JELLIES – ANCIENT OCEAN DRIFTERS by Helen Lockhart©

Introduction

Most people are familiar with jellies as the transparent gelatinous lumps washed up on beaches. Others have painful memories of having been stung by a jelly or bluebottle whilst swimming in the sea. Few will have had the opportunity to view the living animal in its natural environment beneath the waves.

In the open oceans, some 2000 species of jellies pulsate with life as they drift with the ocean currents. The variety of designs and the luminescent colours of these other-worldly creatures will astound even the most fertile of imaginations. In fact it is said that some of the weird futuristic designs of space ships seen in science fiction movies are inspired by the body structures of jellies. Simple in form and of fragile make-up, these animals have survived some 650 million years on this watery planet with little change to their lifestyles or forms.

Structure

Although often referred to as 'jellyfish', they are not fish at all, but are related to sea anemones and corals (falling under the phylum Cnidarians). This group share the characteristics of a simple body structure (two cell layers only), have no specialised organs for respiration and excretion and possess highly specialised stinging cells.
Jellies have a simple body structure which is bell-shaped with long tendrils (tentacles) floating down from the bell. There are only two cell layers, an outer protective layer called the ectoderm and an inner layer of cells which form the body organs (the endoderm). A jelly-like substance is sandwiched between these layers and it is this which keeps them afloat. The cavity in the centre of the body functions as the gut, to which the only entrance is the mouth (there is no anus). Jellies do not have a liver, pancreas or intestine which are vital digestive organs in other animals. Fortunately, they do not produce bulky waste products, as this would make it difficult for them to stay afloat.

There are no specialised organs for respiration i.e. lungs or gills. It can almost be said that jellies breathe with their entire bodies by a process of osmosis. The walls of the body and tentacles are so thin that oxygen and carbon dioxide can easily pass through.
The senses in jellies are fairly limited, but they make adequate use of their tentacles as touch receptors. These receptors are used to capture food and to detect vibrations in the water caused by fish, crabs and other animals. Whilst they have no eyes, they do have light sensitive organs on the outer layer of their bodies. These organs do not sense shape or movement, but enable jellies to distinguish between light and dark. They orientate themselves in the water by using sunlight as a compass.

The most unique feature of jellies is their stinging cells, known as nematocysts. These highly specialised cells are situated all over the body, but mainly in the tentacles. Each cell consists of a capsule inside which are long coiled threads. Attached to these is an array of barbs, hooks or spines. When the cell is stimulated by another animal or by certain chemicals in the water, the thread is discharged like a bullet which penetrates the

flesh of the victim. It is not known whether the 'explosion' of the thread from the capsule is triggered by increased water pressure in the capsule or whether the muscles surrounding the stinging cell contract to fire it. However, the effects are immediate as a neurotoxic poison paralyses the victim. This potent system can immobilise relatively large prey.

Feeding habits

Jellies feed on all kinds of marine animals, ranging from microscopic plankton to large fish and even other Jellies. They employ several methods to capture their prey. Some swim to the surface and then descend slowly, collecting food in the tentacles. Others spread their tentacles out beneath their bodies and prey is trapped in a similar way to that caught in a spider's web. Some jellies, such as the moon jelly, do not rely on their tentacles to the same extent. The body is covered with a slimy mucous substance and tiny plants and animals become trapped in this. The food is then swept up from the body to the mouth by millions of tiny hairs known as cilia.
One species feeds in a manner similar to that of a sponge. This jelly has no tentacles, but has a long mouth tube which is perforated by a stupendous number of little mouths. Water is sucked into these mouths and the animals and plants suspended in this water are then digested.
Another jelly exhibits a rather strange feeding behaviour – it lies upside down on its bell on the sea floor and using its extended arms, ingests drifting plankton.

Movement/ Propulsion

Jellies in motion are graceful to watch in their tranquil environment. They seem to move through the water with little effort. Some time is spent simply drifting with the ocean currents, but they do actually swim. Jellies swim by contracting the muscles on the rim of the bell or 'umbrella'. The movement resembles that of an umbrella being opened and closed very slowly. It is co-ordinated by a simple nervous system and by the sensory organs on the outer layer which are sensitive to light, gravity and chemicals in the water.

The mobile jelly is known as the medusa. This is the adult phase in the lifecycle of the jelly. The medusa reproduces sexually whilst the polyp reproduces asexually.

Reproduction

Having now realised just how elementary the body structure of a jelly is, one probably wonders how these delicate animals reproduce. Jellies are either male or female. The eggs and sperm are contained in gonads within the inner layer of the medusa body. These gonads are often brightly coloured. Once the eggs and sperm have reached maturity, they are released through the mouth into the sea. After fertilisation, they begin a series of cell divisions which finally result in an embryo (sexual reproduction). However, the embryo does not give rise directly to a baby jelly, but rather becomes a tiny, flat creature called the planula. The planula is covered with tiny hair-like cilia which beat rapidly, enabling the planula to swim great distances. It makes its way down to the seabed where it actively searches for something to which it can anchor itself. Once attached, the planula begins to develop into a polyp, just like an anemone. The polyp

may live in this state for several years, feeding on microscopic shrimp-like organisms and other tiny marine animals. Each polyp is able to produce other polyps through 'budding' (asexual reproduction). During this process, new polyps develop off the body wall of the first polyp. In some species this is similar to a branch growing out from a side of a tree. In other species, such as the moon jelly, the polyp then begins to develop a series of grooves which become deeper and deeper until they cut right through the body of the polyp. As a result, a pile of coin-shaped structures in stacks is formed. Each of these 'coins' is in fact an individual baby jelly. It can now break away from the stack and start life as a free-floating jelly.

Blue bottles & Portuguese man-of-war – mistaken identity

A common sight on the beaches of South Africa is blue bottles which are incorrectly referred to as jellies. Bluebottles and Portuguese man-of-war are not true jellies, although they belong to a related group (the Coelenterates). The Portuguese man-of-war is so named as the early English sailors (circa 1400) thought it looked similar to a caravel, the small ship used by the Portuguese to explore the seas.
Although most people tend to think of bluebottles and the Portuguese man-of-war as one and the same, they are two distinct species (*Physalia utriculus* and *Physalia physalis* respectively).

Although many people think that these are single animals, both are actually a colony of individual polyps living together as a single unit (a commune). There can be up to a thousand individuals living together in this manner, each dependent on the other and acting as a single animal. In order to simplify this unique living arrangement, it is easy to think of each individual as a 'person'. There are four different types of 'persons', each fulfilling a particular role.
One 'person' acts as the float which is inflated with gas and acts like a sail. Some species are able to regulate the gas content of the float so that the colony can sink beneath the surface of the water should it encounter stormy seas.
The second type of 'person' is the tentacles, some of which are larger than others. The tentacles can reach lengths of between 3 and 30 m when fully extended. The tentacles are used as defense mechanisms as well as to capture food.
Then there are the 'stomach-persons'. The man-of-war has many stomachs which digest the food. Each stomach is like a bag with a mouth at the end of it. If the prey is relatively large, the 'stomach-persons' attach their mouths to the prey like suckers. They cover the entire body and then secrete digestive juices which absorb the food. The Portuguese man-of-war tends to feed at night when many animals move closer to the surface of the ocean.
The fourth kind of 'person' is the sexual organs. These hang down between the tentacles. The man-of-war is either male or female, but no one is quite sure of how reproduction takes place.

Comb jellies

Another animal which is mistakenly referred to as a 'jelly' is the comb jelly (*Beroe sp*). These animals look similar to true jellies in that they are luminescent, gelatinous and free floating, but they belong to the phylum Ctenophora. Comb jellies are shaped like rugby balls, with a mouth at one end. Eight bands of hair-like cilia run longitudinally down the body. These cilia 'beat continually, passing rhythmic waves of movement down the

bands to propel the animal, creating stunningly beautiful, flickering iridescent colours.' (Two Oceans). Comb jellies are carnivorous, feeding mainly on shrimp-like prey.

Species found off SA coast

Four species of jellies are common off the South African coast. The root-mouthed jelly (*Rhizostoma sp.)* is distributed off both our east and west coast. This jelly is the largest known throughout the world and is on average 30 cm in diameter, but some have measured up to 1.5 m. These jellies have a smooth domed bell, are a translucent white or blue and have no tentacles. Instead of a single mouth, they have many tiny pores through which they filter water and trap microscopic prey in the process.

Box jellies (*Carybdea alata*), frilly-mouth jellies (*Chrysaora sp.*) and red-banded jellies (*Chrysaora hysoscella*) are found predominantly off the west coast.
Box jellies have a very deep bell from which long thin tendrils hang. The diameter of the bell in adults is approximately 40 mm and the tentacles can be over a metre long. Box jellies tend to occur in swarms which are often encountered by scuba divers. Although the box jellyfish is a relative of the deadly sea wasp found off the coast of Australia, it is not as venomous. Nevertheless, it can give an excruciatingly painful sting. A moderate sting by the Australian sea wasp can cause death within just a few minutes.

Frilly-mouthed jellies have 24 long tentacles and 16 – 32 shorter ones. These jellies can grow to approximately 12 cm across the bell. They feed mainly on large planktonic creatures.

Red-banded jellies have a shallow bell, the top of which is marked with 'dark purple-red radiating bands' (Two Oceans). These can grow up to 15 cm in diameter. These Jellies feed on large planktonic animals as well as fish larvae (including those of anchovy and pilchard). They can sometimes be found in sheltered bays in huge numbers.