but is less common on shores with a dense growth of seaweed. Limpets have a conical shell with coarse ridges radiating from the apex. They feed by grazing on algae found on rock surfaces. They scrape films of algae from the rock with a ribbon-like tongue with rows of teeth.

Limpets resist drying out when the tide recedes by grinding their shell into the rock until it is a perfect fit and clamping down with their strong muscular foot until the tide comes in again. They are territorial and return to the home scar they have created by following the trail of mucus they left as they went foraging whilst the tide was in. Shells situated higher up on the shore tend to have taller shells than those on the lower shore. The underside of the muscular foot on which the limpet moves around is yellow, orange or brown and often has a green or greyish tint. They change sex at 4 years old, becoming female, and can live up to 17 years where environmental conditions lead to slow growth.

American Slipper Limpet *(Crepidula fornicata)*



This is another foreign species which has been introduced into British waters. As the name suggests, it is native to the coasts of north America. Its first known occurrence in Europe was in 1872 in Liverpool Bay and it is known to have been introduced to Essex between 1887 and 1890. The individuals in Essex from which the spread of *Crepidula* started were introduced in association with imported American oysters. The species may also have been transported on ships' hulls and in ballast water. By the end of the twentieth century the American slipper limpet was present on the east coast south of Spurn Head, the length of the south coast and northwards along the west coast to Cardigan Bay. Its success is probably due to a lack of predators and its unusual method of reproduction, which relies upon individuals settling upon each other and being assisted through their close proximity. Slipper limpets are commonly found in curved chains of up to 12 animals. Large shells are found at the bottom of the chain, with the shells becoming progressively smaller towards the top.

Razor Shell (*Ensis siliqua*)



A familiar shell around the coast of Britain. The living creature, though, is less commonly seen as they live in sand, lying buried with only a siphon protruding from the sand. The siphon is used to suck in currents of water from which they extract oxygen and food. Even the siphon is rarely seen, as razor shells are vibration and light sensitive and will rapidly retreat into their burrow before it is possible to get close. They can burrow faster than a person can dig. Normally the only sign of their location is a small spout of water as the razor shell burrows or a figure-of-eight in the sand formed by a razor shell that had lain on the surface and then pulled itself upright before burrowing. Maturity is reached after three years and breeding takes place during spring. The life span of the razor shell is thought to be around 10 years.

Winkles (*Littorina littorea*)



The common winkle is also known as the edible winkle, as it has long been gathered from the shore for food. They are found on both rocky coasts and muddy habitats. They can also be found in brackish water. Like its land relation, the snail, the winkle moves on a muscular, fleshy foot lubricated by a film of mucus. When not walking, it often nestles in a crack or gully and seals the gap between its shell and the rock with mucus. They eat with the help of their radula (tongue) which they use to scrape algae from rocks.

Common European Edible Cockle (*Cerastoderma edule*)



This well-known edible cockle has two shells with prominent ribs and concentric growth-lines. They live on the middle and lower shore, where they burrow into soft sand, mud and muddy gravel to depths of less than 5cm. They are often found in huge numbers in estuaries and other sheltered inlets.

The common cockle is a suspension feeder, filtering organic matter from the water. The sexes are separate, and adults typically begin to spawn in their second summer. Growth rates vary with the season; in winter there is very little growth, and this leads to the marked growth-bands on the shell. The typical life-span of this cockle is 2-4 years, although they may live for 9 years or more.

Cockles are preyed on by oystercatchers, crabs, shrimps and flatfish. They are also popular as a food with humans and have been collected and sold for hundreds of years. Mechanised forms of collecting, using tractors and hydraulic dredging, have led to over-exploitation. In some areas, concerns about over-collecting have led to measures that control the numbers of cockles harvested and the methods used. In Scotland, for example, dredging with vehicles is banned, and hand gathering is the only method allowed in some parts of England and Wales.

Spiny Cockle (*Acanthocardia aculeata*)



This is not a widespread species around Britain. It has been recorded as far north as Loch Ewe in Scotland, but it is more common in pockets along the south coast and off the Isles of Scilly.

Acanthocardia aculeata has a solid shell, with 20-22 prominent radiating ribs, each of which carries a row of sharp spines down its centre. In the Mediterranean, where this species is much more common, these spines can be quite prominent, but this example has been well worn and the prickles are most obvious along the side ribs. There are also concentric growth rings covering the surface of the shell, which are well defined between the ribs.

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Dog Cockle (*Glycymeris glycymeris*)



This species is found around Shetland, Orkney and along the south and west coasts of Britain. It is a shallow burrower in fine shell gravels or sandy/muddy gravels and can be found offshore to approximately 100m depth. The shell is thick, robust, almost circular in shape and up to 6.5cm.

Great Scallop (*Pecten maximus*)



The scallop is an unusual bivalve in that the two shells are not symmetrical, one of them being flat and the other curved. Contrary to expectations they spend most of the time resting on the curved shell in self-dug depressions on the sea bottom, so that the flat shell is parallel to the sea-floor. Sand, mud, gravel or living organism cover the upper shell so that only the opening between the shells (with tentacles and eyes protruding) remains visible. When disturbed the animal retracts with a quick movement into its valves and becomes virtually undetectable.

Both a flat and a curved shell have been included in this box. There is also a larger sample, which has been included to show something of the size that they can reach. They may reach a diameter of 17cm, although this example has a diameter of 14cm and has not yet attained its full complement of 15-17 ridges radiating from the dorsal margin.

Scallops are hermaphroditic and both sexes produce roe (eggs) whose colouring depends upon the parent's (current) gender. Red roe is made by females and white by males. They reach sexual maturity after several years and may live up to 18 years, with their age reflected in the concentric rings of their shells. Scallops are a popular seafood and in some places have been over-exploited.

The scallop shell is the traditional emblem of Saint James the Great and medieval Christians making the pilgrimage to his shrine at Santiago de Compostela in Spain often wore a scallop shell symbol on their hats or clothes.

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Dog Whelk (*Buccinum undatum*)



Another very common British shell. Beneath its familiar surface, however, lurks a fierce predator. It preys on a variety of mussels, tubeworms, and even other dog whelks. It either bores a hole in the shell of its victim, or prises open its lips to get at the soft flesh. When a hole has been formed paralysing chemicals and digestive enzymes are secreted inside the shell to break the soft body down into a mush which can be sucked out with the proboscis.

Whelks attack a mussel by waiting in front of it until it opens its shell halves. Then it is already too late. The whelk pushes a tube shaped organ called a sipho between the shell halves and prevents the mussel from closing. Afterwards a snout with a rasping tongue (called a radula) follows the sipho. With its long sharp dagger-shaped toothlets the whelk rips pieces of flesh from the mussel's body. Sometimes the mussel tries to stay closed until the whelk moves on. Unfortunately mussels cannot breathe with their shell halves closed and at some time have to open the shell in order not to suffocate. It takes about a day for a whelk to eat a barnacle, although larger animals such as mussels may take up to a week to digest.

The colour of each individual is dependent on its food. When it feeds mainly on mussels then the shell is dark, but when it lives on barnacles it is off-white, or yellow. A striped shell suggests a varied diet. This example seems to have preferred barnacles!

Whelks, in turn, are eaten by a number of other animals, including various species of crabs and birds. Protection against attack by crabs which attempt to pull the soft body out through the shell opening can be afforded by growing teeth around the edge of the opening. Many predators cannot smash the strong shell of an adult dog whelk, but young whelks are vulnerable to attack from many predatory species. Eider ducks and various other birds simply swallow the entire body with its shell, while oystercatchers and various lobsters are often capable of crushing or breaking the shells. In general, the dog whelk can be thought of as being vulnerable to birds when out of the water and to crabs when in the water.

Common Mussel (*Mytilus edulis*)



This familiar bivalve occurs in huge numbers around the coast of Britain. It anchors itself firmly to the rocks by its tough byssus thread. This anchor is secreted by a special organ and is strong enough to resist a forcible pull, but is attached loosely enough to allow the mussel to swing round to meet the thrust of the moving waters with its narrower end. It feeds on plankton and other microscopic sea creatures syphoning water through its body. *Mytilus edulis* usually lives in the area between high and low tide, where it can form extensive beds dominating the rock surface. If need be, it can live high on the shore because it is tolerant of desiccation and frost. It is, however, susceptible to predation by starfish, dog whelks, shore crabs and various birds. Mussels on exposed coasts are often free of predators, while those in sheltered waters may suffer extreme predation. This kind of mussel is often harvested, cooked and eaten.

