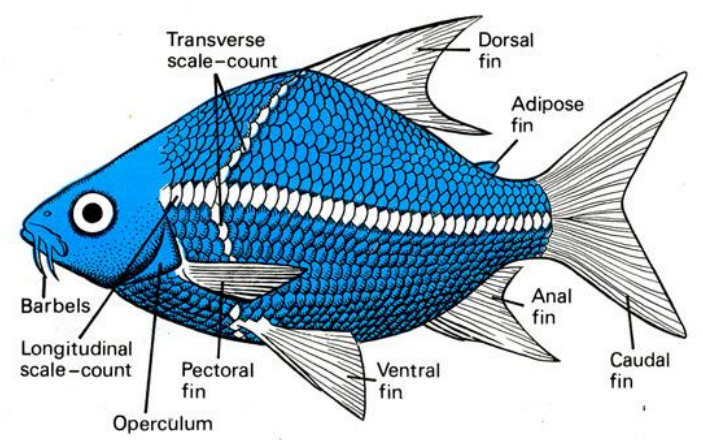
ANATOMY AND PHYSIOLOGY Of FISHES

FINS

There are two main groups of fins, the unpaired kind — the dorsal, the anal and the caudal fins — and the paired kind — the pectoral (the equivalent of arms in animals) and the pelvic fins (in the position of legs in other animals). The fins are made up of rays, the first ones in some species being hard and the remainder soft. The number of soft and hard rays is used in species identification.



External features of a fish

The unpaired fins serve as stabilizers and help to direct the fish the way it wants to go. The caudal fin is an important source of propulsion, while the pectoral fins are used for slow movement, particularly for hanging motionless in the water. In some fishes, which are good leapers, these fins are particularly large. The pelvic fins are used as stabilizers.

SKIN

The skin of the fish consists of two main layers, the epidermis and the deeper dermis. Scales, which are a form of external skeleton, are developed from the dermis. Most of the living species of Osteichthys (bony fishes — the class to which most aquarium species belong) have a bony ridge type of scale which is thin and translucent, the outer surface showing alternate bony ridges and depressions. Scale characteristics are also important in the classification of different genera and species of fishes. The number of scales on the length of the body from gill cover (operculum) to caudal fin along the lateral line (longitudinal scale count) and at the greatest point of body depth (transverse scale count) are constant in each species of fish and are helpful in identification.

Situated also in the dermis are mucous glands, the secretions of which give the characteristic slimy touch and odour to a fish. The mucus probably lessens the drag on a fish as it swims through the water and helps to protect it against infections.

The colour of fishes is largely due to pigments in the skin, although there is some background colour from the colour of the underlying tissues and blood. The special cells in the skin which give rise to colour in fishes are of two kinds — chromatophores which contain pigment granules and iridocytes which contain reflecting materials which mirror colours outside the fish.

The lateral line which is seen either as a complete or incomplete line along the outside of the fish consists of a series of modified scales with a pore which connects to the lateral line canal underneath. The lateral line system enables the fish to detect vibrations in the water.

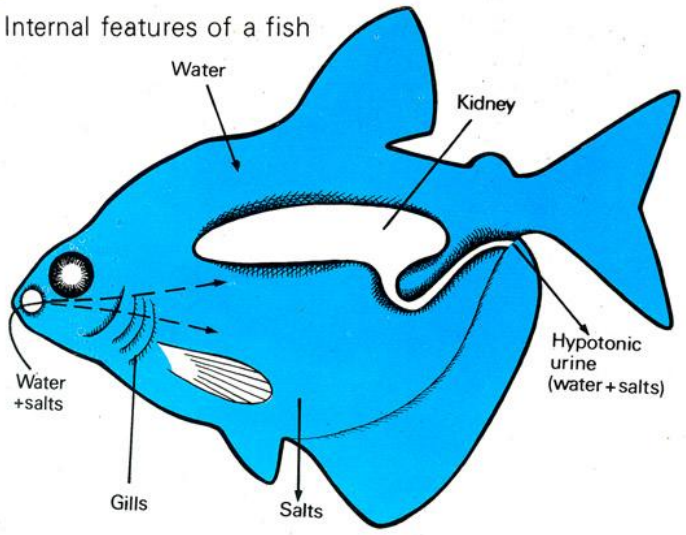
RESPIRATION

Fishes use the dissolved oxygen in water for their respiration. Water is taken in through the mouth and expelled through the opercular openings. The gills separate the mouth cavity from the opercular opening so that water passes through them. There are four gill arches on either side and a large number of gill filaments, each covered by a very thin highly vascular mucous membrane, on each arch. The flow of water through the gills is an extremely complex mechanism which allows oxygen from the water to be taken up by the blood and for carbon dioxide in the blood to be given up to the water.

EXCRETION AND OSMOTIC REGULATION

In freshwater fishes the concentration of salts in the fish is greater than in the surrounding water. Since the epithelia of the gills, mouth and intestine are permeable to water and simple salts, water diffuses into and salts diffuse out of the freshwater fish. If this process was not .regulated the fish would swell and be killed. In order to expel this steady inflow of water the freshwater fish pro-duces large amounts of dilute urine, while the kidney also excretes some nitrogenous waste products and small amounts of salts.

Salt loss, particularly of chlorides, also occurs through the gills and mouth epithelia but to compensate for this there are special cells in these sites which absorb chlorides and other salts selectively and this active absorption can considerably exceed the loss by osmosis.



Movement of water and salts into and out of the body of a fish in fresh water

SWIM BLADDER

The density of a fish is considerably greater than fresh water and this means that it would sink or have to be swimming constantly to maintain its position. If the fish can achieve neutral buoyancy by bringing its density nearer to that of fresh water it will have considerable advantages. Many fishes have accomplished this by the development of a gas bladder. This organ, which can easily be seen in many characins, enables the fish to hover more easily in mid-water and to rest in mid-stream with a minimum of effort, at the same time considerably reducing its energy requirements when swimming. Malfunction of this organ occasionally occurs for some unknown reason and causes abnormal postures and positioning of the fish.