



Over half of all animals with backbones (vertebrates\*) are fish. There are over 25,000 different species\* of fish. Some fish are adapted to eat plants and others to eat meat and they have evolved to fill all available niches\* in the marine environment.\* Some evolved to hunt on coral reefs and others to swim in the open sea.

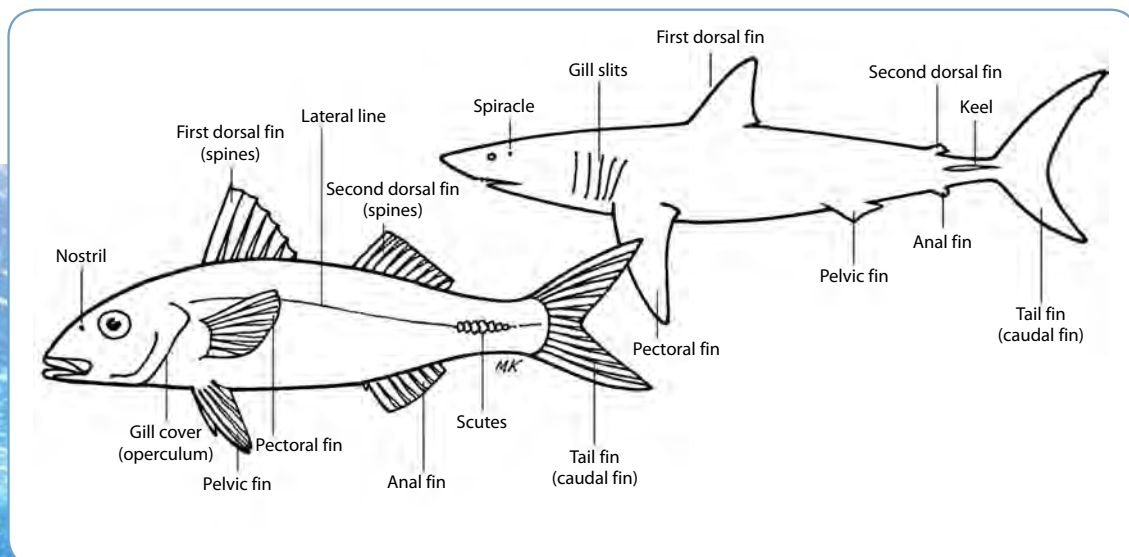
## External features

Fish have two sets of paired fins, the side or pectoral fins and the pelvic fins. Single fins include the dorsal or back fin, the anal fin and the caudal or tail fin.



### Amazing information to think about

Fish appeared on this planet over 400 million years ago. The four limbs of all land-dwelling (terrestrial) animals with backbones that exist today are believed to have evolved from the paired fins of fish.



## Internal features

**How do fish stay afloat?** They are heavier than water and tend to sink. The two main evolutionary lines, the cartilaginous and the bony fish, have solved the problem of staying afloat in different ways.

Sharks and rays have a light skeleton of cartilage, a firm but flexible type of tissue. They also have a large liver which is rich in the light oil, squalene and fixed pectoral fins which act as paravanes. As a shark moves forward through the water, pressure on the underside of its pectoral fins provides uplift. Thus many, but not all, species of sharks have to swim continually to stay afloat.

The other evolutionary group, bony fish or teleosts, have heavy bones of calcium, but solved the problem of remaining buoyant in a different way. Ancient fish had lungs which evolved into the air-filled swim bladder\* of modern bony fish, most of which obtain oxygen through their gills. A small number of fish can gulp air at the surface.

The evolution\* of the swim-bladder allowed fish to move away from speed as a way of life. Pectoral fins, no longer required for aiding flotation, could evolve to allow a greater range of movements. Present-day bony fish use pectoral fins to hover, to swerve, to swim backwards and even, in the case of flying-fish, to glide through the air. The ability to take advantage of a variety of ecological niches, to be either bottom-dwelling or pelagic,\* has allowed modern bony fish to dominate the waters of the world.

The gill rakers, comb-like structures in front of the gills, sift particles of food from the water which enters the mouth and flows out through the gill slits. The digestive system includes an S-shaped stomach leading to an intestine which is often longer in herbivores than in carnivores. At the junction of the stomach and the intestine, there are often finger-like sacs, the pyloric caeca, whose function may include aiding food absorption.

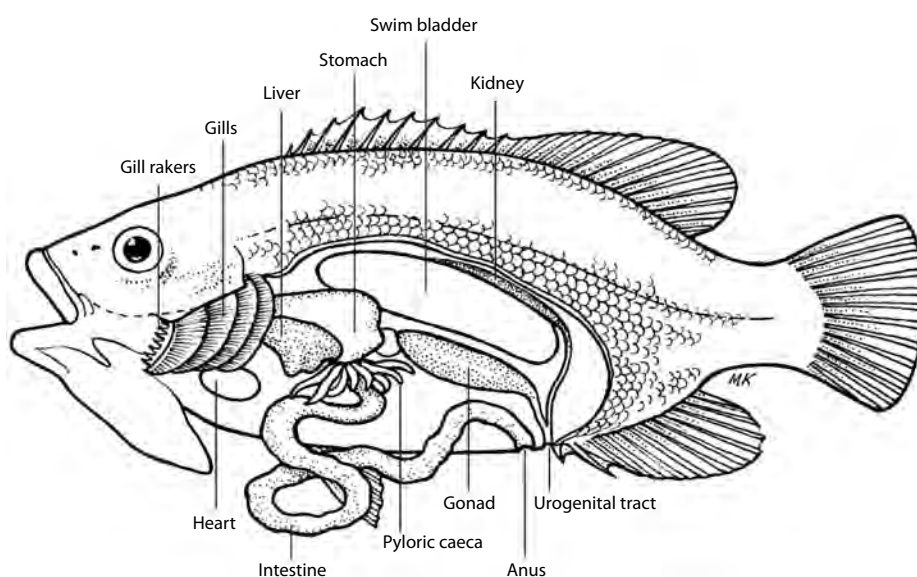
Fish have internal ears with no connection to the outside. Sound waves, travelling through the water and the head, strike dense calcium carbonate "earstones" or otoliths which float in the fluid contained in the inner ear. The otoliths vibrate against sensory hairs in the ear. As the fish grows more layers, these are deposited on the otoliths, which enables them to be used by scientists to estimate the age of some fish.

Many fish produce sounds and this is often reflected in their common English names — drums, croakers and grunts.

And, fish have one sense that we don't have. They have a lateral line which runs down each of its sides. The lateral line is believed to be capable of detecting low-frequency vibrations in the water as well as pressure changes due to different depths.

Fish have gonads\* which are usually paired. In most fish, females release eggs into the sea where they are fertilised by sperm released from males. The fertilised eggs hatch to small larvae\* (often about 5 mm in length) most of which drift with ocean currents.

After a period which varies from species to species, the larvae change — benthic species settle on the sea floor. The juveniles of many fish species grow in nursery areas, including reefs, banks, bays and estuaries.



### Did you know?

*Fish eyes are spherical and have given their name to the photographer's fisheye lens used to take in a field of vision covering up to 180°. The eyes of many fish appear to be capable of distinguishing colours.*

The internal organs of a bony (teleost) fish.

Adapted from King M. 2007. Fisheries biology, assessment and management. UK: Wiley Blackwell. 400 p.