

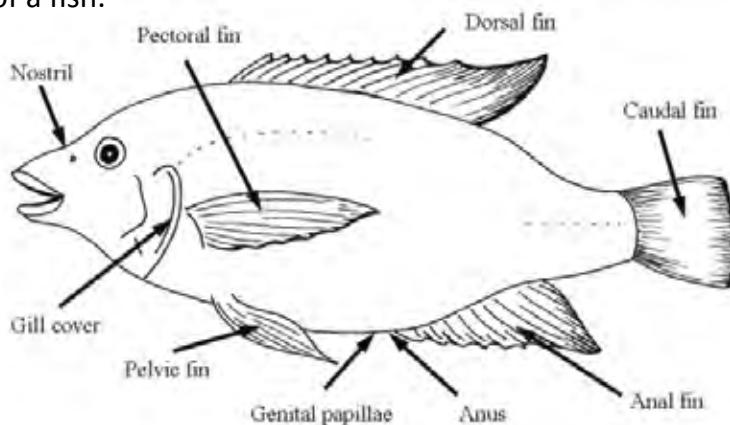


Chapter 2 Fish biology

Fish biology

Like any animal, a basic understanding of how fish function is necessary if one is to try to culture them. Fish are different to land animals as they have evolved to live in water, which makes movement, breathing, buoyancy and food or predator detection very different to that encountered on land. One of the most fundamental differences between fish and land animals is that the former are essentially weightless in their environment and dependent on it for their temperature, being 'cold-blooded', and this means that they neither need food energy for fighting the force of gravity nor for keeping themselves warm, as do land animals like cows and sheep. This makes their conversion of feed into mass more efficient than with land animals, given the right environmental conditions.

The diagram below outlines the typical features of a fish.



The external features of a typical fish.

Movement

Fish have evolved into various shapes and forms depending on how and where they live in water. Fast-swimming species (such as tigerfish or trout) are streamlined and tend to be torpedo-shaped, with big eyes as they use their eyes to hunt. Conversely, bottom-dwellers generally use touch to find their food, like catfish which have small eyes and a wide, flat head with barbels that search the bottom for food.

Instead of fur, fish have scales, which are

stronger and more streamlined. The scales offer protection from other aggressive fish as well as act as a barrier to parasites. Some fish (e.g. catfish) do not possess scales but instead have a slimy layer of mucus for protection, which sometimes makes handling large specimens very difficult.



Breathing

Fish obtain oxygen from the water via their gills which are found at the side of the head, covered by the operculum plate. The gills are composed of finely branched filaments (which look like feathers) across which oxygen diffuses from the water into the blood which is then pumped around the body. By actively pumping water using the mouth and gill cover (operculum), the fish ensures that water is constantly passing over the gill filaments. Except for catfish, which in addition to gills may have an air-breathing organ, all fish require water to survive. When a fish is removed from the water the gill filaments collapse on one another and oxygen cannot diffuse across the filaments fast enough, so the fish 'drowns' due to a lack of oxygen.

Digestion

The digestive system of a fish species depends on what it eats. Fish that eat other fish tend to have a short digestive tract (gut or intestine) as they can get the nutrients they require from their high-protein diet. Plant material is harder to digest as it contains cellulose, which is difficult to break down and digest. Therefore, fish such as tilapia which eat plants or algae tend to have longer digestive tracts as the food needs more time to digest.

Food enters the mouth where it is broken down into smaller pieces before entering the oesophagus (throat), which carries the food to the stomach. The stomach adds acid and enzymes to the food to help break it down. The food then enters the intestine, which helps digest the food as well as absorb the nutrients required by the fish. Once all the nutrients have been removed from the food, the faeces is excreted through the anus. Some fish (e.g. tilapia) have almost no stomach, but only a very

long intestine: this is because they eat almost all the time, and low-protein food is continually moving along the gut and being slowly digested. Some predatory fish (e.g. tigerfish, bass or catfish) have stomachs to hold their larger prey until it is broken down and digested.

Reproduction

Fish breed in a number of different ways. Most lay eggs but some give birth to live young. In freshwater fish, the fertilized eggs usually sink to the bottom or are sticky and therefore stick to plants or rocks. In some species (such as tilapia) the eggs may be collected by the adult fish and held in the mouth by the female after fertilization. The eggs hatch in the parent's mouth and the young develop there until they are large enough to be released. These fish practice a high degree of parental care, which means that large numbers of young can be successfully reared and protected without being eaten by other fish. Female livebearers (such as guppies) may store sperm for months, which they can use to fertilize their eggs when males are not available. The baby fish develop inside the mother and when she gives birth to the babies they are able to feed and look after themselves.

Before fish will breed they must be in good condition. They should be in an environment that is beneficial for spawning (e.g. the correct temperature, plants for egg attachment, etc.). They should also have been eating the correct food which helps make good-quality eggs and sperm.

Buoyancy

Most fish are essentially 'weightless' in their medium, water, and don't need energy to stand up like land animals. Fish need to be able to remain and hover at their preferred position in the water using the minimum amount of energy. They do this by controlling their buoyancy which is the ability to alter whether they float or sink in the water. Most fish have a swimbladder, which is an organ to contain air inside the fish. The fish is able to regulate how much air enters or leaves the swimbladder, thus allowing the fish to float or sink as it needs to. Sometimes fish may get an infection of the swimbladder; this may cause it to swell, resulting in the fish floating on the surface, unable to swim down.



The study of fish informs us about how to best grow fish under aquaculture conditions. The faster we can get fish to grow, by providing them with the correct feeds and water conditions, the more money a fish farmer will make.