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4-H 280 Tropical Fish: Part of the Nebraska 4-H Small Animal and Pet Series

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Tropical Fish

Part of the Nebraska 4-H Small Animal and Pet Series

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

The Cooperative Extension Service provides information and educational programs to all people without regard to race, color, national origin, sex or handicap.
A Note To Parents and Leaders

Welcome to an exciting project in aquatic science. Raising fish can be an enlightening and challenging experience. Project activities are geared to allow considerable flexibility in choosing the expense and depth of involvement. A child may invest just a few dollars if raising goldfish or more if raising tropical fish.

The record keeping teaches scientific recording practices and initiates good data collection. This is not accidental but a planned and necessary part of the program. Notice how the project initiates "experience centered" activities (building the aquarium, selecting containers, buying fish, food, plants, etc.). Specifically, it is designed to help the child learn about purchasing, undertake experiences that help development, acquire responsibilities, make decisions and care for living things. Reading books and talking with other hobbyists will encourage youth to expand their knowledge and interests.

Credits

The content of this project was developed from several sources. Recognition is given to Mrs. Mary Oberthur, 4-H volunteer leader, Indianapolis, Ind., Gary Garey, former Extension Agent in Otoe County, Karen Kolb, General Manager of "The Pet Ark", Lincoln, and others who have contributed to the publication.
Purpose Of the Tropical Fish Project

1. To interest 4-H youth in caring for tropical fish in the home aquarium by teaching them:
   a. the proper handling of fish
   b. grouping of two or more compatible breeds in the same aquarium
   c. feeding
   d. breeding
2. To learn how to construct a simple aquarium.
3. To learn the principles of a balanced aquarium.
4. To learn about environmental factors affecting the health of fish.
5. To help 4-H youth expand their knowledge of principles related to aquatic science.
6. To encourage 4-H youth to make new friends and to learn to share with others.

The best way to learn about tropical fish is to own some and learn their habits by careful observation. This project can be as simple or elaborate as the member desires.

1. Obtain:
   a. One or more large glass jars (gallon size or larger). The diameter of the mouth of the jar should be at least eight inches.
   b. At least three fishes
   c. Some aquatic plants
   d. Gravel and sand
   e. Pump and other accessories, if needed or desired
   f. Commercial fish food
2. Build or purchase an aquarium
3. Make a catch net
   If desired, larger aquariums may be built and a great number and species of fish may be obtained. After obtaining some knowledge of the life and breeding habits of each species, a breeding program may be started. Here the 4-H member will encounter new problems such as:
   1. The need for additional aquariums
   2. The need for different kinds of food such as infusoria, brine shrimps, worms and others

Planning the Project

Youths taking this project can choose many things to learn and do. You can learn the basics the first year, then look for new things to learn each year after that. Check which of the following you will work on this year.

___ Set up an aquarium
___ Identify and tell the origin of at least five breeds of genera (plural for genus) of fish
___ Learn what kinds of fish are compatible in a community tank
___ Learn about diseases that tropical fish are susceptible to and the treatment of the diseases
___ Identify at least three kinds of water plants that are used in aquariums
___ Explain what “balanced aquarium” means
___ Maintain an aquarium and take care of at least three breeds of fish
___ Successfully breed live bearing fish
___ Successfully breed egg laying fish
___ Give one or more demonstrations and talks on the Tropical Fish Project and Aquatic Science Lessons

Suggested Presentation Topics
1. How to make a catch net
2. How to place sand and water in the aquarium
Why A Tropical Fish Project?

Fish are lovely to look at and, with a little planning, they can be inexpensive, easy, interesting, soothing, and educational. Of course, they can be expensive, troublesome, and messy... it's all up to you!

Fish are completely dependent upon you for their food and living conditions. If you develop regular fish-care habits, your fish will thrive. They tolerate occasional neglect if they are in good condition, but continual neglect will show clearly. Remember: they are living creatures! You may select this project if you give your fish regular meals, clean water, and interesting surroundings. How would you feel in a bare bowl, swimming in dirty water, hungry and not knowing when or if you would be fed? Your fish will be a reflection of the real you... careful or careless.

When you get to know your fish, you will find they have personalities. Even in a large aquarium, individuals will stand out and earn names for themselves such as Baby, Grandma, Head Wife, Grumpy, Scaredy Cat, Big Papa.

Classes are divided by equipment and experience. Some of you will be caring for tropical fish for the first time while others may already have equipment and some experience. Equipment will control the kind of fish you have while experience will suggest what you do with them. Beginners who want to continue their work with fish should start planning this fall. In fact, the fish you start with may dictate what you do the second year. If you want to try breeding, you will need a year for results. Your library has many interesting books about tropical fish; ask the librarian to help you.

Raising tropical fresh water fish is quite similar to raising farm animals or a dog, cat or parakeet in the home. They all respond to proper feed, good care and a sanitary place in which to live.

The proper care and raising of all animals requires:
1. An interest in living animals.
2. An understanding of their living habits.
3. A keen sense of observation and interest in how they live and reproduce; interest in relationship between the animal and plant life involved.
4. The learning of skills as each new subject becomes a new learning experience for the 4-H'er. They can consult with their 4-H leader, parents and others in the community for information.
5. The reading of books and magazines to further broaden his knowledge. Much has been written on the topic of tropical fish and books on the subject may be borrowed from libraries or bought from stores.

The project helps develop an inquiring mind. It helps to satisfy the desire for new knowledge and adventure in the world of living things. New knowledge, new experience, new interests and understanding help boys and girls find themselves, their likes and dislikes and often their life's work.

Planning Ahead

Let's think about the "home" you will have prepared for your fish when you get them. Try to allow one or two days for the fish tank to "season." This means:
- dissolved chemicals such as chlorine can leave the water;
- bacteria have time to break down any detergents;
- the plants can get their roots settled; and
- rock dust can settle, leaving the water sparkling.

Here is a list of things you'll need to care for
Choosing Your Fish

If you have an unheated and unaerated bowl, carefully choose your fish. Many fish (betta, goldfish or white clouds) will do well under these conditions; others, however, may not adapt well to the lower temperatures.

Remember: Generally, the water temperature will be a few degrees below room temperature. Water temperature changes more slowly than air temperature. If the tank is in a draft, the water temperature will be cooler than usual. Tanks that are covered and have electric lighting will be several degrees warmer than the room. Guppies, which need water 74 degrees to 84 degrees Fahrenheit, will survive in 68 degree water but they will not breed.

Use an indoor or outdoor thermometer to check water temperature when you change or add water. You may want to get a small aquarium thermometer in order to keep constant check.

In selecting fish for your project you should have a scavenger, such as a catfish, to clean the food that drops to the bottom of the tank. Check with the pet store as to its temperament and the size it will be when full grown. Also check to see whether it is compatible with other fish in your tank.

Kinds of Fish

Barbs and similar fish

Cherry Barb, + Checker Barb, *Gold Barb, +Pear Danio, +Zebra Danio, +Goldfish, +White Cloud Mountain (the last two prefer water from below 64 degrees to 74 degrees)

Tetras

*Neon, Cardinal, Red-eyed, Black-lined, +Buenos Aires, +Tetra from Rio, similar fish is a +Bloodfin

Livebearers (Can be sexed by anal fin-gonopodium)


Labyrinth Fishes (take extra air at surface)

Betta or Siamese Fighting Fish (keep male in individual bowl), * + Three-spotted Gourami,
Blue Gourami, Opaline Gourami, Dwarf Gourami

Assorted Families
*Peppered Corydoras (catfish), Egyptian Mouth-breeder, Glass fish, + Australian Rainbow fish

*Fish suitable for a one-gallon bowl.
+ Fish that tolerate temperatures as low as 64 degrees.

When buying tropical fish from the pet store, make sure to learn where the fish would typically live and how the pet store obtained them. Tropical fish are usually found in tropical or warm sectors of the world, where great diversity in color, shape and size are available. Think of tropical fish as a product from another section of the world, where they are raised, sold and transported to pet stores for resale to pet lovers.

Setting Up Your Aquarium

An aquarium is the container in which live fish are kept. For the beginner, a large wide-mouth glass jar may work. Water weighs about 8-1/2 pounds per gallon, so a five-gallon container with water two thirds full will weigh more than twenty-five pounds plus the weight of the container.

Decide what size aquarium will best fit your home. You should decide where you want the tank and determine the size of aquarium that will fit that space. Aquariums should be away from heat vents and windows.

Pet stores sell all sizes of aquariums. A 10-gallon aquarium may be the most economical size for the beginner. It has enough area to create a good environment without costing a fortune (approximately $10).

Aquariums are made waterproof with aquarium cement. A good cement must hold glass and not dry out. It should be pliable enough to allow for the difference in water pressure as the aquarium is filled or emptied.

Here is a good way to sterilize your tank and check for leaks. Wash the bowl and any accessories such as castles or marbles. Put the accessories into the bowl and fill to the top with room temperature water. Add approximately one tablespoon salt per five gallons of water. Let the water stand for about one hour. Dip or siphon off the water if you have a tank to prevent springing the sides. Rinse the tank and fill with clean conditioned water. Now you are ready to set it up for your fish.

The beginner should fill the jar only to a depth equal to the width of the aquarium. For example, if the container is eight inches wide, the water should not be more than eight inches deep. Even though fish live under water, they need oxygen. Without a constant supply of oxygen, the fish will suffocate. The number of fish, amount of surface area and depth of water needed has been worked out scientifically in order to supply the proper amount of oxygen.

Oxygen can be provided by using a mechanical water aerator or water plants. A mechanical water aerator helps circulate the water in the tank. This helps prevent the water from separating into layers with the warm water on top and cooler water below. It also helps remove harmful gases while picking up soluble oxygen which is introduced in bubbles. The main purpose is to keep the carbon dioxide content of the water as low as possible. Water plants work by using the water's carbon dioxide to produce oxygen.

To find how much water you have available, measure the amount it takes to fill your tank to three inches from the top (two inches top space, one inch gravel). A five gallon tank will
house six fish, plants and other animals. The number of fish which can survive in a given aquarium also depends on the kind of fish selected. The Labyrinth fish, which swallow surface air, can take more crowding. Male Siamese Fighting Fish are never kept with other bettas because they will kill one another if kept in the same tank. Siamese Fighting Fish may be kept in a community tank with docile fish. Allow the fish plenty of elbow room until you have gained experience. Remember: Fish grow and multiply!

Getting Tropical Fish Home Alive

You may have heard of someone who just bought a fish, took it home and it died. The fish owner may have wondered if the fish was already sick when he bought it. It's more likely that it died because of the stress it experienced during the trip home.

Remember to keep your fish at an even temperature while transporting them. You probably received the fish in a plastic bag with just a little water. If it was cold outside, did you hold the bag between your coat and body so that it didn’t lose heat? In the car, did you turn on the heater and ride home warm as toast? Did you overheat them by parking the car in the sun, rolling up the windows and going out to shop more. Solar radiation will warm the inside of a car even in cool weather. Some people like to ride with their car window open and a breeze on their face. This will cool their fish as well as their face! When transporting fish, be careful not to expose them to rapid temperature changes.

Let’s review a few basic rules. Protect your fish from rapid changes at all times. Rapid temperature changes within a range the fish would normally tolerate are as bad as extreme changes. Changes can cause so much stress that the fish’s natural ability to fight infections and diseases may be lessened.

When you get them home, float the bag in your tank for 15 to 30 minutes. Let the temperature equalize slowly. Now take time to help the water conditions equalize. Although the water in the dealer’s tank and your tank came out of the same city water system, they may not be the same chemically. Many factors may affect the water. Take as much time to equalize the water as you did the temperature. Let water from your tank into the bag a little at a time. Rapid changes of water conditions can be just as harmful as rapid temperature changes. Pour the nearly full bag through a net out into a sink or a bucket and place the fish into your tank. Never pour contaminating “shipping water” into your tank.

Filling The Tank

1. Assemble the materials one or two days before getting the fish.
2. Put gravel in a pan or large strainer and run tap water over it until the water runs clear. All gravels have some dust and even after washing, they may cloud the water.
3. Place the gravel in the bottom of the tank. Put more gravel in the back of the tank and less in the front. This will bring dirt to the front for siphoning and allow deeper gravel for background planting. In round bowls with floating plants, cover the bottom evenly with gravel.
4. Put a saucer on the bottom of the tank and pour water into it. This will disturb the gravel less. Fill the tank 1/3 to 1/2 full.
5. Place the plants and accessories. Fill the tank to two or three inches from the top.
(An alternate method)

1. Follow instructions 1 and 2 from above.
2. Fill tank 1/3 to 1/2 full of water. Put the gravel in a cup or jar. Holding the cup under water, pour the gravel slowly into place in the tank and shape it with your fingers.
3. Place the plants and accessories.
4. To complete the filling, place your hand in the tank so your fingers touch the side of the tank and your palm is facing outward. Pour the water onto palm of your hand so that it runs down your fingers and onto the walls of the tank without disturbing the gravel.

Draining The Tank

A commercial vacuum siphon may be purchased or a gravity siphon using a plastic tube may be used to remove water from the tank. The intake end disturbs the gravel letting the dirt siphon out with the wastes from the bottom of the tank.

Siphon as much as 1/4 of the water from the bottom of the tank once a week. Be sure to replace it with seasoned water and you will not have to change the whole tank. To start the siphon, fill the tubing at the sink or slowly lower it into the water. The waste end must be lower than the intake end and the intake end must be under water at all times. Pinch the tubing by folding it sharply when you move the siphon.

If the siphon is working properly, dirt will be quickly sucked into the tube. Keep the tube slightly above the bottom. If gravel or a snail is pulled in the end, they will often drop free if the tubing is pinched to stop the water flow. If one stops the flow, you may be able to flush it out by raising the intake end or by using the faucet. If this does not work, hold one end of the tube with one hand and use the other hand to push the rock or snail out of the tube.

Gravel

A small bag of colored gravel will do for 2 to 3 one-gallon jars. Solid colored gravel is better than multi-colored because you can spot dirt and uneaten food more easily. Use care in picking up rocks to add to the bottom of your tank. Limestone rocks will make the water too alkaline. Some blue and green rocks have poisonous compounds. Be sure that any decorations are colorfast and insoluble. Petrified wood is good. Be sure that any decoration placed in your tank is meant for aquarium use. Before using any rocks found outdoors, examine them to see if they are safe. Also, never use sea shells or coral in a fresh water aquarium because they are made of calcium deposits and may break down and release impurities into your tank. These impurities might harm your fish. Manmade corals are available, but are quite expensive.

Locating the Aquarium

Put your aquarium in a place where it receives a medium amount of light. Strong light encourages the growth of algae which turns the water green. In general, a northern or western exposure of light is most suitable — north being the better of the two. If your aquarium must face a southern window, fasten green cellophane to the side directly facing the sun.

If algae turns the water green, you may add some Daphnia (waterfleas) to clean out the algae. After the water is cleared, your fish will eat the Daphnia. If several fish are in the tank, you may want to move some to another tank so they won’t eat the daphnia before they finish their work. Algicides also are available to kill algae.

If sufficient light is not available and plants begin to lose their green color, place an electric lamp with a 75 watt or 100 watt bulb over the aquarium a few hours each day. Do not keep an aquarium close to a radiator.
Plants

Plants increase the available oxygen in the water. Choose healthy plants with good color, clean odor and no slime. Rooted plants will need one to two inches of gravel. Place plants in the rear of the tank where they can serve as background. Do not crowd plants as they, too, take water space and get food caught on their leaves. If plants are placed on the side with the most light, baby livebearers will swim to them for protection. A $1 bunch of floating water plants will be enough for two to four bowls. A variety of plants are available. Anacharis, Cabomba, or Hornwort are recommended because they are especially hardy.

Although plants are not absolutely necessary in an aquarium, they do have several purposes. Some commercial breeders do not use them because they get in the way when fish must be netted. The plants also hinder inspection of fish for size and health, tend to drop leaves and are sometimes rather messy.

In a home aquarium, plants are likened to a picture with a frame. They serve the following purposes:

1. They give off oxygen during photosynthesis while absorbing and using the carbon dioxide given off by fish.
2. They decorate the aquarium.
3. They act as a water tester. If plants can grow, fish can live in the water.
4. Large leaf plants slow the growth of smaller plants and algae by shading and starving them.
5. They help provide food because organisms which grow on plants are eaten by fish.
6. They act as shelter and hiding places for smaller fish.
7. They act as spawning medium for many types of egg-laying fish.
8. They use fish wastes.

Aquatic plants are divided into three main groups: rooted, bunch and floating plants. Bunch plants don't have roots when purchased, but produce them after planting.

Aquatic plants, like fish, have common names and scientific names. Here is a list for each of the three main groups of aquarium plants. (Using different kinds of plants will make your project and your aquarium more interesting.)

Rooted Plants:
1. Amazon Sword Plant (Echinodorous brevipedicellatus)
2. Pygmy Chain Sword Plants (E. intermedius)
3. Madagascar or Ruffled Sword Plant (Aponogeton undulatus)
4. Madagascar Lace Plant (fenestralis)
5. Water orchid (Spiranthes odorata)
6. Spatterdock or Cow Lily (Nuphar advena)
7. Cryptocoryne Dordata and other species
8. Sagittaria, Tape grass or Arrowheads (Sagittaria subalata)
9. Water fern, water sprite (Ceratopteris thalictroides)
10. Hygrophila ply
11. Spike rush (Eleocharis)

Bunch Plants
1. Fanwort, Washington Plant, Water-shield (Cabaomba caroliniana)
2. Elodea (Anacharis canadensis)
3. Milfoil (Myriophyllum spicatum)
4. Water purslane (Ludwigia palustrus)
5. Water Hyssop or Bacopa (Hydortrida caroliniana)
6. Hornwort (Ceratophyllum demersum)

Floating Plants
1. Water Hyacinth (Eichhornia crassipes)
2. Spanish Moss (Tillandisa usneoides)
3. Nitella gracilis
4. Crystalworth (Riccia)
5. Duckweed (Lemna minor)
6. Salvinia auriculata
7. Water lettuce (Pistia statiotes)

Filter

Many types of filters are available. Undergravel filters work best. They consist of one or more "plates" that lie on the bottom of the tank, with the gravel spread over the top. Air is pumped down a thin plastic tube and released at about gravel level. As the air rises through the larger plastic tube, it draws water from under the plate with it. This creates a suc-
tion under the plate that draws more water down through the gravel, along with waste and debris. An undergravel filter also can be operated by using a "power head", which is a pump that sits on top of the large tube and draws water up, pumping it back out into the tank. Generally, these are more efficient than an air driven pump, but you must have one power head for each filter plate, and these are more expensive.

Be sure to follow the installation and use instructions provided with your filter system.

Food

There are many varieties of food. Carefully examine the different kinds of food and check with the clerk to learn which foods are best for your fish. Some fish are top feeders, some eat only from the bottom, some prefer sinking pieces and others don't care. Tropical fish can be fed one to two times a day. Be sure they eat all the food in five minutes. Overfeeding is easy and dangerous. If too much feed is given, the uneaten portion settles to the bottom of the aquarium and unless it is removed by a syphon or consumed by scavengers, it will turn sour and cause pollution. It can release harmful gases which will cause the fish to die.

Different fish have different feeding requirements. Some fish, such as those you wish to spawn, must be well-fed to reproduce. Small fry must be fed often. Sometimes it is necessary to feed them every eight hours to prevent them from starving to death. Members should learn about the specific feeding needs of their fish. Remember: it is much easier to overfeed than to underfeed.

The beginner should confine his interest to commercial feeds. For the more experienced, worms, brine shrimps, infusoria, daphnia and other foods offer challenge since special techniques are involved in raising them.

Snails

Snails serve two important purposes in the aquarium. First, they serve as excellent clues as to the condition of the aquarium water. Excessive amounts of carbon dioxide gas will drive them to the surface so they can be nearer the oxygen source. When this happens, start aeration and remove some of the old water and replace it with conditioned water. When the snails return to their normal activities, you can tell the condition has improved.

The second reason for using snails is that they serve as scavengers and help keep the aquarium clean. The snails will find surplus food and dispose of it quickly. Snails also will add color and variety to the aquarium. Different types of snails may be purchased at a pet store. Snails also may be on the plants you buy. Baby snails look and feel like a fine grain of sand but they grow quickly. They eat the food the fish leave and help clean the tank by removing algae. They can become a nuisance, however, if you do not control the number of snails. Snail eggs should be allowed only in large tanks. Large snails are good for large tanks since they do not eat plants and do not reproduce rapidly.

You can use two snails per gallon of water except for the large snails. If they are used, do not have more than three in a five gallon tank.

There are many kinds of snails. One species, the Ampullaria cuprina, which is also called the "Mystery Snail", does not eat plants and is a good scavenger. It is a good snail for beginners to use.

Light for the Aquarium

Light is important for the aquarium because it: 1) controls the form, color and reproduction of plants; 2) enables fish to find their food; and 3) affects the color and behavior of fish.

In regard to plant life, here are several points to remember. Depending on where you
place your aquarium, a certain amount of light becomes important.

**Very Little Light** — Plants will fade and decay, roots will rot, and the water will become acid, bad smelling and cloudy. In a rather short time no fish will be able to live.

**Medium Amount of Light** — Plants will be weak and brown algae will form. This condition can go on for months, but your tank will not be in a healthy condition.

**Sufficiently Lighted Tank** — The plants are a rich green, healthy and in good growing condition.

**Too Much Light** — Plants grow over the top and green algae forms. Eventually your tank will react as though it had very little light and plants and fish will soon die.

Remember that the following recommendations for correct lighting are general. Consideration must be given to whether your tank is placed in front of a bright, sunny window or against a wall.

Two kinds of lighting may be used: incandescent and fluorescent. Incandescent lights are rich in yellow, orange and red colors and weak in blue and violet. They give more shadows and more color for warmly colored fish. Their main disadvantage is the amount of heat they give off. The following wattages are recommended:

<table>
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<tr>
<th>Tank size in gallons</th>
<th>Incandescent lamp wattage</th>
<th>Hours of light</th>
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Tests have shown that fish prefer that their light come from the top rather than from the side or bottom of the tank.

**Fish Disease**

Fungi and protozoan called water icht are two of many parasites which bother fish. They cause gray patches and white spots similar to a grain of salt on fish fins. These fish should be isolated quickly. Take a sick fish in a plastic bag to a pet shop to be diagnosed. The best prevention is to never let fish get chilled. Chilling lowers their resistance.

Study fish behavior for other disease symptoms:

1. Hiding in the plants
2. Lying on the bottom
3. Holding fins close to their body
4. Gasping for air at the top
5. Red spots
6. Cottony patches
7. White spots
8. Bloating

Because so little is known about many fish diseases, it may be desirable to destroy the diseased fish.

**Salt**

Aquarium salt is available or you can buy a box of plain, non-iodized table salt to use in cleaning your equipment. NEVER USE DETERGENT! Salt sprinkled on a clean cloth or wad of nylon net does an excellent job.

Livebearers and goldfish benefit by adding one tablespoon of salt per 5 gallon H₂O. This increases their body slime and prevents some diseases. Never add more salt to the tank unless you have removed some of the existing water. Salt does not evaporate.
Fish Care Habits

Each time I look in the bowl do I automatically check for these problems?
- Are all fish alive and healthy? Do they look healthy? Are there any torn fins, etc.?
- Is there any uneaten food on top or bottom?
- Is equipment working properly?
- What is the temperature? Is it out of drafts and in full midday sunlight?
- Are plants healthy and in place?
- Is the water level up, clear, and with no foul smell?
- Is the tank covered? Are there foreign objects?

General Management
- Isolate new or sick fish in a separate small bowl.
- Keep everything but known safe objects out of water.
- Guard against sudden changes in the water temperature.
- Do not tease fish by splashing water or tapping on the glass. However, goldfish may be trained to come to the side of the bowl by tapping softly.
- See that members of family understand the safety rules.

Feeding
- Feed no more than they can eat in five minutes; remove excess food promptly.
- Feed regularly two times a day.
- Feed fish yourself. In emergency leave written instructions or have another hobby member do the feeding.
- Give a variety of food.
- Keep food out of reach of others.

Cleaning
- Wash and rinse hands thoroughly before and after caring for fish.
- Dump waste water in toilet, not in sink.
- Rinse any dishes or pans carefully before using. Do not use metal.
- Condition water by aging with chemicals (well water does not need this, although conditioning can only help your fish.
- Clean the bottom of the tank by siphoning about 1/4 of the water once a week.
- Replace siphoned and evaporated water with conditioned water.
- Check water temperature before adding it to the tank. Warm the water if needed by heating a small amount. Add the water by pouring against your palm and down your fingers onto the side of the bowl.
- When changing the water in the entire bowl, save the top 1/3 to 1/2 of water if possible to place fish in and add it to the new water later.
- When changing an entire bowl of water (with fish out), use salt — not soap — to clean the bowl.
- Scrape the water evaporation mark off the bowl regularly to prevent an accumulation.
- Use an aquarium scrubber pad to clean the sides of the bowl.
- Keep all chemicals on a high shelf . . . they will kill fish if they are not used according to the instructions on the container.
- Never touch fish with your hands. Always use a net.
- Wash any dishes or pans thoroughly after use and replace them.

Safety Rules
(for your family and friends)

Fish need specific kinds of care. Do not leave small children alone with fish until you have supervised their first viewings and carefully explained that they should not try to care or play with the fish. Anyone who does not know how to care for fish should not do the following things:
* put anything in the water
* tap on glass or splash water
* try to catch fish
* feed
* mess with the equipment
Preparing Fish For Exhibiting

* If you have several fish, choose large healthy specimens.
* Carry the fish to the show in a small bowl with a plastic cover. Put the bowl in a box and firmly hold it in place by putting foam rubber or tightly wadded paper around it to protect it from spilling and temperature changes.
* Give the same attention to temperature, air, food and space for the fish on exhibit as in the home aquarium.
* Prepare a background for the fish bowl that will allow visitors to see your fish.
* Prepare a label or poster about your fish including name and other interesting information. Show rules may list the information that should be included.

Simple Equipment To Make Yourself

Net

Materials Needed: Coated wire clothes hanger (not an exposed metal type), a woman’s old nylon hose (no holes or run in toe), tape or file, needle and thread, pliers with wire cutter or both pliers and wire cutter.

To Make: Cut hanger as in picture. Straighten. Bend short end into loop and twist around handle. Smooth rough edges with file or cover with tape. Cut about 3 1/2 inches from toe of hose and sew onto loop of wire or use a small piece of nylon net.

Aquatic Science Lesson 1

What is a Fish?

If you were to ask your friends what a fish is, you would get all kinds of answers. Would you go along with the definition of a fish as being any creature that lives in water? Whales, mahimahi, oysters, squid, and starfish are some of the living creatures that make their homes in water. Are they all fish?

Perhaps the above definition of a fish is not enough. Whales and seals, and even alligators and frogs live in water, but they are not fish. Whales and seals are mammals — they have hair and feed their young milk. Alligators are reptiles like snakes, turtles and lizards. Frogs are amphibians like salamanders.

First of all, every creature mentioned above is an animal. All living things that are not animals are plants.

All animals fall into one of the two groups — one with backbone (vertebrate) and the other without backbone (invertebrate). Do you have a backbone? Do oysters have a backbone?

The first requirement of the definition of a fish is that the creature must have a backbone (vertebra).

The second requirement is that the vertebrate must be adapted purely for living in water. So you can see that amphibians such as frogs and reptiles are excluded. Seals and walruses also are out of the fish classification.

The third requirement is that the creature must move about and keep balance in the water by means of fins. The seal is again disqualified because what we normally think of as fins on seals are actually flippers. Flippers differ very much from fins. The flipper of a mammal and the fin of a fish both serve the same purpose.

The fourth and last important requirement is that the creature must be able to obtain oxy-
PARTS OF THE FISH

- Dorsal Fin
- Caudal Fin (Tail)
- Anal Fin
- Lateral Line
- Dorsal Fin
- Caudal Fin (Tail)
- Anal Fin
- Lateral Line

Male is much more colorful

Male is much more colorful

GUPPY

GONE

MALE

FEMALE

Live bearing
gen from water for breathing through gills. The tadpole is almost a fish. Why isn't it a fish?

If they meet the above requirements, they are fish. Otherwise, they may be crustacea (crabs), amphibians (frogs), mollusks (shell fish) or a number of other things.

Does the creature in your aquarium meet all the requirements?

1. Does it have a backbone?
2. Does it live in water all the time?
3. Does it move about using its fins?
4. Does it breathe through the gills?

**FORMS OF FISH TAILS**

A. Lunate or crescentic - moon shaped  
B. Forked  
C. Emarginate - notched  
D. Truncate - cut off  
E. Rounded  
F. Pointed  
G. Double emarginate - double notched

**Fins**

Let us study dorsal fins first. The word dorsal has a special meaning, so look it up in the dictionary. Fish have different arrangements of dorsal fins.

Then there are the ventral fins and pectoral fins. The tail also is a fin.

Look at a fish and count how many there are of each fin. You will note that some of them come in pairs, while others are single. The single ones are called median or fins that are in the middle line of the fish. Is the tail a median fin? Paired fins are the other kind of fins. These come in pairs — one on each side of the fish.

Fins are used to balance the fish as it swims. They also are used as steering aids. The tail is a caudal fin. Fish tails come in various forms and each shape is given a special name.
### Aquatic Science Lesson 3

**Identifying Animals & Plants**

All known animals are named and classified according to their natural relationships. Most living things can be placed quite naturally into two main groups — animals (Animalia) and plants (Plantae). These two groups are called kingdoms. Kingdoms are further divided into groups of similar organisms called phyla (one single group is called a phylum). Phyla are split into closely related sub-groups called classes. Classes are broken into orders, orders into families and families into genera. Genera (one is called a genus) in turn are split into species. Here are the complete classifications of man, the swordtail fish, the monarch butterfly and the tomato.

The number of species of fishes is about equal to the number of all other animals, reptiles and birds in the world. Therefore, some systems had to be invented to keep their identification straight. More than two hundred years ago, a scientist named Linnaeus discovered that common names of animals and fish referred to more than one kind. He was a Swedish naturalist who was born in 1707 and who died in 1778. Linnaeus proposed a system called the binominal system. "Bi" means two and "nominal" means laws or terms. In other words, this was a system using two names, usually based on Latin or in Latinized Greek.

For instance, the popularly called swordtail is Xiphophorus Hellerii, pronounced Zifo-fo'rus hel'ler-e-eye, which means sword-carrier, and the second part is named after the collector Carl Heller. Wherever you go this fish is known as Xiphophorus Hellerii. If you said, "swordtail", you are using a common name that may mean a different fish to another person.

Both generic (from genus) and specific (from species) may be named in honor of the collector, geographic places or the eyes or nose or other parts of the body that may describe the fish. More commonly the name describes a characteristic of the fish. For more information about using scientific names for your fish, ask a librarian for help in finding books about tropical fish as pets.

<table>
<thead>
<tr>
<th>Group</th>
<th>Man</th>
<th>Swordtail Fish</th>
<th>Monarch Butterfly</th>
<th>Tomato</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom</td>
<td>Animalia</td>
<td>Animalia</td>
<td>Animalia</td>
<td>Plantae</td>
</tr>
<tr>
<td>Phylum</td>
<td>Chordata</td>
<td>Chordata</td>
<td>Arthropoda</td>
<td>Spermatophyta</td>
</tr>
<tr>
<td>Class</td>
<td>Mammalia</td>
<td>Osteichthyes</td>
<td>Insecta</td>
<td>Angiospermae</td>
</tr>
<tr>
<td>Order</td>
<td>Primate</td>
<td>Teleostei</td>
<td>Lepidoptera</td>
<td>Polemoniales</td>
</tr>
<tr>
<td>Family</td>
<td>Hominidae</td>
<td>Poeciliidae</td>
<td>Danaidae</td>
<td>Solanaceae</td>
</tr>
<tr>
<td>Genus</td>
<td>Homo</td>
<td>Xiphophorus</td>
<td>Danaus</td>
<td>Lycopersicon</td>
</tr>
<tr>
<td>Species</td>
<td>sapiens</td>
<td>Hellerii</td>
<td>plexippus</td>
<td>esculentum</td>
</tr>
</tbody>
</table>
Aquatic Science Lesson 4

Water

In many cities, drinking water is chlorinated. This means that chlorine has been added in a very small amount to kill certain harmful bacteria in the water. The chlorine will hurt the fish, unless it is removed from the water. Therefore, the water must be conditioned before it can be added to the aquarium. Fish have gills which take the place of lungs in other animals. The gills remove the soluble oxygen in the water and give off carbon dioxide.

Since most areas do use chlorine, which doesn't break down easily, use water conditioners to remove the chemical. This will create a protective slime shield on the fish, promote growth of essential nutrifying bacteria and reduce stress and injury to your fish. Conditioner also will detoxify some heavy metals.

Water temperature can be a critical factor, depending on the kind of fish you raise. Sudden temperature changes may easily harm or kill your fish. If you are raising tropical fish, the temperature should be kept at 75-78 degrees Fahrenheit. Do not put tropical fish in water below 75 degrees Fahrenheit. Goldfish, however, can live in water from 50 degrees to 75 degrees Fahrenheit.

Another important thing about the water is the pH factor. Under usual conditions, water is either acid or alkaline (seldom exactly neutral). The term "pH" refers to those opposite factors and their degree of intensity. Chemists use a scale in which 7.0 represents neutral. Alkaline is higher — acid is lower. The following scale indicates the degrees of intensity.

<table>
<thead>
<tr>
<th>Acid</th>
<th>Neutral</th>
<th>Alkaline</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0, 6.2, 6.4, 6.6, 6.8</td>
<td>7.0</td>
<td>7.2, 7.4, 7.6</td>
</tr>
</tbody>
</table>

In some areas of the United States and other counties, the pH of the water in lakes and ponds has been lowered to a level that will no longer support fish. This has been caused by "acid rain", rain that falls over areas with much pollution in the air. Industries which produce high levels of pollution are working to reduce the damage caused by air pollution and acid rain.

Most pet stores carry a number of water testing kits and the necessary chemicals to correct water acidity. Some systems use a sensitive dye called an "indicator solution." The color is compared to a standard comparison scale. Other systems are less messy and also accurate.

Some areas have a concern regarding hard water. Hard water will affect treatments you may be attempting to make to the aquarium by acting as a buffer against change.

Aquatic Science Lesson 5

Fish Behavior

As you continue to raise and care for aquarium fish, you will find certain behaviors that are interesting and fun to study. By observing your fish regularly, you may be able to determine the causes of some fish behavior. This will give you information about the fish and their habits.

Prepare a form for recording information about your fish. Following are a few things you may look for:

1. Location - Where do they prefer to
   - feed:
   - rest:
   - hide:

2. How do they interact with other kinds of fish?
3. What kind of food do they prefer?

4. What effect does the bubbler or aerator have on the fish?

5. How do they react to light?

6. How do they react to plants?

7. Other observations:

Set up a schedule when you will observe the fish. Determine how many observations you want. Twenty observations could be made at 5 minute or 60 minute intervals. Observing on a regular schedule would be a random sample that provides an accurate description of the fish behavior for the specified period of time. If you have access to a computer, you may wish to record your observations for easy summary.

Use the information you have gained for a presentation or an exhibit about your fish.