Hands On Learning
with Reading Museum Service

SHELLS Z15/B



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, as well as many other groups of animals.

Most shells that you find on the beach were made by molluscs. There are said to be about 112,000 species within this group, including species of squid and octopus. True, octupuses and squid have soft, shell-less bodies, but they did have shells once, although over time they have evolved so that they no longer have them!

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.



Most of the shells in this box are from the warm Indian and Pacific Oceans. They are more colourful and strangely shaped than most of the shells that are found in the North Atlantic and around the coasts of Britain. When they had a living creature inside they would have been even more exotic. They are frequently encrusted with other shells and weed, and their flesh, which protrudes from the opening, is often brightly coloured and elaborately folded.

Univalves & Bivalves

Animals with shells divide into two major groups univalves and bivalves.

Animals that have a single shell are known as univalves. Univalves have a shell which is in one piece and usually coiled or spiraled. Several species have an operculum that operates as a trapdoor to close the shell. Winkles 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.

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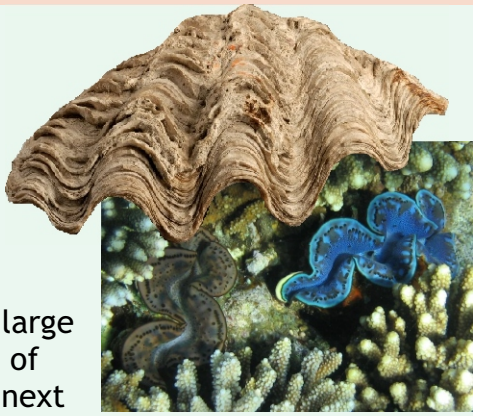
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Bivalves have a two-part shell, with both parts being more or less symmetrical. Some of the shells in this box are from bivalves, even though in most cases only a single shell is included. The two shells are held together by a ligament that can look 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 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 swells and acts as an anchor, the foot muscle is then shortened. Some can swim by clapping their valves together. The class has 30,000 species, including scallops, clams, oysters and mussels.

Small Giant Clam (*Tridacna maxima*)



Above: A living Tridacna gigas.

The largest living bivalve mollusc is the Giant Clam (*Tridacna gigas)*, which can measure as much as 1.5 metres (5 feet) across. At less than a third of the size of *Tridacna gigas*, the confusingly named Small Giant Clam (*Tridacna maxima*) is still impressive. As an adult, it has a large shell that adheres to a rock by its byssus - a tuft of long, tough filaments that protrude from a hole next to the hinge of the shell. When open, the bright blue, green or brown mantle is exposed and obscures the edges of the shell with its prominent and distinctively furrowed edges (see picture). The bright colouring of the mantle is caused by iridophores - pigment cells which are thought to protect the clam from the effects of intense light. The small giant clam siphons water through its gills to extract oxygen and to feed on algae.

Squamosa or Fluted Clam (*Tridacna squamosa*)



The Squamosa Clam gets its species name from the Latin word for scale, *squamosa*. Numerous rows of large scales cover its entire shell and are often used as shelter by other organisms, such as small crabs, other clams, and other invertebrates. In this case the fluted scales have been worn down. The shell is symmetrical, and the matching growth pattern in its shell allows it to close together very tightly when it needs to. The Squamosa Clam is often found living amongst *Acropora* coral, anchored by its byssal filaments. It has a wide byssal opening and long tentacles surrounding its incurrent siphon. The Squamosa Clam can grow up to 12 inches (6 cm).

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Ram's Murex (*Chicoreus ramosus*)



This is one of many species which belongs to the large Muricidae family. At least 1,000 species are known. The shell spire is usually ornamented with protective knobs, ribs, or spines. Most species are carnivorous, feeding on other molluscs and on barnacles.

The Ram's Murex is also known as the Giant Murex. It is found in the Pacific and Indian Oceans and the Red Sea.

Tiger Cowry (*Cypraea tigris*)



Cowry shells are found chiefly in tropical regions. The shell itself is almost always smooth and more or less egg-shaped, with a long, narrow, slit-like opening. Most varieties have a porcelain-like shine and many have colourful patterns.

The Tiger Cowry is probably the best known of all the cowries and the most variable in size, shape and colour. It is found throughout the Indian and Pacific Oceans. It can be seen under rocks or resting on soft corals during the day and foraging for food at night.

Bearded Thorny Oyster (*Spondylus barbatus*)



Thorny oysters have radiating ribs which bear pointed spines. There are many species of thorny oyster and they vary considerably in appearance and range. They are grouped in the same superfamily as the scallops but like the oysters they cement themselves to rocks, rather than attaching themselves by the tough filaments known as a byssus. Their key characteristic is that the two parts of their shells are fixed together with a ball and socket type of hinge, rather than a toothed hinge, which is more common in other bivalves. *Spondylius barbatus* is found in the sea off Japan and south-east Asia.

Dolphin Shell (*Angaria delphinus*)



One of several similar species which are native to the Indo-West Pacific region.

Pilgrim Scallop (*Pecten jacobaeus*)



Two members of the scallop genus *Pecten* occur in European waters. *Pecten maximus* is largely an Atlantic species whilst *Pecten jacobaeus* is almost completely confined to Mediterranean waters despite a slight overlap of distributions in the western Mediterranean.

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 organisms 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.

Scallops are hermaphroditic and both sexes produce roe (eggs) whose colouring depends upon the parent's (current) gender. Red roe is that of a female, and white, that of a male. They reach sexual maturity after several years, and may live to be as old as 18 years of age, with their age reflected in the concentric rings of their shells. Scallops are a popular seafood and in some areas 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.

Common Pacific Vase (*Vasum turbinellum*)



This is one of the most common Vase shells of the Pacific. It ranges from East Africa throughout the Indo-pacific to western Polynesia. In some regions it is abundant. It lives in the intertidal zone to a depth of about 3 metres. It remains hidden during the day under coral rocks and boulders and comes out at night to find food.

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Nicobar Cone (*Conus nicobaricus*)



The *Conus* group is one of the most popular with shell collectors as they are generally beautifully coloured and patterned. All members of the group are carnivorous, generally eating marine worms, small fish, and even other molluscs. They kill their prey by injecting poison with a harpoon shaped barb or tooth. Some species are able to catch fast-moving prey such as fish. Most of them are not harmful to humans, but a few species can cause death. The picture to the right shows a Geographic Cone (*Conus geographus)*. This *Conus* species is highly venomous and is known colloquially as the Cigarette Snail, in the belief that the victim will only have enough time to smoke a cigarette before perishing! *Conus nicobaricus* is dangerous, but not as deadly as the the *C. geographicus*. It is found in the eastern Pacific and the Phillippines.

Hebrew Cone (*Conus ebraeus*)



Another Conus species from the Indo-Pacific region. A small, chunky shell with three distinctive bands of chevron markings. It lives in shallow waters down to about 3 metres and feeds on worms.

Sunrise Tellin (*Tellina radiata*)



A West Indian marine bivalve with a smooth shell marked with radiating bands of varied colours resembling those seen at sunset or before sunrise. It is generally found on mudflats, although it occasionally turns up on sandy beaches.

Lamark's Cowry (*Erosaria lamarckii lamarckii*)



Erosaria lamarckii lamarckii can be found off the coast of East Africa. An intermediate zone separating it from *Erosaria lamarckii redimita* of India, Thailand and Indonesia probably stretches from northern Kenya to Pakistan. The classification of shells is difficult and contentious and sometimes it is difficult to distinguish separate species.

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Black Lip Pearl (*Pinctada margaritifera*)



Above: Looking for pearls.

There are several species of oyster which produce pearls and this is one of them. The black lip pearl oyster is a bivalve which is native to the Pacific Ocean.

The most striking feature of the example in this box is the thick layer of iridescent nacre, popularly known as Mother-of-Pearl, although in fact jewellers make use of such material from a variety of shells, including from species which do not produce pearls. In traditional Pacific societies the shell was used to make jewellery, decorations and tools such as fishing hooks and knives. With the coming of European ships the demand for the shell increased rapidly for use as buttons and decorative inlay. As a result of this over-fishing, many areas of the Indo-Pacific have very low populations of black lip pearl oysters today.

Pearls are formed from the same material that makes up the inner layers of the shell. They are made naturally when the oyster is irritated by the presence of a foreign particle in its body. This is usually a small piece of rock or a grain of sand. To get rid of the irritant, the oyster lays down a layer of the shiny, iridescent nacre around the particle to form the pearl. Natural pearls are extremely rare (1 in 2,000 oysters may have one) and are generally small and irregular in shape. However, such was their value that researchers in the early 1900s found a way to implant a nucleus into pearl oysters that would produce a round pearl. Oysters were now more valuable alive than dead as they could be used to grow the precious pearls rather than just being sold for the shell. This revolutionised the pearling industry, putting the emphasis on farming pearls rather than collecting them from the wild. It takes an oyster about four years, on average, to create a pearl.

Saburon Helmet (*Phalium saburon*)



A rare 'bonnet' shell, which lives on deep sandy mud bottoms off the coast of Tunis.

Tabulate Nutmeg (*Scalptia contabulata*)



One of a range of 'nutmeg shells' from the Indo-Pacific region.