ISU Fisheries Extension

Managing Iowa Fisheries

Freshwater Aquarium Management

Introduction

Aquaria can be used for ornamental decoration, entertaining children and guests, breeding aquatic animals, or simply for viewing pleasure. Owning aquaria can be especially favorable for people who do not have adequate time to care for high-maintenance pets. However, potential hobbyists should consider the basic requirements of managing an aquarium before establishing one.

Basic Components

Tank

The required size and shape of a tank depends on the type and density of fish you desire.

Type: Consider the fish's natural swimming pattern (horizontal or vertical) when deciding to purchase either a wide tank [e.g., 20L (20 gallon long)] or a tall tank [e.g., 20H (20 gallon high)]. Also, fish can be territorial. Such fish may guard a portion of the tank, or sometimes the entire tank; it is not uncommon for fish to badly injure or kill one another during territorial disputes. Be sure to allow plenty of room for fish known to exhibit territoriality.

Density: An overcrowded aquarium is unhealthy. Too high a fish density can result in water quality problems, which can increase disease susceptibility. The recommended maximum stocking density is about 1 inch of fish per 1 gallon of water, provided the fish are socially compatible. However, density can be increased if proper filtration is used.

Aquarium Stand and Positioning

It is not essential to place the aquarium on a stand, but it is essential to place it on a flat surface of considerable strength (1 gallon of water weighs about 8 pounds). The tank should be placed on an elevated surface so that the water can be siphoned. Also, it is important to choose an appropriate location to establish an aquarium. Position your aquarium near electrical outlets (ground fault circuit interrupter, if possible) and away from areas of high traffic. Placing your aquarium next to a window may promote the growth of algae (see Algae Problems) and also cause abrupt temperature fluctuations. Also leave extra space for external accessories.

Tank size and shape need to accommodate fish swimming patterns, territorial needs, and density.

Hood

An aquarium hood serves several purposes. Usually it provides a light source; prevents fish from jumping out of the tank; and reduces evaporation, noise, and the release of foul odors. Providing proper lighting is not essential, but can enhance the coloration of fish. Too much light can be as much a problem as not enough light. Fluorescent lights in hoods may emit more light than needed. If your fish appear frightened in a well-lighted environment, try

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Aquarium hoods can supply light, reduce evaporation, prevent release of odors, and keep fish from jumping out (or the cat from reaching in).

dampening the intensity by placing construction paper under the light device. If your tank receives adequate lighting from surrounding lights, a hood may not be needed, and covering the tank with a piece of glass may be sufficient and less expensive. Nevertheless, some type of cover should be used.

Filtration

Filtration devices maintain suitable water conditions for fish (see Water Quality). Types of filters include sponge filters, power filters, canister filters, and underground filters. Tanks containing high densities of fish generally require a larger filter. A smaller filter, however, may be used if fish are fed properly and the water is changed frequently. Generally there are three mechanisms of filtration: mechanical, biological, and chemical. Modern filtration devices can provide all three of these mechanisms, and are suitable as stand-alone filters under most conditions.

Mechanical Filtration

This mechanism removes solids (food and fish waste) when water is drawn from the tank and forced through a porous medium, such as the medium on filter cartridges. Mechanical filtration also plays a role in biological filtration because bacteria may attach to filter cartridges.

Biological Filtration

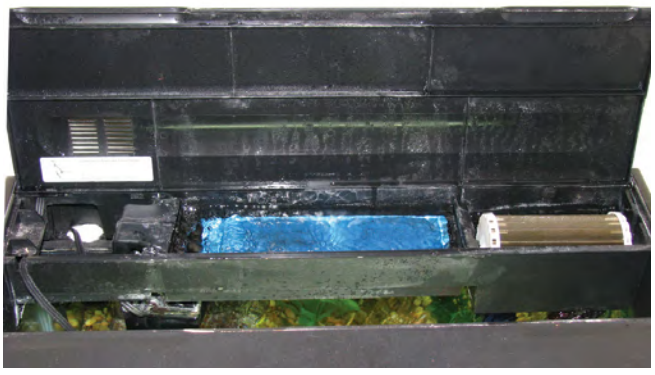
Biological filtration is the most important mechanism of filtration. It is responsible for "detoxifying" ammonia that originates from fish waste and decaying food. This compound is toxic to fish. Fortunately, the presence of ammonia stimulates the growth of nitrifying bacteria. These bacteria first transform ammonia to nitrite, then transform nitrite into nitrate. Nitrate will not harm fish unless present in very high concentrations, which is unlikely to occur if the water is changed periodically. High levels of nitrate, however, may promote the growth of algae (see Algae Problems). Nitrifying bacteria reproduce and begin to attach to all tank surfaces soon after ammonia enters the water. Biological filters, or biofilters, concentrate these bacteria into one area. As the water is forced through this area, the bacteria efficiently detoxify the ammonia present in the water.

A newly established tank often becomes cloudy due to heavy bacterial reproduction. This is a natural process, and the bacteria do not harm the fish. The cloudiness may begin the day after the tank is filled or may not occur for weeks. It can last from one day to more than 30 days. Frequent water changes will only prolong this natural "break-in phase." If a water change is necessary, do not change more than one-fourth of the water. Also, do not replace biofilter media until the aquarium has matured for at least two months. It is important to be patient and allow the bacteria to fully establish.

Chemical Filtration

Chemical filtration involves the use of activated carbon. Activated carbon removes odors, colors, and small impurities that mechanical filtration cannot remove, such as metals and chlorine. Tap water usually contains two forms of chlorine: free chlorine and chloramine (chlorine combined with ammonia). Both forms are toxic to fish and nitrifying bacteria, and need to be eliminated. Activated carbon should not be used as the primary means of removing chlorine. Instead, water should be treated with conditioners designed specifically for this purpose (see Aquarium Set-up). Conditioners designed to treat both forms of chlorine will break the chlorine/ammonia bond of chloramines and will convert all free chlorine to harmless chloride. Some conditioners may increase ammonia levels, but some have no effect on it. In either case, biological filtration is needed to eliminate the ammonia.

Filtration devices maintain tank water conditions.



A heater helps to keep water temperatures stable.

Aeration (Air pumps)

Air pumps supply the most critical element for fish survival: dissolved oxygen (see Water Quality). These devices may be used specifically for this purpose, but also may be used to drive filters, such as underground filters. Provided fish density is not too high, air-driven filters can provide adequate aeration and filtration, whereas mechanically driven filters may not produce enough oxygen; in this case, an air pump can be used to add oxygen.

Gravel

As a general rule, use about 1 pound of gravel for every gallon of your tank's capacity. Although beneficial, gravel is not essential; cleaning a tank is easier when gravel is not present. Smaller-sized gravel, however, can benefit fish that burrow or build dens.

When selecting colors, keep in mind that the color of some fish may change in accordance with the color of the gravel. Also, some artificially colored gravel may emit small paint chips that can foul filters. If this occurs, try using a new brand, or use non-colored or naturally colored gravel.

Small-size gravel allows fish to burrow or build dens, and artificial plants, ceramics, and rocks provide hiding places.

Ornaments

In addition to bringing natural beauty to an aquarium, large rocks, artificial plants, and ceramic devices act as hiding places for fish. Background paper attached to tanks also can be used to comfort fish. When introduced to a new environment, most fish will seek shelter. If shelter is not provided, fish may become greatly stressed, and may damage themselves by colliding into the walls of the tank. Some fish are naturally insecure and will continually seek shelter, especially when kept with aggressive fish. Avoid adding too much habitat, however, that may trap food and foul the water.

Heaters

Heaters should be used when fish require a specific temperature. Room temperature (68˚F) may be suitable for some fish, provided this temperature does not change abruptly. The consistency of the temperature is usually more important than the actual temperature. In a cool environment, fluorescent lights in hoods used without a heater may cause temperature fluctuations.

Aquarium Set-up

Wash the tank thoroughly with hot water. Dry the tank, and apply the background paper to the outside of the tank. Position the tank. If an underground biofilter will be used, establish it. Wash the gravel in hot water to remove fine particles and add it to the tank. Wash and add the ornaments, filters, and heaters – do not plug in any accessories at this time. Ornaments made of wood should be boiled, as they can discolor water.

If tap water is used, treat the water with an anti-chlorine/chloramine solution before or during the addition of water. The prescribed dosage may not be enough if your tap water contains an excessive concentration of chlorine; most conditioners designed for aquarium use can be used at concentrations higher than what is prescribed, but check the label to make sure. Do not use distilled water and use a limited amount of hot water if from the tap. Hot water often contains many impurities not present in cold water. Allow the faucet to run until a consistent room-temperature water is obtained. Slowly add the water so as not to disturb the gravel and ornaments. Use a net to remove small particles of gravel that remain suspended in the water.

Purchasing

Examine fish before purchasing them. Avoid selecting fish with "cottony" patches, eroded fins, and abnormal white or black speckles. Also avoid fish that remain near the water's surface, unless this is their natural behavior.

Examine the other fish in the tank as well, because disease can spread unnoticed. Finally, ask the salesperson how long the fish have been kept at the facility. Typically, the longer fish have been there, the better chance they will survive the adjustment into a new home.

Ask the salesperson what food he or she has observed the fish eating. Training fish to eat a different food can sometimes be very difficult. Determine whether the fish will be compatible with the other fish that will be in your tank. Ask the salesperson, or observe the fish's behavior. Fish that exhibit territoriality may prove to be expensive since they may require their own tank.

Stocking

Fish can be stocked soon after the aquarium has been established. Newly established tanks, however, contain low numbers of nitrifying bacteria, and possibly high ammonia concentrations if conditioned tap water is used. Do not initially stock many fish, or ammonia or even nitrite may reach toxic levels. If you are not sure whether the conditioner you use eliminates ammonia ("neutralizes" chloramine does not always mean that it eliminates ammonia), it is beneficial to allow your filter to operate in your tank for at least a week before adding fish.

Fish should be acclimated (slowly adjusted) to their future environment. Abrupt changes in conditions can cause great stress to fish, making them more susceptible to contracting disease. First, acclimate the fish to the temperature by placing the container (bag) with the fish into the tank for at least 15 minutes. Next, acclimate the fish to the water's chemical properties by periodically adding small amounts of the aquarium water to the device containing the fish. Before adding the fish, dim the lights to reduce stress. It is not uncommon for a fish to adjust to its new home by resting at the bottom of the tank. Also, a fish's color may temporarily change after being placed into a new environment.

Maintenance

Feeding

The type of food needed for fish depends on their feeding behavior. For example, a fish that feeds from the surface usually requires a floating food, while a bottom feeder usually requires a sinking food. Aquarists commonly feed fish flake food. Most fish purchased from a pet store are trained to eat this.

It is very important to not overfeed fish. Because fish "waste" contains ammonia, feeding too much can create water quality hazards. Also, decaying food produces ammonia, and stimulates the growth of water fungi (a white cottony substance that may be harmful to weak fish). Feed fish a little at a time (as much as they will eat in one to three minutes), about two or three times per day if possible.

However, fish can safely endure long periods (sometimes days or weeks) without food. Do not feed large portions, but be sure that each fish gets an opportunity to eat its share. With the exception of feeding bottom-dwelling fish, a large amount of food settling to the bottom is an indication to reduce the portion size.

Water Changes and Cleaning

If properly maintained, the water may not need to be changed for extended periods (one month or greater). However, changing the water every two to three weeks should be considered if fish are kept at high densities. There are a number of indications that the water should be changed including: murky water, large amounts of fish waste or food at the bottom, decreased appetite of fish, and the presence of fungi or algae.

Procedure

Fish can remain in the tank during this procedure. Never attempt to move an aquarium when it is full or even partially full of water. Unplug all accessories, and reduce lighting if possible. If desired, ornaments can be removed and cleaned. Remove filters, but be careful not to release any waste into the water. Scrub the walls of the tank with an aquarium scrub brush; do not use chemicals. If available, use a gravel cleaner to siphon the water and debris from the gravel into a bucket. Otherwise, use some other type of siphon.

Remove no more than half of the water from the tank. Continue following the directions in Aquarium Set-up and add new water. Clean and replace any ornaments or accessories; do not use chemicals. When rinsing filter inserts or media, use de-chlorinated water at a temperature similar to that of the water in the tank; otherwise, nitrifying bacteria may be killed. The old aquamarine water can be used for this.

Water Quality

See the ISU Extension publication on water quality at http://www.extension.iastate.edu/Publications/PM1352A.pdf for more information. To obtain information on the chemical properties of your tap water, contact your local municipal water treatment plant.

Disease and Treatment

It is likely that you will encounter the need to treat fish for some type of disease. Four common diseases are "ick," fungi, fin rot, and black spot. Like humans, fish are constantly exposed to diseases. Whether the disease will be contracted depends on the health of the fish's immune system. There are many stressors that can suppress the immune system of fish. These may include over-handling, abrupt temperature change, water chemistry fluctuations, overcrowded conditions, attacks from other fish, and degraded or unsuitable water quality. Unfortunately, medicating can inflict great stress to fish and also kill nitrifying bacteria.

The presence of a disease on or in an individual fish does not always mean that the other fish will contract it. It is common to remove the infected fish and treat it in isolation. This reduces the amount of medication needed, avoids stressing healthy fish, and eliminates the need to cease filtration. The possibility still remains, however, of the disease re-infecting the fish after it's been treated or affecting other fish. If desired, the entire tank may be treated.

Tips and Facts about Treating Diseases

Symptoms may include external abnormalities; rubbing of the body on hard surfaces; coughing; loss of appetite, activity, equilibrium, and coloration; heavy breathing; and surface dwelling.

Before treating, cease all filtration. Medications can be adsorbed by filters, and also can kill nitrifying bacteria. However, aeration must continue and should be increased.

Reduce lighting to reduce stress. If the fish will be treated in isolation, use water from the tank, maintain a constant temperature, and minimize handling stress when removing the fish.

Dilute the medication before adding it. Concentrated medications can burn or kill fish. Some medications can stain tanks.

Disease can be spread by dip nets and by hands. Use separate dip nets for each aquaria and sterilize between usages. Also, wash your hands regularly. Aggressive fish often nip off pieces of fin; this makes the victim susceptible to disease, especially fungi. Use medications labeled for aquarium use, and store all chemicals in an area safe from children.

Do not flush sick fish down the toilet. If you wish to humanely end the suffering of a sick fish, place the fish in club soda, then into the refrigerator.

Algae Problems

Many different kinds and colors of algae, such as blue-green, red, and green, can grow in aquaria. Excess amounts of dissolved nutrients are usually factors that promote algal growth. Physically removing algae will provide only short-term results. Algae problems can be reduced by 1) frequently changing the water and cleaning filters, 2) reducing the intensity or duration of light, 3) reducing feeding and/or by stocking a bottom scavenger, 4) reducing fish density, and 5) by adding desirable aquatic plants that may out-compete the algae. Also, algae-eating fish are commonly used; however, in rare circumstances, these fish may consume the protective slime coat of large, non-aggressive fish. As a last resort the entire tank, including all accessories, can be disinfected with bleach and reestablished. Be sure to thoroughly rinse until all traces of the bleach are gone.

Suggested Readings

Gratzek, J.B. and J.R. Matthews. 1992. *Aquariology (Master Volume): The Science of Fish Health Management*. New Jersey: Tetra Press. 330 pp. ISBN – 1-56465-105-3

Post, G. 1987. *Textbook of Fish Health*. New Jersey: T.F.H. Publications, Inc. 288 pp. ISBN – 0- 86622-491-2

Scheurmann, I. 2000. *The Natural Aquarium Handbook*. New York: Barron's Educational Series, Inc. 159 pp. ISBN – 0-7641-1440-9

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File: Wildlife 5

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