

## Dolphins



Dolphins are mammals, not fish. What makes a dolphin a mammal?

1. They breathe air directly into their lungs.
2. They have hair at some point during their life cycle.
3. They are warm-blooded.
4. They give birth to live young.
5. They suckle their young (give milk).

### Physiology

Dolphins have a sleek, streamlined torpedo shaped body that enables them to move swiftly through the water. Dolphins have very good vision, both above and below water. Bottlenose dolphins are usually grey to grey-black on the dorsal (upper) surface fading to white on the belly and lower jaw. The belly may also be pinkish. The rostrum ('nose') is usually well defined with a lateral or side crease which is known as the smile or gape. The eyes are on the sides of the head near the corners of the mouth. The ears are small inconspicuous openings located just behind the eyes and have no external flaps.

A dolphin's pectoral flippers have all the skeletal elements of the forelegs of terrestrial mammals, but are shortened and modified. Dolphins use their pectoral flippers mainly to steer and with the help of flukes, to stop. Each lobe of the tail is called a fluke. The flukes are flattened pads of tough, dense, fibrous connective tissue, completely without bone. Dolphins propel themselves forward by moving their flukes up and down. The dorsal fin is located centrally on the back and contains no bones either. It stabilises the dolphin by acting as a keel. The dorsal

fin is also used as a weapon when fighting. Females have a slit on either side of the genital opening. Within these are tiny nipples from which the calf can suckle milk.

The core of a dolphin's body is well insulated by a thick layer of blubber. Generally, a blubber layer is anywhere between 2 to 3 cm thick. The thickness is related to the type of environment the dolphin lives in. Colder waters require a thicker blubber layer. The blubber is actually the modified third layer or "hypodermis" of a dolphin's skin. Skin is made up of three layers: an epidermis (top layer), a dermis (middle layer) and a hypodermis (bottom layer). The surface layer, or epidermis, of a dolphin's skin is ten times thicker than any land mammal, and serves as protection against the elements. The entire top layer of skin sloughs off every two to four hours. This helps to keep the dolphin streamlined, moist and free of external attachments while travelling through the water.

Water conducts heat away from the dolphin's body 25 times more efficiently than air. There are two ways that dolphins keep warm: through insulation provided by their blubber and through thermo-regulation.

All mammals are warm-blooded, which means they can regulate their own internal body temperature. If you look closely, you can see many veins running through the tail flukes of a dolphin. These veins are important for maintaining its internal body temperature.

The tail, dorsal fin, and pectoral fins are great places for a dolphin to release heat because they contain no blubber.

## **Evolution**

Inside their pectoral fins, dolphins have a skeletal structure similar to a human arm and hand. They have a humerus, complete with a ball and socket joint. They have a radius and ulna, as well as a complete hand structure, including five finger bones. This is one of the many internal physiological structures leading scientists to believe that dolphins and whales evolved from a terrestrial ancestor.

One theory suggests that cetaceans are descendants of the Mesonychid, an animal that lived about 55 million years ago. This terrestrial mammal ranged from the size of a small dog to the size of a large bear and for some reason started to frequent the shallow water areas of the Tethys sea. The Tethys Sea was a body of water located just north of Africa, which stretched from the modern day Mediterranean to beyond India.

Another theory, based on DNA, molecular, and genetic studies, suggests that cetaceans (dolphins, whales, porpoises) share a common heritage with that of the hippopotamus.

## **Dolphins vs. Porpoises**

Dolphins and porpoises are both small-toothed whales and are separated into two distinct families. Dolphins belong to the family Delphinidae, while porpoises belong to the family Phocoenidae. There is only one difference that is consistent between a dolphin and a porpoise: the shape of their teeth. All cetaceans in the

family Delphinidae have conical shaped teeth. All cetaceans in the family Phocoenidae have flat, spade-shaped teeth.

There are a few other differences that are generally true, but not in every case. Porpoises generally have a blunt, rounded snout, while dolphins have an elongated, protruding rostrum. In general, porpoises are much smaller than dolphins and have a small triangular-shaped dorsal fin, as opposed to the dolphin's larger sickle-shaped dorsal fin.

Dolphins breathe air directly into their lungs via the blowhole on top of their head. Dolphins and whales can also use their blowhole to create sounds. Toothed whales have only one nasal opening, or blowhole, at the surface of the skin. They do have two nasal passages underneath the skin, but the septum does not rise all the way to the surface. Cetaceans do not breathe through their mouths at all.

## **Locomotion**

The tail is the strongest part of the dolphin's body. All marine mammals move their tails up and down, rather than side to side like a fish. The upstroke is believed to be the more powerful stroke for a dolphin. When a dolphin moves its tail down, the tips of the tail bend upward, creating less surface area to push with. When a dolphin moves its tail up, the tips of the tail remain ridged and flat, creating maximum surface area to propel with. Another clue indicating a more powerful upstroke than downstroke is the muscle movement. When a dolphin moves its tail upward, the large muscle mass along its back must contract, and contracted muscles are stronger.

The pectorals are used for steering and balance. The body is smooth and streamlined so that it offers very little resistance as it moves through the water. Bottlenose dolphins can swim at speeds of up to 30 km per hour but they usually cruise at between 8 and 11 km per hour.

## **Feeding**

Dolphins are active, opportunistic predators that eat a wide variety of fish, cephalopods and crustaceans. Dolphins do not chew their food and usually swallow fish whole.

On average an adult dolphin probably eats between 6 and 10 % of its body weight per day. Dolphins have a high metabolic rate because they are always in motion and they constantly lose heat to the environment. They therefore need lots of food to keep them going.

The stomach of a dolphin is compartmentalised for rapid digestion. The three chambered stomach, similar to that of an ungulate (cow or antelope), also points to the dolphin's evolution from a terrestrial ancestor. Since dolphins do not chew their food, the mastication of their meal is taken care of in their first or fore stomach. The majority of digestion is processed in the main stomach or second chamber. The last section of their stomach, the pyloric stomach, takes care of the remainder of their digestion prior to the contents emptying into the intestinal region. Excess salt is removed by producing large quantities of urine. Dolphins

have a very small bladder, which causes them to urinate frequently. They can replace their body water by eating food which contains fluids e.g. squid, octopus and cuttlefish.

Scientists have found that every year a dolphin lays down a new layer of enamel inside its teeth, causing a ring to form inside the tooth. Therefore, one of the ways we can determine the age of a dolphin is by counting the enamel rings found inside the teeth, one for each year of its life. This is similar to counting the rings inside a tree to determine its age.

Dolphins seem to live an average of 25 years, although some dolphins have lived into their early 50s. As a dolphin gets older, it becomes very difficult to count rings in their teeth since they are so tightly compressed.



## **Reproduction**

The age of sexual maturity in dolphins varies from 5 to 10 years depending on the species.

Females appear to be sexually responsive during a large part of the year. Dolphins are not monogamous and they will mate with different individuals. Dolphins have been observed to mate while they swim alongside each other with the male bending his tail under the female's body. Great success has been achieved with breeding dolphins in captivity. In fact 9 out of the 11 dolphins at Sea World were born here! To prevent inbreeding, the males and females separate, and are integrated when it is decided to breed. When they are paired

up, the insemination happens without assistance from the behaviourists as Sea World has healthy viable couples who breed naturally.

After a gestation period of between 10 and 12 months, depending on the species, the dolphin calf is born. Young dolphins are born alive, usually tail first. Tail first birth enables the calf to take a breath as soon as possible after emerging. As soon as the calf is born, the mother usually pushes it to the surface of the water to breathe. Another female in the herd often helps the mother with this activity.

During suckling, the calf wraps its tongue around the mother's nipple to form a water tight tube which it then presses with its tongue. The milk is then sprayed out of the nipple and into the calf's mouth. The milk is very rich in protein and the calf rapidly develops a thick insulating layer of blubber. Depending on the species of dolphin, the young are weaned between 8 months and one year - sometimes even longer.

For many months after the birth, the mother remains close to the calf and directs its movements. The calf swims close to the mother and is carried in the mother's slip stream, a type of wake that develops as the mother swims. This enables the calf to swim and keep up with the rest of the herd.

## **Social Behaviour**

Dolphins are highly social creatures. A group of bottlenose dolphins usually consists of about 15 members. This group is called a pod. Pods usually consist of several mature females, their offspring, large adult males and several sub-adult males and females. Smaller pods of single sex adolescent dolphins may also occur. Dolphins appear to establish strong social bonds within their pods and recognise particular individuals in their pods.

Several pods may form a herd which may contain several hundred animals. A certain amount of social hierarchy appears to exist within the pods with some dominant and other submissive individuals.

Due to the social nature of these animals, Sea World has an enrichment program and training forms a large part of it. All types of enrichment are used e.g. trainer and animals free play sessions. They have lots of toys which they can play with or the trainers can join in. Gelatine is also used as enrichment; this also gives them extra liquids. They are social animals and thus they are kept in groups, socially enriching them. Training does serve to replace activity they would engage in naturally in the wild.



## **Echolocation**

Echolocation is a sensory sonar system that dolphins use for communication and for locating things in their environment.

The dolphin's echolocation process goes like this:

- 1) The dolphin uses nasal passages to make a click and sends it through its forehead (the melon), which focuses the sounds together into a beam before sending it into the water.
- 2) When the sound hits an object in the water, it bounces back to the dolphin as an echo.
- 3) The dolphin absorbs this returning echo through its jaw.
- 4) A passage of fat from the jaw conducts the sound to the dolphin's inner ear, which exchanges nerve impulses with its brain to interpret the object's characteristics, such as size, shape, material, distance, speed, direction and internal structure (depending on the object).

## **Threats to Dolphins**

Thousands of dolphins are killed every year in the purse seine tuna fisheries operations. Certain species of tuna are commonly found associated with dolphins. Both dolphins and tuna are then herded into a net and captured. Once entangled in the nets, many dolphins drown.

Drift nets are made from a monofilament plastic line which cannot be easily detected by dolphin sonar. As these nets float in the oceans, dolphins become entangled in them and drown. Many thousands of kilometres of nets drift through the world's oceans indiscriminately killing thousands of animals. Although drift nets have been banned in many countries, they will continue to plague the oceans for many years because they do not break down very easily.

Shark nets also have an impact on dolphins as they do not understand how to jump over objects in the wild. In captivity this is taught to them. The dolphins may become entangled in the shark nets and drown.

Solid pollution in the form of six pack rings, balloons, straws, etc. can be deadly to dolphins. The litter is either eaten by the animals which can then die from starvation or they may become entangled in the litter and die.

Chemical pollution may not always be as visible as solid pollution but it can be just as deadly. Oil spills and the outflow of effluent from factories can easily harm marine mammals.

Untargeted bycatch remains the biggest threat to dolphins and other cetaceans with over 308 000 cetaceans caught and killed annually as bycatch.

### **What you can do to help**

- *Throw your litter into refuse bins*
- *Recycle as much of your waste as possible*
- *Use organic pest control in your garden*
- *Report factories which discharge effluent into the sea*
- *Do not buy fish from countries that use gill nets*
- *Buy tuna with the "dolphin friendly" label*
- *Learn about threats to dolphins and teach others*
- *Becoming aware is the first real step to doing something*
- *Support conservation organisations that protect our environment*

### **Did you know?**

- When they are born, dolphins have whiskers on their rostrum. A dolphin's whiskers are about 0.5 cm long, and will fall out shortly after birth.

- The maximum recorded & published depth achieved by an Atlantic bottlenose dolphin during a dive exceeded just over 300 metres by a Navy-trained dolphin named Tuffy.

- Dolphins can be taught to give a urine sample on command for medical purposes.