

## I. INTRODUCTION

According to the 2007-2008 National Pet Owners Survey conducted by the American Pet Products Manufacturers Association (APPMA), 14.2 million U.S. households are freshwater fish hobbyists, making it the third most popular pet among American pet owners (behind cats and dogs). Freshwater fish owners keep an average of 10 fish each, creating ongoing opportunities for sales of fish and the products to keep them healthy. Serving as a trusted source of information about the many different types of freshwater fish also can help your store stand out from the competition.

This pet group does present unique challenges related to water quality, as well as housing, filtration, nutrition, stress factors, and aquarium set up and maintenance. The knowledge you will gain from this chapter will allow you to help your customers avoid or overcome these problems to keep their fish healthier and enjoy them more.

### Learning Objectives

After completing this chapter, you should be able to:

- Help customers start a successful freshwater fish aquarium.

- Care for the freshwater fish in your store.
- Communicate basic needs for each species to customers.
- Recommend equipment and necessary items to keep and maintain freshwater fish.

## II. HOUSING REQUIREMENTS

An aquarium is a closed system that contains a relatively small volume of water compared to the ponds, rivers, lakes and streams freshwater fish come from originally. The three major pieces of equipment of an aquarium are the heater, filter and hood. The hood includes both the cover and light fixture.

Fish and other aquatic life do best when properly maintained in an environment that avoids creating stress, which can lead to illness or even death. Knowledge of correct aquarium set up for different species and groups of fish is essential to help your customers maintain a successful aquarium and to keep the fish in your store healthy.

### Aquarium Tank

Choosing the right size tank is the first decision. Aquariums are available in many sizes, ranging from 2.5 gallons to more than 250 gallons. Larger tanks accommo-

date more fish and a greater variety. The larger volume also keeps water chemistry more stable and slows waste build up.

Although larger aquariums offer a number of benefits, they typically cost more to purchase, set up and maintain. For first-time aquarists, a general rule of thumb is to encourage customers to purchase the biggest tank they have room for and can comfortably afford.

### Standard Aquarium Dimensions:

Volume (Gallons)	Length	Width	Height
10	20"	10"	12"
15	24"	12"	12"
20 (Low)	30"	12"	12"
20 (High)	24"	12"	16"
30	36"	12"	17"
55	48"	12"	21"

Other points to remember when recommending an aquarium:

- Actual capacity will be less than stated unless the aquarium is filled to the brim with water and contains no gravel or decorations.
- Gravel and decor reduce the amount of water the aquarium can hold.
- When selecting an aquarium and deciding where to place it, customers should con-

sider weight carefully. Water weighs approximately eight pounds per gallon and gravel and equipment can add another pound or two per gallon. To estimate tank weight, multiply the size (in gallons) by 9 to 10 pounds. For example, a 20-gallon tank will weigh 180 to 200 pounds when full, and must be placed somewhere that can support this weight.

- Customers with odd sized tanks at home can estimate approximate size by multiplying length (in inches) by width (in inches) by depth (in inches), then dividing by 231.

### Heater

Tropical freshwater fish originate in warmer regions of the world. Unlike goldfish and some other species, these fish require a steady water temperature slightly warmer than room temperature to stay healthy and prevent stress, which can make them more vulnerable to disease. Always use an aquarium heater with tropical fish to keep water at an appropriate temperature.

Every heater should include a thermostat that turns it on and off automatically to maintain a consistent temperature and minimize fluctuations that can stress and/or kill fish. A thermometer also should be used to monitor the temperature in case of heater malfunctions.

Heater strength is measured in wattage and recommended strength should be determined by aquarium size. The accepted rule for calculating required heater size is to allow five watts per gallon of water; for example, a 20-gallon tank would require a 100-watt heater. Larger aquariums (55 gallons and up) usually require only 3 to 4 watts per gallon, depending on the temperature of the room where the tank is kept.

Older styles of aquarium heaters were designed to be hung on the back of the tank with the top out of the water and were prone to cracking or breaking when exposed to air while plugged in. Newer, preferred heater models are fully submersible. Suction cups allow the heater to be positioned horizontally toward the bottom of the tank so that it is not exposed to air during a partial water change.

Submersible heaters should be positioned approximately one to two inches above the gravel and can be hidden behind decor if desired. The heater should always be unplugged before removing it or exposing it to air. When first placing the heater in the tank, leave it unplugged for at least 10 minutes to allow it to adjust to the water temperature.

### Filter

The filter is an important component of

any aquarium setup. Aquarium filters remove suspended debris and harmful solid and liquid waste products from the tank. Filters also add oxygen to the water. As a general rule, the filter should move ten times the tank's water volume per hour. For example, a 10-gallon tank should have a filter that moves 100 gallons per hour (gph) or more. Whenever possible, use a filter that moves even more water than needed and has a large area to hold filter media. You'll learn more about filtration and the different types of filters in the next module of this chapter.

### Hood

An aquarium hood (or canopy) should consist of a cover and a light fixture. The hood looks attractive, helps reduce water evaporation and prevents fish from jumping out of the aquarium. Most quality hoods are made to fit standard aquarium sizes and can accommodate a light fixture to illuminate the tank for better viewing.

Like other animals, fish need light during the day and darkness at night to sleep properly. A timer ensures that the aquarium receives a consistent amount of light each day. Tanks without live plants should get six to eight hours of light daily. Customers who want to enjoy their tanks after work can time their lights to be on during part of the evening, such as from

1:00 p.m. to 9:00 p.m.

Tanks with live plants need more light for longer periods. These tanks should be fitted with additional lighting and be lit for 10 to 12 hours a day. Special, brighter bulbs designed for live plants will help them thrive. Bulbs should be replaced every six months, even if the light output looks the same to human eyes.

### Substrate

The bottom layer of the aquarium usually consists of a substrate material, usually gravel, sand, crushed coral or special substrates for growing live aquarium plants. A wide variety of substrate materials is available to meet customer objectives, such as a specific look or growing live plants.

Substrate also provides a large amount of surface area for good nitrifying bacteria to grow. These bacteria break down fish waste from very toxic ammonia into nitrites, then convert nitrites to nitrates, which are much less toxic to fish.

The depth of the substrate should be approximately one inch in most aquariums (about 15 pounds of substrate in a standard ten-gallon tank). Longer tanks will require more gravel or substrate than taller ones. Avoid overfilling the tank with substrate, since this will reduce the

amount of oxygen exposure and increase the level of toxins.

Pebble size should also be considered. Larger pieces allow more oxygen into the gravel bed, but fewer, larger pebbles reduce the total surface area, holding less good bacteria than smaller pieces. The regular sized gravel available in your store works well in most tanks and usually comes in a variety of colors.

## III. FILTRATION

Aquariums are closed systems, without the continuous replacement of water that occurs naturally in rivers, ponds, lakes or streams. Waste products, uneaten food and decaying plant matter accumulate, stressing fish and causing illness or even death. A filtration system removes many waste products, improving water quality and keeping fish healthy. Filters also help keep water clearer so fish are easier to see and enjoy.

Aquarium filters use different filtering materials, methods and systems to do their work. Regardless of the type, strength or degree of sophistication of the filtering system used, no filter can remove all waste products. Frequent partial water changes are a must for healthy fish.

## Filtration Methods

Filtration methods can be classified as mechanical, chemical or biological. Most filters incorporate more than one method and the best options use all three for maximum benefit.

• **Mechanical Filtration**—uses one or more filtering substances to remove solid waste particles. Aquarium water is pumped through a mechanical filter medium, which screens out particles that are too large to pass. Mechanical filters also become limited biological filters as the filtering substance’s surface area attracts nitrifying bacteria.

• **Chemical Filtration**—removes dissolved (liquid) organic waste and other substances from the tank water. Activated carbon is the most common chemical filtering medium.

• **Biological Filtration**—relies on beneficial nitrifying bacteria that live on the filter media to break down the ammonia in fish waste. One type of bacteria converts ammonia into the slightly less toxic compound of nitrite, then a second bacteria type breaks nitrite into nitrate, a process called the “Nitrogen Cycle”.

This cycle is extremely important because

ammonia is toxic to fish and can build up quickly. Adding too many fish to a tank at once or adding fish too often can cause ammonia to spike to deadly levels.

Bacteria typically need three to four weeks to multiply enough to treat ammonia levels produced by a small number of additional fish.

Fish emit sufficient nitrifying bacteria along with waste to support the tank, as long as a small amount of fish (usually three inches in a ten gallon tank) are added no more than once a month. To jump start this process, a handful of gravel or filter media from a well-established aquarium can be used to seed a new tank, or liquid tank bacteria can be added. Aerobic (oxygen using) bacteria are much more efficient than anaerobic (non-oxygen using) bacteria, breaking down ammonia and nitrite more quickly.

## Basic Filtering Materials

• **Foam Pads/Sponges**—are used for mechanical filtration. They are available in many shapes, sizes and porosity (i.e. fine or coarse) to remove solid waste. As water filters through the foam pads or sponges, they trap suspended particles. The surface area of the foam or sponge also supports colonies of good nitrifying bacteria and microscopic animal life that

are a source of fish food.

Foam pads or sponges usually are reusable and can be cleaned monthly or as needed by rinsing to remove trapped solid waste. To avoid killing good bacteria on the surface, use water from the aquarium or conditioned tap water. Replace foam pads and sponges every three to four months.

• **Filter Floss**—is a mechanical filtration medium available in bulk or in cartridges to fit many different types of filters. Particles suspended in the water are trapped as it flows through the floss. The floss’ surface area also supports colonies of good nitrifying bacteria. Floss should be cleaned monthly to remove trapped solid waste and replaced every three to four months. When replacing bulk filter floss, leave some dirty floss in the filter to seed bacteria growth on the new material.

• **Gravel**—is used as a substrate but also can be considered a biological filtration medium. As water flows around the gravel, some solid waste particles are trapped. The gravel’s surface area also supports colonies of nitrifying bacteria that help break down liquid waste. The gravel bed should be cleaned once a month with a gravel vacuum to remove trapped substances. Vacuum tanks with live plants very lightly or not at all.

• **Plastic/Ceramic Pieces, Wheels & Bioballs**—are biological filtration media that provide maximum surface area for nitrifying bacteria colonies to grow. Plastic and ceramic pieces are most commonly used in trickle filters; heavily aerated water falls or sprinkles over the pieces, encouraging growth of aerobic (oxygen loving) nitrifying bacteria that break down ammonia and nitrite from fish waste more efficiently than anaerobic (oxygen lacking) bacteria.

• **Diatomaceous Earth**—is generally considered a specialized mechanical filtration medium and consists of fossilized remains of diatoms, a type of hard-shelled algae. As water flows through the diatomaceous earth, the rough surface area and microscopic pores of these skeletal remains entrap tiny waste particles, along with parasites, algae and some types of bacteria. The filtered water emerges clear. Frequent replacement is necessary. Micron cartridges also can be used to “polish” the water as needed.

• **Sand**—is a mechanical filter medium. Usually No. 20 grade washed silica is used in large, canister-type filters in central filtration systems in pet stores. Waste particles are trapped in the sand, along with algae and some disease causing pathogens. Periodic back flushing

unclogs the system and renews filtering capacity.

• **Activated Carbon/Other Chemical Media**—are specially manufactured materials used for chemical filtration.

Activated carbon, the most common chemical filtration medium, is capable of adsorbing dissolved organic matter (DOM), as well as some gases and metals. Adsorption occurs when a gas or liquid accumulates on the surface of a solid or a liquid, forming a molecular or atomic film. It differs from absorption, in which a substance diffuses into a liquid or solid to form a solution.

Activated carbon's adsorbing ability is approximately five times greater than that of charcoal (another common chemical filtering material). Activated carbon removes waste products that can discolor the water or cause odors, and helps keep aquarium water sparkling clear. It also will adsorb most medications, so must be removed when treating fish. Additional chemical media include resins and other materials that remove specific substances, such as ammonia and phosphates.

## Filters

Many types of filters are available on the market. Although they may look very dif-

ferent, all filters work to remove waste products and keep water cleaner, clearer and well oxygenated. Commonly available types include corner/box, sponge, canister, outside/hang-on power, sump/trickle, undergravel and UV sterilizer filters.

When choosing a filter, keep in mind that it should move at least ten times the tank's water volume per hour. A 20-gallon tank needs a filter that can move at least 200 gallons per hour (gph) while a 100-gallon tank requires a filter that can move 1,000 gph or more.

Filters can run for years if maintained properly, including periodic replacement or cleaning of filter media. You should understand how the filters in your store work, as well as how to disassemble and clean them so you can help customers take proper care of their own.

Almost all filters include a water pump that may be built in or a separate unit. The water pump spins an impeller, which includes a cylinder metal part and a piece with arms or "wings", to move water. Over time, aquarium water will deposit dirt, slime and other gunk that may prevent the impeller from spinning correctly or from restarting after a power outage. In extreme cases, this can cause the motor to

burn out, requiring costly replacement of the water pump unit or the entire filter.

To keep the impeller operating correctly, it should be removed and brushed off every three to four months. The "well" or area the impeller sits in should be cleaned out at the same time. Regular filter maintenance is important both in your store and at customers' homes.

## Corner/Box Filter

Unlike most filters, corner/box filters use an air pump rather than a water one. The pump forces air down through a tube in the center; the resulting air bubbles pull water through a mechanical filter medium that traps solid particles and a chemical medium that removes liquid waste.

Although the bubbles do not add air to the tank, the motion when they hit the surface helps aerate the water. Gravel occasionally is added to the filter to keep it submerged and provide surface area for nitrifying bacteria colonies.

To avoid losing nitrifying bacteria, customers should change filtering components (floss, carbon, gravel, etc.) on a staggered schedule of two weeks or more, rather than all at once. Corner/box filters are the least expensive option for cus-

tomers with small tanks.

A Sponge Filter works like a corner/box filter, but pulls water through a large sponge instead of a small container filled with floss or other filter media. A sponge filter primarily acts as a biological filter, although it removes some solid waste.

## Canister Filter

Canister filters are shaped like cylinders, with intake and outtake hoses that go from the top of the filter into the tank. These filters can be placed anywhere, but usually are positioned in the stand under the tank.

A motor spins an impeller, pulling water into the canister. These filters usually include activated carbon inserts, or trays where carbon can be placed, along with foam or sponge pads and some sort of biological filter media, such as ceramic beads.

Some canister filters accommodate temporary use of other filter materials to remove even the smallest particles. A cloth membrane coated with diatomaceous earth or micron cartridge will make the water exceptionally clear, but typically are used for only a day or two because they clog easily. Canister filters are available in various sizes for use in different types of aquariums.

## Outside/Hang-On Power Filter

As their name implies, outside/hang-on power filters are hung outside the back of the tank. An electric motor drives the impeller, which pulls water into a chamber that holds various filtering materials to achieve mechanical, chemical and, in many cases, biological filtration.

Many sizes of power filters are available to accommodate various aquariums; inserts are designed to fit specific filter sizes or models.

## Sump/Trickle Filter

Sump/trickle filters are placed underneath the tank. Water is pumped from the tank into a separate containment area with one or more chambers that include mechanical and biological filter material. These filters usually are used for bigger tanks and can service very large aquariums.

In one common style, a foam pad is placed on a tray with lots of holes in the bottom; water flows through the foam and drips over bioballs or another biological medium with a large surface area. Other filters use a spray bar instead of a tray to distribute and aerate the water.

The biological media is positioned above

water that collects at the bottom of the chamber so the trickling water stays in constant contact with the air, absorbing higher amounts of oxygen and encouraging more efficient, aerobic nitrifying bacteria to grow. Water also may flow through a chemical medium before or after it passes through the biological medium.

Water then moves into the “sump” area where it is pumped back into the tank. Depending on the filter construction and number of chambers, water may pass through a second chamber that includes additional filter media, before moving into a third chamber for pumping into the tank.

## Undergravel Filter

Undergravel filters are placed under the gravel bed. A plate with slots and uplift tubes draws aquarium water through the gravel, oxygenating it and allowing nitrifying bacteria to convert ammonia into nitrite and then into nitrate more efficiently and quickly.

Newer filter styles that incorporate biological filtration media have made undergravel filters less popular, since they are more efficient and avoid problems due to dirt getting trapped under the plate. Aquariums with undergravel filters should be vacuumed

monthly with a gravel vacuum.

## UV Sterilizer

Ultraviolet (UV) sterilizers are secondary filters, used in conjunction with sump, canister, outside power and other filters.

UV sterilizers kill a number of microorganisms in tank water, such as parasites, viruses, protozoa and bacteria, preventing the transmission of disease pathogens between fish. They are particularly recommended for pet store aquariums used to house new fish arrivals, as well as species with a high disease risk profile, such as goldfish and discus. UV sterilizers also kill suspended algae and work well to control green water in tanks that have high phosphate levels or get too much direct sunlight.

The amount of UV light produced is reflected in the bulb’s wattage; bulbs with a higher wattage produce more UV. Regardless of wattage, UV intensity will decline over time; bulbs should be replaced every six months, even if the light output looks the same to human eyes.

## IV. WATER QUALITY

### Introduction

Water quality is critical to keep freshwater fish healthy and vibrant. Quality should be adjusted as needed before being added to an aquarium, then managed through the use of frequent water changes, proper filtration and good feeding practices.

Never add fish to an aquarium filled with unconditioned tap water. Municipal tap water usually is treated with disinfectants (chlorine or chloramine) that are poisonous to freshwater fish. Tap and well water also may include harmful heavy metals, such as iron and copper, and must be treated with a water conditioner to remove these substances.

Bottled, spring or well water also can be used and usually are free from most contaminants. Some pet stores offer RO (reverse osmosis) or RO/DI (deionized) filtered water, from which harmful substances have been removed using special filters. RO or RO/DI water is a good option in areas where tap water is particularly bad for fish, even after the addition of water conditioners. Never use distilled water in aquariums because it lacks nutrients vital to overall fish health.

## Water Conditioners

Water conditioners should always be added to tap water before filling freshwater aquariums. They also are recommended for well, spring and bottled water to remove any harmful elements.

Conditioners neutralize water treatment chemicals like chlorine and chloramine instantly and also remove heavy metals, including copper and iron. Many water conditioners also add electrolytes and vitamins to boost fishes' immune systems.

Some conditioners can help fish regain the protective slime coat they lose when moved from tank to tank, while other include beneficial disease inhibitors. Other conditioning products help simulate natural conditions for specific groups of fish, such as discus or African cichlids.

Make sure you fully understand the different types of water conditioners you sell and their features and benefits.

## Chlorine/Chloramine

Chlorine and/or chloramine are commonly added to municipal supplies to make water suitable for human consumption. Both chemicals are toxic to fish. Although chlorine and chloramine will

break down and evaporate from tap water left in an open container, a water conditioner neutralizes these chemicals instantly and can offer additional benefits.

It is very important to know where customers live and how local water is treated when recommending a conditioner. Chloramine, which includes chlorine and ammonia, is more stable and remains in water longer than chlorine. Using a water conditioner that only removes chlorine in water treated with chloramine can cause ammonia to spike to levels high enough to kill fish.

## pH

pH measures the hydrogen ions in water. Water at a pH of 7.0 is considered neutral. pH levels below 7.0 are considered acidic, while over 7.0 is considered basic or alkaline (not to be confused with "alkalinity", which refers to water's ability to support pH levels, an important factor for saltwater tanks).

pH is measured on a logarithmic scale, which means that very small variance in numbers represent a significant difference in pH level. For example, a pH of 7.0 is 40 times higher than a pH of 6.6, while a pH of 6.0 is 80 times lower than one of 6.8.

Many tropical fish thrive at a pH level of 6.8 to 7.0, but some species do best at different pH levels. For example, African cichlids require a pH around 7.8, while a number of South American species prefer a pH of 6.4. For information on pH preferences of various freshwater fish species, see the Common Species Identification module later in this chapter.

Although fish often can survive for a time in the "wrong" pH level, they generally do not live as long and may be more susceptible to diseases. If local tap water is not an appropriate pH for tropical fish, products are available to help customers adjust pH levels. pH changes can be made quickly in new tanks that do not yet include fish or when preparing new water to add to an existing tank. In established tanks, pH adjustments should be made over the period of a few days or longer to avoid shocking and/or killing fish.

Always test the pH of tap water before adjusting, since municipality treatment plants may vary the amount or types of chemicals used. pH may change over time and usually will need more frequent adjustment in tanks that are less than four months old. Customers should test pH at least twice a week in new aquariums, then every two weeks or so. Using water treated to the right pH for periodic changes will

help keep tank levels on target.

When transferring fish into a new tank, the pH should be the same as their old aquarium whenever possible to prevent additional stress. Fish generally can tolerate +/- 0.2 pH between old and new tanks, but larger differences can make them vulnerable to disease, or may even cause death from shock.

## Water Hardness

Hardness refers to the amount or concentration of minerals dissolved in water and is measured in parts per million (ppm) or milligrams per liter (mg/L). Water that has a high concentration of calcium, magnesium and other minerals is considered hard, while water with low levels is classified as soft.

Most tap water is slightly to very hard. If needed, hardness can be adjusted with a water softener or peat moss. Water changes are important to manage water hardness. Minerals do not evaporate; customers who only replace evaporated water rather than following a recommended schedule for partial water changes may end up with harder water than desired.

Most fish, particularly those from South America, prefer slightly soft water (50 to

100 ppm). Discus and live plants prefer softer water (under 50 ppm). Livebearers and goldfish prefer slightly hard to hard water (100 to 200 ppm), while African cichlids and other brackish water fish like very hard water (over 200 ppm). Many species do fine in the middle values, and it is rare for hardness to be a problem in most tropical fish tanks.

Water hardness does affect fish medications, so that a standard dose can be toxic in very soft water and ineffective in very hard water. Customers may need to adjust medication amounts based on water hardness. Test kits are available for purchase and many pet stores offer water testing.

## Electrolytes

Electrolytes are essential for fish to take in oxygen through their gills and release carbon dioxide. When electrolyte levels are too low, fish cannot breathe properly, making them more vulnerable to disease.

Adding aquarium salt directly to the tank or to water changes supplies the electrolytes fish need to breathe easily and remain active. Depending on species of fish kept, 1/2 to 1 teaspoon of salt should be added per gallon. Salt should never be added to tanks with live plants. Some species, including mollies, usually do bet-

ter in tanks with higher levels of salt.

## Oxygen Levels

Freshwater fish do best with oxygen levels of 7 to 8 parts per million (ppm). Oxygen levels below 4 ppm severely stress fish. When levels are too low, fish may be seen gasping at the surface, even though most cannot take in oxygen from the air.

Oxygen depletion most often results from:

- Aquarium overcrowding, a common problem in pet stores, leading to increased carbon dioxide levels and decreased oxygen levels.
- Inadequate filtration, resulting in not enough water movement and failure to break the water surface tension enough to permit oxygen to enter the water and carbon dioxide to exit.
- High temperatures, since warmer water holds less oxygen than cooler water.
- Decomposing materials that use oxygen to break down.
- Not enough surface area to permit adequate exchange of oxygen and carbon dioxide, often the case in very tall tanks. Customers with tall tanks usually need additional filters and/or water pumps to allow more gas exchange and should keep their fish populations low.

## Ammonia

Fish waste includes ammonia (NH<sub>3</sub>), which breaks down into nitrites, then nitrates. Both in your store and at customers' homes, freshwater fish aquariums should be closely monitored for levels of these three waste products.

Ammonia should test at zero in established tanks with sufficient nitrifying bacteria. However, ammonia can rise to very high concentrations in new tanks or when too many fish are added. Levels should be carefully monitored in new tanks and after adding fish, particularly in smaller tanks where waste can concentrate faster.

An immediate partial water change (from 25% to 50%) will help reduce ammonia to acceptable levels. Adding real freshwater aquarium bacteria or ammonia removing media and/or liquids also can help decrease ammonia quickly. Note that some products that remove ammonia will prevent ammonia test kits from reading correctly. Some medications, including methylene blue and certain antibiotics, can kill nitrifying bacteria, resulting in high ammonia levels. Always test ammonia during and after treatment, and take action to reduce levels as needed.

## Nitrite & Nitrate

Nitrite (NO<sub>2</sub>) and nitrate (NO<sub>3</sub>) should be monitored closely. Ammonia is broken down into nitrite, which is less toxic but still dangerous to fish at high levels. Nitrite is then broken down into nitrate by another type of bacteria, completing the nitrogen cycle.

Nitrite generally is detected only in new tanks (during the initial phases of establishing nitrifying bacteria colonies) and when new fish are added. In established tanks, nitrite levels should test at zero as it breaks down into nitrate.

Nitrate will accumulate in the aquarium over time, but can be kept at safe levels by frequent partial water changes. Although nitrate is not nearly as toxic to fish as ammonia or nitrite, at high levels it is stressful to fish and causes excessive algae growth. Overfeeding and overcrowding increase the rate at which nitrogenous wastes build up in aquarium systems and should be avoided. Customers who are having problems with fish disease or loss and/or algae build up should test water quality at home or bring a sample to your store. Before testing, always ask how long the tank has been set up, if they have added any new fish recently, and how often and how much water

they change. Assuming the tank has been set up for at least six months and no fish have been added recently, nitrate levels are the problem.

## Temperature

Water in aquarium tanks should be maintained a constant temperature that approximates each fish species' natural environment. For tropical fish, the ideal temperature falls between 75 to 80 degrees F for most species, with room temperatures acceptable for goldfish and a few other species.

Always use an aquarium heater with tropical fish to keep water at an appropriate temperature and prevent fluctuations, which stress fish and can cause disease. A thermometer should be used to monitor the temperature in case of heater malfunctions.

Other important points to remember about water temperature include:

- Tropical fish are more active in warm water.
- Bacteria growth increases in warm water.
- Oxygen levels are lower in warm water.

Refer to the Common Species Identification module for ideal temperature ranges for specific species of freshwater fish.

## V. FEEDING & NUTRITION

Providing a complete diet is one of the most important, yet neglected, aspects of fish husbandry. Proper nutrition is critical to maximum life and color, and also results in faster growth, increased resistance to disease and parasitic infection, enhanced vigor and greater breeding capabilities.

Tropical fish require a varied diet to stay healthy and vibrant. Although flake fish food is well-balanced and fortified with vitamins and minerals, fish need more than one type of food to get all the nutrients they need.

Each species has an optimum balance of food groups that fish eat in their natural environment. While it's difficult to exactly match nutritional needs in an aquarium setting, providing a wide selection of food helps ensure nutritional completeness. Monotonous diets can lead to a slow decline, while a variety ensures fish live long and healthy lives.

### Common Types of Food

Common types of fish food include:

- **Dried Prepared Food**—is convenient;

inexpensive; and available in flakes, pellets and wafers. Better-quality dried foods contain a wide variety of ingredients, including fish and shrimp meal, liver, yeast, plant material, fish oils and vitamins. Dried foods provide a fairly balanced diet, but should not be fed exclusively. Note that some formulations include more plant matter and are designed for mostly vegetarian fish; others are primarily meat based for mostly carnivorous fish.

- **Freeze-Dried Food**—contains a single ingredient, such as brine shrimp, krill, tubiflex worms, daphnia, bloodworms or other ingredients. Freeze dried foods may be a whole organism or processed into a dried cube. Freeze drying results in greater retention of nutrients.

- **Frozen Food**—is known for its excellent nutritional values and may include a single ingredient or a mix, such as shrimp, algae, clam, zooplankton, plant material and other types of food, along with added vitamins and minerals. Always feed frozen food after it has been fully thawed, which can be accomplished by placing it in very warm water for 10 to 15 minutes.

- **Live Food**—regular live food feedings stimulate appetite in picky eaters and are good for almost all freshwater fish. Common aquatic live foods include:

- o Tubiflex worms—must be rinsed or soaked in fresh water before feeding to reduce the likelihood of transmitting infectious pathogens to pet fish. Avoid overfeeding, since uneaten worms burrow into gravel, where they die and pollute the water.

- o Brine shrimp—are one of the most common live foods fed to fish. Adult brine shrimp have a relatively low nutrient content that can be boosted by soaking them in liquid invertebrate diet for six to eight hours before feeding.

- o Small feeder fish—usually include feeder guppies and comet goldfish. The nutritional value of feeder fish can be enhanced by feeding them high quality flake food. Feeder fish can carry diseases and pollute the water much faster than other types of food and should be fed sparingly.

## Feeding Best Practices

Best practices for feeding freshwater fish include:

- **Meet Fish Needs**—It's important to know what specific type of food each individual species of freshwater fish prefers. Certain species prefer only live food or will eat only a meat diet. Bottom dwellers and shy fish may not get enough to eat if

food is fed only at the surface or in an area of the tank where faster and more aggressive fish eat it all. For more on the food preferences of specific freshwater fish, refer to the Common Species Identification module later in this chapter.

• **Adjust for Temperature**—Like most things related to fish health, feeding habits depend on two important factors: Water temperature and water quality. The higher the water temperature, the more food fish need. Coldwater fish also feed more actively when kept towards the warmer end of their preferred temperature range.

• **Set Feeding Times**—Most fish need to be fed only once a day. Although time of day generally doesn't matter, food should be offered at the same time each day. When feeding fish in your store, first thing in the morning before the store opens is recommended; a second feeding can be given after closing if needed. Demonstrating feeding live and frozen foods during store hours can increase sales, but these feedings should be kept light.

• **Avoid Overfeeding**—Overfeeding is one of the major causes of fish loss. Overfeeding produces more fish waste (ammonia) that can build up to harmful levels quickly, especially in a new tank; uneaten food also can disintegrate and spoil,

causing cloudy water and ammonia build up.

To prevent overfeeding, customers should feed fish no more food than they can eat in two minutes, and limit feeding to once a day, particularly during the first few weeks with a new tank. Food on the aquarium floor indicates fish have been overfed or fed an inappropriate food. Siphoning settled food particles before they disintegrate will help prevent tank pollution.

To prevent overfeeding, encourage customers to:

- o Drop a few pieces of food into the tank, then step back and watch.
- o When fish have finished eating, offer a few more flakes or pieces.
- o After two or three portions, fish will lose interest and start spitting food back out, indicating they are no longer hungry.
- o Never throw in a whole pinch of food. Two flakes the size of a pinky nail or 5-6 small pellets or equivalent of other food is sufficient for a one-inch sized fish, such as a platy.

Reassure customers that it is very difficult to underfeed fish in an established tank. Fish can easily go a weekend without food if their owner will be away. For longer periods, placing a food or vacation block in the tank will allow the fish to eat dur-

ing the customer's absence.

## Supplements

Most flake and pelleted fish food contain added vitamins and other supplements for maximum health. Vitamin C supplements are particularly important, since fish can't produce it on their own.

Problems that can result from vitamin or supplement deficiency include:

- Vitamin A deficiency—poor growth, eye problems
- Vitamin B deficiency—lateral line erosion
- Vitamin C deficiency—eye problems, weight loss, disease resistance, skeletal deformities
- Vitamin E deficiency—muscular deformities
- Thiamine deficiency—convulsions/death
- Riboflavin deficiency—eye problems
- Pantothenic Acid deficiency—gill disease

Many vitamins degrade after the canister has been opened, giving dry fish foods a limited shelf life. Most dried foods also contain fat, which can become rancid or go bad.

To avoid nutritional problems, always feed high quality food that is within its

expiration date. Once opened, dry fish food should be used within six months or replaced.

## VI. COMMON STRESS FACTORS

When it comes to reducing freshwater fish stress levels, the old adage, "An ounce of prevention is worth a pound of cure," certainly applies.

Disease diagnosis and control are the most difficult aspect of the aquarium hobby for both retailers and customers. By paying attention to water quality, fish handling, temperature and stock levels, you can minimize stress, prevent disease and help reduce the loss of freshwater fish in your store.

### Water Quality

Poor water quality stresses fish and allows organisms that cause disease to flourish, such as protozoa, bacteria and fungus. When water quality is less than adequate, fish are increasingly less resistant to disease and eventually become ill and die.

Regular testing, water conditioners, filter maintenance and frequent partial water changes are all important to ensure water quality and keep fish healthy. Clean aquar-

iums also allow customers to see fish more clearly, boosting sales in your store and allowing them to better enjoy their pets at home.

### Netting, Bagging & Releasing

Netting, bagging and releasing fish is a significant source of stress, whether they are being moved into another tank in the store or to the customer's home. The following can help reduce stress from these activities.

- **Netting**—Always use a sterilized net to minimize the likelihood of transferring a disease from tank to tank.
- **Bagging**—Bagged fish use up the relatively small amount of available oxygen and release waste products, lowering pH. Temperature changes as the fish is moved from the store to the customer's home also cause stress. Fish should be kept in bags for as short a time period as possible.
- **Releasing**—Releasing fish into water with a different temperature or pH can shock them to the point of contracting disease or infection and may cause death. Water from the bag includes concentrated waste products and may transfer disease causing organisms. To minimize the stress of release:

1. Float the unopened bag in the aquarium for 10 minutes to allow the water temperature to adjust.
2. Open a hole near the top of the bag and let in water from the tank (about 20% of the volume of water in the bag).
3. Fold the bag over the side of the tank so no water gets in or out and wait five to 10 minutes.
4. Repeat step 3 one or two more times. If there is not enough room in the bag to accommodate more water, pour some of the bag water into a sink or bucket to make space.
5. Once mixing is finished, place a sanitized net over a bucket or other container, then gently pour the bag water and fish into the net. Quickly release the fish from the net into the tank.
6. Top off the tank to replace water used for mixing after first treating it with conditioner and adjusting pH and temperature as needed.

### Overcrowding

Too many fish in an aquarium leads to oxygen depletion, ammonia build-up, waste accumulation and aggression. Adding fish over time and in small numbers allows nitrifying bacteria to multiply to sufficient levels to consume additional waste and keeps stress to a minimum.

As a general rule, the total number of fish kept in an aquarium should equal out to one inch or less of fish per gallon of water. Encourage customers to add fish no more often than once a month. Just a few fish should be added at one time, usually no more than three inches of fish per ten gallons of water.

When adding fish to any aquarium, always remember to monitor ammonia and nitrite levels closely and make necessary adjustments.

### Temperature

Water temperature is a major stress factor for freshwater fish. At temperatures that are too high, oxygen content is diminished; temperatures that are too low can reduce resistance to infection and parasites.

Heaters with automatic thermostats will help prevent temperature fluctuations. To help fish adjust to temperature changes when moving to a new tank, follow the steps under Netting, Bagging & Releasing in the earlier window.

When selling tropical fish, verify that the customer's tank is kept at an appropriate temperature and includes a heater. To help protect fish as they are transferred from the

store to customers' homes, place plastic bags in thicker paper bags and warn buyers to never leave fish in their cars, even for a short time. Particularly during cold weather, the water temperature in the bag can change quickly, causing shock that may kill the fish.

### Medical Treatment

Many fish health problems can be treated successfully. Your supervisor or experienced store employees can teach you how to recognize different diseases and parasites, and to diagnose customer problems.

When treating fish, applying medication incorrectly or using the wrong product will have little to no effect and may cause additional stress, killing already weakened fish. When administering medication to freshwater fish in your store, always follow directions exactly and encourage customers to do the same. And don't forget to remove any carbon filter media, which may absorb medication from the tank water.

## VII. CLEANING & MAINTENANCE

Part of your job may include inspecting the fish in your store on a regular basis and keeping tanks clean. This will help ensure the fish you sell are as healthy as

they can be.

Using checklists and carefully following maintenance routines will allow you to spot problems early and take necessary steps. Encourage customers to develop and follow a regular routine to care for their fish and aquariums.

Never use soap to clean fish tanks or equipment. Even small amounts of soap will kill fish.

### Daily Checklist

Freshwater fish and tanks must be inspected and maintained daily. Follow your store's procedures, which likely will include the following steps:

- Inspect all aquariums
- Verify heaters are functioning and check thermometers
- Remove dead fish and track on loss sheet
- Treat tanks with sick fish or move fish into treatment tanks
- Confirm filters are functioning
- Feed fish appropriate amounts of proper food
- Verify there is an adequate supply of disinfectant solution
- Disinfect nets between each use
- Straighten decorations and live plants (as needed)

- Remove algae (where necessary)
- Top off aquariums with water
- Turn lights on during the day and off at night
- Verify adequate supply of fish bags in inventory
- Confirm signage and pricing are correct

### Weekly Checklist

In addition to the daily checklist, there are tasks you should do every week to ensure the fish in your store remain in good overall health, including testing pH, ammonia, nitrite and nitrate levels as needed.

Regular testing is the only way to monitor water quality in the aquarium. The pH level may shift over time and require adjustment. Zero levels of ammonia and nitrite are important indicators that the aquarium has a good nitrifying bacterial culture, while low nitrate levels mean that enough water is being changed.

Follow your store's weekly procedures, which likely will include the following steps:

- Complete daily checklist
- Spot check ammonia, nitrite, nitrate and pH levels (as needed)
- Siphon detritus from aquarium gravel
- Change 25% to 33% of the water in each

aquarium once or twice a week (change a larger percentage or change water more frequently if needed)

- Refill tanks with new water at same temperature and pH as aquarium water
- Adjust pH slowly over a period of a few days (for any tanks that need adjustment)
- Check nets for wear and replace if torn or damaged
- Change net disinfectant solution
- Check equipment for cracks or wear and replace if necessary
- Clean algae and dirt from glass tops, fronts and sides, inside and out
- Total fish losses by species
- Replace any worn signage

### Monthly Checklist

In addition to the daily and weekly checklists, there are tasks you should do every month, such as cleaning the filter and changing or rinsing the filter media.

Follow your store's monthly procedures, which likely will include the following steps:

- Complete daily checklist
- Complete weekly checklist
- Inspect air line and air pumps and unclog or replace any tubing as needed
- Change filter media as needed
- Rinse out reusable filter materials and

replace if worn

- Verify filters and water pumps are working correctly and clean impeller and well area if needed
- Clean sides of aquarium thoroughly
- Inspect electrical wiring for problems

### Maintenance Supplies

Equipment that you will need to clean and maintain the aquariums in your store includes:

- Fish nets of various sizes
- Siphon hose
- Submersible pump drain hose
- Net disinfectant
- Aquarium scrub pads
- Paper and cotton towels
- Activated carbon, filter floss, foam and/or extra filter cartridges
- Tube brushes
- Glass cleaner safe for use around tanks
- Mob and bucket for floor use
- Dust pan/whisk broom for quick floor pickup
- Gravel vacuum
- Scissors
- pH test kit
- Ammonia test kit
- Nitrite test kit
- Nitrate test kit
- Water hardness test kit (if needed)
- Chlorine/chloramine test kit (if needed)

## VIII. AQUARIUM SET UP

### Introduction

Setting up a freshwater fish tank at home is relatively easy. Following standard procedures will simplify the process and position new aquarists for success.

When selling an aquarium to a first-time hobbyist, you should carefully review the process to set up and maintain the tank. Go through each piece of equipment, making sure to remove the filter and show the customer how to take it apart and reassemble it after cleaning.

Always provide any relevant care sheets so the customer can refer to them at home. Don't forget to stress the importance of reading all instruction manuals to understand how to use and maintain equipment, particularly the filter.

### Aquarium Set Up

1. Choose a location. It's important to select a location carefully, since once tanks are filled with water, they should not be moved. Encourage customers to position their tank for maximum enjoyment. Rooms where people tend to congregate, such as a TV room, are often a

good choice. The tank should ideally be located away from direct sunlight to minimize algae growth.

The aquarium should be placed on a very sturdy piece of furniture that can support its weight when full (estimated by multiplying size in gallons by 9 to 10 pounds). For larger tanks, be sure the floor can support the tank's weight when full; an aquarium stand is recommended for larger tanks. Customers should avoid using antiques or family heirlooms that may be damaged by leaking water and consider protecting furniture with a sheet of acrylic.

If the tank is being built into a wall or other area, make sure there is enough space at the top and bottom to access equipment easily, change water and do other maintenance.

2. Level the tank. Verify the tank is horizontally and vertically level.
3. Add gravel. Carefully pour gravel or another substrate into the tank and spread it into a fairly even layer, approximately one inch deep. Avoid pouring gravel from above the tank, which may damage the glass; instead, hold the bag close to the bottom of the aquarium or use a strainer or bucket to add gravel gradually.

Most gravel sold for aquariums does not

need to be rinsed before using unless it is noticeably dusty. To clean gravel, put some in a strainer and rinse with tap water until the water runs clear. For larger amounts, fill a bucket of gravel with tap water and swirl; pour off the dirty water and repeat until the gravel is clean.

4. Fill the tank. Fill the tank with water that is slightly above room temperature (75 to 80 degrees F). Use a thermometer at the sink or in the tank to monitor temperature, and adjust tap water temperature as needed. Leave about 1-1/2 inches at the top of the tank to accommodate decor and plants, as well as to float new fish in their bags.

Even trace amounts of soap can kill fish; use new buckets or other containers to transfer water to avoid possible contamination.

5. Add the heater. Tropical fish aquariums must have a heater to maintain temperature. With the heater still unplugged, set the thermostat to the desired temperature, usually in the high 70 degrees F. Place the heater in the tank and secure it following the manufacturer's instructions. Fully submersible heaters should be positioned horizontally, approximately one to two inches above the gravel. To avoid damaging the heater, allow it to rest in the tank for at least 10 minutes to adjust to the

water temperature before plugging it in.

6. Install the filter. Follow the manufacturer's instructions to set up the filter and verify it is running smoothly. Most filters must be filled with water before they are plugged in.

7. Add decorations. Decor not only makes the aquarium look more attractive, it provides places for fish to hide as needed, increasing security and reducing stress. Decorations also can be positioned to hide the heater and other equipment.

For most tanks, a good guideline is to place one, large piece of decor off center as a focal point, then use plants and smaller decor around the tank. Plants of different heights help fish feel more secure; include at least one that reaches to the top of the tank. Live plants need nutrients from fish waste to survive; after adding fish (step 11), wait at least three days and preferably a full week before introducing live plants. When using plastic plants, a more natural look can be achieved by using different sizes of the same plant so it looks like it is growing.

Natural decor (rocks, wood, etc.) sold in pet stores has been specially treated for use in aquariums and is strongly recommended over such items customers may find in nature. Never use shells, coral or

other ocean products in a freshwater tank since they affect the water chemistry.

8. Adjust water chemistry. Add water conditioner. Check pH levels and use appropriate chemicals to adjust as needed (if desired, allow tap water to sit for 24 hours first, since pH levels may change naturally).

Make further adjustments as needed based on the type of fish that will be kept in the tank. For livebearers like mollies, add 1/2 to 1 teaspoon of aquarium salt per gallon of water. For African cichlids, scats, archer fish, monos and other fish that prefer brackish (slightly salty) water, use two teaspoons of ocean salt per gallon. Never use salt in tanks with live plants.

9. Finish assembling the tank. Place the hood or glass cover and light on the tank. If needed, cut or break off pieces from the back of the hood or cover to accommodate the filter or other equipment. Avoid leaving large areas of the aquarium uncovered to minimize water evaporation and prevent fish from jumping out of the tank.

If using a timer on lighting, set it to allow six to eight hours of light daily (10 to 12 hours for tanks with live plants). Lights should be turned off at night to allow fish to sleep properly, but may be adjusted so the light is on during early

evening to allow customers to enjoy their aquarium after work.

10. Check the temperature. Water temperature should be monitored every few hours for the first 24 hours to verify it is holding at the target level.

11. Add fish. Once the water temperature and pH are stable (usually about 24 hours after the initial set up), fish can be added.

### New Tank Maintenance

• **Water quality**—should be monitored closely during the first few months since it tends to fluctuate more in new tanks than in established ones. After the first fish are added, ammonia and nitrite should be tested twice a week until the nitrogen cycle has reduced levels to zero (approximately three to four weeks). Ammonia and nitrite levels should be monitored closely whenever new fish are added.

pH levels should be checked two to three times a week for the first three to four months, and gradually adjusted over a period of a few days as needed. Once the tank is established, the customer should periodically test for nitrates.

• **Partial water changes**—are important to remove certain waste products, particu-

larly in new tanks. A general guideline is to replace 10% of tank water every week, with a 25% to 33% water change every month. Tanks with larger fish or species that give off a lot of waste, such as cichlids and goldfish, may need larger volumes of water changed each week or twice weekly changes. Water conditioner and pH treatments should be added before new water is poured into the tank.

To avoid unnecessary stress, customers should never change more than 50% of tank water at one time. Note that topping off tanks to replace evaporated water is not considered part of the water change, since waste products do not evaporate. When explaining fish tank maintenance to customers, remind them that the goal is to find the balance between too clean and too dirty that will keep their fish at optimal health.

• **Gravel vacuuming**—should be done once a month with a gravel vacuum (usually a siphon tube with a larger tube attached on the end) to prevent the accumulation of solid waste that can lead to toxic buildup over time. Approximately 70% to 80% of the gravel should be vacuumed, with the rest left undisturbed to avoid wiping out beneficial bacteria colonies. Carefully vacuum under any decorations placed on the gravel bed.

• **Filter maintenance**—is critical. Filter media should be changed every month or according to manufacturer's instructions, with some of the old media left to seed new nitrifying bacteria. Sponges or pads should be washed with tank water (or conditioned tap water) and replaced when worn. The filter should be removed, disassembled and cleaned every three to four months or so, particularly the impeller and the well it sits in. Different filter media in the same tank should be changed on a staggered schedule to preserve nitrifying bacteria colonies.

## IX. CUSTOMER PROBLEM SOLVING

Customers expect that the fish they purchase from your store will be healthy and long lived. You can help avoid potential problems and position yourself and your store as good sources of expert advice by:

- Verifying tank water chemistry and equipment will meet fishes' needs.
- Asking about types of fish stocked in the customer's home aquarium, tank size and number of fish to prevent compatibility issues and/or overcrowding.
- Providing care sheets for new fish purchases.

Regardless of the steps you take to help

customers care for their fish, most home hobbyists will experience fish loss or other problems. This section will help you troubleshoot and solve the most common issues.

Whenever water quality problems may be an issue, ask customers to bring a sample from the tank to the store for testing (about one cup or eight ounces). Note that in some cases there may be no obvious reason for fish loss.

### Problem: New Fish Die

If newly purchased fish die within a few days of purchase, likely causes include pH shock; unacceptably high levels of ammonia, nitrite or nitrate; or temperature fluctuations during the move. Use the following questions to troubleshoot this problem:

1. How long has the aquarium been set up? How do you care for the aquarium? Has the water chemistry been checked?

In newer aquariums (set up for less than six months), probable causes of new fish death include:

- High ammonia levels, usually due to adding too many fish at once.
- Using the wrong water conditioner, typically one that only treats chlorine for tap

water that contains chloramine, releasing large amounts of ammonia even before fish were added.

- Large pH difference between water in the store and customer tanks.
- Exposure to extreme temperature changes on the way home from the store or failure to follow appropriate release practices.
- Being left in the bag too long.
- Incorrect water temperature levels (although this usually takes longer than a few days to kill).

For established aquariums that have been set up for six months or more, high nitrate levels are the most likely problem and should be addressed by increasing the volume or frequency of partial water changes. Although older fish may have adjusted to these levels, they are stressed and eventually will sicken and perhaps die. Always check water quality in cases where customers claim that new fish killed or infected older fish, since in many cases pre-existing nitrate levels are the real problem.

2. How many fish did you add? What is the total number of fish in the aquarium?

Depending on the size of the tank, filter and original number of fish, deaths may be due to more fish than the existing oxy-

gen level or nitrifying bacteria can support. When fish are added to an aquarium where bacteria have maximized the amount of surface area in the tank and filter, ammonia can increase to dangerous levels.

3. When did you last change the biological media in the filter?

Failure to change biological media on a regular schedule can result in declining levels of nitrifying bacteria, leading to ammonia build up. Adding new fish to this situation causes ammonia levels to spike even higher, killing fish.

### Problem: Older Fish Die

When fish that have been in the tank for months or years die, causes usually include old age; disease; changes in pH or temperature; or unacceptably high levels of ammonia, nitrite or nitrate. Use the following questions to troubleshoot this problem:

1. When did you last check pH?

pH may change over time and require adjustment.

2. Does the tank include a heater and thermometer?

Malfunctioning heaters may cause fluctuations in water temperature. Customers should always use a thermometer to monitor that the heater is working correctly.

3. How long have the fish been in the tank? Do fish show signs of disease?

Older fish may have reached the end of their natural life; some small tropical fish only live one to two years. Older and/or stressed fish are more vulnerable to disease pathogens that exist in the tank. When more than one fish dies, water quality should be assessed and/or disease treatment may be necessary.

4. How often do you change out water? How much water do you change at a time?

Over time, nitrate will build up to dangerous levels if not enough water is replaced during partial water changes and/or too much time occurs between changes. High nitrate levels can stress fish, making them more susceptible to disease or even death. Changing too much water at one time (usually anything over 50%), particularly after a long interval, may alter the water chemistry too quickly for fish to handle. Smaller, more frequent partial water changes are recommended.

5. How often do you vacuum the gravel?

When did you last vacuum?

Vacuuming the gravel bed more than once a month may disturb nitrifying bacteria to the point that they are not as proficient at breaking down waste. Never or rarely vacuuming allows solid waste to accumulate and pollute the tank.

6. How big are the fish in the aquarium? Are fish breeding?

As fish age and grow, they produce more waste, which may exceed the capacity of nitrifying bacteria to break down ammonia and nitrites. Larger fish also require more oxygen. Breeding fish may also cause problems as babies grow and push the limit of the tank's capacity.

7. What method of filtration and type of filter are you using? When did you last clean the filter and/or change filter media?

The filter may not move enough water to remove waste products quickly and efficiently, or may not be strong enough to break the surface tension of the water to aerate it. Filters get clogged over time, impacting performance. The filter may need to be cleaned or have the filter media changed or washed out.

### **Problem: Certain Species Die**

Select species or types of fish usually die when their water or nutrition requirements have not been met. Use the following questions to troubleshoot this problem:

1. What species or types of fish do you keep? Which species have died?

Most likely specific species died because their water chemistry, temperature or food requirements were not being met. When choosing fish, select those who are comfortable in the same water conditions. For example, tetras and barbs do well together but neither is a good match for African cichlids. Species with similar water chemistry or temperature requirements may have different food and nutrition needs.

2. What food are you feeding your fish? How do you feed them?

Mixing aggressive surface feeding fish with shy or bottom feeding fish may prevent the latter from getting the food they need to fight off disease or survive. Some species require a specific food type to meet their nutrition needs. For example, glass catfish are meat eaters; even if they are willing to eat a general flake or pellet diet, they cannot digest it properly and

will not be able to survive on it for long.

### **Problem: Fish Disappear**

Disappearing fish most likely have been eaten by other fish, jumped out of the tank or been sucked into the intake tube or the filter. Use the following questions to troubleshoot this problem:

1. What type(s) of fish disappeared?

Larger fish, even peaceful species, often eat small fish. Fish also may eat newly dead fish, leaving no sign of their passing. Certain species, like swordtails, are strong jumpers; it is not unusual for fish to jump out of the tank and be eaten by a family pet or vacuumed up accidentally.

2. What is the method of filtration?

Missing fish may have become stuck to the strainer of the intake tube or sucked into the filter box. Usually this happens to sick or dead fish, but occasionally healthy fish may not be powerful enough to fight against the filter, particularly less active species with extremely long fins, like Siamese fighting fish.

### **Problem: Fish Become Aggressive**

Some species or individual fish are naturally aggressive; others may become aggressive after reaching a certain size, when ready to breed or in response to new additions to the tank. Use the following questions to troubleshoot this problem:

1. Which fish have become aggressive?

Aggressive species may have set up territorial boundaries within the aquarium, particularly after they reach a certain size, become sexually mature and/or are ready to breed. New fish may have accidentally trespassed on established territories, triggering aggressive behavior. Certain species or individuals may need to be relocated to a tank with slightly larger or more aggressive fish.

2. Is aggression directed at specific fish or groups of fish?

Sometimes existing fish will attack new fish of the same species, common with angelfish. Certain species like tiger barbs and serpaes tetras, may fin nip and chase other fish but usually will ignore groups of five or more of the same species.

## 3. How is the tank decorated?

Customers can help minimize aggression by using decor to create areas where quieter fish can retreat. Using plants that hit the surface, rocks, driftwood and other items to break up the tank also encourages fish to set up smaller territories rather than taking over the whole tank.

**Problem: Green Water/Algae Growth**

Some algae growth on glass and decor is expected in any tank and can be cleaned off as needed. Excessive algae growth or green water due to suspended algae is a common complaint and usually due to high levels of nitrates or phosphate; inadequate water movement or too much light. Use the following questions to troubleshoot this problem:

1. How often do you change out water? How much water do you change at a time?

Nitrates will build up over time if not enough water is replaced during partial water changes and/or too much time occurs between changes. Algae grows faster in tanks with high nitrate levels, which should be adjusted through frequent, small partial water changes.

## 2. What is the phosphate level in the tank?

Fish food may leach phosphate into the aquarium, but tap water usually is the cause of high phosphate levels. Although phosphate doesn't hurt fish, it does lead to rapid algae growth. In many cases, stronger filtration, additional carbon and/or specialized chemical filter media will reduce phosphate levels and algae growth. In places where tap water contains very high levels of phosphates, customers should consider using bottled water or a UV sterilizer to kill suspended algae, particularly in large tanks.

## 3. What method of filtration and type of filter are you using? When did you last clean the filter/change filter media?

Water movement helps control algae growth in any tank. Filters should be strong enough to move at least 10 times the tank's water volume per hour. Filters get clogged over time, impacting performance. The filter may need to be cleaned or have the filter media changed or washed out. Adding a water pump to the bottom of the aquarium also can help keep algae down, particularly in taller tanks.

## 4. How much natural and artificial light does the tank receive? When was the tank light bulb last changed?

Sunlight can cause excessive algae growth. Customers may need to reduce the amount of light received by moving the tank, covering the window or using a background to block the amount of light that enters the aquarium. Tank lights should be left on no more than six to eight hours each day; a timer will help control the amount of light the aquarium receives.

Brighter light will help control algae growth. Bulbs lose their intensity over time and should be replaced every six months, even if the light output looks the same to human eyes. Live plants will compete with algae for nutrients and control its growth, but require special lighting that can be costly.

**Problem: Live Plants Die**

Live plants may do poorly in response to water quality issues, inadequate nutrients or insufficient lighting. Some "aquatic" plants simply are not suitable for aquariums. Use the following questions to troubleshoot this problem:

## 1. What types of plants died?

Like fish, some plant species have specific temperature or water quality requirements. Which plants are dying may help

determine the problem. Certain plants that may be labeled as aquatic are not suitable for aquariums, including mondo grass, underwater pine, underwater palm, dumb cane, sandriona, red sandriona, nerve plant and krinkle (purple krinkle).

True water plants will wilt or bend over when held out of the water. Species that usually do well in freshwater tanks include anacharis (elodea), cabomba, red ludwigia, swords (Amazon, melon, Brazil, micro, etc.), ambulia, wisteria, cardamine, jungle val, foxtail, hornwort, cryptocorynes, anubias, hygrophila, water sprite, lilies, banana plant, java fern and moss.

## 2. How much light does the tank receive?

To stay healthy and survive, live plants need 10 to 12 hours of very bright light a day. Aquariums should be fitted with additional lighting fixtures that provide at least 3 watts per gallon (more for taller tanks) and use brighter bulbs designed for live plants, such as compact bulbs or T5s. Bulbs should be replaced every six months, even if the light output looks the same to human eyes.

## 3. How old is the tank? What type of substrate do you use?

Most aquatic plants feed on fish waste; in

aquariums where waste levels are low, particularly newer tanks, customers may need to add plant food to provide necessary nutrients. Live plants usually do best with plant-specific substrates.

### Other Problems

Other common problems with new aquarium set ups include:

• **Cloudy Water**—Water in newly set up tanks may become cloudy white after the third or fourth day. This condition is caused by a bacteria bloom. To clear the water, customers should feed little or no food while tank is cloudy. The bacteria will rapidly consume nutrients in the water then die off, returning the water to its original clarity.

• **pH Bounce**—For the first three to four months, pH levels often vary much more than in established tanks. The chemical makeup and water hardness may cause difficulty in adjusting and maintaining a consistent pH reading over time.

When using chemicals to raise or lower the pH, customers should be careful to avoid rapid changes that may cause additional fish stress or death. Correcting pH before adding new water to the tank (by first adjusting it in a bucket or other con-

tainer) will help minimize stress. For tanks that continue to require ongoing adjustment, customers may want to consider transitioning to fish that will thrive at the water's natural pH level.

• **Regulating Temperature**—Customers should never rely on room temperatures to keep tanks warm enough for tropical fish. A heater is required to keep the water temperature at a consistent, desired level. When adding water to the aquarium, customers should match the temperature between tank and tap water as closely as possible. Before adding fish to a new set up, the customer should verify the heater is working properly and the tank maintains a consistent temperature for at least 24 hours.

• **Tap Water Quality**—Tap water can be an unrecognized factor in fish loss due to a number of factors, including:

o Source water may contain toxic elements, including metals, chlorine, chloramines, bacteria, phosphates and nitrates. Treatments are available for all of these problems.

o Residual water may be contaminated with copper or soldering flux (from copper piping) or bacteria (from PVC piping). Customers should always flush contaminants by letting water run from the

tap for a few minutes before filling up a tank or bucket. Water from outside faucets is not recommended due to potential leached chemicals from garden hoses and lower temperatures.

o Well water may be high in toxic agricultural or industrial chemicals and heavy metals or low in oxygen.

In severe cases, customers may need to switch to bottled, spring, RO (reverse osmosis) or RO/DI (deionized) filtered water.

## X. EQUIPMENT CHECKLIST

- Aquarium tank
- Aquarium glass top and light or hood
- Aquarium heater
- Thermometer
- Filter(s)
- Filter media (including cartridges, carbon, floss, etc.)
- UV sterilizer unit (if needed)
- Gravel or other substrate
- Aquarium decor
- Plants (if applicable)
- Fish food (different types depending on species)
- Fish nets of various sizes
- Net disinfectant
- Siphon hose/gravel vacuum
- Aquarium safe glass cleaner

- Aquarium safe pads/razor blades
- pH test kit
- Water hardness test kit
- Chlorine/chloramine test kit
- Ammonia test kit
- Nitrite test kit
- Nitrate test kit
- Fish care books and literature

## XI. COMMON GROUPS & SPECIES

### Introduction

There are more than 11,500 known species of freshwater fish. Learning about even the most popular types may seem overwhelming, but content in this chapter will help, combined with time on the sales floor and talking with your supervisor and experienced coworkers.

Body shape, markings, fin structure and coloration are important indicators to distinguish between groups of related fish and identify specific species. This module includes information to help you identify the most common species sold in pet stores, and also provides important details about water quality, water temperature, diet requirements and other useful information.

Each species listing includes a

Maintenance Rating to help you determine whether a particular fish is a good fit for each customer's experience level and aquarium set up. Ratings are based on the following scale of 1 to 5, with fish rated 1 or 2 best for beginning hobbyists:

1. Peaceful, mixed community, small adult size (under 4"); average water conditions, beginning hobbyist species.
2. Peaceful to moderately aggressive, mixed community, medium to large adult size (over 4"); average water conditions, beginning hobbyist species.
3. Moderately aggressive, mixed community, average water conditions, intermediate to advanced hobbyist species.
4. Aggressive, special community or single species, advanced hobbyist species.
5. Special concern or requirements.

### Labyrinth Fish (Anabantids)

Labyrinth fish are called anabantids, which includes a group of Asian and African perch-like fish from several different but related families. Their main distinction is an accessory breathing organ that allows them to take in air at the surface, allowing them to live in oxygen-poor water.

The males build a bubble nest to place eggs in when breeding. There are a variety

of sizes, shapes, colors and dispositions in this group. Many species are extremely hardy and perfect for the beginning hobbyist, while others pose challenges for even the most advanced aquarists.

The Gourami Group includes many popular labyrinth fish.

#### Siamese Fighting Fish

- Scientific Name: *Betta splendens*
- Sexing: Males are larger, have larger fins and are usually more colorful than females.
- Ideal Water Quality: Soft to very hard water (50 to 400 ppm); pH around neutral (6.8 to 7.2).
- Ideal Water Temperature: 75 to 82 degrees F.
- General Diet: Must get a meat diet, a number of "Betta" dry foods are available, along with freeze-dried and frozen and live food.
- Maintenance Rating: 3
- Comments: Males are extremely intolerant of other males and will fight to the death. Females can be kept together, while a male and female cannot be kept together for long. Males often are kept in small bowls that require small, daily changes to ensure high water quality.

#### Paradise Fish

- Scientific Name: *Macropodus opercularis*

- Common Color Variations: Blue, Albino, Red.
- Sexing: Males are brighter with stronger color patterns, and longer and larger fins.
- Ideal Water Quality: Moderately soft to very hard (50 to 500 ppm); pH 6.8 to 7.2.
- Ideal Water Temperature: 65 to 80 degrees F.
- General Diet: Omnivore but mainly a meat diet (similar diet preference to Siamese fighting fish but with a very small amount of plant food).
- Maintenance Rating: 3
- Comments: A hardy fish that will adapt to most conditions. Due to its ability to jump, the aquarium or bowl should be covered at all times or the water level kept lower.

### Gourami Group

#### Dwarf

- Scientific Name: *Colisa lalia*
- Common Color Variations: Blood Red, Neon Blue Dwarf, Powder Blue, Flame.
- Sexing: Males are much more colorful than females.
- Ideal Water Quality: Moderately soft (20 to 100 ppm); pH 6.8 to 7.2.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.

- Maintenance Rating: 1
- Comments: This peaceful species does best when kept in mixed pairs as males will fight with each other. The natural color of the wild 2" male shows distinct, brilliant turquoise bands on a red and silver body, but many colors are available in aquarium fish. More prone to disease than other fish if maintained in poor water quality.

#### Blue Gourami

- Scientific Name: *Trichogaster trichopterus*
- Common Color Variations: Gold, Lavender, Opaline, Platinum.
- Sexing: Males have longer, pointed dorsal fins.
- Ideal Water Quality: Soft to very hard (50 to 400 ppm); pH 6.8 to 7.2.
- Ideal Water Temperature: 76 to 82 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 2
- Comments: One of the hardiest species in aquarium hobby, it grows to over 4" in length and can become quite aggressive when older. Mature males are most aggressive and best kept one to an aquarium.

#### Kissing Gourami

- Scientific Name: *Helostoma temminckii*
- Common Color Variations: Pink, Green.

- Sexing: Very difficult.
- Ideal Water Quality: Moderately soft to very hard (50 to 500 ppm); pH of 6.8 to 7.2.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: Large (up to 12"), hardy species comes in two colors, greenish and pink. Common name comes from aggressive tendency of males to lip lock as form of challenge to other males.

### Pearl Gourami

- Scientific Name: *Trichogaster leeri*
- Sexing: Male has extended rays in dorsal and anal fins as well as reddish-orange breast.
- Ideal Water Quality: Moderately soft to very hard (50 to 500 ppm); pH 6.8 to 7.2.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 2
- Comments: Very beautiful, long-lived species grows to 4". It is peaceful and hardy, and makes an excellent addition to any peaceful aquarium with larger fish.

## Catfish

### Corydoras Catfish

Corydoras are probably the best-known group of bottom dwelling catfish. Members of this genus are peaceful, hardy, attractive and active. Some may be shy, frequently hiding in darker places until night. They do best in the company of other corydoras catfish and are excellent scavengers.

### Bronze Catfish

- Scientific Name: *Corydoras aeneus*
- Common Color Variation: Albino.
- Sexing: Females are larger with higher backs and broader bodies (when viewed from above).
- Ideal Water Quality: Soft to moderately hard (30 to 250 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food. They especially enjoy worms.
- Maintenance Rating: 1
- Comments: 3" species is the most commonly bred aquarium catfish in the hobby. A hardy, active and useful fish that is good for any small fish community aquarium.

### Skunk Catfish

- Scientific Name: *Corydoras arcuatus*

- Sexing: Females are larger with higher backs and broader bodies (when viewed from above).
- Ideal Water Quality: Soft to moderately hard (30 to 250 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food. They especially enjoy worms.
- Maintenance Rating: 1
- Comments: This is a small (2"); peaceful and attractive species. It has a broad black stripe that starts at the snout, passes through the eye along the back (just under the dorsal fin) and back to the base of the caudal fin.

### Salt & Pepper Catfish

- Scientific Name: *Corydoras paleatus*
- Sexing: Males have an elongated dorsal fin. Females are larger with higher backs and broader bodies (when viewed from above).
- Ideal Water Quality: Soft to moderately hard (30 to 250 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food. They especially like worms.
- Maintenance Rating: 1
- Comments: This species is extremely hardy and adaptable to many aquarium

conditions. Most are farm raised in Florida or in the Far East. Although they can grow to 4" in length, most are less than 3" long.

### Panda Catfish

- Scientific Name: *Corydoras panda*
- Sexing: Males have an elongated dorsal fin. Females are larger with higher backs and broader bodies (when viewed from above).
- Ideal Water Quality: Soft to moderately hard (30 to 250 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food. They especially enjoy worms.
- Maintenance Rating: 1
- Comments: Small species barely reaching 1-1/2". Very peaceful and great in smaller tanks.

### Plecostomus Catfish (Loricariids)

The Loricariids are suckermouth catfish best recognized by their heavily protected bodies, covered with overlapping plates of armor, and very large, round, toothy mouths. This group includes the well-known algae eaters, *Plecostomus* (Pleco for short). Loricariids are herbivores and very useful in removing algae from tank walls and decor.

There seldom is enough algae in an aquarium to support a single catfish, let alone a group of them. Supplemental food should be provided in the form of algae wafers or flakes, along with vegetables like zucchini and squash that have been blanched or briefly boiled, then cooled. Driftwood also provides these fish with needed roughage and helps them control the growth of their tiny teeth.

#### **Bristlenose Plecostomus (Ancistrus Catfish)**

- Scientific Name: *Ancistrus dolichopterus*
- Sexing: Males develop large bristles during breeding season.
- Ideal Water Quality: Soft to moderately soft (20 to 200 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Algae in tank supplemented with algae wafers, flakes and vegetables, such as zucchini and squash.
- Maintenance Rating: 2
- Comments: Slightly territorial towards their own species but peaceful with other fish. Average size is less than 5" in length. Adaptable to different water conditions and quite effective at cleaning unwanted algae from glass.

#### **Common Plecostomus**

- Scientific Name: *Hypostomus plecostomus*

- Sexing: Difficult.
- Ideal Water Quality: Moderately soft (30 to 300 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Algae in tank supplemented with algae wafers, flakes and if needed, vegetables such as zucchini and squash.
- Maintenance Rating: 2
- Comments: Relatively large (12" or more) species. As a juvenile (1-1/2" to 2") these fish clean rocks, walls and leaves of plants of unwanted algae. After they mature, they usually eat whole live plants. Has been known to scratch acrylic with sharp teeth.

#### **Royal Plecostomus**

- Scientific Name: *Panaque nigrolineatus*
- Sexing: Unknown.
- Ideal Water Quality: Soft (20 to 200 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Algae in tank supplemented with algae wafers, flakes and vegetables, such as zucchini and squash.
- Maintenance Rating: 2
- Comments: Customers often buy this extremely beautiful catfish while small, only to discover it can grow to almost 24" in length. Like other large Loricariids, this species is peaceful to all but its own kind. If two are kept in a tank that is too

small, serious battles may occur that can harm or kill both fish.

#### **Clown Plecostomus**

- Scientific Name: *Peckoltia pulcher*
- Sexing: Unknown.
- Ideal Water Quality: Soft (20 to 200 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Algae in tank supplemented with algae wafers, flakes and vegetables, such as zucchini and squash.
- Maintenance Rating: 1
- Comments: Small (3-1/2"); peaceful algae eating species that does well in a planted aquarium although it may eat some plants. Keep population low (1 fish per 20 gallons) to ensure there is enough algae and provide supplemental food as needed.

#### **Otocinclus Catfish**

- Scientific Name: *Otocinclus affinis*
- Sexing: Males are smaller and more slender than females.
- Ideal Water Quality: Soft (20 to 200 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 72 to 80 degrees F.
- General Diet: Algae in tank supplemented with algae wafers, flakes and vegetables, such as zucchini and squash.
- Maintenance Rating: 1
- Comments: Tiny (less than 2" in

length), suckermouth catfish that are ideal for eating algae in small tanks. Number should be limited since established tanks usually produce enough algae for only two to three fish. Supplemental food should be provided, but fish require algae to survive. They prefer the company of other otocinclus cats.

#### **Synodontis Catfish**

The *Synodontis* catfish are a well-known genus of the family Mochocidae, which come from different regions in Africa. These catfish have been known to make a sound when caught up in a net and therefore are sometimes called "squeakers". Most species are nocturnal and should be kept in dimly lit or well decorated aquariums.

#### **Polka-Dot Catfish**

- Scientific Name: *Synodontis angelicus*
- Sexing: Difficult.
- Ideal Water Quality: Soft (20 to 200 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Prefers mainly a meat diet that can include dried food, such as flakes, pellets and tablets, along with freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: Juveniles are beautiful, peaceful community fish, but adults can

grow over 8" and become territorial and aggressive unless have sufficient space to not feel threatened. A variable colored species, some have a purplish base color, with others appearing almost black. One of the true "collector" catfish, this nocturnal species requires a place to hide during the day.

#### **Brichard's Synodontis**

- Scientific Name: *Synodontis brichardi*
- Sexing: Males are generally smaller than females and tend to have longer pectoral fin spines.
- Ideal Water Quality: Soft (20 to 200 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Unlike other synodontis, this one has a sucker mouth and is omnivorous. Needs vegetable matter as well as meat, which can come from dried flakes, pellets and tablets, along with freeze-dried, frozen and live food.
- Maintenance Rating: 2
- Comments: This species from the lower Zaire River rapids requires clean, well-oxygenated water. It is peaceful compared to other Synodontis species to the point of being almost shy and grows to about 6" in length. Provide hiding places for this fish, as it is sometimes the target of attacks from other aggressive species.

#### **Cuckoo Synodontis**

- Scientific Name: *Synodontis multipunctatus*
- Sexing: Difficult.
- Ideal Water Quality: Moderately hard to hard (150 to 400 ppm); pH 7.6 to 8.2.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Prefers mainly a meat diet, which can include dried flakes, pellets and tablets, along with freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: This species is particularly popular with aquarists that keep African cichlids. Like cuckoo birds, they eat the eggs of another species (mouth-brooding cichlids), leaving their own eggs to be cared for by the unknowing foster parents. Thrives in a well-rocked, cichlid community aquarium with low nitrate levels.

#### **Upside-Down Catfish**

- Scientific Name: *Synodontis nigriventris*
- Sexing: Females are larger and more robust than males.
- Ideal Water Quality: Softer (20 to 200 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Prefers mainly a meat diet, which can include dried flakes, pellets and tablets, along with freeze-dried, frozen

and live food.

- Maintenance Rating: 1
- Comments: This species grows up to 4" and does quite well in community aquariums. Best when kept with four or five of the same species. Name comes from its common practice of swimming upside down. Belly is dark with lighter back, the reverse of most fish.

#### **Pimelodids Catfish**

The Pimelodids are New World catfish from South and Central America. They are predatory catfish, and great care should be exercised when picking suitable tank mates. They grow remarkably quickly, rapidly becoming large enough to other fish. Likely suspect for unexplained fish disappearances.

#### **Pictus (Angelica) Catfish**

- Scientific Name: *Pimelodus pictus*
- Sexing: Unknown.
- Ideal Water Quality: Soft (20 to 150 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Prefers mainly a meat diet, which can include dried flakes, pellets and tablets, along with freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: Attractive, bright silver cat-

fish with black polka dots and long whiskers that moves gracefully and rapidly. Prefers cover, so needs decor and/or a layer of floating plants. Will grow to about 5" in length. Does not tolerate nitrogenous waste or heavy metal (especially copper) buildup; requires more frequent partial water changes.

#### **Shovel-Nosed Lima Catfish**

- Scientific Name: *Sorubim lima*
- Sexing: Unknown.
- Ideal Water Quality: Soft (20 to 150 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Prefers mainly a meat diet, which can include dried flakes, pellets and tablets, along with freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: Grows reasonably large (18" in length) but appears smaller. A predatory species that lies in wait for small fish to swim within reach, but ignores those too big to swallow. Does best when given a tangled batch of roots in which to hide. Hardy species to maintain if given enough food. Does not tolerate nitrogenous waste or heavy metal (especially copper) buildup; requires more frequent partial water changes.

#### **South American Bumblebee Catfish**

- Scientific Name: *Microglanis iheringi*

- Sexing: Unknown.
- Ideal Water Quality: Soft (20 to 150 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Prefers mainly a meat diet, which can include dried flakes, pellets and tablets, along with freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: Newer texts sometimes classify this catfish as its own family of Pseudopimelodidae instead of with the Pimelodids. Small (3") nocturnal species good for community aquariums with larger fish. Contrasting chocolate brown and gold-banded body is reminiscent of a bumblebee. Has a relatively small mouth but will eat any fish it can swallow. Does not tolerate nitrogenous waste or heavy metal (especially copper) buildup; requires more frequent partial water changes.

## Tetras

Tetras represent some of the most popular fish sold in pet stores and include several related families. There are about 1,200 species, of which approximately 190 are found in Africa, with the rest from North and South America, particularly the Amazon drainage region of Brazil.

The diversity of tetras is tremendous and

includes herbivores, detritus eaters, blind species, species that can fly and one that can spawn out of water. Virtually all the commonly kept tetras prefer to be in schools of five or more fish. Each species has its own needs and special requirements, which must be communicated to customers.

In addition to the species included below, other common tetras in the pet trade include: Black, Black Neon, Black Skirt, Blind Cave, Bloodfin, Brass, Buenos Aires, Congo, Emperor, Glass, Gold, Flame, Hatchet (Marble and Silver), Head & Tail Light, Loretta, Phantom, Pristella, Red Colombian, Red Eye, Rummy Nose, Serpae, Silver Tip and White Skirt.

### Glolite or Glowlight Tetra

- Scientific Name: Hemigrammus erythrozonus
- Sexing: Male is slender while female is larger with a rounder belly.
- Ideal Water Quality: Soft (under 75 ppm); pH 6.5 to 6.8.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: This special small species (1-1/2") only shows off its true beauty

when displayed in a small group. Excellent in quiet and peaceful community aquariums with other small fish species. They do best with a small amount of peat extract added to aquarium water.

### Bleeding Heart Tetra

- Scientific Name: Hyphessobrycon erythrostigma
- Sexing: Male dorsal and anal fin are very elongated and tipped in black.
- Ideal Water Quality: Soft (under 75 ppm); pH 6.5 to 6.8.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: This is a larger (3-1/2" to 4") but gentle species that does well in a peaceful community aquarium. Somewhat sensitive to nitrogenous waste buildup and basic (high pH) water. They make an excellent focal point for a large aquarium of smaller fish.

### Von Rio Tetra

- Scientific Name: Hyphessobrycon flammeus
- Sexing: Ventral fins and anal fin are brilliant red on male. On female, ventral fins are tinged with black edging, and anal fin is dull red to yellowish. Female is plumper

while male is sleek and slender.

- Ideal Water Quality: Soft (under 50 ppm to 150 ppm); pH 6.5 to 7.0.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: This very hardy species is colorful, peaceful and makes an excellent community species. Dark bottom substrate and background bring out best colors for this small fish (1-1/2" in length).

### Lemon Tetra

- Scientific Name: Hyphessobrycon pulchripinnis
- Sexing: Difficult.
- Ideal Water Quality: Soft water (under 100 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: This 2" species is peaceful, hardy and does well in community aquariums. Need more space than most tetras because they swim constantly, investigating their surroundings.

**Black Phantom Tetra**

- Scientific Name: *Megalampodus megalopterus*
- Sexing: Males can be distinguished by larger dorsal and smoky black pectorals, anal and adipose fins. Females have red adipose, pectoral and anal fins.
- Ideal Water Quality: Soft water (under 100 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: This 1-1/2" species is peaceful, very hardy and should be kept in small groups. A great beginner fish for smaller tanks.

**Cardinal Tetra**

- Scientific Name: *Paracheirodon axelrodi*
- Sexing: Very difficult.
- Ideal Water Quality: Soft water (under 75 ppm); pH 6.5 to 6.8.
- Ideal Water Temperature: 76 to 82 degrees F.
- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1 (with provisions)
- Comments: This highly sought after tetra has traditionally been a difficult

species to keep, but captive-bred fish now are more available and do much better in an aquarium setting. This small (less than 2") species is peaceful and does best in large groups. Its bright blue upper half resembles the Neon Tetra; the cardinal can be distinguished by the colorful red lower half, which is part red and part white on neons. This species should be kept only in well-established tanks that have been set up for at least four months; it prefers tanks with live plants.

**Neon Tetra**

- Scientific Name: *Paracheirodon innesi*
- Sexing: Females are heavy bodied while males are slimmer and more intensely colored.
- Ideal Water Quality: Soft water (under 100 ppm); pH 6.5 to 7.0.
- Ideal Water Temperature: 76 to 82 degrees F.
- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1 (with provisions)
- Comments: The best known of all tetras sold in the pet industry. This species should be kept only in well-established tanks that have been set up for at least four months; it prefers tanks with live plants. This 1-1/2" species requires cooler water than most customers are willing to provide.

**Penguin Tetra**

- Scientific Name: *Thayeria boehlkei*
- Sexing: Very difficult.
- Ideal Water Quality: Soft to moderately hard (under 200 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: Fairly easy and interesting species to maintain if kept in clean water. This 2-1/2" species is sensitive to nitrogen cycle build-up and needs frequent partial water changes. Swims with tail down and a "seesaw" motion that makes it stand out in a crowd.

**Disc Tetras****Silver Dollar**

- Scientific Name: *Metynnis argenteus*
- Sexing: Anal fin of male is longer and has a reddish tinge.
- Ideal Water Quality: Soft water (under 80 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Distinctly herbivorous; can eat dried flakes and pellets or frozen food with mostly vegetable matter and a little meat.
- Maintenance Rating: 2

- Comments: Peaceful and very hardy species reaches 5" and requires a roomy aquarium with subdued lighting and lots of decor. Tall plastic plants recommended as will eat live plants.

**Red-Hook Silver Dollar**

- Scientific Name: *Myleus rubripinnis*
- Sexing: Unknown.
- Ideal Water Quality: Soft water (under 80 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Distinctly herbivorous; can eat dried flakes and pellets or frozen food with mostly vegetable matter and a little meat.
- Maintenance Rating: 2
- Comments: Potential length of 10" seldom reached. Peaceful species makes a great addition to large community aquariums but will eat live plants.

**Pencilfish**

The long, slender body of the Pencilfish distinguishes it from the deeper bodies of most tetras. Pencilfish have small mouths, prefer planted tanks and are quite peaceful, but do best in the company of their own species. Dominant males will chase other males away from females occasionally.

**Golden Pencilfish**

- Scientific Name: *Nannostromus beckfordi*
- Sexing: Difficult when young. Mature males are more brilliantly colored and much slimmer than mature females.
- Ideal Water Quality: Moderately soft (under 80 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: This 2" species is hardy, peaceful and can be kept with more active tank mates, as long as they are not large or aggressive. There are many color varieties depending on the origin of wild populations. They prefer older, well-established tanks.

**Dwarf Pencilfish**

- Scientific Name: *Nannostromus marginatus*
- Sexing: Difficult to sex, but mature males are slimmer than females.
- Ideal Water Quality: Moderately soft (under 80 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: An excellent pencilfish for

beginners, forgiving of aquarist errors.

Likes roomy tanks with plants (preferably live) and decor. Small size (1-1/2") requires tank mates that will not bother or eat it. Prefers older, well-established tanks.

**Three-Lined Pencilfish**

- Scientific Name: *Nannostromus trifasciatus*
- Sexing: Female is rounder in belly and slightly less brilliant in color.
- Ideal Water Quality: Soft (under 50 ppm); pH 6.5 to 6.8.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: This 2" species is the most brilliantly colored pencilfish and also the most aggressive. It does best in older, well-established community aquariums with mixed tetras and hiding places to escape dominant males. Sensitive to nitrogenous waste buildup, requiring more frequent partial water changes.

**Spotted Headstander**

- Scientific Name: *Chilodus punctatus*
- Sexing: Unknown.
- Ideal Water Quality: Moderately soft (under 80 ppm); pH 6.5 to 6.8.
- Ideal Water Temperature: 75 to 80

degrees F.

- General Diet: Small dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: This 2" species is the most brilliantly colored pencilfish and also the most aggressive. It does best in older, well-established community aquariums with mixed tetras and hiding places to escape dominant males. Sensitive to nitrogenous waste buildup, requiring more frequent partial water changes.

**Cichlids**

Cichlids are the single best-selling family of fish in the aquarium hobby. Over 1,500 species from around the world include an extremely diverse group of interesting, colorful fish in many different sizes. Cichlids water requirements vary, with some suitable for beginners and others appropriate only for experienced aquarists.

**New World Cichlids**

Many of the best known and most popular cichlids originated in South America, making them part of the New World group.

**Angelfish**

- Scientific Name: *Pterophyllum scalare*
- Common Color Variations: Silver, Lace,

Marble, Gold, Black, Blushing.

- Sexing: Difficult.
- Ideal Water Quality: Soft to medium hard (between 50 and 200 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 76 to 82 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: Easily recognized by vertically elongated triangular body shape and extended fins. Many captive-bred varieties exist. Can get quite large (over 8"). Tolerant of each other when raised together, but an adult may not accept other angels in its tank.

**Discus**

- Scientific Name: *Symphysodon aequifasciatus*
- Common Color Variations: Blood, Blue, Turquoise, Green, Red Ruby, Yellow.
- Sexing: Difficult.
- Ideal Water Quality: Soft (under 80 ppm); pH 6.2 to 6.6.
- Ideal Water Temperature: 80 to 85 degrees F.
- General Diet: Diets specifically for discus are available, but should be supplemented with high quality dried flakes and pellets, plus freeze-dried, frozen and especially live food.
- Maintenance Rating: 3

- Comments: Easily recognized by rounded body shape. Considered a very peaceful cichlid and excellent community fish when housed with other quiet fish that can tolerate the high temperature and low pH this species prefers. Requires extremely frequent, large water changes to stay healthy.

### Oscar

- Scientific Name: *Astronotus ocellatus*
- Common Variations: Albino, Albino Tiger, Red, Snow, Tiger, Albino, Mottled.
- Sexing: Difficult.
- Ideal Water Quality: Soft to moderately hard (between 40 and 200 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Mainly a meat diet. Specific oscar diets are available, but should be supplemented with freeze-dried, frozen and live food or they may become picky eaters.
- Maintenance Rating: 3
- Comments: Very hardy, large species (up to 14") that needs to be kept in a sizeable tank with fish that are not too aggressive but big enough to not be eaten. This fish gives off a lot of waste so needs larger, more frequent water changes and a strong filter to stay healthy. Can become very tame, taking food from owner's fingers.

### Dwarf Cichlids

- Scientific Names: *Apistogramma cacatuoides*, *apistogramma bitaeniata*, *apistogramma brevis*, *apistogramma agassizi*
- Sexing: Males are bigger, more colorful and have longer, larger dorsal fins with extensions on tips of fin rays.
- Ideal Water Quality: Soft (under 50 ppm); pH 6.4 to 6.8.
- Ideal Water Temperature: 76 to 82 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: This group of species is generally peaceful, except to other dwarf cichlid males. Grows to only 2" in length. A good fish for community tanks; prefers live plants and plenty of decor.

### Striped Convict

- Scientific Name: *Archocentrus nigrofasciatus*
- Common Color Variation: Pink.
- Sexing: Males have longer, more pointed fins. Females have orange or red scales on flank.
- Ideal Water Quality: Soft (between 50 and 200 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Dried food, such as flakes

and pellets, plus freeze-dried, frozen and live food.

- Maintenance Rating: 3
- Comments: This medium-sized (6" to 8") cichlid is fairly aggressive, with a deep, spade-shaped body and long pointy fins. Several varieties are available, based upon their original collecting location, plus a captive-bred pink variation. Can become very aggressive with other species when breeding, which it does readily.

### Firemouth Cichlid

- Scientific Name: *Thorichthys meeki*
- Sexing: Males are larger, more brilliantly colored and have pointed, extended dorsal and anal fins.
- Ideal Water Quality: Soft (between 50 and 200 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: This approximately 6" species will attempt to bluff potential threats by expanding its flame-red operculum and throat sac to appear much larger. These fish breed fairly easily in captivity and can become very territorial and aggressive.

### Texas Cichlid

- Scientific Name: *Herichthys cyanoguttatum*
- Sexing: Males are generally larger, with pointed dorsal and anal fins.
- Ideal Water Quality: Soft (between 50 and 200 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: Most common representative of more herbivorous cichlids. Can grow to 12" in length, but seldom reaches this size in captivity. This territorial, digging species needs a larger tank to minimize aggression and will eat live plants. Must reach 4" before will begin breeding.

### Jack Dempsey

- Scientific Name: *Chichlasoma octofasciatum*
- Common Color Variation: Electric Blue Jack Dempsey.
- Sexing: Females are smaller and less colorful.
- Ideal Water Quality: Soft (between 50 and 200 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and

live food.

- Maintenance Rating: 3
- Comments: Named after the legendary boxer from the 1920s, this fish is a good tank mate if kept with similar sized cichlids. Very hardy once acclimated to tank. Can grow from 6” to 10” and needs lots of space to stay healthy, preferably a 55-gallon or larger tank.

### African Cichlids

More than half of the cichlids sold in the industry originally came from the Great Lakes of Eastern Africa, including Lake Victoria, Lake Tanganyika and Lake Malawi. These fish are very colorful and easy to keep and breed.

Unlike other cichlids, African species must be kept in brackish water with a higher pH, which can be achieved by adding two teaspoons of salt per gallon. These fish can be quite aggressive to one another and do best in well decorated aquariums that include a rock pile or wall to create caves for many territories.

#### Lake Malawi African Cichlids

Lake Malawi is the ninth largest lake in the world, with more than 11,400 square miles of surface area and a maximum depth of 2,310 feet. Its rocky shoreline includes many small, offshore islands and large,

sandy stretches, creating a variety of habitats and ecological niches.

All Lake Malawi Cichlids will overeat when given the opportunity, which can lead to abnormal growth, medical problems and even death. To promote better healthy, feed these fish small portions several times a day and skip a day occasionally.

#### Electric Yellow Cichlid

- Scientific Name: Labidochromis Caeruleus
- Sexing: Difficult. Males can be larger and considerably more brilliant at spawning time.
- Ideal Water Quality: Brackish/moderately hard (between 100 and 300 ppm); pH 7.6 to 8.0.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Omnivorous so can eat dried flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: This smaller African cichlid is not as aggressive as other species and can be kept in pairs or multiple pairs if there are adequate hiding places available.

#### Johanni Cichlid

- Scientific Name: Melanochromis Johanni

- Sexing: Mature females are bright yellow orange. Males are deep midnight black with sky blue horizontal bands on flank and back.
- Ideal Water Quality: Brackish/moderately hard (between 100 and 300 ppm); pH 7.6 to 8.0.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Omnivorous so can eat dried flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: Colorful, easy to maintain and popular species. Grows to 3-1/2” in length and is less aggressive than other African cichlids.

#### Elongate Mbuna Cichlid

- Scientific Name: Pseudotropheus Elongatus
- Sexing: Mature males are larger, with a more vividly colored anal fin with “egg” spots.
- Ideal Water Quality: Brackish/moderately hard (between 100 and 300 ppm); pH 7.6 to 8.0.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Omnivorous so can eat dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 4
- Comments: Aggressive, territorial

species has a nasty disposition and can grow over 5” long, causing problems in smaller tanks or those lacking sufficient hiding places for less dominant species. To limit aggression, keep only one male in a tank with several females. Has a slender body with broad vertical bars.

#### Red Zebra Cichlid

- Scientific Name: Pseudotropheus Zebra
- Sexing: Males have well developed “egg” spots on the anal fin, which are less distinct or absent on females.
- Ideal Water Quality: Brackish/moderately hard (between 100 and 300 ppm); pH 7.6 to 8.0.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Omnivorous with more emphasis on vegetable matter. Can eat dried flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: This 5-1/2” species comes in solid and marbled color variations; some have a deep colored body and vertical bars. Aggressive and territorial.

#### Yellow Regal Peacock (“Sunshine Peacock”) Cichlid

- Scientific Name: Aulonocara baenschhi
- Sexing: Males are bright yellow and blue. Females are brownish black.
- Ideal Water Quality: Brackish/moderately

hard (between 100 and 300 ppm); pH 7.6 to 8.0.

- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Omnivorous so can eat dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: This beautiful, 4" yellow species does well when mixed with other peaceful sand dwelling or open water varieties of Lake Malawi cichlids.

#### **Moorii (Dolphin) Cichlid**

- Scientific Name: *Cyrtocara moorii*
- Sexing: Difficult.
- Ideal Water Quality: Brackish/moderately hard (between 100 and 300 ppm); pH 7.6 to 8.0.
- Ideal Water Temperature: 70 to 86 degrees F.
- General Diet: Omnivorous so can eat dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: A sand dwelling species. Males are polygamous and should be maintained with at least three females. Large (almost 10"), aggressive species needs a big tank. Beautiful sky blue color.

#### **Sulphurhead Peacock Cichlid**

- Scientific Name: *Aulonocara maylandi*
- Sexing: Male is larger, has sulphur yel-

low blaze on forehead and brilliant "egg" spots on dorsal fin. Female is a blue/gray color with darker vertical bars.

- Ideal Water Quality: Brackish/moderately hard (between 100 and 300 ppm); pH 7.6 to 8.0.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Mixed diet of vegetable matter and insect/crustacean food with emphasis on the latter.
- Maintenance Rating: 2
- Comments: This 5" species is somewhat more territorial than others.

#### **Lake Tanganyika African Cichlids**

Lake Tanganyika is larger and deeper than Lake Malawi, with a surface area of more than 13,000 square miles and a maximum depth of 4,823 feet, making it the second deepest lake in the world. The lake is home to only about 175 species of cichlids, but the variation between groups is much greater than in Lake Malawi, possibly due to the more stable temperature.

#### **Regani Cichlid**

- Scientific Name: *Julidochromis regani*
- Sexing: Difficult. Mature females are generally larger with rounder bellies.
- Ideal Water Quality: Brackish/hard (between 300 and 450 ppm); pH 7.8 to 8.2.
- Ideal Water Temperature: 76 to 80

degrees F.

- General Diet: Omnivorous so can eat dried flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: Somewhat territorial to others of the same species; to limit aggression, should be kept in well-rocked aquariums that create multiple territories. Colors are not exotic, but contrast makes these very attractive fish. Most reach 3" to 6" in length and make good community members if kept with fish of similar requirements.

#### **Brichardi Cichlid**

- Scientific Name: *Neolamprologus brichardi*
- Common Color Variations: Albino, Daffodil (yellow).
- Sexing: Difficult. Males have longer fin tips than females.
- Ideal Water Quality: Brackish/hard (between 300 and 450 ppm); pH 7.8 to 8.2.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Omnivorous so can eat dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: This 4" species requires a well-rocked aquarium and makes a good community species. Several breeding pairs can be housed in larger (55 gallon or

more) aquariums and will protect fry (young fish).

#### **Leleupi Cichlid**

- Scientific Name: *Neolamprologus leleupi*
- Sexing: Difficult.
- Ideal Water Quality: Brackish/hard (between 300 and 450 ppm); pH 7.8 to 8.2.
- Ideal Water Temperature: 77 to 80 degrees F.
- General Diet: Omnivorous so can eat dried food, such as flakes and pellets, plus freeze-dried, frozen and live food. Bright color can be enriched by feeding frozen shrimp, krill or other food rich in carotene.
- Maintenance Rating: 3
- Comments: This 4" species requires a well-rocked aquarium and makes a good community species. Brilliant yellow to bright orange color makes it an excellent display fish.

#### **Other African Cichlids: River Cichlids**

Unlike African Lake Cichlids, the river species do not require high pH, brackish water.

#### **Kribensis**

- Scientific Name: *Pelvicachromis pulcher*
- Sexing: Males grow longer and larger,

with bigger, more pointed dorsal and anal fins. Females have rounded anal fins and are brightly colored with red bellies.

- Ideal Water Quality: Moderately soft (between 50 and 150 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Mainly carnivorous so can eat dried food, such as meaty flake and pellet diets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 2
- Comments: Common, tank-raised species makes a fine addition to a peaceful community aquarium. Grows to 4" in length but usually will not harm other fish except when breeding.

### Jewel Cichlid

- Scientific Name: *Hemichromis cristatus*
- Sexing: Difficult. Females usually are redder while males have more blue when breeding.
- Ideal Water Quality: Soft (under 75 ppm); pH 6.6 to 7.0.
- Ideal Water Temperature: 76 to 80 degrees F.
- General Diet: Omnivorous so can eat dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: This 3" species is extremely aggressive for its size. Different colors should be kept separately. Will defend its

territory vigorously, so should be kept only with larger, more robust species. Prefers clean, well-oxygenated water and requires more frequent, partial water changes.

### Barbs

There are well over 300 species of barbs found in Asia and Africa, yet only a few are seen in the aquarium trade. The majority are aggressive and territorial, sometimes given to nipping the fins of slower moving fish. Like tetras, barbs are a schooling species and should be maintained in small groups.

### Tiger Barb

- Scientific Name: *Puntius tetrazona*
- Common Color Variations: Albino, Green, Red.
- Sexing: Difficult in young fish. When mature, males may have more red in face.
- Ideal Water Quality: Slightly soft (50 to 150 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1 (with provisions)
- Comments: One of the most common barbs, most are gold with black stripes but

other colors are available. Fin nipping tendencies make it unsuitable for community aquariums with smaller or slower moving fish, but can be controlled by keeping groups of six or more. May be appropriate in larger tanks with decorations. This species will nibble on soft or delicate live plants.

### Cherry Barb

- Scientific Name: *Puntius titteya*
- Common Color Variation: Albino.
- Sexing: Male is cherry red while female is a rich brown.
- Ideal Water Quality: Slightly soft (50 to 150 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: One of the more peaceful barbs. Stays under 2" and is well suited to a quiet community aquarium.

### Rosy Barb

- Scientific Name: *Puntius conchonius*
- Common Variations: Longfin, Neon.
- Sexing: Difficult to sex when young, but mature males develop beautiful, coppery-red color while females are golden brown.
- Ideal Water Quality: Slightly soft (50 to 150 ppm); pH 6.8 to 7.0.

- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 2
- Comments: Lively, beautiful barb that fits well into a hardy community with active, medium-sized fish, especially as a youngster. Gets more aggressive and territorial as it gets older, especially towards other male rosy barbs. One of the few fish to eat hair and other algae readily, so a good addition to tanks with an algae problem; also will accept many types of prepared food.

### Danios

Danios are schooling fish that are constantly in motion, adding visual animation to an aquarium. Very peaceful and hardy in a community tank, they are an excellent species for beginning hobbyists as they do well in a variety of water conditions.

An excellent group to recommend for first-time attempts to spawn an egg-laying species. They require only sufficient space to swim. Fry are hardy and generally disease-resistant.

**Zebra Danio**

- Scientific Name: *Brachydanio rerio*
- Common Variations: Gold, Leopard, Longfin Gold, Longfin Leopard, Longfin.
- Sexing: Difficult in young fish. Mature females are larger and considerably plumper, with rounded bellies. Males are more streamlined and have a straight outline to belly region.
- Ideal Water Quality: Moderately soft (50 to 150 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 72 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: A schooling species that does best in groups of five or more. The striped and streamlined appearance is easily identifiable. A fairly hardy fish, good for beginners.

**GloFish (Genetically Bred Zebra Danio)**

- Scientific Name: *Brachydanio rerio*
- Common Color Variations: Fluorescent Pink, Orange, Green.
- Sexing: Difficult in young fish. Mature females are larger and considerably plumper, with rounded bellies. Males are more streamlined and have a straight outline to belly region.
- Ideal Water Quality: Moderately soft (50

to 150 ppm); pH 6.8 to 7.0.

- Ideal Water Temperature: 72 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: The first genetically engineered fish in the pet industry, developed by introducing jellyfish and coral genes into zebra danios. Controversial in some areas and banned in California. Bright colors are distinctive in regular light and glow under a black light. Color does not fade over time and breeds true.

**Pearl Danio**

- Scientific Name: *Brachydanio albolineatus*
- Sexing: Difficult.
- Ideal Water Quality: Moderately soft water (50 to 80 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 72 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: This very popular species is active, peaceful and easily visible in open water. Available in several color varieties, based on location of origin.

**Giant Danio**

- Scientific Name: *Danio aequipinnatus*

- Sexing: Difficult.
- Ideal Water Quality: Moderately soft water (50 to 80 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 2
- Comments: A larger (3" to 4") danio that is fairly peaceful, like smaller species, and very active. They make an excellent community species in medium- to larger-sized tanks.

**White Cloud Minnow**

- Scientific Name: *Tanichthys albonubes*
- Common Color Variations: Gold.
- Sexing: Males are more colorful.
- Ideal Water Quality: Moderately soft water (50 to 100 ppm); pH 6.0 to 8.0.
- Ideal Water Temperature: 60 to 76 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: Although actually a minnow, this fish usually is grouped with danios. It grows to 2" in length and will tolerate colder water conditions. This peaceful fish does best when kept in groups of six or more. Illegal to sell in some states because they can easily survive outdoors

and may impact native fish populations.

**Rasboras**

Rasboras are peaceful, active and colorful community fish from Southeast Asia. They are fairly hardy and good beginner fish. Sizes range from 1" to 6", with most species falling somewhere in the middle.

**Scissortail Rasbora**

- Scientific Name: *Rasbora trilineata*
- Sexing: Difficult.
- Ideal Water Quality: Soft (under 50 ppm); pH 6.5 to 6.8.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: This is a schooling species with a long thin body and distinctive markings on caudal fin. The common name of Scissortail comes from the clamping and reopening of its caudal fin when swimming.

**Brilliant Rasbora**

- Scientific Name: *Rasbora einthoveni*
- Sexing: Very difficult.
- Ideal Water Quality: Soft (under 50 ppm); pH 6.5 to 6.8.
- Ideal Water Temperature: 75 to 80 degrees F.

- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 2
- Comments: This schooling species grows to 6” in length. A peaceful and undemanding species that prefers large open spaces for swimming.

### Harlequin Rasbora

- Scientific Name: *Rasbora heteromorpha*
- Sexing: Difficult.
- Ideal Water Quality: Soft (under 50 ppm); pH 6.5 to 6.8.
- Ideal Water Temperature: 78 to 85 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: This schooling species is reddish copper in color with elongated triangular markings on the sides of body. Grows to 1-1/2” in length. A peaceful fish, great for community tanks.

### Sharks

The aquarium industry sometimes develops trade names to boost fish sales. “Shark” is used to describe any fish with an unusually high or large dorsal fin, including many Cyprinids and several catfish.

### Bala Shark

- Scientific Name: *Balantiocheilus melanopterus*
- Sexing: Unknown, as seldom survive to maturity.
- Ideal Water Quality: Soft (under 100 ppm); pH 6.5 to 6.8. Well oxygenated with some water motion.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: This omnivore eats dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 5
- Comments: This shoaling species grows to 17” in length. A peaceful fish that loves to jump and needs room to swim and grow. Uncomfortable in groups of less than five fish and in confined spaces. Needs at least a 100-gallon tank; not a good species for beginners or those with small aquariums.

### Red Tail Shark

- Scientific Name: *Epalzeorhynchus bicolor* (formerly *Labeo bicolor*)
- Sexing: Shape of dorsal fin provides indication of sex; trailing edge of fin is distinctly pointed in males and somewhat rounded in female. Male also is more brilliantly colored and slightly slimmer.
- Ideal Water Quality: Soft to moderately hard (up to 150 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 80

degrees F.

- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 4
- Comments: This 4-1/2” species is a classic territorial loner that will not tolerate another of own species unless a large aquarium is provided. Not recommended for community aquariums unless other tank mates are robust and capable of defending themselves. Requires hiding places for comfort.

### Rainbow Shark

- Scientific Name: *Epalzeorhynchus frenatus* (formerly *Labeo erythrurus*)
- Common Color Variation: Albino.
- Sexing: Males are thinner than females and have a black edged anal fin.
- Ideal Water Quality: Moderately soft (under 150 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 3
- Comments: This territorial loner does not like to be with others of own species, but is quite tolerant of other fish. Grows to 6” in length.

### Livebearers

This group of fish includes mollies, guppies, swordtails and platys that give birth to live young rather than lay eggs. They have been bred in captivity for many years, resulting in different color and fin varieties.

Livebearers are fairly easy to keep and breed, although most babies will be eaten, some by their own mother. Most prefer water with added salt (1/2 to one teaspoon of aquarium salt per gallon).

### Molly Group

- Scientific Name: *Poecilia latipinna*
- Common Variations: Black, Black Sailfin, Albino, Black, Black Lyretail, Balloon, Cremecicle, Cremecicle Lyretail, Dalmatian, Gold, Gold Sailfin, Golddust, Green, Leopard Lyretail, Marble, Red Sunset, Silver, Silver Lyretail, Silver Sailfin, Chocolate, Leopard, Yucatan.
- Sexing: Similar body shapes, but mature males have a pointed anal fin, called a gonopodium; females’ anal fin is fan shaped.
- Ideal Water Quality: Brackish/hard (150 to 200 ppm); pH 7.0 to 7.4.
- Ideal Water Temperature: 75 to 82 degrees F.
- General Diet: Primarily herbivores, this species will eat algae from plants and

rocks, along with dried flakes and pellets, plus algae wafers, freeze-dried, frozen and live food.

- Maintenance Rating: 1
- Comments: A number of color, fin and body shapes varieties have been developed by serious breeders. Mollies' natural habitat is brackish water; they do best at warmer temperatures in water with added salt (one teaspoon per gallon) and can adapt to saltwater aquariums.

#### **Guppy Group**

- Scientific Name: Poeciliidae reticulata
- Common Variations: Black, Blue Star, Blue Veiltail, Cobra, Common, Feeder, Redtail, Red Tuxedo, Semi-Fancy, Variegated, Sunrise, Half-Black.
- Sexing: Males have a large tail fin and pointed anal fin, called a gonopodium. Females have a fan-shaped anal fin, smaller tail and usually less color.
- Ideal Water Quality: Brackish/moderately soft (50 to 200 ppm); pH 7.0 to 7.2.
- Ideal Water Temperature: 70 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: Coloration and long fins on aquarium specimens have been developed by serious breeders. Females are able to store male sperm in packets called sper-

mataphores and use individual packets for reproduction, allowing them to produce young for several months after mating, even after males have been removed from the aquarium.

#### **Platy Group**

- Scientific Name: Xiphophorus maculatus
- Common Variations: Black, Blue, Blue Coral, Blue Spotted, Dawn, Crescent, Flame, Gold, Hi Fin, Mickey Mouse (Red & Neon), Mixed, Moonfish, Painted, Peppermint Candy, Red, Red Cherry, Red Tiger, Redtop, Salt & Pepper, Sunburst, Tuxedo, Twin Bar, Wag (Red, Rainbow & Gold), White Calico, White Moon.
- Sexing: Similar body shape. Males have pointed anal fin, called a gonopodium; females' anal fins are fan shaped.
- Ideal Water Quality: Moderate hardness (X to X ppm); pH 7.0 to 7.2.
- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Diet should include mainly vegetable matter, such as dried flakes and pellets, plus some freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: An extremely variable species from southern Mexico, Guatemala and Belize. Numerous populations have been collected and intensely bred and hybridized with other Xiphophorus species.

#### **Swordtail Group**

- Scientific Name: Xiphophorus helleri
- Common Variations: Albino, Black, Brick, Gold, Green, Hi Fin, Lyretail, Marble, Marigold, Neon, Painted, Pineapple, Red Velvet, Sunset, Tuxedo, Twin Bar, Wag.
- Sexing: Mature males have a sword-shaped extension off their lower tail fin and a pointed gonopodium or anal fin, while females and young males do not have a sword. Females have a fan-shaped anal fin.
- Ideal Water Quality: Medium hard (X to X ppm); pH 7.0 to 7.2.
- Ideal Water Temperature: 75 to 79 degrees F.
- General Diet: Omnivorous feeders can be fed dried flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: There are several subspecies and many hybrids in this group. Behavior within any of species can range from peaceful to slightly aggressive, with larger males often aggressive to other males. Female has ability to change sex and become male.

#### **Goldfish**

One of the most recognized fish in the world, goldfish have been bred for centuries; this one species comes in many col-

ors and variations. Koi are grouped with goldfish but actually related to carp. Fancier fantail varieties of goldfish generally do best in tanks, while streamlined comets and koi are great for outdoor ponds.

Goldfish give off a lot of waste. To prevent water from becoming polluted too quickly, allow no more than one inch of goldfish for every two to three gallons. Species that stay small, like the China Doll variety, can be kept in a bowl but need at least two gallons of water. These fish act hungry at all times, but should never be overfed to avoid producing even more waste.

#### **Comet and Fantail Goldfish**

- Scientific Name: Carassius auratus
- Sexing: Male is thinner and may display tubercles on cheeks, gill covers and leading edge of pectoral fins during breeding season.
- Ideal Water Quality: Soft to moderately hard (50 to 150 ppm); pH 7.0 to 7.5.
- Ideal Water Temperature: Outdoor or up to 78 degrees F (for fancy goldfish).
- General Diet: Dried flakes or pellets made especially for goldfish, plus freeze-dried, frozen and some live food. The diet should primarily include plant matter with some protein content. They enjoy cooked green peas occasionally, which help keep their digestive system working properly.

- Maintenance Rating: 2
- Comments: Available in more than 100 varieties. Some of the common varieties include: Comet (in many colors), Shubunkin, Fantail (in many colors such as Red, Red and White, Red and Black), Lionhead (in many colors), Oranda (in many colors and some special varieties like Red Cap), Celestial (in many colors), Bubble Eye (in many colors), Black Moor, Pearlscale (in many colors), and China Doll (in many colors).

### Koi

- Scientific Name: *Carassius carpio*
  - Common Color Variations: White, Red, Black, Gold, Cream, Blue.
  - Sexing: Male is thinner and may display tubercles on cheeks, gill covers and leading edge of pectoral fins during breeding season.
  - Ideal Water Quality: Moderately soft to hard (80 to 200 ppm); pH 7.2 to 7.5.
  - Ideal Water Temperature: Ambient outdoor temperature. Will tolerate surface freezing as long as change is gradual and water is not frozen solid. Species does not eat when preparing to hibernate and should not be fed when water is below 50 degrees F.
- General Diet: Dried pellets made especially for koi, plus freeze-dried, frozen and some live food. The diet should primarily include plant matter with some protein

content. They enjoy cooked green peas occasionally, which help keep their digestive system working properly.

- Maintenance Rating: 5
- Comments: These vibrant carp were developed in Japan and China for outdoor ponds. Certain colors and/or scale size combinations have specific names. A Butterfly Koi with long fins also is available. Koi can grow up to 3' in length and are quite long lived, sometimes for 100+ years. Indoor, koi thrive only in very large aquariums with powerful filter systems.

### Miscellaneous Fish

#### Loaches

Loaches are a small family of bottom-dwelling freshwater fish primarily from Europe and Asia. They are generally small in size, with the largest species reaching only 12". Care must be taken when handling loaches because they have one or two small erectable spines under or between the eyes.

Loaches may be susceptible to parasitic infection or metal poisoning because their bodies lack the normal scale protection of most fish. They may be covered with very small scales or be partially or completely without scales.

#### Kuhli Loach

- Scientific Name: *Acanthopthalmus kuhlii*
- Sexing: Unknown.
- Ideal Water Quality: Soft (under 100 ppm); pH 6.6 to 6.8.
- Ideal Water Temperature: 76 to 82 degrees F.
- General Diet: Mainly a meat diet, including dried flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: Popular, snakelike species delights viewers with its twists and turns. Grows to 4" in length. Peaceful fish can be kept in small groups. Most active in evening or just after lights out. Bottom feeders that like to eat in the evening; may spend daylight hours hidden in decor or buried in gravel.

#### Clown Loach

- Scientific Name: *Botia macracanthus*
- Sexing: Males are more robust and have proportionally larger caudal fin. Females are thinner.
- Ideal Water Quality: Soft to moderately hard (50 to 200 ppm); pH 6.4 to 6.8.
- Ideal Water Temperature: 78 to 84 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 2
- Comments: Extremely popular and beau-

tiful fish that is active during the day but prefers subdued lighting. Should be kept in small groups of three or more. Can grow to more than 15" in length, but seldom reaches more than 8" in home aquariums. Bottom dweller has been known to live up to 20 years in captivity. Prone to *Ichthyophthirius* (Ick) parasite infections if maintained at temperatures below 78 degrees F for extended periods.

#### Rainbowfish

Rainbowfish are a schooling species from the southern hemisphere. They have double dorsal fins and live in both freshwater and brackish water environments in the wild.

#### Threadfin Rainbowfish

- Scientific Name: *Iriatherina wernerii*
- Sexing: Males have dorsal fins with extended rays and elongated caudal and anal fins.
- Ideal Water Quality: Moderately hard (100 to 200 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 1
- Comments: Only 2" in length, this lively schooling species makes an excellent addition to a community aquarium of equally

peaceful fish. Hardy, colorful and prolific, making it popular with hobbyists. Males display exotic fins to each other.

### **Bosemani Rainbowfish**

- Scientific Name: *Melanotaenia bosemani*
- Sexing: Males are larger and have deeper bodies than females. Males are half orange and half blue-black in color. Females lack bright coloration.
- Ideal Water Quality: Moderately hard (100 to 250 ppm); pH 6.8 to 7.2.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 2
- Comments: This peaceful, schooling species reaches 4" in length. Coloring is most brilliant first thing in the morning and in live planted tanks. Quite active in larger aquariums. This fish is an excellent jumper and should be kept in a covered tank.

### **Celebes Rainbowfish**

- Scientific Name: *Telmatherina ladegesi*
- Sexing: Males are more brilliantly colored and have extensions on the second dorsal and anal fins.
- Ideal Water Quality: Brackish/hard (150 to 250 ppm); pH 7.0 to 7.2.

- Ideal Water Temperature: 74 to 78 degrees F.
- General Diet: Small, live food but will eat flake or freeze-dried food.
- Maintenance Rating: 5
- Comments: This peaceful, shoaling species reaches 3" in length. It does best with added salt (one teaspoon per gallon). Somewhat sensitive to nitrogenous waste buildup; requires more frequent partial water changes.

### **Miscellaneous Brackish Water Fish**

"Brackish" is the term used to describe the result of freshwater and coastal marine waters mixing in nature. To simulate brackish water in aquariums, add two teaspoons of ocean salt per gallon. The resulting solution will be fairly hard and alkaline.

### **Archerfish**

- Scientific Name: *Toxotes jaculatrix*
- Sexing: Unknown.
- Ideal Water Quality: Brackish/hard (200 ppm or more); pH 7.6 to 8.2.
- Ideal Water Temperature: 78 to 82 degrees F.
- General Diet: Primarily eats insects in the wild, so prefers live food, such as flies, grasshoppers, crickets, cockroaches, etc. Can be trained to eat meaty dried food, such as flakes and pellets, plus

freeze-dried and frozen food.

- Maintenance Rating: 5
- Comments: Famed species spits a bullet of compressed water to bring down insect prey from branches above its natural habitat. Large species can grow to 10" in length, but seldom does in captivity. Normally peaceful, but large fish often are aggressive towards smaller ones. Requires an aquarium with large surface area; special water conditions and food requirements make this species better suited to advanced aquarists.

### **Green Scat**

- Scientific Name: *Scatophagus argus*
- Sexing: Unknown.
- Ideal Water Quality: Brackish/hard (200 ppm or more); pH 7.8 to 8.4.
- Ideal Water Temperature: 75 to 78 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 5
- Comments: Extremely hardy species is sensitive to buildup of nitrogenous waste; requires more frequent, partial water changes. Grows to 12" in length. Juvenile do best in brackish water, while adults (6" or more) prefer pure salt water. Change in water requirements as species matures make it suitable only for advanced aquarists.

### **Mono**

- Scientific Name: *Monodactylus argenteus*
- Sexing: Unknown.
- Ideal Water Quality: Brackish/hard (200 ppm or more); pH 7.8 to 8.2.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 5
- Comments: Large fish grows to 10" in length; very interesting coloration as matures. Generally peaceful species when kept with similarly sized fish with same water requirements.

### **Green Puffer**

- Scientific Name: *Tetradon fluviatilis*
- Common Variations: Figure 8 Puffer, Spotted Green Puffer.
- Sexing: Unknown.
- Ideal Water Quality: Brackish/hard (above 150 ppm); pH 7.4 to 7.8.
- Ideal Water Temperature: 75 to 80 degrees F.
- General Diet: Meaty, dried food, such as flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 5
- Comments: Young fish are peaceful and mix well with other fish, but become very aggressive as they mature. Grows to 6" in length and can be quite destructive.

Species does best in brackish water in an individual fish aquarium.

## Freshwater Invertebrates

Animals without backbones are called invertebrates and represent approximately 95 percent of the known species on the planet, primarily insects. Some species in this very diverse group make excellent additions to a freshwater aquarium, particularly crayfish, snails and shrimp.

Freshwater invertebrates do best in a live planted tank with no added salt. They should be removed from the tank before adding some medications and algae controls that do not hurt fish but may be fatal to these species.

### Crayfish

- Scientific Name: Cambaridae camburus
- Other Common Names: Crawfish, Crawdad.
- Sexing: Difficult to determine except when females are carrying eggs.
- Ideal Water Quality: Softer water (50 to 100 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 60 to 80 degrees F.
- General Diet: Scavenger feeder will eat anything, including dried flakes and pellets, plus freeze-dried, frozen and live food.
- Maintenance Rating: 4

- Comments: Usually reach up to 3" in length; available in a beautiful blue color morph. Crayfish require a hiding place and usually will fight and kill each other except in larger tanks. These scavengers will eat anything, including fish. Require a well-secured lid to prevent escape.

### Ghost Shrimp Group

- Scientific Name: Palaemonetes species
- Other Common Names: Glass Shrimp, Grass Shrimp.
- Sexing: Difficult to determine except when females are carrying eggs.
- Ideal Water Quality: Softer water (50 to 100 ppm); pH 6.8 to 7.0.
- Ideal Water Temperature: 65 to 80 degrees F.
- General Diet: Scavenger feeder will eat anything, including dried flakes and pellets, freeze-dried and frozen food, and algae wafers.
- Maintenance Rating: 1
- Comments: Reach up to 2" in length. Provide an interesting addition to a community aquarium of smaller, less aggressive fish but will be eaten by larger species.

### Gold Inca Snail

- Scientific Name: Pomacea bridgesii
- Other Common Names: Gold Snail, Mystery Snail.
- Sexing: Difficult, but females grow to be

slightly larger.

- Ideal Water Quality: Softer water (50 to 100 ppm); 6.8 to 7.2.
- Ideal Water Temperature: 65 to 80 degrees F.
- General Diet: Primarily eats tank algae but also likes algae wafers.
- Maintenance Rating: 1
- Comments: Grows to 2" and usually can be found on tank glass and aquarium decor grazing on algae. When kept in a tank with sand substrate, they usually burrow during the day and come out at night. Should not be kept in tanks with clown loaches, which are known to eat snails. Can be very proficient breeders; may require a calcium supplement for proper shell development.

## XII. GLOSSARY

**Adipose Fin:** Small fin located on peduncle, behind dorsal fin. Found on tetras, corydoras, plecostomus, salmonids, few other species.

**Adsorption:** Adhesion of gas, liquids or substance to surface.

**Aerobic:** Able to live and grow only when oxygen is present.

**Anabantid:** Bubble-nest builders. Eggs of female fish are deposited in air bubbles

on water's surface. Gouramis and bettas are examples of bubble-nest builders.

**Anal Fin:** Last fin on the bottom of the body before the tail.

**Antimicrobials:** Term used to denote agent that kills or inhibits growth of microorganisms.

**Barbel:** A whisker-like sensory organ near the mouth found in some fish (notably catfishes, loaches and cyprinids); used by bottom feeders to help locate food.

**Caudal Fin:** Tail fin of fish.

**Chloramine:** Chemical used to sterilize drinking water that is toxic to fish; must be removed from tap water before using in freshwater aquariums.

**Chlorine:** Chemical used to sterilize drinking water that is toxic to fish; eventually escapes from water as gas in twenty-four hours but must be removed from tap water before using in freshwater aquariums.

**Detritus:** Accumulation of disintegrated materials.

**Dorsal Fin:** Large fin located on upper portion (back) of fish.

**Electrolytes:** Chemicals and salts added to water to help match water conditions to chemical physiology of fish.

**Fry:** Recently hatched, juvenile fish.

**Gonopodium:** Anal fin that has been modified to allow internal fertilization in certain species of livebearers.

**Ichthyophthirius:** Common fish parasite that appears as white spots on the body; called “Ick” for short.

**Labyrinth:** Refers to fish with auxiliary breathing organ in addition to gills and air bladder; gouramis and betta are examples.

**Lamellae:** Appendages in fish gills that absorb oxygen and excrete carbon dioxide.

**Lateral Line:** Sensory organ, sensitive to change in pressure and pulsations; also midline of fish body.

**Microorganisms:** Any microscopic bacteria, protozoan, virus, etc.

**Necrosis:** Death or decay of tissue

**Operculum:** Bony covering that protects the gills of fish.

**Peduncle:** Area on fish located behind

dorsal fin and extending to caudal fin rays.

**Protozoan:** Single-celled microscopic animals that can be parasitic.

**School:** Group of fish that swim in a synchronized manner, with similar speeds and direction.

**Shoal:** Group of fish that remain together for social reasons, including feeding, breeding or resting and can consist of anywhere from a few fish to hundreds.

**Tubercles:** Growth that appears on gill plates (operculum) of adult male fish in breeding season.