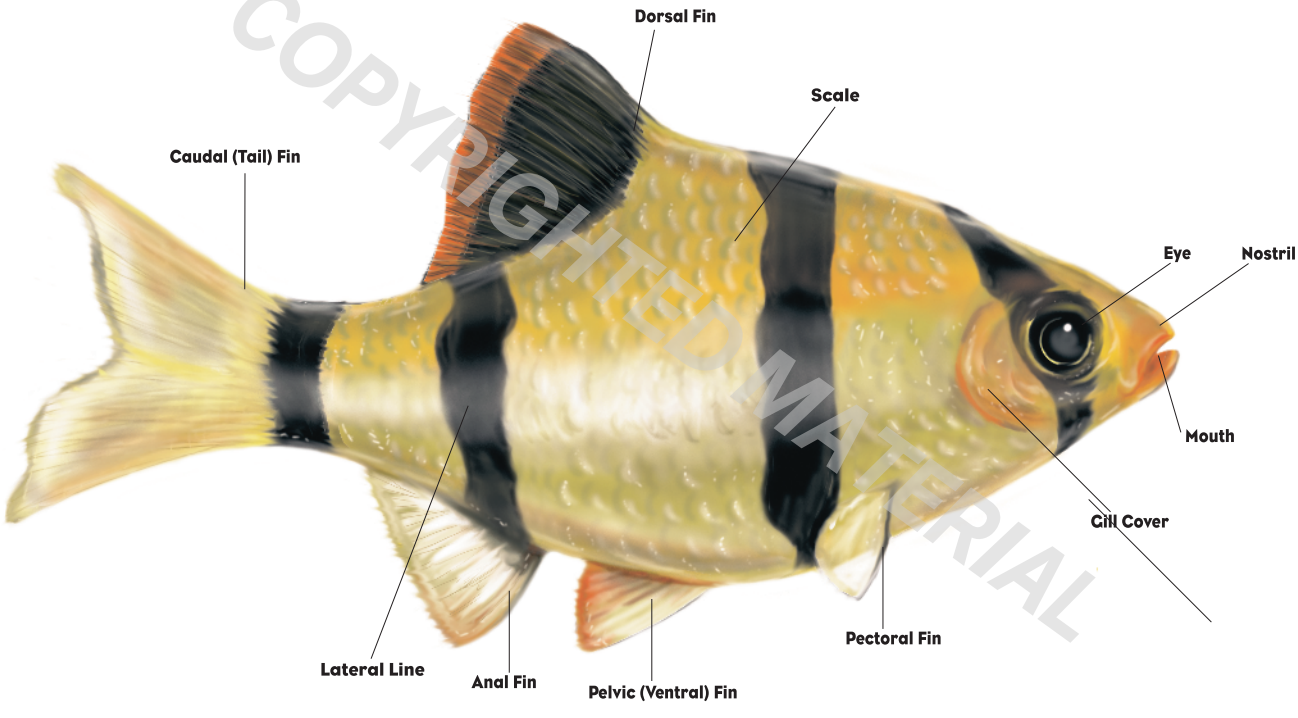
The Freshwater Fish



Chapter 1

About Freshwater Fish

You are reading this book because of your interest in owning and maintaining an aquarium. So you are likely a fish enthusiast, like me. The world of fish is both fascinating and complex. This book will help you to understand this watery world and teach you what you need to know to successfully set up and maintain a freshwater aquarium.

Of course, before you get started you should have a general knowledge of fish, their anatomy and biology, as well as a thorough understanding of their proper care and husbandry. First, let's take a look at fish anatomy and what makes these animals unique. Then we'll examine the aquarium and the importance of meeting the biological needs of fish.

Fish Evolution

The group of aquatic animals that we call fish has evolved over 400 million years to be the most numerous and diverse of the major vertebrate groups (animals with backbones). Fishes have permeated all the waters of the world, adapting with an incredible variety of forms, lifestyles, and behaviors. From seasonal freshwater streams, desert springs, and salty bays to coral reefs and the deep abyss, different species of fish have found and created niches for themselves.

Fish Terminology

Many folks think that the plural of fish is "fish," but actually when you are referring to more than one kind or species of fish, the plural of fish is "fishes." For example, there are many kinds of fishes in the ocean. However, more than one fish of the same species is fish, as in, "These Guppies are beautiful fish." And it's also "fish" when you are talking generally about the fish as a particular type of animal.

There are well over 20,000 known species of fish that currently inhabit the earth, and many are discovered every year.

Since salt water covers more than 70 percent of the earth's surface and fresh water only 1 percent, one would expect that there would be many more marine (saltwater) species than freshwater species of fishes. Actually, 41 percent of the world's fishes inhabit strictly fresh water. Although quite similar in many ways to their marine counterparts, freshwater fish have adapted to a much wider range of habitats and a greater variety of water conditions. Hence, freshwater fish are typically hardier than their marine friends and much easier to maintain. That's good for you.

Fish Biology

Because there are no fewer than 8,000 species of freshwater fish, it is difficult to describe the "typical" fish. However, all fish have some common characteristics. Since water is 800 times denser than air, fish have developed a variety of ways to move easily, breathe, and feed in this dense medium. The biological adaptations for life in a watery world include the body shape, fins, scales, and swim bladder.

Body Shape

A great deal can be learned about a species of fish by looking at its body form or shape. Fish that are streamlined or bullet-shaped, like Neon Tetras, are well

Streamlined fish, like this Malawi Golden Chichlid, are adapted to the open waters of lakes and ponds.

adapted to the open waters of freshwater lakes and ponds. On the other hand, flat or stocky fish, like Catfish, typically live on or close to the bottom.

Fins

All species of fish have fins in one form or another. The fins are critically important appendages that enable the fish to propel, stabilize, maneuver, and stop itself. In some cases, fins have developed to protect the fish as well. Again, depending on the type of fish and the habitat it lives in, the fins can take on many shapes and functions. Bottom, sedentary, or slower moving fish typically have rounded fins, while faster, open water fish generally have longer, pointed fins.

Fish fins are either paired or unpaired. The only fins that come in pairs are the pectoral and pelvic fins, while the dorsal, anal, and caudal fins are unpaired. The pectoral fins are the paired fins closest to the head. The fish uses these fins to stabilize, turn, maneuver, hover, and swim backwards. These fins are generally found just behind or below the gills on each side of the fish, under the midline of the body.

The pelvic fins are also paired and vary the most in position. In some fish, they lie under the fish toward the rear. In others, such as many tropical species, the pelvics are closer to the head under the pectorals. In general, the pelvic fins act as brakes while aiding in stabilizing and turning the fish.

The dorsal and anal fins are unpaired fins that are found protruding from the top and bottom of the fish, respectively. Dorsal fins may be elongated or short, elaborate or simple, singular or multiple. In some species of fish, the dorsal or anal fin may be completely lacking. Both fins help stabilize the fish and keep it moving straight.

The caudal or tail fin is a single fin largely responsible for propelling the fish forward. This fin can also assist in turning and braking. Faster fish have deeply forked caudal fins, while many deep-bodied and bottom fish have square or rounded tail fins.

In general, the main supporting structures of fish fins are soft rays. However, anyone who has handled a fish knows that the dorsal, anal, pectoral, or pelvic fins of many species also have spines. These sharp, bony structures provide protection against predators and can certainly hurt us as well.

Scales

The bodies of most tropical fish are covered with scales. The scales are composed of a hard bony substance and serve to protect the fish, reducing the chance of injury and infection. Covering the scales is a very thin layer of epidermal (skin)

The colors of this Discus depend on what type of pigment cells it has in its scales.

Fish Anatomy

There are thousands of different species of fishes, all uniquely adapted to their particular environments. However, most share fundamental characteristics that allow them to be classified together as fish.

Gills: These blood-filled structures enable the fish to absorb oxygen from the water in exchange for carbon dioxide.
Fins: These move the fish through the water, providing propulsion and steering.
Swim bladder: This organ fills up with air, thereby controlling the fish's level in the water column.
Lateral line: This sensory organ runs along the body and alerts the fish to movement close by, and also helps fish in schools to move in synchronization.
Scales: These streamline and protect the body of the fish as it moves through the water.

tissue that contains mucous cells. These cells produce the slime that we normally attribute to fish. The mucous coating not only protects the fish against injury and infection, but also helps the fish to swim more easily in the water, reducing friction between the body and the water.

The scales of a fish are actually translucent, like glass, and lack color. The vibrant colors of tropical fish come from specialized pigment cells called *chromatophores* in the deeper dermal layer of the skin. Fish that are clear, like the Glassfish, lack these pigment cells. The color of the fish depends on the types of chromatophores present. There are generally three types of chromatophores in fish: melanophores give fish the darker colors of black, brown and blue; xanthophores produce red, yellow, and orange; and iridophores reflect light, producing a silvery shine common to many fish.

Swim Bladder

As mentioned earlier, living in the dense medium of water presents a few problems for fish, and one of these is buoyancy. Maintaining a certain level in the

These Goldfish have a two-chambered swim bladder.

water column without having to expend a lot of energy is very important to fish. Therefore, most species have a special organ called the swim bladder. This gas-filled sac, located in the abdominal cavity of the fish, acts as a life vest, keeping the fish at the correct level in the water column.

There are many types of swim bladders. The Trout has a simple single-chambered sac, the Goldfish a two-chambered type, and the Angelfish a three-chambered bladder. Different species also use different methods to fill the swim bladder with air. Some have a direct connection between the esophagus and the bladder and simply swallow air to fill it. Others must rely on gas exchange from specialized blood vessels in the circulatory system to fill the swim bladder.

In addition to its role in buoyancy control, the swim bladder helps to mechanically amplify sound for better hearing in certain species of fish.

Feeding

Just as a fish's body shape can tell you a lot about its swimming habits, its mouth can tell you something about its feeding habits. Bottom feeders have downward pointing mouths, while surface feeders have mouths that point upward. For most fish, the mouth is at the end of the snout.

The size of the mouth is usually directly related to the size of the fish's preferred food. For example, large predatory fish like Oscars have larger oval mouths for consuming smaller fish. Fish that normally feed on small aquatic invertebrates, like Neon Tetras, have smaller mouths. Some tropical freshwater fish have specialized mouths for specialized feeding strategies. Plecostomus fish, for example, have special sucking mouths for bottom feeding.

Freshwater tropical fish have a relatively straightforward digestive system, which varies from species to species. In general, food passes from the mouth, down the esophagus, to the stomach, and through the intestine; wastes are expelled from the anal vent. However, several species lack true stomachs and instead have elongated, super-coiled intestines.

Breathing

Among the most primary of the basic needs of fish is oxygen. Like land animals, fish require oxygen to live. However, fish must derive oxygen from water and special respiratory organs, called *gills,* enable them to do so. The gills of a fish are analogous to our lungs: They supply oxygen and remove carbon dioxide from the blood of the fish. Then, oxygen is transported by the blood to the tissues where it is used to produce energy.

Most fish have four gills on each side of the head, protected by a single gill flap, or *operculum.* When a fish breathes, water is taken into the mouth and passed over the gills and out the operculum. As water passes over the membranes and filaments of the gills, oxygen is removed and carbon dioxide is excreted. To accomplish this, the gills have a very high number of blood vessels that deliver the oxygen to the rest of the fish via the blood.

Oxygen and carbon dioxide are not the only substances exchanged by the gills. Large amounts of ammonia are also excreted by the gills and, as you will see in chapters 2 and 3, ammonia is something that you have to be concerned with in the home aquarium.

Most fish have four gills on each side of the head, protected by a single gill flap. These are Butterfly Dwarf Cichlids.

The Fish's Senses

With few exceptions, fish have five senses that they use to feed, avoid predators, communicate, and reproduce.

The eyes of most fish are similar to our own, except they lack eyelids and their irises work much more slowly. Rapid changes in light intensity tend to shock a fish, a fact that should be taken into account by the aquarist. Gradual changes in light allow the fish to accommodate and avoid temporary blindness. The location of the spherical lenses of fish eyes renders most fish nearsighted. Although it varies from species to species, fish can detect color.

Hearing is an important part of a fish's life. Most fish do not posses external ears, but have an inner ear structure that is not noticeable on the outside of the fish. The auditory component of the inner ear consists of the *sacculus* and the *lagena,* which house the sensory components of hearing, the *otoliths.* Sound vibrations pass through the water, through the fish, and cause the otoliths in the inner ear to vibrate. In some cases the swim bladder articulates with the ear to amplify sound.

For fish, smell is particularly important in prey and mate detection. A fish has external nasal passages called *nares* that

In addition to the anatomical features already noted, fish typically possess other unique circulatory, digestive, respiratory, and nervous system features. Curious fishkeepers should examine the books listed in the appendix for more detailed descriptions of the unique anatomy of fish.

Freshwater and Saltwater Fish

As the name implies, salt water contains much higher concentrations of dissolved salt (sodium chloride) than fresh water. Although salt is the major constituent, there are many other dissolved elements in higher concentrations than

allow water to pass into and out of the olfactory organ located above its mouth and below its eyes. Water flows through the nares and into the olfactory pits, where odors are perceived and communicated to the brain via a large nerve. The olfactory system of the fish is not attached to the respiratory system, as it is in humans, but remains isolated from the mouth and gills.

Taste is generally a close-range sense in fish and is especially helpful in identifying both food and noxious substances. In addition to being in the mouth, the taste buds are located on several external surfaces, such as the skin, lips, and fins. Catfish have specialized barbels with taste buds that help them detect food items in murky waters.

Fish have special organs comprising the lateral line system that enable them to detect water movements. Sensory receptors lying along the surface of the fish's body in low pits or grooves detect water displacement. The lateral line is easily visible along the sides of most fish. This unique system helps the fish detect other fish and avoid obstacles.

are found in fresh water. The amount of these dissolved "salts" in water is referred to as its *salinity* or *specific gravity.*

Although, anatomically, freshwater and saltwater fish are similar in appearance, they have evolved two very different ways of living in these chemically different environments. As a means of maintaining their internal salinity, freshwater fish drink very little water and produce large quantities of dilute urine. On the other hand, most marine fish drink large quantities of water and eliminate salts in small amounts of highly concentrated urine and feces, as well as at the gills. So the kidneys of these groups are very different.

An ancient interest in ornamental Goldfish led the Chinese to develop varieties with unusual characteristics.

Fish in Captivity

It is no surprise that humans have favored keeping fish in captivity for centuries. The Chinese kept the common Goldfish as far back as the year 265. Care and husbandry of fish has come a long way over the centuries, and in recent years there has been an incredible explosion in fish culture.

There was a time when most tropical freshwater fish kept in captivity were taken from their native habitats. This practice contributed to the degradation of tropical habitats and the local depletion of many species. Fortunately, modern husbandry techniques have taken the tremendous pressure off natural stocks; now, many of the common aquarium species are bred in captivity. Selective breeding has also allowed for the rearing of hardier fish that more easily adapt to the varying water conditions of the aquarium.

Your Responsibilities

Fish in their natural environment are subjected to many challenges. Most of these involve natural processes of predation, feeding, reproduction, and disease. Natural catastrophic events that alter water quality are rare, and fish can generally avoid them by swimming to other areas.

The Fishkeeper's Responsibilities

The fishkeeper (that's you) has an obligation to care for the fish that they have brought home. Because the fish are contained in an artificial environment, it is up to you to establish and to maintain their living space in an appropriate manner. The fishkeeper is responsible for providing:

- High water quality
- Proper feeding
- Correct water temperature
- A balanced fish community of the proper density
- Appropriate habitat and shelter
- Sufficient lighting

Make sure you are ready to accept these responsibilities and the daily chores that go with them before you start setting up your aquarium.

Fish in their natural habitats are usually very much responsible for their own well-being—when they are hungry, they seek out food; when the environment becomes hostile, they move to an area that is more hospitable. (A possible exception to this would be fish living in areas assaulted by man-made pollution.)

Fish maintained in an artificial environment are also faced with survival challenges. However, in the confines of the aquarium, most of these challenges cannot be met by the fish and must instead be met by the fishkeeper. When you take it upon yourself to set up an aquarium, you are accepting the responsibility of meeting all of the needs of its inhabitants. The aquarist is responsible for high water quality, proper feeding, correct water temperature, a balanced fish community of the proper density, appropriate habitat and shelter, and sufficient lighting, to name a few. The fish are totally dependent upon you to meet their everyday and emergency needs.

As you gain experience as a fishkeeper, you may go beyond the basic needs and try to breed your fish or establish specialty tanks. But first, it's important to

start slowly with your aquarium and develop your talents as an aquarist; you will learn a tremendous amount through your own experiences.

Find a Source of Reliable Advice

Before you buy your aquarium supplies and fish, try to visit all the local aquarium stores and then choose one or two to work with. It is very important to establish a good working relationship with your aquatic dealer, because you need someone to advise you during the setup and maintenance of your system.

You want somebody who maintains a good, clean business, has healthy fish, and is always willing to take time to answer your questions. The good dealer will give you invaluable information on new and reliable products. Choose someone with the right attitude, who will be consistently available to help.

Try to avoid dealers who will not take the time to explain things to you or net the specific fish you desire. Larger dealers with many employees may not meet your needs as a beginner. I've always preferred the smaller pet shops that cater to the needs of aquarists at all levels, are willing to special order supplies, and would rather send you elsewhere than sell you an improper choice. When you settle on one or two dealers, you are ready to begin planning your aquarium.